Maths

UNIT 1

SETS

EXERCISE 1.1

1. State, given reason, whether the following objects form a set or not:

(i) All problems of this books, which are difficult to solve.

Solution:

It is not well defined because some problems can be difficult for one student but easy for others. So it is not a set.

(ii) All problems of this book, which are difficult to solve for Amjad.

Solution:

It is well defined because some difficult problems of the book can be identified for Amjad. So it is set.

(iii) All the objects heavier than 26 kg.

Solution:

It is well defined and hence it is a set.

(iv) Students in a classroom.

Solution:

It is not well defined because class in not mentioned. So it is not a set.

(v) Books in your school-bag.

Solution:

It is well defined and hence it is a set.

(vi) Counting numbers from 5 to 15.

Solution:

It is well defined and hence it is a set.

(vii) Students of your class, who are taller than you.

Solution:

It is well defined and hence it is a set.

2. If set $Z=\{4,6,8,10,12,14\}$. State which of the following statements are correct and which are wrong.

(i) $5 \in Z$

Solution:

Wrong, because '5' is not member of set 'Z'.

(ii) $12 \in Z$.

Solution:

Correct, because 12 is member of set 'Z'.

(iii) $14 \in Z$

Solution:

Correct, because 14 is member of set 'Z'.

(iv) $9 \in Z$

Solution:

Wrong, because 9 is not member of set 'Z'.

(v) 4, 6 and 10 are members of the set Z.

Solution:

Correct, because 4, 6 and 10 are members of the set 'Z'.

3. Write the following in tabular form of the set:

(i) Set of days in a week.

Solution:

{Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}.

(ii) Set of first ten natural numbers.

Solution:

{1,2,3,4,5,6,7,8,9,10}

(iii) Set of vowels in English alphabet.

Solution:

{a, e, i, o, u}.

(iv) Set of first six months of Islamic calendar.

Solution:

{Muharram, Safar, Rabi-ul-Awal, Rabbi-ul-Sani, Jamadi-ul-Awal, Jamadi-ul-Sani}.

(v) Set of months in English calendar.

Solution:

{January, February, March, April, May, June, July, August, September, October, November, December}.

(vi) Set of prime numbers.

Solution:

{2,3,5,7,.....}.

(vii) Set of seasons in a year.

Solution:

{Summer, Autumn, Winter, Spring}

EXERCISE 1.2

1. Which one of the following sets is infinite?

(i) The set of whole number less than 10.

(ii) The set of prime numbers less than 10.
(iii) The set of integers less than 10.
(iv) The set of factors of 10.
(v) {7,8,10,13}
(vi) {1,3,5....}

Solution:

{1,3,5,.....} is infinite set.

2. Write in tabular form:

(i) The set of first five natural numbers.

Solution:

{1,2,3,4,5}.

(ii) The set of first six letters of English alphabets.

Solution:

{a, b, c, d, e, f}

(iii) The set of all odd numbers less than 9.

Solution:

{1,3,5,7}

(iv) The set of all natural numbers, which divide 12.

Solution:

{1,2,3,4,6,12}

(v) The set of all letters in the word Mathematics.

Solution:

{M, A,T, H, E, I, C, S}.

(vi) The set of last four months of the year.

Solution:

{September, October, November, December}.

3. Name the following sets:

(i) Set of triangles with four vertices.

Solution:

Empty set.

(ii) {Umar}

Solution:

Singleton set.

(iii) {105}

Solution:

Singleton set.

4. Which of the following sets are equal sets?

A = {0, 1, 2}, B = {0, 1, 2, 3}
C = {1, 2, 0}, D = {1, 0, 3, 2}

Solution:

A = C and B = D.

5. Which of the following are equivalent sets? Use the symbols.

Solution:

A $\simeq$ B and C $\simeq$ D

REVIEW EXERCISE 1

1. Fill in the following blanks.

(i) {1, 2} is a tabular form of set.
(ii) {0} has one member, this set is called Singleton set.
(iii) {a, b, c} has Three members.
(iv) {1, 2, ... 7} is a Finite set.
(v) {1, 2, 3, ...} is an Infinite set.
(vi) {p, q, r, s} and {q, r, s, p} are Equal sets.
(vii) {chair, desk, table} and {Samina, Shazia, Irum} are Equivalent sets.

2. Fill in the following blanks in the following using symbols $\subseteq$ or $\not\subseteq$

(i) {0}....{1, 0} $\subseteq$
(ii) {a, b} ..... {a, b, c, d} $\subseteq$
(iii) {-1, -2}...{-1,-3,-5} $\not\subseteq$
(iv) { } .... {0} $\subseteq$
(v) {1, 2, 3, ...} .... {0, 1, 2, ...} $\subseteq$
(vi) {1, 2, 3...} ... {-1, -2, -3...} $\not\subseteq$

3. Is A = {1, 3, 5,...} subset of B = {1,3,5,7,9,11,13,15}?

Solution:

No, because A is an infinite set and B is finite set.

4. List all possible subsets of the given set.

(i) G = {}

Solution:

All possible subsets of G is only G.

(ii) H = {6}.

Solution:

All possible subsets of H are { } and H.

(iii) I = {6, 7}

Solution:

All possible subsets of I = {6,7} are { }, {6}, {7}, {6,7}.

(iv) J = {6,7,8}

Solution:

All possible subsets of J= {6,7,8} are { }, {6}, {7}, {8}, {6,7}, {6,8}, {7,8}, {6,7,8}.

(v) K = {6,7,8,9}

Solution:

All possible subsets of K = {6,7,8,9}, are { }, {6}, {7}, {8}, {9}, {6,7}, {6,8}, {6,9}, {7,8}, {7,9}, {8,9}, {6,7,8}, {6,7,9}, {6,8,9}, {7,8,9}, K.

5. Look for a pattern in Question 4. can you guess how many subsets the set L = {6,7,8,9,10} has?

Solution:

L = {6,7,8,9,10}

In set number of members are 5.

So, No.of subsets of set L = $2^5 = 32$

6. Find all possible subsets of S={a,b,c}.

Solution:

S = {a, b, c}.

All possible subsets of set S are { },{a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a, b, c}

7. Find the cardinality of each of the following sets.

(i) $P=\{\omega, \gamma, \pi, \Delta\}$

Solution:

$P=\{\omega, \gamma, \pi, \Delta\}$

No.of cardinality = 4

(ii) $S=\{\ \}$

Solution:

$S=\{\ \}$

No.of cardinality = 0.

(iii) T = {states of United States}

Solution:

T = {States of the united states}.

No. of Cardinality = 50.

UNIT 2
WHOLE NUMBERS
EXERCISE 2.1

1. Replace each box with < or >.

(i) 46>35	(ii) 5>3
(iii) 49<70	

2. Fill in the blanks by using the symbol.

(i) 3 < 4 but 3 > 0

(ii) 10 > 9 but 10 < 30

(iii) 11 < 20 but 11 > 10.

3. Fill in the blanks by using the symbol < or >.

(i) 6 < 7 (ii) 9 > 8.

(iii) 0 < 1

4. Which of the following statements are true and which are false.

(i) 18 < 19 (True)

(ii) 12 > 20 (False)

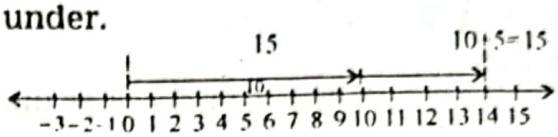
(iii) 0 > 1 (False)

5. Find the sum of the following numbers on the number line.

(i) 10, 5

Solution:

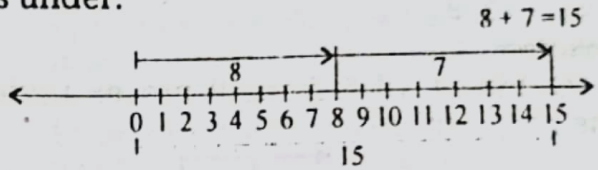
Sum of 10, 5 on the number line are as under.



(ii) 8, 7

Solution:

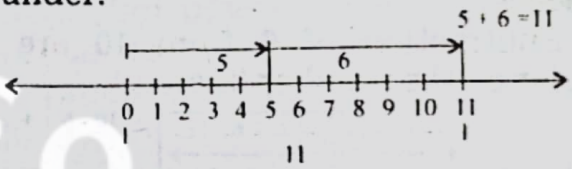
Sum of 8, 7 on the number line are as under.



(iii) 5, 6

Solution:

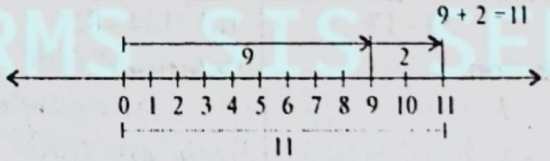
Sum of 5, 6 on the number line are as under.



(iv) 9, 2

Solution:

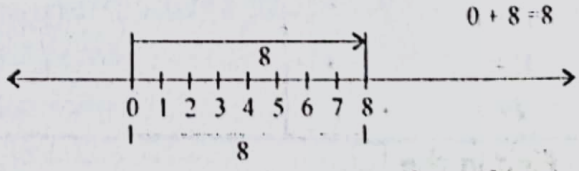
Sum of 9, 2 on the number line are as under.



(v) 0, 8

Solution:

Sum of 0, 8 on number line are as under.

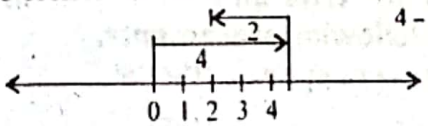


6. Subtract the first number from the second on the number line.

(i) 2, 4

Solution:

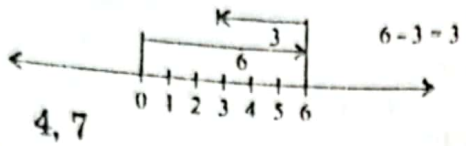
Subtraction of 2 from 4 are as under on the number line.



(ii) 3, 6

Solution:

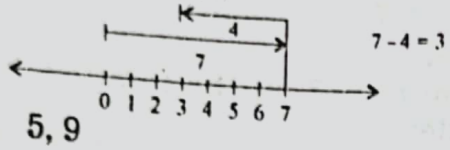
Subtraction of 3 from 6 are as under.



(iii) 4, 7

Solution:

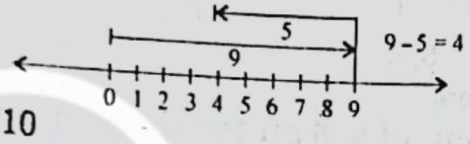
Subtraction of 4 from 7 are as under on the number line.



(iv) 5, 9

Solution:

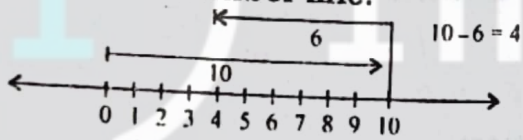
Subtract of 5 from 9 are as under the number line.



(v) 6, 10

Solution:

Subtraction of 6 from 10 are as under on the number line.



EXERCISE 2.2

1. Find each difference.

(i) 53 – 17 **Solution:** 5 3 - 1 7 3 6	(ii) 104 – 82 **Solution:** 104 - 82 22
(iii) 152 – 123 **Solution:** 152 - 123 29	

2. Find in the □.

(i) $2+3=\boxed{2}+3$

(ii) $4+\boxed{5}=5+4$

(iii) $2+\boxed{0}=2$

(iv) $2+(3+4)=(\boxed{2}+3)+4$

3. Tick T for true and F for false in each of the following statements.

(i) $3+(5+7)=(3+5)+7$ T✓ /F

(ii) $6+7=6+5$ T/F✓

(iii) $0+2=2$ T✓ /F

EXERCISE 2.3

1. Find product.

(i) 48×5

Solution:

48
× 5
240

(ii) 106×13 **Solution:** 106 × 13 318 1060 1378	(iii) 59×127 **Solution:** 127 × 59 1143 6350 7493

2. Verify the commutative law under multiplication.

(i) 3,7

Solution:

3, 7

To verify the commutative law under multiplication, we prove

$3\times7=7\times3$.

(ii) 4, 5

Solution:

As $3\times7=21$

And $7\times3=21$

Hence $3\times7=7\times3$

Thus commutative law under multiplication is verified.

(iii) 7, 8

Solution:

To verify commutative law under multiplication, we prove.

$7\times8=8\times7$

As $7\times8=56$

And $8\times7=56$

Hence $8\times7=7\times8$

Thus commutative law under multiplication is verified.

3. Name the property shown by each statement.

(i) $5\times3=3\times5$

Solution:

Commutative property of multiplication.

(ii) $1 \times 4 = 4$

Solution:

Multiplicative identity

(iii) $6(2+1) = 6 \times 2 + 6 \times 1$

Solution:

Distributive property of multiplication over addition.

(iv) $(12 \times 8) \times 3 = 12 \times (8 \times 3)$

Solution:

Associative property of multiplication.

4. Find each sum or product mentally.

(i) $17 + 5 + 33$	(ii) $15 \times 0 \times 2$
Solution: $17 + 5 + 33 = 55$	**Solution:** $15 \times 0 \times 2 = 0$

(iii) $5 + 18 + 15 + 2$

Solution:

$5 + 18 + 15 + 2 = 40$

REVIEW EXERCISE 2

1. Complete the following statements.

(i) '0' is a whole number.

(ii) '2' is a less than 3.

(iii) $24 \div 3 =$ 8.

(iv) $9 + (6 + 3) =$ $(9+6)+3$

(v) If $\times$ is a whole number, the distributive property of multiplication over addition says that $7 \times x + 3 \times x =$ $(7+3) \times x$

2. Encircle 'T' for true and 'F' for false in each of the following statements.

(i) $6 < 8$ T✓/F

(ii) $17 \leq 20$ T✓/F

(iii) For any three whole number a, b, c $a \times (b - c) = a \times c - a \times b$ T/F✓

(iv) For any whole number a, b, c, $a \times (b \times c) = (a \times b) \times c$ T✓/F

(v) $(x + y) + z = x + (y + z)$ for all whole numbers. T✓/F

3. Choose the correct answer.

(i) Name of the property $2+3=3+2$ is ✓

(a) Commutative property of addition

(b) Associative property of addition

(c) Distributive property of addition

(ii) '0' in whole number is called ___

(a) Multiplicative identity

(b) Additive identity✓

(c) Additive inverse

(iii) If $25 \div 5 = 5$, then the quotient is

(a) Zero (b) 5✓

(c) 25

(iv) The statement $e + (f + g) = (f + g) + e$ is an example of which property of addition?

(a) Commutative

(b) Associative

(c) Identity

4. A wagon manufacturing plant in Japan, can produce 8000 wagons a day at top production. Which of the following is a reasonable amount of wagons that can be produced in a month?

a. 24,000 b. 240,000

c. 2,400,000 d. 240,000,000

Solution:

Explanation:

Production of wagons per day = 8000

As one Month = 30 days

So production of wagons per month = 8000×30

So production of wagons per month = 240,000

So correction answer is option b.

5. Name the property used in the following expressions.

(i) $3 \times 5 = 5 \times 3$

Solution:

Commutative property of Multiplication.

(ii) $5 + (3 + 4) = (5 + 3) + 4$

Solution:

Associative property of addition.

(iii) $4(2 + 5) = 4(2) + 4(5)$

Solution:

Distributive property of multiplication over addition.

(iv) $6(7 - 2) = 6(7) - 6(2)$

Solution:

Distribute property of multiplication over subtraction.

6. Find each sum or product mentally.

(i) $13 + 87$	(ii) $6 \times 9 \times 5$
Solution: $13 + 87 = 100$	**Solution:** $6 \times 9 \times 5 = 270$

(iii) $8+11+22+4$	(iv) $2\times5\times10$
Solution:	**Solution:**
$8+11+22+4=45$	$2\times5\times10=100$

7. **A storekeepers buys 24 pens for Rs. 99 each. A method for mentally multiplying 24×99 is to compute $(24\times100)-(24\times1)$. Use a distributive property to show why these two expressions are equal.**

Solution:

A storekeepers buys = 24 pens

Price of each pen = Rs. 99

Price of 24 pens = 24×99

= Rs. 2376

Also

$(24\times100)-(24\times1)=2400-24$

$=2376$

Now by distributive property

$24(100-1)=(24\times100)-(24\times1)$

$24(99)=2400-24$

$2376=2376$

Hence showed that these two expressions are equal.

8. **Amjad and Najma are using the Associative Properties of addition and Multiplication to rewrite expressions.**

Amjid:

$(4+3)+6=4+(3+6)$

Najma:

$(2+7)\times5=2+(7\times5)$

Solution:

Expression of Amjad is correct

UNIT 3
FACTORS AND MULTIPLES
EXERCISE 3.1

1. **Which of the following numbers are prime numbers and which of them are composite numbers?**

(i) 17

Solution:

Prime number

(ii) 25

Solution:

Composite number

(iii) 21

Solution:

Composite number

(iv) 29

Solution:

Prime number

(v) 35

Solution:

Composite number

(vi) 37

Solution:

Prime number

(vii) 40

Solution:

Composite number

(viii) 47

Solution:

Composite number

(ix) 65

Solution:

Composite number

(x) 71

Solution:

Prime number

2. **Write prime numbers between 20 and 40.**

Solution:

Prime numbers between 20 and 40 are 23,29, 31, 37.

3. **Write composite numbers between 40 and 50.**

Solution:

Composite number between 40 and 50 are 42, 44, 45, 46, 48, 49.

4. **Find the factors of:**

(i) 20

Solution:

Factors of 20 are 1,2,4,5,10,20.

(ii) 26

Solution:

Factors of 26 are 1,2,13,26.

(iii) 48

Solution:

Factors of 48 are 1, 2, 3, 4, 6, 8, 12, 16, 24, 48.

(iv) 30

Solution:

Factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30.

(v) 42

Solution:

Factors of 42 are 1, 2, 3, 6, 7, 14, 21, 42.

(vi) 16

Solution:

Factors of 16 are 1, 2, 4, 8, 16.

(vii) 32

Solution:

Factors of 32 are 1, 2, 4, 8, 16, 32

(viii) 49

Solution:

Factors of 49 are 1, 7, 49.

5. Write 3 multiples of each of the following numbers.

(i) 7

Solution:

Multiples of 7 are 7, 14, 21.

(ii) 11

Solution:

Multiples of 11 are 11, 22, 33.

(iii) 17

Solution:

Multiples of 17 are 17, 34, 51

(iv) 19

Solution:

Multiples of 19 are 19, 38, 57.

(v) 12

Solution:

Multiples of 12 are 12, 24, 36.

(vi) 15

Solution:

Multiples of 15 are 15, 30, 45.

(vii) 18

Solution:

Multiples of 18 are 18, 36, 54.

(viii) 20

Solution:

Multiples of 20 are 20, 40, 60.

6. Write even numbers between 50 and 70.

Solution:

Even numbers between 50 and 70 are 52, 54, 56, 58, 60, 62, 64, 66, 68.

7. Write odd numbers between 80 and 100.

Solution:

Odd numbers between 80 and 100 are 83,85,87,89,91,93,95,97,99.

EXERCISE 3.2

1. Using the tests of divisibility, find out which of the following numbers are divisible by (a) 2, (b) 3, (c) 4, (d) 5:

(a) 2

Solution:

(i) 532 is divisible by 2 because the ones digit is 2 which is even.

(ii) 706 is divisible by 2 because the ones digit is 6 which is even.

(iii) 7230 is divisible by 2 because the ones digit is which is even.

(iv) 5421 is not divisible by 2 because the ones digit is 5 which is not even.

(v) 425 is not divisible by 2 because the ones digit is 5 which is not even.

(vi) 9128 is divisible by 2 because the ones digit is 8 which is even.

(vii) 4773 is not divisible by 2 because the ones digit is 3 which is not even.

(viii) 1048 is divisible by 2 because the ones digit is 8 which is even.

(ix) 8005 is not divisible by 2 because ones digit is 5 which is not even.

(x) 7072 is divisible by 2 because ones digit is 2 which is even.

(xi) 5217 is not divisible by 2 because ones digit is 7 which is not even.

(xii) 12960 is divisible by 2 because ones digit is 0 which is even.

(b) 3

(i) 532 is not divisible by 3 because the sum of the digits is 5+3+2 or 10 and 10 is not divisible by 3.

(ii) 706 is not divisible by 3 because the sum of the digits is 7+0+6 or 13 and 13 is not divisible by 3.

(iii) 7230 is divisible by 3 because the sum of the digits is 7+2+3+0 or 12 and 12 is divisible by 3.

(iv) 5421 is divisible by 3 because the sum 5+4+21 of 12 and 12 is divisible by 3.

(v) 425 is not divisible by 3 because the sum 4+2+5 or 11 and 11 is not divisible by 3.

(vi) 9128 is not divisible by 3 because the sum 9+1+2+8 or 20 and 20 is not divisible by 3.

(vii) 4773 is divisible by 3 because the sum 4+7+7+3 or 21 and 21 is divisible by 3.

(viii) 1048 is not divisible by 3 because the sum 1+0+4+8 or 13 and 13 is not divisible by 3.

(ix) 8005 is not divisible by 3 because the sum 8+0+0+5 or 13 and 13 is not divisible by 3.

(x) 7072

7072 is not divisible by 3 because the sum 7+0+7+2 or 16 and 16 is not divisible by 3.

(xi) 5217 is divisible by 3 because the sum 5+2+1+7 or 15 and 15 is divisible by 3.

(xii) 12960 is divisible by 3 because the sum 1+2+9+6+0 or 18 and 18 is divisible by 3.

(c) 4

Solution:

(i) 532 is divisible by 4 because the last two digits is divisible by 4.

(ii) 706 is not divisible by 4 because the last two digits are neither '0' nor divisible by 4.

(iii) 7230 is not divisible by 4 because the last two digits are neither '0' nor divisible by 4.

(iv) 5421 is not divisible by '4' because the last two digits are neither '0' nor divisible by 4.

(v) 425 is not divisible by '4' because the last two digits are neither '0' nor divisible by 4.

(vi) 9128 is divisible by '4' because the last two digits are divisible by 4.

(vii) 4773 is not divisible by '4' because the last two digits are neither '0' nor divisible by 4.

(viii) 1048 is divisible by 4 because the last two digits is divisible by 4.

(ix) 8005 is not divisible by 4 because the last two digits are neither '0' nor divisible by 4.

(x) 7072 is divisible by 4 because the last two digits are divisible by 4.

(xi) 5217 is not divisible by 4 because the last two digits are not '0' nor divisible by 4.

(xii) 12960 is divisible by 4 because the last two digits are divisible by 4.

(d) 5

Solution:

(i) 532 is not divisible by 5 because the last digit is neither '5' nor '0'.

(ii) 706 is not divisible by 5 because the last digit is neither '5' nor '0'.

(iii) 7230 is divisible by '5' because the last digit is '0'.

(iv) 5421 is not divisible by '5' because the last digit is neither '5' nor '0'.

(v) 425 is divisible by '5' because the last digit is '5'.

(vi) 9128 is not divisible by '5' because the last digit is neither '5' nor '0'.

(vii) 4773 is not divisible by '5' because the last digit is neither '5' nor '0'.

(viii) 1048 is not divisible by '5' because the last digit is neither '5' nor '0'.

(ix) 8005 is divisible by '5' because the last digit is '5'.

(x) 7072 is not divisible by '5' because the last digit is neither '5' nor '0'.

(xi) 5217 is not divisible by '5' because the last digit is neither '5' nor '0'.

(xii) 12960 is divisible by '5' because the last digit is '0'.

2. Using the tests of divisibility, find out which of the following numbers are divisible by (a) 6, (b) 9, (c) 10, (d) 11:

(a) 6

Solution:

(i) 423 is not divisible by '6' because the number is divisible by '3' but not divisible by '2'.

(ii) 960 is divisible by 6, because the number is divisible by 2 and 3.

(iii) 4125 is not divisible by 6, because the number is divisible by '3' but not divisible by 2.

(iv) 2340 is divisible by '6' because the number is divisible by '2' and 3.

(v) 7260 is divisible by '6' because the number is divisible by '2' and '3'.

(vi) 7821 is not divisible by '6' because the number is divisible by '3' but not on '2'.

(vii) 3920 is not divisible by '6' because the number is divisible by '2' but not divisible on '3'.

(viii) 1542 is divisible by '6' because the number is divisible by '2' and '3'.

(ix) 9823 is not divisible by '6' because the number is not divisible by '2' and '3'.

(x) 5553 is not divisible by '6' because the number is divisible by '3' but not on '2'.

(xi) 7860 is divisible by '6' because the number is divisible by '2' and 3.
(xii) 2970 is divisible by '6' because the number is divisible by '2' and '3'.

(b) 9

Solution:

(i) 423 is divisible by '9' because the sum of the digits is 4+2+3 or 9 and 9 is divisible by 9.
(ii) 960 is not divisible by '9' because the sum of the digits is 9+6+0 or 15 is not divisible by '9'.
(iii) 4125 is not divisible by '9' because the sum of the digits is 4+1+2+5 or 12 is not divisible by '9'.
(iv) 2340 is divisible by '9' because the sum of the digits is 2+3+4+0 or 9 and 9 is divisible by '9'.
(v) 7260 is not divisible by '9' because the sum of the digits 7+2+6+0 or 15 is not divisible by 9.
(vi) 7821 is divisible by '9' because the sum of the digits 7+8+2+1 or 18 and 18 is divisible by 9.
(vii) 3920 is not divisible by '9' because the sum of the digits 3+9+2+0 or 14 and 14 is not divisible by 9.
(viii) 1542 is not divisible by '9' because the sum of the digits 1+5+4+2 or 12 and 12 is not divisible by '9'.
(ix) 9823 is not divisible by '9' because the sum of the digits 9+8+2+3 or 22 and 22 is not divisible by 9.
(x) 5553 is divisible by '9' because the sum of the digits 5+5+5+3 or 18 and 18 is divisible by '9'.
(xi) 7860 is not divisible by '9' because the sum of digits 7+8+6+0 or 21 and 21 is not divisible by 9.
(xii) 2970 is divisible by '9' because the sum of digits 2+9+7+0 or 18 and 18 is divisible by 9.

(c) 10

Solution:

(i) 423 is not divisible by '10' because the last digit is not zero.
(ii) 960 is divisible by '10' because the last digit is '0'.
(iii) 4125 is not divisible by '10' because the last digit is not zero.
(iv) 2340 is divisible by '10' because the last digit is zero.
(v) 7260 is divisible by '10' because the last digit is zero.
(vi) 7821 is not divisible by '10' because the last digit is not zero.
(vii) 3920 is divisible by '10' because the last digit is zero.
(viii) 1542 is not divisible by '10' because the last digit is not zero.
(ix) 9823 is not divisible by '10' because the last digit is not zero.
(x) 5553 is not divisible by '10' because the last digit is not zero.
(xi) 7860 is divisible by '10' because the last digit is zero.
(xii) 2970 is divisible by '10' because the last digit is zero.

(d) 11

Solution:

(i) 423 is not divisible by 11 because the sum of the digits in the odd places are 7 and the sum of the digits in the even places is 2 and their difference is 5 which is neither '0' nor divisible by 11.
(ii) 960 is not divisible by 11 because the sum of the digits in the odd places are 9 and the sum of the digits in the even places are 6 and their difference is 4 which is neither '0' divisible by 11.
(iii) 4125 is divisible by 11 because the sum of the digits in the odd places are 6 and the sum of the digits in the even places are 6 and their difference is zero.
(iv) 2340 is not divisible by 11 because the sum of the digits in the odd places are 2 and the sum of the digits in the even places are 6 and which is neither '0' nor divisible by 11.
(v) 7260 is divisible by 11 because the sum of odd places are 9 and the sum of even places are 9 and their difference is zero.
(vi) 7821 is divisible by 11 because the sum of odd places are 9 and the sum of even places are 9 and their difference is zero.
(vii) 3920 is not divisible by 11 because the sum of odd places are 9 and the sum even places are 5 and their

difference 4, which neither '0' nor divisible by 11.
(viii) 1542 is not divisible by 11 because the sum of odd places are 6 and the sum of even places are 5 and their difference is 1 and which is neither '0' nor divisible by '11'.
(ix) 9823 is divisible by '11' because the sum of odd places are 11 and the sum of even places are 11 and their difference is 0.
(x) 5553 is not divisible by '11' because the sum of odd places are 8 and the sum of even places are 10 and their difference is 2 and which is neither '0' nor divisible by 11.
(xi) 7860 is not divisible by '11' because the sum of odd places are 8 and the sum of even places are 13 and their difference is 5 which is neither '0' nor divisible by 11.
(xii) 2970 is divisible by '11' because the sum of odd places are 9 and the sum of even places are 9 and their difference is 0.

3. Using the tests of divisibility find out which of the following numbers are divisible by (a) 8, (b) 12, (c) 15, (d) 25:

(a) 8

Solution:

(i) 756 is not divisible by 8 because the last three digits are neither zero nor divisible by 8.
(ii) 5820 is not divisible by 8 because the last three digits are neither zero nor divisible by 8.
(iii) 7400 is divisible by 8, because the last three digits are divisible by 8.
(iv) 2384 is divisible by 8 because the last three digits are divisible by 8.
(v) 6500 is not divisible by 8 because the last three digits are neither zero nor divisible by 8.
(vi) 8235 is not divisible by 8 because the last three digits are neither zero nor divisible by 8.
(vii) 4128 is divisible by 8 because the last three divisible by 8.
(viii) 8775 is not divisible by 8 because the last three digits are neither zero nor divisible by 8.
(ix) 10064 is divisible by 8, because the last three digits are divisible by 8.
(x) 26124 is not divisible by 8, because the last three digits are neither zero nor divisible by 8.
(xi) 13005 is not divisible by 8, because the last three digits are neither zero nor divisible by 8.
(xii) 14400 is divisible by 8, because the last three digits are divisible by 8.

(b) 12

(i) 756 is divisible by 12, because the sum 7+5+6 or 18 and 18 is divisible 3 and last two digits are divisible by 4.
(ii) 5820 is divisible by 12, because the sum 5+8+2+0 or 15 and 15 is divisible by 3 and the last two digits are divisible by 4.
(iii) 7400 is not divisible by 12, because the sum 7+4+0+0 or 11 and 11 is not divisible by 3.
(iv) 2384 is not divisible by 12, because the sum 2+3+84 or 17 and 17 is not divisible by 3.
(v) 6500 is not divisible by 12, because the sum 6+5+0+0 or 11 and 11 is not divisible 3.
(vi) 8235 is not divisible by 12, because the sum 8+2+3+5 or 18 and 18 is divisible by 3 but the last two digits are not divisible by 4.
(vii) 4128 is divisible by 12, because the sum 4+1+2+8 or 15 and 15 is divisible by 3 and the last two digits are divisible by 4.
(ix) 10064 is not divisible by 12, because the sum 1+0+0+6+4 or 11 and 11 is not divisible by 3.
(x) 26124 is divisible by 12, because the sum 2+6+1+2+4 or 15 and 15 is divisible by 3 and the last two digits are divisible by 4.
(xi) 13005 is not divisible by 12, because the sum 1+3+0+0+5 or 9 and 9 is divisible by 3 but the last two digits are not divisible by 4.
(xii) 14400 is divisible by 12, because the sum 1+4+4+0+0 or 9 and 9 is divisible by 3 and the last two digits are zero.

(c) 15

Solution:

(i) 756 is not divisible by 15 because the sum 7+5+6 or 18 and 18 is divisible 3, while the last digit neither '0' nor 5.
(ii) 5820 is divisible by 15 because the sum 5+8+2+0 or 15 and 15 is divisible by 3 and the last digit is 0.
(iii) 7400 is not divisible by 15, because the sum 7+4+0+0 or 11 and 11 is not divisible by 3.
(iv) 2384 is not divisible by 15, because the sum 2+3+8+4 or 17 and 17 is not divisible 3.
(v) 6500 is not divisible by 15, because the sum 6+5+0+0 or 11 and 11 is not divisible by 3.
(vi) 8235 is divisible by 15, because the sum 8+2+3+5 or 18 and 18 is divisible by 3 and last digit is 5.
(vii) 4128 is not divisible by 15, because the sum 4+1+2+8 or 15 and 15 is divisible by 3 while last digit is neither '0' not.
(viii) 8775 is divisible by 15, because the sum 8+7+75 or 27 and 27 is divisible by 3 and last digit is 5.
(ix) 10064 is not divisible by 15, because the sum 1+0+0+6+4 or 11 and 11 is not divisible 3.
(x) 26124 is not divisible by 15, because the sum 2+6+1+2+4 or 15 and 15 is divisible by 3 while last digit is neither zero not 5.
(xi) 13005 is divisible by 15, because the sum 1+3+0+0+5 or 9 and 9 is divisible by 3 and last digit is 5.
(xii) 14400 is divisible by 15, because the sum 1+4+4+0+0 or 9 and 9 is divisible by 3 and last digit is '0'.

(d) 25

Solution:

(i) 756 is not divisible by 25, because the last two digits are neither '0' nor divisible by 25.
(ii) 5820 is not divisible by 25, because the last two digits are neither '0' nor divisible by 25.
(iii) 7400 is divisible by 25, because the last two digits are zero.
(iv) 2384 is not divisible by 25, because the last two digits are neither zero nor divisible by 25.
(v) 6500 is divisible by 25, because the last two digits are zero.
(vi) 8235 is not divisible by 25, because the last two digits are zero nor divisible by 25.
(vii) 4128 is not divisible by 25, because the last two digits are neither zero nor divisible by 25.
(viii) 8775 is divisible by 25, because the last two digits are divisible by 3.
(ix) 10064 is not divisible by 25 because the last two digits are neither zero nor divisible by 25.
(x) 26124 is not divisible by 25, because the last two digits are neither zero nor divisible by 25.
(xi) 13005 is not divisible by 25, because the last two digits are neither zero nor divisible by 25.
(xii) 14400 is divisible by 25, because the last two digits are zero.

EXERCISE 3.3

1. Write down the numbers whose prime factorization are.

(*i*) 2×3

Solution:

$2 \times 3 = 6$

(*ii*) $2 \times 3 \times 5$

Solution:

$2 \times 3 \times 5 = 30$

(*iii*) $2 \times 2 \times 5 \times 7$

Solution:

$2 \times 2 \times 5 \times 7 = 140$

(*iv*) $3 \times 3 \times 5$

Solution:

$3 \times 3 \times 5 = 45$

2. Find the prime factorization of:

(*i*) 144

Solution:

2	144
2	72
2	36
2	18
3	9
	3

So $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$= 2^4 \times 3^2$

(ii) 3600

Solution:

2	3600
2	1800
2	900
2	450
5	225
5	45
3	9
	3

So $3600 = 2\times2\times2\times2\times5\times5\times3\times3$

$= 2^4 \times 3^2 \times 5^2$

(iii) 1250

Solution:

2	1250
5	625
5	125
5	25
	5

So $1250 = 2\times5\times5\times5\times5$

$= 2\times5^4$

(iv) 7056

Solution:

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
	7

So $7056 = 2\times2\times2\times2\times3\times3\times\times7\times7$

$= 2^4 \times 3^2 \times 7^2$

EXERCISE 3.4

1. Find H.C.F. of the following numbers by prime factorization.

(i) $2\times3\times7$ and 5×7

Solution:

The common factors are 7.

So H.C.F is 7.

(ii) $2\times3\times5\times7$ and $2\times5\times7\times11$

Solution:

The common factors 2,5 and 7.

So H.C.F = $2\times5\times7$

= 70

(iii) $2\times2\times2\times5\times5$ and $2\times2\times5\times5\times5$

Solution:

The common factors are 2,2,5,5

So H.C.F = $2\times2\times5\times5$

= 100

2. Find HCF of the following numbers by prime factorization.

(i) 30,45

Solution:

2	30
3	15
	5

3	45
3	15
	5

$30 = 2\times3\times5$

$45 = 3\times3\times5$

The common factors are 3 and 5

So H.C.F = 3×5

= 15

(ii) 45,108

Solution:

3	45
3	15
	5

2	108
2	54
3	27
3	9
	3

$45 = 3\times3\times5$

$108 = 2\times2\times3\times3\times3$

The common factor are 3,3

So H.C.F = 3×3

= 9

(iii) 12,18,30

Solution:

2	12
2	6
	3

2	18
3	9
	3

2	30
3	15
	5

$12 = 2\times2\times3$

$18 = 2\times3\times3$

$30 = 2\times3\times5$

The common factors are 2, 3

So H.C.F = 2×3

= 6

(iv) 36,54,72,90

Solution:

2	36
2	18
3	9
	3

2	54
3	27
3	9
	3

2	72
2	36
2	18
3	9
	3

2	90
3	45
3	15
	5

$36 = 2 \times 2 \times 3 \times 3$

$54 = 2 \times 3 \times 3 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

$90 = 2 \times 3 \times 3 \times 5$

The common of factors are 2,3,3

So H.C.F $= 2 \times 3 \times 3 = 18$

EXERCISE 3.5

1. Find the HCF of the following numbers by division method.

1. 36, 96

$$36\overline{)96}\,(2 \quad 72 \quad 24\overline{)36}\,(1 \quad 24 \quad 12\overline{)24}\,(2 \quad 24 \quad 0$$

Hence H.C.F of 36 and 96 is 12.

2. 90, 54

Solution:

$$54\overline{)90}\,(1 \quad 54 \quad 36\overline{)54}\,(1 \quad 36 \quad 18\overline{)36}\,(2 \quad 36 \quad 0$$

Hence H.C.F of 90 and 54 is 18.

3. 325, 175

Solution:

$$175\overline{)325}\,(1 \quad 175 \quad 150\overline{)175}\,(1 \quad 150 \quad 25\overline{)150}\,(6 \quad 150 \quad 0$$

Hence H.C.F of 325, 175 is 25

4. 350,420,560

Solution:

First we find H.C.F of 350, 420

$$350\overline{)420}\,(1 \quad 350 \quad 70\overline{)350}\,(5 \quad 350 \quad 0$$

Now we find H.C.F of 70 and 560

So

$$70\overline{)560}\,(8 \quad 560 \quad 0$$

Hence H.C.F of 350, 420 and 560 is 70.

5. 735,840,1050

Solution:

First we find H.C.F of 735, 840

$$735\overline{)840}\,(1 \quad 735 \quad 105\overline{)735}\,(7 \quad 735 \quad 0$$

Now we find H.C.F of 105 and 1050

$$105\overline{)1050}\,(10 \quad 1050 \quad 0$$

Hence H.C.F of 735,840,1050 is 105

6. 189, 315, 420

Solution:

First we find H.C.F of 189,315

$$189\overline{)315}\,(1 \quad 189 \quad 126\overline{)189}\,(1 \quad 126 \quad 63\overline{)126}\,(2 \quad 126 \quad 0$$

Now we find H.C.F of 63 and 420

$$63\overline{)420}\,(6 \quad 378 \quad 42\overline{)63}\,(1 \quad 42 \quad 21\overline{)42}\,(2 \quad 42 \quad x$$

7. 150, 315, 435, 675

Solution:

First we find H.C.F of 150 and 315.

$$150\overline{)315}\,(2 \quad 300 \quad 15\overline{)150}\,(10 \quad 150 \quad 0$$

So H.C.F of 315 and 150 is 15

Now we find H.C.F of 435 and 675.

435) 675 (1
435
240) 435 (1
240
195) 240 (1
195
45) 195 (
180
15) 45 (3
45
0

So H.C.F of 435 and 675 is 15.
Hence H.C.F of 150, 315, 435 and 675 is 15.

8. 35, 675, 540, 765

Solution:

First we find H.C.F of 35 and 675

35) 675 (19
665
10) 35 (3
30
5) 10 (2
10
0

Now we find H.C.F of 540 and 765.

540) 765 (1
540
225) 540 (2
450
90) 225 (2
180
45) 90 (2
90
x

Now we find H.C.F of 45 and 5

5) 45 (9
45
0

Hence H.C.F of 35,675,540 and 765 is 5.

EXERCISE 3.6

1. Find the LCM of the following numbers by prime factorization.

1. 6,8

Solution:

$6 = 2 \times 3$

$8 = 2 \times 2 \times 2$

L.C.M = common factors × non common factors

$= 2 \times 3 \times 2 \times 2$

$= 24$

2. 15, 20

Solution:

$= 5 \times 3 \times 2 \times 2$

$= 60$

Common factors = 5
Non common factors = 3,2,2
L.C.M = Common factors × non common factors

$= 5 \times 3 \times 2 \times 2$

$= 60$

3. 16, 20

Solution:

$16 = 2 \times 2 \times 2 \times 2$

$20 = 2 \times 2 \times 5$

Common factors = 2, 2
Now common factors = 2,2,5
L.C.M = Common factors × Non common factors

$= 2 \times 2 \times 2 \times 2 \times 5 = 80$

4. 8,12, 20

Solution:

$8 = 2 \times 2 \times 2$

$12 = 2 \times 2 \times 3$

$20 = 2 \times 2 \times 5$

Common factors = 2, 2
Non common factors = 2,3,5
L.C.M = Common factors × Non common factors

$= 2 \times 2 \times 2 \times 3 \times 5$

$= 120$

5. 18,30,42

Solution:

$18 = 2 \times 3 \times 3$

$30 = 2 \times 3 \times 5$

$42 = 2 \times 3 \times 7$

Common factors = 2,3
Non common factors = 3,5,7
L.C.M = Common factors × Non common factors

$= 2 \times 3 \times 3 \times 5 \times 7$

$= 630$

6. 15, 30, 50

Solution:

$15 = 3 \times 5$

$30 = 2 \times 3 \times 5$

$50 = 2 \times 5 \times 5$

Common factors = 2,3,5

Non common factors = 5

L.C.M = Common factors × Non common factors

$= 2 \times 3 \times 5 \times 5$

$= 150$

7. 70, 98, 175

Solution:

5 | 70	2 | 98	5 | 175
2 | 14	7 | 49	5 | 35
7	7	7

$70 = 2 \times 5 \times 7$

$98 = 2 \times 7 \times 7$

$175 = 5 \times 5 \times 7$

Common factors = 2,5,7

Non common factors = 5,7

L.C.M = common factors × Non common factors

$= 2 \times 5 \times 7 \times 5 \times 7$

$= 2450$

8. 32, 48, 72

Solution:

2 | 32	2 | 48	2 | 72
2 | 16	2 | 24	2 | 36
2 | 8	2 | 12	2 | 18
2 | 4	2 | 6	3 | 9
2	3	3

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$48 = 2 \times 2 \times 2 \times 2 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

Common factors = 2,2,2,2,3

Non common factors = 2,3

L.C.M = Common factors × Non common factors

$= 2 \times 2 \times 2 \times 2 \times 3 \times 2 \times 3$

$= 288$

9. 6, 8, 12, 18, 24

Solution:

2 | 6	2 | 8	2 | 12	2 | 18	2 | 24
3	2 | 4	2 | 6	3 | 9	3 | 12
	2	3	3	2 | 4
				2

$6 = 2 \times 3$

$8 = 2 \times 2 \times 2$

$12 = 2 \times 2 \times 3$

$18 = 2 \times 3 \times 3$

$24 = 2 \times 2 \times 2 \times 3$

Common factors = 2,2,2,3

Non common factors = 3.

L.C.M = Common factors × Non common factors

$= 2 \times 2 \times 2 \times 3 \times 3$

$= 72$

EXERCISE 3.7

1. Find the LCM by division method.

1. 16, 20, 24, 30

Solution:

2 | 16 - 20 - 24 - 30
2 | 8 - 10 - 12 - 15
2 | 4 - 5 - 6 - 15
5 | 2 - 5 - 3 - 15
3 | 2 - 1 - 3 - 3
2 - 1 - 1 - 1

L.C.M = $2 \times 2 \times 2 \times 5 \times 3 \times 2$

= 240

2. 18, 27, 36, 45

Solution:

2 | 18 - 27 - 36 - 45
3 | 9 - 27 - 18 - 45
3 | 3 - 9 - 6 - 15
3 | 3 - 3 - 2 - 5
1 - 1 - 2 - 5

L.C.M = $2 \times 3 \times 3 \times 3 \times 2 \times 5$

$= 540$

3. 35, 40, 21, 28

Solution:

2 | 35 - 40 - 21 - 28
2 | 35 - 20 - 21 - 14
7 | 35 - 10 - 21 - 7
5 | 5 - 10 - 3 - 1
1 - 2 - 3 - 1

L.C.M $= 2 \times 2 \times 7 \times 5 \times 2 \times 3$

$= 540$

4. 42, 56, 70, 84

Solution:

2	42 – 56 – 70 – 84
2	21 – 28 – 35 – 42
7	21 – 14 – 35 – 21
3	3 – 2 – 5 – 3
	1 – 2 – 5 – 1

L.C.M $= 2 \times 2 \times 7 \times 3 \times 2 \times 5$

$= 840$

5. 63, 175, 50, 45

Solution:

5	63 – 175 – 50 – 45
5	63 – 35 – 10 – 9
3	63 – 7 – 2 – 3
7	21 – 7 – 2 – 1
	3 – 1 – 2 – 1

L.C.M $= 5 \times 5 \times 3 \times 7 \times 3 \times 2$

$= 3150$

6. 15, 32, 45, 60

Solution:

2	15 – 32 – 45 – 60
2	15 – 16 – 45 – 30
5	15 – 8 – 45 – 30
3	3 – 8 – 9 – 6
2	1 – 8 – 3 – 2
2	1 – 4 – 3 – 1
	1 – 2 – 3 – 1

L.C.M $= 2 \times 2 \times 5 \times 3 \times 2 \times 2 \times 2 \times 3$

$= 1440$

7. 30, 35, 42, 63

Solution:

3	30 – 35 – 42 – 63
2	10 – 35 – 14 – 21
5	5 – 35 – 7 – 21
7	1 – 7 – 7 – 21
	1 – 1 – 1 – 3

L.C.M $= 3 \times 2 \times 5 \times 7 \times 3$

$= 630$

8. 16, 32, 24, 36

Solution:

2	16 – 32 – 24 – 36
2	8 – 16 – 12 – 18
2	4 – 8 – 6 – 9
2	2 – 4 – 3 – 9
3	1 – 2 – 3 – 9
	1 – 2 – 1 – 3

L.C.M $= 2 \times 2 \times 2 \times 2 \times 3 \times 2 \times 3$

$= 288$

9. 48, 72, 96, 144, 168

Solution:

2	48 – 72 – 96 – 144 – 168
2	24 – 36 – 48 – 72 – 84
2	12 – 18 – 24 – 36 – 42
3	6 – 9 – 12 – 18 – 21
2	2 – 9 – 4 – 6 – 7
3	1 – 3 – 2 – 3 – 7
	1 – 1 – 2 – 1 – 7

L.C.M $= 2 \times 2 \times 2 \times 3 \times 2 \times 3 \times 2 \times 7$

$= 2016$

EXERCISE 3.8

1. Tahira guessed that she can distribute the amount of Zakat exactly among needy persons if she gives Rs. 25, Rs. 30, Rs. 45, Rs. 50 or Rs. 90 to each person. Find the least amount of Zakat Tahira has to pay.

Solution:

We have to find L.C.M of 25, 30, 45, 50 and 90.

5	25 – 30 – 45 – 50 – 90
5	5 – 6 – 9 – 10 – 18
3	1 – 6 – 9 – 2 – 18
2	1 – 2 – 3 – 2 – 16
3	1 – 1 – 3 – 1 – 3
	1 – 1 – 1 – 1 – 1

L.C.M $= 5 \times 5 \times 3 \times 2 \times 3$

$= 450$

2. Find the least number of students in school that can be sent exactly in groups of 15, 18, 27, 36 and 45 to visit the zoo.

Solution:

We have to find L.C.M of 15, 18, 27, 36 and 45.

3	15 – 18 – 27 – 36 – 45
3	5 – 6 – 9 – 12 – 15
2	5 – 2 – 3 – 4 – 15
5	5 – 1 – 3 – 2 – 15
3	1 – 1 – 3 – 2 – 3
	1 – 1 – 1 – 2 – 1

L.C.M = $3 \times 3 \times 2 \times 5 \times 3 \times 2$
= 540

So required number of students = 540

3. Find the least number of oranges that can be packed is crates having capacity of 45, 40 or 60 oranges per crate.

Solution:

We have to find L.C.M of 45, 40, 60.

5	45 – 40 – 60
3	9 – 8 – 12
2	3 – 8 – 4
2	3 – 4 – 2
	3 – 2 – 1

L.C.M = $5 \times 3 \times 2 \times 2 \times 3 \times 2 = 360$

So required oranges = 360

4. Find the least number of candies that can be packed in packets of 12, 24,60 or 144 candies per pocket.

Solution:

We have to find L.C.M of 12, 24, 60, 144.

2	12 – 24 – 60 – 144
2	6 – 12 – 30 – 72
3	3 – 6 – 15 – 36
2	1 – 2 – 5 – 12
2	1 – 1 – 5 – 6
	1 – 1 – 5 – 3

L.C.M = $2 \times 2 \times 3 \times 2 \times 2 \times 5 \times 3$
= 720

So required candles = 720.

5. Find the least number that is exactly divisible by 28, 98 and 105.

Solution:

We have to find L.C.M of 28, 98, 105.

2	28 – 98 – 105
7	14 – 49 – 105
3	2 – 7 – 15
	2 – 7 – 5

L.C.M = $2 \times 7 \times 3 \times 2 \times 7 \times 5$
= 2940

6. Find the greatest length of a measuring tape that can measure distances of 405cm, 315cm and 390cm completely.

Solution:

We have to find H.C.F of 405, 315, 390.

First we find H.C.F of 405 and 315.

$$\begin{array}{r} 315\overline{)405}\,(1 \\ 315 \\ \hline 90\overline{)315}\,(3 \\ 270 \\ \hline 45\overline{)90}\,(2 \\ 90 \\ \hline x \end{array}$$

H.C.F of 405 and 315 is 45

Now we find H.C.F of 45 and 390.

$$\begin{array}{r} 45\overline{)390}\,(8 \\ 360 \\ \hline 30\overline{)45}\,(1 \\ 30 \\ \hline 15\overline{)30}\,(2 \\ 30 \\ \hline 0 \end{array}$$

Hence required length is 15cm

7. Find the greatest length of a piece of bamboo that can be used to completely measure four bamboos having length 45m, 60m, 75m and 90m.

Solution:

We have to find H.C.F of 45, 60, 75 and 90.

First we find H.C.F of 45 and 60

$$\begin{array}{r} 45\overline{)60}\,(1 \\ 45 \\ \hline 15\overline{)45}\,(3 \\ 45 \\ \hline 0 \end{array}$$

So H.C.F of 75 and 90 is 15 and hence H.C.F of 45, 60, 75 and 90 is 15.

Hence required length is 15m.

8. Find the greatest length of s string that can measure completely the string having lengths 910cm, 945cm and 980cm respectively.

Solution:

We have to find H.C.F of 910, 945 and 980.

First we find H.C.F of 910, 945.

$$910\overline{)945}\,(1$$
$$\underline{910}$$
$$35\overline{)910}\,(25$$
$$\underline{910}$$
$$x$$

So H.C.F of 945 and 90 is 35.

Now we find H.C.F of 35 and 980

$$35\overline{)980}\,(28$$
$$\underline{980}$$
$$0$$

So H.C.F of 910, 945 and 980 is 35.

Hence required length = 35

9. Find the greatest measure of a container that can measure completely the quantities of kerosene all measuring 210 liters, 350 litres and 490 liters.

Solution:

We have to find H.C.F of 210, 350 and 490.

First we find H.C.F of 210 and 350.

$$210\overline{)350}\,(1$$
$$\underline{210}$$
$$140\overline{)210}\,(1$$
$$\underline{140}$$
$$70\overline{)140}\,(2$$
$$\underline{140}$$
$$0$$

So H.C.F of 210 and 350 is 70.

Now we find H.C.F of 70 and 490.

$$70\overline{)490}\,(70$$
$$\underline{490}$$
$$0$$

So H.C.F of 210, 350 and 490 is 70.

Hence required litres = 70.

10. Find the greatest number that can completely divide the numbers 252, 315, 441 and 504.

Solution:

We have to find H.C.F of 252, 315, 441 and 504.

First we find H.C.F of 252 and 315.

$$252\overline{)315}\,(1$$
$$\underline{252}$$
$$63\overline{)252}\,(1$$
$$\underline{252}$$
$$x$$

Now we find H.C.F of 441 and 504.

$$441\overline{)504}\,(1$$
$$\underline{441}$$
$$63\overline{)441}\,(7$$
$$\underline{441}$$
$$0$$

Hence H.C.F of 252, 315, 441 and 504 is 63.

Hence required number = 63

REVIEW EXERCISE 3

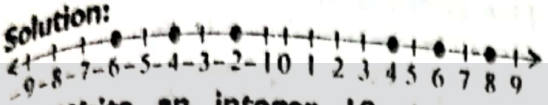
Select the correct answer from the four suggested answers of the following questions:

1. Which of the following numbers is not divisible by 3?
a. 1512 b. 1645✓ c. 433
2. Which of the following numbers is divisible by 15 and 25?
a. 7400 b. 2525 c. 6150✓
3. HCF of 18, 24 and 30 is:
a. 360 b. 30 c. 6✓
4. LCM of 6,8 and 12 is:
a. 24✓ b. 48 c. 96
5. Which of the following is not a prime number.
a. 7 b. 5 c. 1✓
6. Which of the following is a prime number.
a. 8 b. 4 c. 2✓
7. Prime factorization of 56 is:
a. 14×2^2 b. 7×2^3 ✓
c. 28×2
8. Which the following numbers is not an even number?
a. 2100 b. 59372
c. 48629✓
9. Which of the following numbers is divisible by 9?
a. 482763 b. 596340✓
c. 70539
10. Which of the following numbers is divisible by 11?
a. 7897593✓ b. 8478551
c. 323266
11. HCf of 14, 35 and 98 is:
a. 7✓ b. 98
c. 70

UNIT 4
INTEGERS
EXERCISE 4.1

1. Draw a number line from −2, −4, −6, 5, 6, 8

Solution:



2. Write an integer 10 describe each situation.

(i) A loss of Rs. 10.

Solution:

−10

(ii) A gain of Rs. 50.

Solution:

50

(iii) 3 feet to the right.

Solution:

3

(iv) 5 feet to the left

Solution:

−5

(v) The temperature rise 7 degrees.

Solution:

7

(vi) 5 degree below zero.

Solution:

−5

3. Write the opposite of each integer.

(i) 32

Solution:

The opposite of 32 is −32

(ii) −3

Solution:

The opposite of −3 is +3

(iii) −21

Solution:

The opposite of −21 is +21.

(iv) 16

Solution:

The opposite of 16 is −16

EXERCISE 4.2

1. Display the sum of the following integers on a number line.

(i) (+3) + (+5)

Solution:

Step 1.

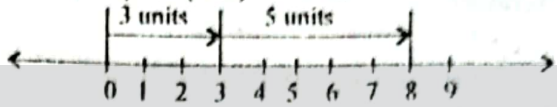
Draw an arrow from '0' to +3.

Step 2.

Then draw a second arrow 5 units to the right to represent adding +5.

Step 3.

The second arrow ends at the sum +8. So (+3) + (+5) = +8.



(ii) 4 + (−6)

Solution:

Step 1.

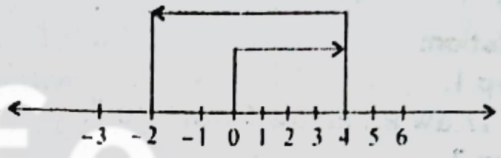
Draw on arrow from 0 to 4.

Step 2.

Then draw a second arrow 6 units to the left to represent adding −6.

Step 3.

The second arrow ends at the sum −2. So 4 + (−6) = −2



(iii) (−3) + (−5)

Solution:

Step 1.

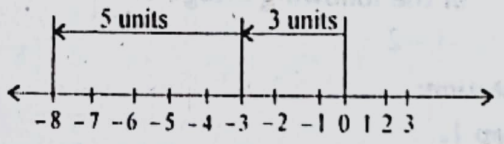
Draw an arrow from 0 to −3.

Step 2.

Then draw a second arrow 5 units to the left to represent adding −5.

Step 3.

The second arrow ends at the sum −8. So (−3) + (−5) = −8.



2. Display the differences of the following integers on a number line.

(i) (+8) − (+3)

Solution:

Step 1.

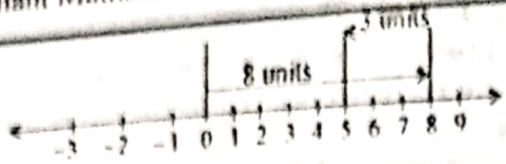
Draw an arrow from 0 to 8.

Step 2.

Then draw a second arrow 3 units to the left to represent subtracting +3.

Step 3.

The second arrow ends at the difference 5. So (+8) − (+3) = 5.



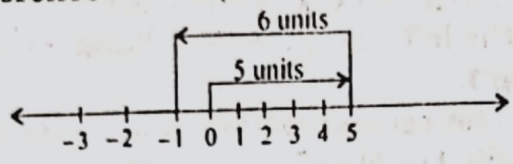
(ii) $(+5)-(+6)$

Solution:

Step 1.
Draw an arrow from 0 to 5.

Steps 2.
Then draw a second arrow 6 units to the left to represent subtracting +6.

Step 3.
The second arrow ends at the difference -1 So $(+5)-(+6)=-1$



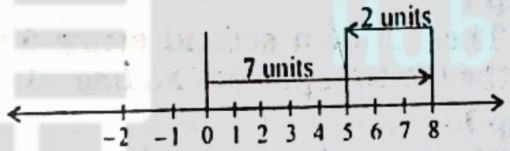
(iii) $(+7)-(+2)$

Solution:

Step 1.
Draw an arrow from 0 to 7.

Step 2.
The draw a second arrow 2 units to the left to represent subtracting +2.

Step 3.
The second arrow ends at the difference 5. So $(+7)-(+2)=5$



3. By using number line, display the sum of the following integers.

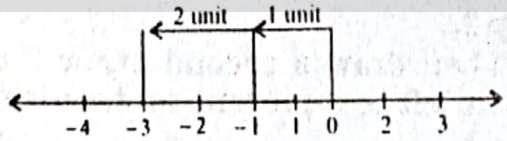
(i) $-1,-2$

Solution:

Step 1.
Draw an arrow from 0 to -1.

Step 2.
Then draw a second arrow 2 units to the left to represent adding -2.

Step 3.
The second arrow ends at the sum -3. So $(-1)+(-2)=-3$



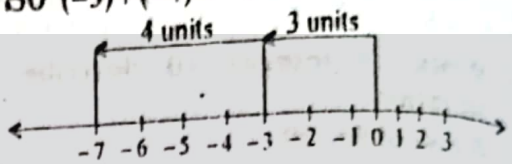
(ii) $-3,-4$

Solution:

Step 1.
Draw an arrow from 0 to -3

Step 2.
Then draw a second arrow 4 units to left to represent adding -4.

Step 3.
The second arrow ends at the sum -7. So $(-3)+(-4)=-7$.



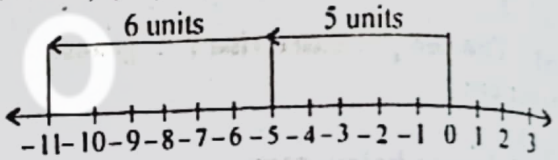
(iii) $-5,-6$

Solution:

Step 1.
Draw an arrow from 0 to -5.

Step 2.
Then draw a second arrow 6 units to left to represent adding -6.

Step 3.
The second arrow ends at the sum -11. So, $(-5)+(-6)=-11$.



4. Find each sum.

Solution:

(i) $7+(-5)$

Solution:

$7+(-5)=7-5$

$=2$

(ii) $(-6)+(-4)$

Solution:

$(6)+(4)=-6-4$

$=-10$

(iii) $-5,-6$

Solution:

$5+(-9)=5-9$

$=-4$

5. By three steps method, find each sum.

(i) $(+5)+(-9)$

Solution:

Step 1.
$|+5|=5$ and $|-9|=9$

Step 2.

$(+5)+(-9)=|(+5)|-|-9|$

$=5-9$

$=-4$

Step 3.

(ii) $(+3)+(+2)$

Solution:

Step 1.

$|+3|=3, |+2|=2$

Step 2.

$(+3)+(+2)=|+3|+|+2|$

$=3+2$

Step 3. $=5$

(iii) $(-8)+(+2)$

Solution:

Step 1.

$|-8|=8$ and $|+2|=2$

Step 2.

$(-8)+(+2)=-(|-8|-|+2|)$

$=-(8-2)$

Step 3. $=-6$

EXERCISE 4.3

1. Solve the following:

(i) $(+20)-(+10)$

Solution:

$(+20)-(+10)=20-10$

$=10$

(ii) $(+45)-(60)$

Solution:

$(+45)-(60)=45-60$

$=-15$

(iii) $(-40)-(60)$

Solution:

$(-40)-(60)=-40-60$

$=-100$

(iv) $(+60)-(-50)$

Solution:

$(+60)-(-50)=60+50$

$=110$

(v) $(-23)-(+47)$

Solution:

$(-23)-(+47)=-23-47$

$=-70$

2. Find each product:

(i) $5\times(-7)$

Solution:

$5\times(-7)=-35$ (As $(+)\times(-)=-$)

OR

$$\begin{array}{r} +5 \\ \times\ -7 \\ \hline -35 \end{array}$$

(ii) $(-7)\times(-7)$

Solution:

$(-7)\times(-7)=49$ (As $(-)\times(-)=+$)

OR

$$\begin{array}{r} -7 \\ \times\ -7 \\ \hline 49 \end{array}$$

(iii) $(-5)\times(-1)$

Solution:

$$\begin{array}{r} -5 \\ \times\ -1 \\ \hline 6 \end{array}$$ (As $(-)\times(-)=+$)

(iv) $2\times(3)$

Solution:

$$\begin{array}{r} 2 \\ \times\ 3 \\ \hline 6 \end{array}$$ $(As\ (+)\times(+)=+)$

(v) $-8\times(-9)$

Solution:

$$\begin{array}{r} -8 \\ \times\ -9 \\ \hline 72 \end{array}$$ $(As\ (-)\times(-)=+)$

3. Find each quotient:

(i) $45\div(-3)$

Solution:

$$3\overline{)\,45}\ 15$$

3

15

15

0

As $(-)\div(+)=-1$

So Quotient $= -15$

(ii) $(63)\div(-9)$

Solution:

$$9\overline{)\,63}\ 7$$

63

0

As $(+)\div(-)=-1$

So Quotient $= -7$

(iii) $75 \div (-25)$

Solution:

$$25\overline{)75}\ 3$$
$$\underline{75}$$
$$0$$

As $(+) \div (-) = -$

So Quotient = -3

(iv) $-81 \div (9)$

Solution:

$$9\overline{)81}\ 9$$
$$\underline{81}$$
$$0$$

As $(-) \div (+) = -$

So Quotient = -9

(v) $(-288) \div (36)$

Solution:

$$36\overline{)288}\ 8$$
$$\underline{288}$$
$$0$$

As $(-) \div (+) = -$

So Quotient = -8

REVIEW EXERCISE 4

1. Fill in the blank space in each question by putting a suitable number/ word.

(i) -1 is negative integer.

(ii) '0' is neither positive nor negative

(iii) -2 greater than -3

(iv) $|-4| =$ 4

2. Encircle T for true statement and F for false statement in each of the following.

(i) $-1 < 0$ (T)/ F

(ii) $|-2| = -2$ T /(F)

(iii) $(-1) + (-2) = -3$ (T)/ F

(iv) $(+2) \div (-1) = +2$ T /(F)

3. Choose the correct answer.

(i) $(+3) \times (-2) =$

(a) 6 (b) -6 ✓ (c) 1

(ii) $|-4| =$

(a) 4 ✓ (b) -4 (c) ± 4

(iii) $-1 \square 0$

(a) = (b) < ✓ (c) >

(iv) $(+12) \div (-3) =$

(a) $+4$ (b) -4 ✓ (c) –

4. Use =, > & < sign to indicate the relationship between each of the following pairs of numbers.

(i) $-6 > -7$ (ii) $2 > -5$

(iii) $-7 < |-7|$ (iv) $-|9| < -(-9)$

(v) $|-3| = 3$ (vi) $0 > -2$

UNIT 5
SIMPLIFICATION
EXERCISE 5.1

1. Simplify the following equations.

1. $8 - (3 - \overline{5 + 2})$

Solution:

$$8 - (3 - \overline{5 + 2})$$
$$= 8 - (3 - 7)$$
$$= 8 - (-4)$$
$$= 8 + 4$$
$$= 12$$

2. $10 - \left[8 - \{5 - (2 - \overline{3 + 6}\}\right]$

Solution:

$$10 - \left[8 - \{5 - (2 - \overline{3 + 6}\}\right]$$
$$= 10 - [8 - \{5 - (2 - 9)\}]$$
$$= 10 - [8 - \{5 - (-7)\}]$$
$$= 10 - [8 - \{5 + 7\}]$$
$$= 10 - [8 - 12]$$
$$= 10 - [-4]$$
$$= 10 + 4$$
$$= 14$$

3. $30 - 2[5 - \{15 \div 3 \times 4 - (3 - \overline{5 - 3}\}]$

Solution:

$$30 - 2[5 - \{15 \div 3 \times 4 - (3 - \overline{5 - 3}\}]$$
$$= 30 - 2[5 - \{15 \div 3 \times 4 - (3 - 2)\}]$$
$$= 30 - 2[5 - \{15 \div 3 \times 4 - (1)\}]$$
$$= 30 - 2[5 - \{15 \div 3 \times 4 - 1\}]$$
$$= 30 - 2[5 - \{5 \times 4 - 1\}]$$
$$= 30 - 2[5 - \{20 - 1\}]$$
$$= 30 - 2[5 - 19]$$
$$= 30 - 2[-14]$$
$$= 30 + 28$$
$$= 58$$

4. $\frac{5}{2}+\left(\frac{2}{3}-\frac{5}{6}\right)$

Solution:

$$\frac{5}{2}+\left(\frac{2}{3}-\frac{5}{6}\right)$$
$$=\frac{5}{2}+\left(\frac{2\times2-5\times1}{6}\right)$$
$$=\frac{5}{2}+\left(\frac{4-5}{6}\right)$$
$$=\frac{5}{2}+\left(\frac{-1}{6}\right)$$
$$=\frac{5}{2}-\frac{1}{6}$$
$$=\frac{5\times3-1\times1}{6}$$
$$=\frac{15-1}{6}$$
$$=\frac{14}{6}$$
$$=\frac{7}{3}$$
$$=2\frac{1}{3}$$

5. $3\frac{5}{8}-\left\{\frac{3}{8}-\left(\frac{3}{4}+\frac{5}{8}\right)\right\}$

Solution:

$$3\frac{5}{8}-\left\{\frac{3}{8}-\left(\frac{3}{4}+\frac{5}{8}\right)\right\}$$
$$=\frac{29}{8}-\left\{\frac{3}{8}-\left(\frac{2\times3+5\times1}{8}\right)\right\}$$
$$=\frac{29}{8}-\left\{\frac{3}{8}-\left(\frac{6+5}{8}\right)\right\}$$
$$=\frac{29}{8}-\left\{\frac{3}{8}-\frac{11}{8}\right\}$$
$$=\frac{29}{8}-\left\{\frac{3\times1-11\times1}{8}\right\}$$
$$=\frac{29}{8}-\left\{\frac{3-11}{8}\right\}$$
$$=\frac{29}{8}-\left\{\frac{-8}{8}\right\}$$
$$=\frac{29}{8}-\{-1\}$$
$$=\frac{29}{8}+1$$
$$=\frac{29+1\times8}{8}$$
$$=\frac{29+8}{8}$$
$$=\frac{37}{8}$$
$$=4\frac{5}{8}$$

As $8\overline{)37}\ 4$, 32, 5

6. $\frac{3}{2}+\left\{\frac{1}{2}+\left(\frac{3}{4}\div2\frac{1}{4}\right)\right\}$

Solution:

$$=\frac{3}{2}+\left\{\frac{1}{2}+\left(\frac{3}{4}\times\frac{9}{4}\right)\right\}$$
$$=\frac{3}{2}+\left\{\frac{1}{2}+\left(\frac{3}{4}\times\frac{4}{9}\right)\right\}$$
$$=\frac{3}{2}+\left\{\frac{1}{2}+\frac{1}{3}\right\}$$
$$=\frac{3}{2}+\left\{\frac{1\times3+1\times2}{6}\right\}$$
$$=\frac{3}{2}+\left\{\frac{3+2}{6}\right\}$$
$$=\frac{3}{2}+\frac{5}{6}$$
$$=\frac{3\times3+5\times1}{6}$$
$$=\frac{9+5}{6}=\frac{14}{6}=\frac{7}{3}=2\frac{1}{3}$$

7. $2\frac{1}{4}-\left[\frac{3}{2}\div\left\{\left(\frac{5}{2}-\frac{1}{4}\right)\times\frac{4}{3}\right\}\right]$

Solution:

$$2\frac{1}{4}-\left[\frac{3}{2}\div\left\{\left(\frac{5}{2}-\frac{1}{4}\right)\times\frac{4}{3}\right\}\right]$$
$$=\frac{9}{4}-\left[\frac{3}{2}\div\left\{\left(\frac{5\times2-1\times1}{4}\right)\times\frac{4}{3}\right\}\right]$$
$$=\frac{9}{4}-\left[\frac{3}{2}\div\left\{\frac{10-1}{4}\times\frac{4}{3}\right\}\right]$$
$$=\frac{9}{4}-\left[\frac{3}{2}\div\left\{\frac{9}{4}\times\frac{4}{3}\right\}\right]$$
$$=\frac{9}{4}-\left[\frac{3}{2}\div3\right]$$

$= \frac{9}{4} - \left[\frac{3}{2} \times \frac{1}{3}\right]$

$= \frac{9}{4} - \frac{1}{2}$

$= \frac{9 \times 1 - 1 \times 2}{4} = \frac{9-2}{4}$

$= \frac{7}{4}$

$= 1\frac{3}{4}$

8. $2\frac{1}{3} \div \left[2\frac{5}{6} \div \left\{1\frac{1}{2} + \left(3\frac{1}{2} \times 2\frac{2}{3} - 1\frac{1}{6}\right)\right\}\right]$

Solution:

$2\frac{1}{3} \div \left[2\frac{5}{6} \div \left\{1\frac{1}{2} + \left(3\frac{1}{2} \times 2\frac{2}{3} - 1\frac{1}{6}\right)\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{3}{2} + \left(\frac{7}{2} \times \frac{8}{3} - \frac{7}{6}\right)\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{3}{2} + \left(\frac{7}{2} \times \frac{2 \times 8 - 7 \times 1}{6}\right)\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{3}{2} + \left(\frac{7}{2} \times \frac{9}{6}\right)\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{3}{2} + \left(\frac{7}{2} \times \frac{3}{2}\right)\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{3}{2} + \frac{21}{4}\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{2 \times 3 + 21 \times 1}{4}\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \left\{\frac{6+21}{4}\right\}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \div \frac{27}{4}\right]$

$= \frac{7}{3} \div \left[\frac{17}{6} \times \frac{4}{27}\right]$

$= \frac{7}{3} \div \left[\frac{17}{3} \times \frac{2}{27}\right]$

$= \frac{7}{3} \div \frac{34}{81}$

$= \frac{7}{3} \times \frac{81}{34}$

$= 7 \times \frac{27}{34}$

$= \frac{189}{34}$

$= 5\frac{19}{34}$

As
$$\begin{array}{r} 5 \\ 34\overline{)189} \\ \underline{170} \\ 19 \end{array}$$

EXERCISE 5.2

Simplify the following equations.

1. $1.4 + (1.6 - 0.3)$

Solution:

$1.4 + (1.6 - 0.3)$

$= 1.4 + 1.3$

$= 2.7$

2. $4.26 + [1.35 + \{(0.5 - 0.3) \times 1.5\}]$

Solution:

$4.26 + [1.35 \div \{(0.5 - 0.3) \times 1.5\}]$

$= 4.26 + [1.35 + \{0.15 \times 1.5\}]$

$= 4.26 + [1.35 \div 0.225]$

$= 4.26 + 6$

$= 10.26$

3. $1.9 \times [2.3 \times \{3.6 - (1.2 + 1.4)\}]$

Solution:

$1.9 \times [2.3 \times \{3.6 - (1.2 + 1.4)\}]$

$= 1.9 \times [2.3 \times \{3.6 - 2.6\}]$

$= 1.9 \times [2.3 \times 1.0]$

$= 1.9 \times 2.3$

$= 4.37$

4. $9.25 \div \left[1.75 + \{2.05 - (1.5 + \overline{2.5 - 2})\}\right]$

Solution:

$9.25 \div \left[1.75 + \{2.05 - (1.5 + \overline{2.5 - 2})\}\right]$

$= 9.25 \div [1.75 + \{2.05 - (1.5 + 0.5)\}]$

$= 9.25 \div [1.75 + \{2.05 - 2\}]$

$= 9.25 \div [1.75 + 0.05]$

$= 9.25 \div 1.8$

$= 5.14$

5. $2.9 - [1.05 \times \{1.17 + (2.5 + \overline{1.9 - 0.4})\}]$

Solution:

$2.9 - [1.05 \times \{1.17 + (2.5 + \overline{1.9 - 0.4})\}]$

$= 2.9 - [1.05 \times \{1.17 + (2.5 + 1.5)\}]$

$= 2.9 - [1.05 \times \{1.17 + 4.0\}]$

$= 2.9 - [1.05 \times 5.17]$

$= 2.9 - 5.42$

$= -2.5285$

EXERCISE 5.3

1. A shopkeeper sold $5\frac{1}{2}$ kg sugar, $4\frac{1}{4}$ kg maize and $10\frac{3}{4}$ kg flour to three customers. How much did he sell in all?

Solution:

Sold sugar of a shopkeeper = $5\frac{1}{2}kg$

Sold maize of a shopkeeper = $4\frac{1}{4}kg$

Sold flour of a shopkeeper = $10\frac{3}{4}kg$

Total numbers of kgs did he sell

$$=5\frac{1}{2}+4\frac{1}{4}+10\frac{3}{4}$$

$$=\frac{11}{2}+\frac{17}{4}+\frac{49}{4}$$

$$=\frac{2\times11+17+43}{4}$$

$$=\frac{22+17+43}{4}$$

$$=\frac{82}{4}$$

$$=\frac{41}{2}$$

$$=20\frac{1}{2}$$

As $20\overline{)41}\ 5$, $\frac{40}{1}$

2. A room is $5\frac{1}{2}$ metre long and $3\frac{1}{4}$ metre wide. How much square metre carpet is required for its floor?

Solution:

Length of a room = $5\frac{1}{2}$ metre

Width of a room = $3\frac{1}{4}$ metre

For this we find area of a room.

So Area = length × width

$$=5\frac{1}{2}\times3\frac{1}{4}$$

$$=\frac{11}{2}\times\frac{13}{4}$$

$$=\frac{143}{8}$$

As $8\overline{)143}\ 17$, $\frac{8}{63}$, $\frac{56}{7}$

$$=17\frac{7}{8}$$

So Required square metre for the floor $=17\frac{7}{8}m^2$.

3. Nasir's total income is Rs. 10,000. He paid $\frac{1}{10}$ of his income as house rent and $\frac{1}{4}$ of the remaining on other necessities. What amount has been left with him?

Solution:

Nasir's total income = Rs. 10,000

Payment of house rent = $\frac{1}{10}$ of 10,000

$$=\frac{1}{10}\times10.000$$

$$=1000$$

Remaining amount of income = 10,000 − 1000

=9000

Payment of other necessities = $\frac{1}{4}$ of 9000

$$=\frac{1}{4}\times9000$$

$$=2250$$

Left amount = 9000 − 2250

= Rs. 6750

4. Tasneem has 40 toffees. She gave $\frac{3}{5}$ of it to Ghazala. Ghazala gave $\frac{1}{6}$ of her won share to her younger brother. How much toffees Ghazala's brother got?

Solution:

Tasneem total toffees = 40

Gave to Ghazala = $\frac{3}{5}$ of 40

$$=\frac{3}{5}\times40$$

$$=3\times8$$

$$=24$$

Ghazala gave to her younger brother = $\frac{1}{6}$ of 24

$$=\frac{1}{6}\times24$$

$$=4$$

Required toffees = 4

5. How much time Waseem will take to cover 50.5 kilometers distance with a speed of 12.25 kilometers per hour?

Solution:

Total distance = 50.5km

Speed per hour = 12.25km

Total time to cover the required distance = $\frac{50.5}{12.25}$

= 4.122 hrs.

6. Shahab travelled 4.7 km distance on foot, 15.5 km distance by bicycle. How much distance traveled altogether? Also tell how much more distance he traveled by bicycle than on foot?

Solution:

Traveled distance on foot = 4.7 km

Traveled distance on bicycle = 15.5km

Total traveled distance = 4.7+15.5

= 20.2km

Traveled distance by bicycle more than on foot = 15.5 – 4.7

= 10.8km

7. The price of one dozen eggs is Rs. 60.50. Find the price of one egg?

Solution:

Price of one dozen eggs = Rs. 60.50

Price of one egg =?

As we know that

1 dozen = 12

So price of one egg = $\frac{60.50}{12}$

= Rs. 5.041

8. A bamboo is 24 metres long. Its 0.75 part is above the ground and remaining part is inside the ground. How many metres bamboo inside the ground?

Solution:

Length of bamboo = 24m

Part of bamboo above the ground = 0.75 of 24

= 0.75×24

= 18m

Part of bamboo inside the ground = 24 – 18

= 6m

9. The total population of a village is 6000. Out of this 0.05 of the population is in service, 0.4 of it is in trade and 0.06 of it are labrours. The rest of population is jobless. Tell how many are jobless?

Solution:

Total population of village = 6000

In service = 0.05 of 6000

= 0.05 × 6000

= 300

In trade = 0.4 of 6000

= 0.4 × 6000

= 2400

Labours = 0.06 of 6000

= 0.06 × 6000

= 360

So Jobless population = 6000 – 300 – 2400 – 360

= 6000 – [300 + 2400 + 360]

= 6000 – 3060

= 2940

REVIEW EXERCISE 5

1. Choose the correct answer.

(i) ( ) is

(a) Vinculum (b) Parentheses ✓

(c) Braces (d) Square brackets

(ii) Word 'S' used in BODMAS is abbreviation of

(a) Solution (b) Subtraction ✓

(c) Square (d) None

(iii) Order of brackets is

(a) Braces, square bracket, vinculum and parenthesis

(b) Vinculum, braces, parenthesis and square bracket.

(c) Vinculum, parenthesis, braces and square brackets.✓

(d) Parenthesis, vinculum, braces and square brockets.

(iv) 5.12 – 5.02 is equal to

(a) 10.14 (b) 0.14

(c) 0.1✓ (d) 0.01

(v) Brackets are of

(a) 2 types (b) Three types

(c) 4 types✓ (d) 5 types

2. Simplify the following.

(i) $\frac{1}{2}+\left\{\frac{5}{14}\times\left(\frac{25}{15}-\frac{21}{25}\right)\right\}$

Solution:

$\frac{1}{2}+\left\{\frac{5}{14}\times\left(\frac{25}{15}-\frac{21}{25}\right)\right\}$

$$= \frac{1}{2} + \left\{ \frac{5}{14} \times \left(\frac{25 \times 5 - 21 \times 3}{75} \right) \right\}$$

$$= \frac{1}{2} + \left\{ \frac{5}{14} \times \left(\frac{125 - 63}{75} \right) \right\}$$

$$= \frac{1}{2} + \left\{ \frac{\cancel{5}^{1}}{\cancel{14}_{7}} \times \frac{\overset{31}{\cancel{62}}}{\cancel{75}_{15}} \right\}$$

$$= \frac{1}{2} + \frac{31}{105}$$

$$= \frac{105 \times 1 + 2 \times 31}{210} = \frac{105 + 62}{210}$$

$$= \frac{167}{210}$$

(ii) $1.02 + \{3.9 \times (4.05 - \overline{2.02 - 0.98})\}$

Solution:

$1.02 + \{3.9 \times (4.05 - \overline{2.02 - 0.98})\}$

$= 1.02 + \{3.9 \times (4.05 - 1.04)\}$

$= 1.02 + \{3.9 \times 3.01\}$

$= 1.02 + 11.739$

$= 12.759$

(iii) Sum of two fractions is $10\frac{1}{2}$. If one fraction is $3\frac{6}{8}$, find the other.

Solution:

Sum of two fraction $= 10\frac{1}{2}$

One fraction $= 3\frac{6}{8}$

Suppose 2nd fraction $= x$

According to give condition

$$3\frac{6}{8} + x = 10\frac{1}{2}$$

$$\frac{30}{8} + x = \frac{21}{2}$$

$$\frac{15}{4} + x = \frac{21}{2}$$

$$x = \frac{21}{2} - \frac{15}{4}$$

$$= \frac{21 \times 2 - 15}{4}$$

$$= \frac{42 - 15}{4}$$

$$= \frac{27}{4}$$

$$= 6\frac{3}{4}$$

As
$$\begin{array}{r} 6 \\ 4\overline{)27} \\ \underline{24} \\ 3 \end{array}$$

(iv) What will be the fare for 300.75 kilometer at the rate of Rs. 2.25 per kilometer?

Solution:

Total distance = 300.75 km

Fare per kilometer = Rs. 2.25

Fare for 30075 km $= 2.25 \times 300.75$

$= 676.6875$

(v) In Peshawar the temperature on one day of June was 45.6^0, on second day 43.3^0, on the third day 40.5^0 and the fourth day it was 44.7^0. Find the total temperature of four days.

Solution:

Ist day temperature $= 45.6^0$

2nd day temperature $= 43.3^0$

3rd day temperature $= 40.5^0$

4th day temperature $= 44.7^0$

Total temperature of four days

$= 45.6^0 + 43.3^0 + 40.5^0 + 44.7^0$

$= 174.1^0$

UNIT 6
RATIO AND PROPORTION
EXERCISE 6.1

1. Find the ratio between the following quantities and reduce them to the lowest form:

(i) Rs. 450 and Rs. 525

Solution:

450 : 525

90 : 105 (Dividing by 5)

18 : 21 (Dividing by 5)

6 : 7 (Dividing by 3)

(ii) 364 cows and 455 cows

Solution:

364 : 455

4 : 5 (Dividing by 91)

(iii) 594kg and 990kg

Solution:

594 : 990

198 : 330 (Dividing by 3)
66 : 110 (Dividing by 3)
33 : 55 (Dividing by 2)
3 : 5 (Dividing by 11)

(iv) 1 kilometer, 8 meters and 672 meters.

Solution:

Since the measurements are not in same unit, we change both the measurements to the same unit meters.

1 kilometer, 8 meters
= (1×1000+8) meters
= (1000+8) meters
= 1008 meters

So required Ratio = 1008 : 672
= 504:336 (Dividing by 2)
= 252:168 (Dividing by 2)
= 126:84 (Dividing by 2)
= 63:42 (Dividing by 2)
= 9 : 6 (Dividing by 7)
= 3 : 2 (Dividing by 3)

(v) 2 hours, 8 minute and 3 hours, 12 minutes.

Solution:

First we convert both measurements to minutes.

2 hours, 8 minutes
= (2×60+8) minutes
= (120+8) minutes
= 128 minutes

Also
3 hours, 12 minutes
= (3×60+12) minutes
= (180+12) minutes
= 192 minutes

Required Ratio = 128 : 192
= 64 : 96 (Dividing by 2)
= 32 : 48 (Dividing by 2)
= 16 : 24 (Dividing by 2)
= 8 : 12 (Dividing by 2)
= 4 : 6 (Dividing by 2)
= 2 : 3 (Dividing by 2)

2. Convert the ratios to their lowest form.

(i) 25 : 35

Solution:

25 : 35
5 : 7 (Dividing by 5).

(ii) 28 : 84

Solution:

28 : 84
4 : 12 (Dividing by 7)
2 : 6 (Dividing by 2)
1 : 3 (Dividing by 2)

(iii) 40 : 24

Solution:

40 : 24
20 : 12 (Dividing by 2)
10 : 6 (Dividing by 2)
5 : 3 (Dividing by 2)

(iv) 200 : 150

Solution:

200 : 150
40 : 30 (Dividing by 5)
8 : 6 (Dividing by 5)
4 : 3 (Dividing by 2)

(v) 0.45 : 0.75

Solution:

0.45 : 0.75
100×0.45 : 100×.75 (Multiplying by 100)
45 : 75 (Dividing by 5)
9 : 15 (Dividing by 5)
3 : 5

3. The age of Uzair is 10 years, 8 months. Find the ratio between their ages in the lowest form.

Solution:

First we convert both ages to months then we find Ratio.

Age of Uzair = 10 years, 8 months
= (10×12+8) months
= 120+8
= 128

Age of Usman = 13 years, 4 months
= (113×12+4) months
= (13×12+4) months
= 160

Required Ratio = 128 : 160

= 64 : 80 (Dividing by 2)
= 32 : 40 (Dividing by 2)
= 16 : 20 (Dividing by 2)
= 8 : 10 (Dividing by 2)
= 4 : 5 (Dividing by 2)

4. Weekly income of a labour is Rs. 1500, and of a carpenter Rs. 2000 per week. Find the ratio, between their weekly incomes in the lowest form.

Solution:
Weekly income of a labour = Rs. 1500
Weekly income of a carpenter = Rs. 2000
Required Ratio = 1500 : 2000
= 15 : 20 (Dividing by 100)
= 3 : 4 (Dividing by 5)

5. Saeeda earns Rs. 85,000 and spends Rs. 15,000 in a year. Find the ratio of her income to expenditure.

Solution:
Required Ratio = 85,000 : 51,000
= 85 : 51 (Dividing by 1000)
= 57 : 3 (Dividing by 17)

6. A car covered 360 km in 4 hours, and another car covered 240 km in 4 hours. Find the ratio between the distances covered by both the cars.

Solution:
Required Ratio between two car
= 360 : 240
= 36 : 24 (Dividing by 10)
= 12 : 8 (Dividing by 3)
= 3 : 2 (Dividing by 4)

7. In a 100 meter race Zahid Covered it in 5.8 minutes, while Iqbal covered it in 4.8 minutes. Find the ratio between their timing.

Solution:
Required Ration between their time
= 5.8 : 4.8
= 10×5.8 : 4.8×10 (Multiplying by 10)
= 58 : 48
= 29 : 24 (Dividing by 2)

8. In an examination 112 students appeared. Out of them 16 failed. Find the ratio between the passed and failed students.

Solution:
Total students = 112
Failed students = 16
Passed students = 112 − 116
= 96
So required ratio between passed and failed students = 96 : 16
= 6 : 1 (Dividing by 16).

Exercise 6.2

1. Which of the following proportions are true?

(*i*) $\frac{5}{3}=\frac{20}{12}$

Solution:
The proportion can be written as 5 : 3 :: 20 : 12
Product of extremes = 5×12
=60
Product of Means = 3×20
= 60
A product of extremes = Product of means
So the given proportion is true.

(*ii*) $\frac{11}{13}=\frac{55}{65}$

Solution:
$\frac{11}{13}=\frac{55}{65}$
The proportion can be written as
11:13::55:65
Product of extremes =11×65
=715
Product of Means = 13×55
=715
As product of extremes = Product of Means
So the given proportion is true.

(*iii*) $\frac{11}{13}=\frac{44}{55}$

Solution:
$\frac{11}{13}=\frac{44}{65}$
The proportion can be written as 11 : 13 : : 44 : 65
As Product of extremes =11×65
=715
Product of means = 13×44
= 572

As product of extremes ≠ Product of Means
So the given proportion is false.

(iv) 12 : 6 :: 24 : 12

Solution:

Product of extremes = 12×12
= 144

Product of Means = 6×24
= 144

As product of extremes = Product of Means
So the given proportion is true.

(v) 6 : 2 :: 18 : 4

Solution:

6 : 2 :: 18 : 4

Product of extremes = 6×4
= 24

Product of Means = 2×18
= 36

As product of extremes ≠ Product of Means
So the given proportion is false.

2. Find the value of ☐ in the following proportions:

(i) 5 : 3 :: ☐ : 12

Solution:

As product of means = Product of extremes

3×☐ = 5×12

☐ = $\frac{60}{3}$

☐ = 20

(ii) ☐ : 13 :: 55 : 65

Solution:

As product of extreme = Product of Means

65×☐ = 13×55

☐ = $\frac{715}{65}$

☐ = 11

(iii) 20 : 9 :: 40 : ☐

Solution:

As product of extremes = Product of Means

20×☐ = 9×40

☐ = $\frac{9\times40}{20}$

☐ = 9×2

☐ = 18

(iv) 22 : ☐ :: 44 : 52

Solution:

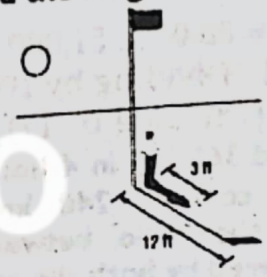
As product of Means = Product of extremes

☐×44 = 22×52

☐ = $\frac{\cancel{22}^{1}}{\cancel{44}_{2}}$

☐ = 26

3. Answer is standing next to a flagpole as shown at the right. Answer is 6 feet tall. Which proportion could you use to find the height of the flagpole?



(i) $\frac{3}{6}=\frac{x}{12}$ (ii) $\frac{x}{6}=\frac{3}{12}$

(iii) $\frac{6}{3}=\frac{x}{12}$ (iv) $\frac{3}{x}=\frac{12}{6}$

Solution:

As shown in the figure the height of answer increases as compare to its shadow. So the height of flagpole is also increase as compare to its shadow.

So there is a directly proportional. Now let height of flagpole is 'x' then

6 : 3 :: x : 12

$\Rightarrow \frac{6}{3}=\frac{x}{12}$

So this is the required proportional. To find the height of flagpole.

4. Test which of the following relations are in direct proportion and which are inversely proportional?

(i) $y=3x$

Solution:

To check that the given relation is in direct proportional or inverse proportional.
We put different value of x

$x=1$, $y=3\times1=3$

$x=2$, $y=3\times2=6$

$x=3$, $y=3\times3=9$

x	1	2	3	...	...
y	3	6	9	...	...

As we see that when value of 'x' increase the value of y is increase. This shows that there is directly proportional x.

(ii) $y=\frac{2}{3x}$

Solution:

To check that the given relation is in direct or inverse proportional we put different of x.

$x=1, y=\frac{2}{3\times1}=\frac{2}{3}=0.6667$

$x=2, y=\frac{2}{3\times2}=\frac{1}{3}=0.333$

$x=3, y=\frac{2}{3\times3}=\frac{2}{9}=0.222$

x	1	2	3	.....
y	.66	.33	.22	.....

As we see that when value of 'x' increase the value of 'y' is decrease. This shows that there is inverse proportional.

(iii) $y=4x$

Solution:

To check that the given relation is in direct or inverse proportional. We put different value of x.

$x=1, y=4\times1=4$

$x=2, y=4\times2=8$

$x=3, y=4\times3=12$

x	1	2	3	....	....
y	4	8	12	....	....

As we see that when value of 'x' increase the value of y is increase. This shows there is directly proportional.

(iv) $y=\frac{7}{x}$

Solution:

To check that the given relation is in direct proportional or inverse proportional we put different value of x.

$x=1, y=\frac{7}{1}=7$

$x=2, y=\frac{7}{2}=3.5$

$x=3, y=\frac{7}{3}=2.33$

x	1	2	3	.....	.....
y	7	3.5	2.33	.....	.....

As we see that when value of 'x' increase the value of y is decrease. This shows that there is in inversely proportional.

5. Price of 5 chairs is Rs. 400. Find the price of 15 chairs.

Solution:

Suppose price of 15 chairs = x
As their direct proportional,
So 5 : 400 : : 15 : x
As product of extreme = Product of Means.

$5\times x=400\times15$

$x=\frac{400\times15}{5}$

$x=400\times3$

$x=1200$

So price of 15 chairs = R.400

6. Price of one dozen of bananas is Rs. 30. Find the price of 100 bananas.

Solution:

Suppose price of 100 bananas = x
As there are direct proportional,
As 1 dozen = 12,
So 12 : 30 : : 100 : x
As product of extremes = Product of Means

$12\times x=30\times100$

$x=\frac{30\times100}{12}=250$

So price of 100 bananas = Rs. 250

7. A shopkeeper earned a profit of Rs. 27 on selling goods for Rs. 360. Find the profit on selling goods for Rs. 100.

Solution:

Suppose profit on selling goods for Rs. 100 = x

As there is a direct proportional,

So $27 : 360 : x : 100$

As product of Means = Product of extremes

$$360 \times x = 27 \times 100$$

$$x = \frac{2700}{360}$$

$$x = 7.5$$

Required Profits = Rs. 7.5

8. Majida paid Zakat of Rs. 25 on Rs. 1000. How much Zakat Farida will pay on Rs. 8000.

Solution:

Suppose required Zakat = x

As there is direct proportional,

So $25 : 1000 :: x : 8000$

As product of Means = Product of extremes

$$100 \times x = 25 \times 8000$$

$$x = \frac{25 \times 8000}{1000}$$

$$x = 200$$

So paid Zakat = Rs. 200

REVIEW EXERCISE 6

1. Fill in the blanks.

(i) The numbers 27 and 9 are in the ratio 3 : 1

(ii) The number 2.7 and 0.9 are in the ratio 3 : 1

(iii) The numbers $\frac{3}{2}$ and $\frac{7}{2}$ are in the ratio of 3 : 7

(iv) In 3 : 5, antecedent = 3 and consequent = 5.

(v) In 13.5 : 17.2, antecedent = 13.5 and consequent = 17.2.

(vi) The lowest form of $\frac{9}{12} = \frac{3}{4}$

(vii) The lowest form of $\frac{4.5}{1.5} = \frac{3}{1}$

(viii) The lowest form of 65 : 39 = 5 : 3

(ix) In 1 : 2 :: 2 : 4, extremes are 1, 4 and means are 2, 2

(x) In 3.2 : 5 :: 6.4 : 10, extremes are 3.2, 10 and means are 5, 6.4

(xi) $y = \frac{1}{2}x$ is in direct proportion.

(xii) $y = 7x$ is in direct proportion.

2. The perimeter of a farm is 187.2 m. If its width is 39m, then find the ratio between its length and width.

Solution:

Perimeter of a frame = 187.2m

Width = 39m

As Perimeter = 2 (width + length)

$187.2 = 2\ (39 + \text{length})$

$$39 + \text{length} = \frac{187.2}{2}$$

$39 + \text{length} = 93.6$

$\text{length} = 93.6 - 39$

$= 54.6$

Now length : Width = 54.6 : 39

= 546 : 390

= 273 : 195

= 91 : 65

= 7 : 5

3. Sum of the heights of Bushra and Sajida is 3.3m. If the height of Sajida is 1.5 m, find the ratio between their heights.

Solution:

Sum of heights = 3.3m

Height of Sajida = 1.5m

So Height of Bushra = 3.3 – 1.5

= 1.8

Ratio between their height

= 1.8 : 1.5

= 18 : 15

= 6 : 5

4. Price of 3 Kg of apples is Rs. 135. Find the price of 11 kg of apples.

Solution:

Suppose price of 11 kg apples = x

As there are direct proportional

So

$3 : 135 :: 11 : x$

As Product of extremes = Product of Means

$$3 \times x = 135 \times 11$$

$$x = \frac{135 \times 11}{3}$$

$$x = 45 \times 11$$

$$x = 495$$

So price of 11 kg apples = Rs. 495

5. In a house of 15 persons food was sufficient for 30 days. 5 persons left the house. For how many days the food would be sufficient?

Solution:

Suppose number of days = x

As there are inverse proportional,

So

$15 : : : 10 : 30$

$x \times 10 = 15 \times 30$

$x = \frac{15 \times 30^{3}}{\cancel{10}}$

$x = 45$

So required number of days = 45

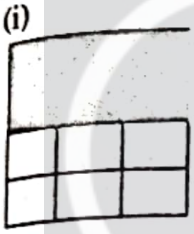
Unit 7

FINANCIAL ARITHMETIC

EXERCISE 7.1

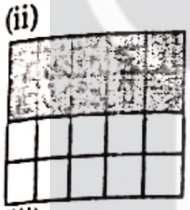
1. Answer the following.

(i)



How many squares? 12
Shade 50%
How many shaded? 6
50% of 12 is 6.

(ii)



How many squares? 20
Shade 50%
How many shaded? 10
50% of 12 is 6.

(iii)

How many flowers? 12
Circle 50%
How many circled? 6
$\frac{1}{2}$ of 12 is 6.
50% of 12 is 6.

(iv)

How many bulbs ? 20
Circle 50%
How many circled? 10
$\frac{1}{2}$ of 20 is 10.
50% of 20 is 10.

2. Convert each of the following percent into lowest common fraction.

(i) 80%

Solution:

$80\% = 80 \times \frac{1}{100}$

$= \frac{80}{100}$

$= \frac{8}{10} = \frac{4}{5}$

(ii) 60%

Solution:

$60\% = 80 \times \frac{1}{100}$

$= \frac{80}{100}$

$= \frac{8}{10} = \frac{4}{5}$

(iii) $12\frac{1}{2}$

Solution:

$12\frac{1}{2}\% = 12\frac{1}{2} \times \frac{1}{100}$

$= \frac{25}{2} \times \frac{1}{100}$

$= \frac{5}{2} \times \frac{1}{20}$

$= \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$

(iv) $16\frac{2}{3}\%$

Solution:

$16\frac{2}{3}\% = \frac{50}{3}\%$

$= \frac{50}{3} \times \frac{1}{100}$

$= \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

(v) 13%

Solution:

$13\% = 13 \times \frac{1}{100}$

$= \frac{13}{100}$

(vi) 10%

Solution:

$10\% = 10 \times \frac{1}{100}$

$$=\frac{1}{10}$$

(vii) $12\frac{2}{3}\%$

Solution:

$$12\frac{2}{3}\%=\frac{38}{3}\%$$
$$=\frac{38}{3}\times\frac{1}{100}$$
$$=\frac{19}{3}\times\frac{1}{50}$$
$$=\frac{19}{150}$$

3. Convert the following as percent.

(i) $\frac{9}{15}$

Solution:

$$\frac{9}{15}=\frac{9}{15}\times\frac{100}{100}$$
$$=\left(\frac{9}{15}\times100\right)\times\frac{1}{100}$$
$$=\left(\frac{3}{5}\times100\right)\%$$
$$=\left(\frac{3}{1}\times20\right)\%$$
$$=60\%$$

(ii) $\frac{7}{30}$

Solution:

$$\frac{7}{30}=\frac{7}{30}\times\frac{100}{100}$$
$$=\left(\frac{7}{30}\times100\right)\times\frac{1}{100}$$
$$=\left(\frac{7}{3}\times10\right)\times\frac{1}{100}$$
$$=\frac{70}{3}\%$$
$$=23\frac{1}{3}\%$$

As $3\overline{)70}\ 23$, $\frac{6}{10}$, $\frac{9}{1}$

(iii) $2\frac{1}{4}$

Solution:

$$2\frac{1}{4}=2\frac{1}{4}\times\frac{100}{100}$$
$$=\left(\frac{9}{4}\times100\right)\times\frac{1}{100}$$
$$=\left(\frac{9}{1}\times25\right)\%$$
$$=225\%$$

(iv) $\frac{1}{16}$

Solution:

$$\frac{1}{16}=\frac{1}{16}\times\frac{100}{100}$$
$$=\left(\frac{1}{16}\times100\right)\times\frac{1}{100}$$
$$=\left(\frac{1}{4}\times25\right)\%$$
$$=6\frac{1}{4}\%$$

As $4\overline{)25}\ 6$, $\frac{24}{1}$

(v) $\frac{8}{25}$

Solution:

$$\frac{8}{25}=\frac{8}{25}\times\frac{100}{100}$$
$$=\left(\frac{8}{25}\times100\right)\times\frac{1}{100}$$
$$=\left(\frac{8}{1}\times4\right)\times\frac{1}{100}$$
$$=32\%$$

4. Express each of the following as decimal fraction.

(i) 40%

Solution:

$$40\%=40\times\frac{1}{100}$$
$$=\frac{4}{10}$$
$$=0.4$$

(ii) 75%

Solution:

$$75\%=75\times\frac{1}{100}$$
$$=0.75$$

(iii) 125%

Solution:

$$125\% = 125 \times \frac{1}{100}$$
$$= 1.25$$

(iv) 0.4%

Solution:

$$0.4\% = 0.4 \times \frac{1}{100}$$
$$= \frac{4}{10} \times \frac{1}{100}$$
$$= \frac{4}{100} = 0.004$$

(v) $33\frac{1}{3}\%$

Solution:

$$33\frac{1}{3}\% = \frac{100}{3} \times \frac{1}{100}$$
$$= \frac{1}{3}$$
$$= 0.33$$

5. Convert each of the following as decimal fraction into percent.

(i) 0.5

Solution:

$$0.5 = 0.5 \times \frac{100}{100}$$
$$= \left(\frac{5}{10} \times 100\right) \times \frac{1}{100}$$
$$= (5 \times 10)\%$$
$$= 50\%$$

(ii) 0.76

Solution:

$$0.76 = 0.76 \times \frac{100}{100}$$
$$= \left(\frac{76}{100} \times 100\right) \times \frac{1}{100}$$
$$= 76\%$$

(iii) 2.45

Solution:

$$2.45 = 2.45 \times \frac{100}{100}$$
$$= \left(\frac{245}{100} \times 100\right) \times \frac{1}{100}$$
$$= 245\%$$

(iv) 0.375

Solution:

$$0.375 = 0.375 \times \frac{100}{100}$$
$$= \left(\frac{375}{1000} \times 100\right) \times \frac{1}{100}$$
$$= \frac{375}{10}\%$$
$$= 37.5\%$$

(v) 0.0125

Solution:

$$0.0125 = 0.0125 \times \frac{100}{100}$$
$$= (0.0125 \times 100) \times \frac{1}{100}$$
$$= \left(\frac{125}{10000} \times 100\right)\%$$
$$= \left(\frac{125}{100}\right)\%$$
$$= 1.25\%$$

EXERCISE 7.2

1. A squared box is divided into 100 equal circles of the some radii. 30 circles are black, 20 are blue and the remaining circles are red. What is the percentage of red circles in the box?

Solution:

Number of circles = 100
Black circles = 30
Blue circles = 20
So remaining red circle
= 100 – 30 – 20
= 100 – (30 + 20)
= 100 – 50
= 50
So percentage of red circle = 50%

2. 25% of a wall painted blue, 30% painted green and the rest of the wall painted white. Find the percentage of the white part of the wall.

Solution:

Percentage of blue part of a wall = 25%
Percentage of green part of a wall = 30%
Percentage of blue and green part = 25% + 30%
= 55%

So
Percentage of white part of a wall
$= 100 - 55\%$
$= 45\%$

3. In a home examination Ali obtained 350 marks out of 500. Find the percentage of the marks.

Solution:
Obtained marks = 350
Total marks = 500
Let 'x' be percentage of marks.
So

$$x = \frac{350}{500} \times \frac{100}{100}$$
$$= \left(\frac{350}{500} \times 100\right) \times \frac{1}{100}$$
$$= \left(\frac{350}{5}\right)\%$$
$$= 70\%$$

Percentage of marks = 70%

4. Aslam got Rs. 500 as pocket money in a month. He spent Rs. 150 on cold drinks, Rs. 100 on stationary and saved the rest amount. What percentage of the pocket money he spent on cold drinks?

Solution:
Pocket money = Rs. 500
Spent on cold drink money Rs. 150
Let 'x' be percentage of the pocked money he spent on cold drink.
So

$$x = \frac{150}{500}$$
$$= \frac{150}{500} \times \frac{100}{100}$$
$$x = \left(\frac{150}{500} \times 100\right) \times \frac{1}{100}$$
$$= \left(\frac{150}{5}\right)\%$$
$$= 30\%$$

So percentage of the packet money he spent on cold drinks = 30%.

5. 20 out of 32 members of a football team weigh over 100 kg. What percent of the team weighs over 100 kg?

Solution:
Members of a football team weigh over 100 kg = 20 out of 32

$$= \frac{20}{32}$$

Let 'x' required percent $= \frac{20}{32}$

$$= \frac{20}{32} \times \frac{100}{100}$$
$$= \left(\frac{20}{32} \times 100\right) \times \frac{1}{100}$$
$$= \left(\frac{10}{16} \times 100\right)\%$$
$$= 62.5\%$$

EXERCISE 7.3

1. Find the value of the discount and the amount actually paid for the following.

S#	Items	Price (Rs.)	Discount
1.	Radio	500	10%
2.	Kettle	200	5%
3.	Record player	800	25%
4.	Refrigerator	25000	20%
5.	Bicycle	6000	15%
6.	Washing machine	8000	10%

1. Solution:
Price of Radio = Rs. 500
Discount rate = 10%
Discount = 10% of 500

$$= \frac{10}{100} \times 500$$
$$= Rs.50$$

Thus the amount paid = 500 – 50
= Rs. 450

2. Solution:
Price of Kettle = Rs. 200
Discount rate = 5%
Discount = 5% of 200

$$= \frac{5}{100} \times 200$$
$$= Rs.10$$

The amount paid = 200 – 10
= Rs. 190

3. Solution:
Price of record player = 800

Discount rate = 25%
Discount = 25% of 800

$$= \frac{25}{100} \times 800$$

$$= Rs.200$$

The amount paid = 800 – 200
= Rs. 600

4. Solution:

Price of refrigerator = 25000
Discount rate = 20%
Discount = 20% of 25000

$$= \frac{20}{100} \times 25000$$

= Rs. 5000
Amount paid = 25000 – 5000
= 2000

5. Solution:

Price of Bicycle = 6000
Discount rate = 15%
Discount = 15% of 6000

$$= \frac{15}{100} \times 6000$$

$$= Rs.900$$

Thus amount paid = 600 – 900
= Rs. 5100

6. Solution:

Price of washing machine = Rs. 8000
Discount rate = 10%
Discount = 10% of 8000

$$= \frac{10}{100} \times 8000$$

$$= Rs.800$$

Thus amount paid = 8000 – 800
= Rs. 7200

2. Aslam bought 5 dozens of eggs at the rate of Rs. 30 per dozen and sold per dozen at the rate of Rs. 40. Find the profit he gained.

Solution:

Per dozen rate = Rs. 30
5 dozen rate = 30×5
= Rs. 150
Sold rate per dozen = Rs. 40
5 dozen sold rate = 40×5
= Rs. 200
Profit = S.P – C.P
= 200 – 150
Profit = Rs. 50

3. Asim bought a bicycle for Rs. 2500 and spent Rs. 300 an its decoration. He then sold it for Rs. 4000. Find profit percent.

Solution:

Purchased price = Rs. 2500
Decoration price = Rs. 300
Total cost price = 2500 + 300
= 2800
Sale price = Rs. 4000
As we know that

$$\text{Profit percent} = \left(\frac{S.P - C.P}{C.P}\right) \times 100\%$$

$$= \left(\frac{4000 - 2800}{2800}\right) \times 100\%$$

$$= \frac{1200}{2800} \times 100\%$$

$$= \frac{12}{28} \times 100\%$$

$$= \frac{6}{14} \times 100\% = \frac{3}{7} \times 100\%$$

$$= \frac{300}{7}\%$$

$$= 42.85\%$$

As
$$7\overline{)300}\ \begin{array}{r} 42.85 \\ 28 \\ \hline 20 \\ 14 \\ \hline 60 \\ 56 \\ \hline 40 \\ 35 \\ \hline 5 \end{array}$$

4. A chair was purchased for Rs. 600 and sold for Rs. 575. Find the profit or Loss.

Solution:

Purchased price = Rs. 600
Sale price = Rs. 575
As sale price is less than purchased price so this is loss.
Loss = C.P – S.P
= 600 – 575 = 25
So
Loss = Rs. 25

5. Saima bought a pack of ten pencils for Rs. 20 and sold per pencil for Rs. 2.5. Find profit or loss percent.

Solution:

Purchased price of ten pencils = 20

$$\text{Price of one pencils} = \frac{20}{2}$$

$$= 2$$

Sale price of 1 pencil = 2.5
Sale price of 10 pencils = 10×2.5
= Rs 25
As S.P > C.P, So there is profit.

Profit percent $= \left(\frac{S.P - C.P}{C.P}\right) \times 100\%$

$= \left(\frac{25-20}{20}\right) \times 100\%$

$= \frac{5}{20} \times 100\%$

$= \frac{1}{4} \times 100\%$

$= 25\%$

6. A bookseller bought 5 dozens note books at the rate of Rs. 20 per notebook and sold at the rate of Rs. 300 per dozen. Find profit or loss.

Solution:

C.P of per dozen $= 12 \times 20$

$= 240$

C.P of 5 dozens $= 240 \times 5$

$= 1200$

S.P per dozen $= 300$

S.P of 5 dozens notebooks

$= 300 \times 5$

$= 1500$

As S.P > C.P

So profit = S.P – C.P

$= 1500 - 1200$

$= 300$

Profit = Rs. 300

7. Aqeel bought some books from a book stall costing Rs. 1000. He got a discount of 10%. Find the amount that he paid.

Solution:

Cost price = Rs. 1000

Discount rate = 10%

Discount = 10% of 1000

$= \frac{10}{10} \times 1000$

$= 100$

Thus amount paid = 1000 – 100

= Rs. 900

8. If the written price of a toy is Rs. 200 and its discounted price is Rs. 150, find the rate of discount.

Solution:

Written price of toy = Rs. 200

Discount price = Rs. 150

As

Discount = Discount rate % × price

$150 = \text{Discount rate \%} \times 200$

$\text{Discount rate \%} = \frac{150}{200}$

$\text{Discount rate} \times \frac{1}{100} = \frac{150}{200}$

$\text{Discount rate} = \frac{150}{200} \times 100$

$= 75\%$

REVIEW EXERCISE 7

1. If a statement is true then encircle 'T' and if the statement is False then encircle (F) in each of the following questions.

(*i*) $\frac{1}{100} = 1\%$ T✓ – F

(*ii*) 25% of 60 = 20 T – F✓

(*iii*) $\frac{2}{5} = 40\%$ T✓ – F

(*iv*) 50% = 0.4 T – F✓

(*v*) Profit = Sale price – cost price T✓– F

2. Choose the correct answer.

(*i*) 25% =

(*a*) $\frac{1}{4}$✓ (*b*) $\frac{1}{8}$ (*c*) $\frac{1}{6}$

(*ii*) 0.2 =

(*a*) 2% (*b*) 20%✓ (*c*) 5%

(*iii*) 30% =

(*a*) 0.03 (*b*) 0.3✓ (*c*) 30

3. Find the unknown in each of the following questions.

(i) What number is 50% of 150?

Solution:

Required number = 50% of 150

$= \frac{50}{100} \times 150$

$= 75$

(ii) 8 is 5% of what number?

Solution:

8 = 5% of required number

$8 = \frac{5}{100} \times \text{number}$

$\text{Number} = \frac{8 \times 100}{5} = 160$

(iii) 12 is 35% of what number?

Solution:

$12 = 35\%$ of number

$12 = \frac{35}{100} \times$ number

$\text{Number} = \frac{12 \times 100}{35}$

$= 34.28$

(iv) 98 is what percent of 200?

Solution:

Let x be required percent,

So $98 = x\% \times 200$

$98 = \frac{x}{100} \times 200$

$x = \frac{98}{2}$

$x = 49\%$

(v) $8\frac{5}{9}$ is what percent of 11?

Solution:

Let x be required percent,

So, $8\frac{5}{9} = x\% \times 11$

$\frac{77}{9} = \frac{x}{100} \times 11$

$x = \frac{77}{9} \times \frac{100}{11} = \frac{700}{9} = 77.77\%$

4. Twenty five out of 150 students failed mathematics in the annual examination. What percent of the whole class failed?

Solution:

Let 'x' be required percentage,

So

$x = \frac{25}{150}$

$= \frac{25}{150} \times \frac{100}{100}$

$= \left(\frac{25}{150} \times 100\right) \times \frac{1}{100}$

$= \left(\frac{25}{15} \times 10\right)\%$

$= \left(\frac{5 \times 10}{3}\right)\%$

$= \frac{50}{3}\%$

$= 16.6\%$

5. 20 out of 32 members of a football team weigh over 100 kg. What percent of the team weighs over 100 kg?

Solution:

Members of football team weigh over 100 Kg = 20 out of 32

$= \frac{20}{32}$

Let 'x' be required $= \frac{20}{32}$

$= \frac{20}{32} \times \frac{100}{100}$

$= \left(\frac{20}{32} \times 100\right) \times \frac{1}{100}$

$= \left(\frac{10}{16} \times 100\right)\%$

$= 62.5\%$

UNIT 8
INTRODUCTION TO ALGEBRA
EXERCISE 8.1

1. Separate the constants and variables in the following algebraic expressions.

(i) $x-5$

Solution:

Constant = -5, Variable = x

(ii) $y-1$

Solution:

Constant = -1, Variable = y

(iii) $a+4$

Solution:

Constant = 4, Variable = a

(iv) $x+y+2$

Solution:

Constant = 2, Variable = x, y

2. Write the co-efficient and exponents in the following expressions.

(i) $-2x$

Solution:

Coefficient = -2, Exponent = 1

(ii) $3y^2$.

Solution:

Coefficient = 3, Exponent = 2

(iii) $5z^3$

Solution:

Coefficient = 5, Exponent = 3

(iv) $-6x^2$

Solution:

Coefficient =, Exponent = 2

3. Identify true sentences, false sentences and open sentences in the following algebraic sentences.

(i) $6+2=8$

Solution:

True sentence

(ii) $3\times5=16$

Solution:

False sentence

(iii) $7x-5=10$

Solution:

Open sentence

(iv) $x<3$

Solution:

Open sentence

(v) $4\nless2$

Solution:

False sentence

(vi) $(11+2)<6$

Solution:

True sentence

4. Put "=", "<" or ">" in the blank spaces to make the sentences true.

Solution:

(i) $5+3$ __<__ 9

(ii) $6x-2x$ __=__ $4x$

(iii) $8-5$ __>__ 2

5. In a match box there are 50 matches. How many matches are there in

(i) 2 boxes?

Solution:

1 Match box = 50 matches

So, 2 Match bones = 2×50

$= 100$

(ii) 3 boxes?

Solution:

1 Match box = 50 matches

3 Match boxes = 3×50

$= 150$

(iii) x boxes?

Solution:

1 Match box = 50 matches

x Match boxes $= 50\times(x)$

$= 50x$

(iv) 4 x boxes?

Solution:

1 Match box = 50 Matches

$4x$ match bones $= (4x)\times50$

$= (4\times50)x$

$= 200x$

EXERCISE 8.2

1. Find the number of terms in the following algebraic expressions.

(i) $6x$

Solution:

One term

(ii) 2

Solution:

One term

(iii) $2x+3$

Solution:

Two terms

(iv) $4x-6y$

Solution:

Two terms

(v) $a+b+c$

Solution:

Three terms.

(vi) $2xy$

Solution:

One term

(vii) $7xy+9z$

Solution:

Two term

2. In each of the following algebraic expressions find the like terms.

(i) $a^2+ab+2ab+3a^2$

Solution:

a^2 and $3a^2$, ab and $2ab$

(ii) $x^2y+2xy^2+3x^2y+5xy^2$

Solution:

x^2y and $3x^2y$, $2xy^2$ and $5xy^2$

(iii) $a^3-2a^2b+4a^2b+5a^3$

Solution:

a^3 and $5a^3$, $-2a^2b$ and $4a^2b$.

(iv) $xy+yz+2xy-3yz$

Solution:

xy and $2xy$, yz and $-3yz$

3. Write the following sum as a single term.

(i) $2x+3x$

Solution:

$2x+3x=5x$

(ii) $4a^2+5a^2$

Solution:

$4a^2+5a^2=9a^2$

(iii) $x+2x+3x$

Solution:

$x+2x+3x=6x$

(iv) $9ab+2ab$

Solution:

$9ab+2ab=11ab$

(v) $2xyz+3xyz$

Solution:

$2xyz+3xyz=5xyz$

(vi) $4a^3+7a^3$

Solution:

$4a^3+7a^3=11a^3$

4. Simplify the following expressions.

(i) $3x+4x+6y$

Solution:

$3x+4x+6y=7x+6y$

(ii) $x^2y+2xy^2-3x^2y+5xy^2$

Solution:

$$x^2y+2xy^2-3x^2y+5xy^2$$
$$=x^2y-3x^2y+2xy^2+5xy^2$$
$$=-2x^2y+7xy^2$$

(iii) $ab+bc-2ab$

Solution:

$$ab+bc-2ab=ab-2ab+bc$$
$$=-ab+bc$$

(iv) $ax+by+cx$

Solution:

$$ax+by+cx=ax+cx+by$$
$$=(a+c)x+by$$

5. Identify the terms, like terms, coefficients and constants in the expression.

(i) $3x+4x+y-2$

Solution:

Like term = $3x$ and $4x$

Coefficient = 3, 4 and 1.

Constant = -2

(ii) $4x+3+5x+y$

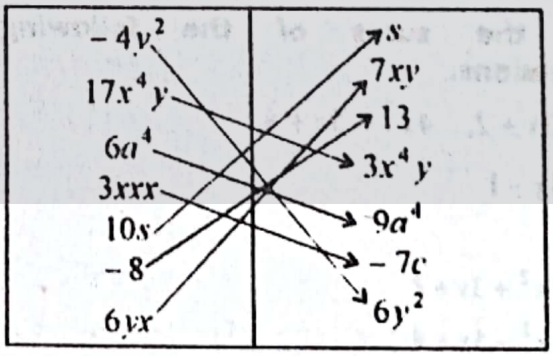
Solution:

Like terms = $4x$ and $5x$

Coefficient = 4, 5 and 1.

Constant = 3.

6. Match like and unlike terms.



EXERCISE 8.3

1. Add the following expressions:

(i) $x+y,\ 2x+3y$

Solution:

$(x+y)+(2x+3y)$

$=(x+2x)+(y+3y)$

(Like terms combined)

$=(1+2)x+(1+3)y$

(Coefficient added)

$=3x+4y$

(ii) $2x+4y, 3x+5y, 6x+y$

Solution:

$(2x+4y)+(3x+5y)+(6x+y)$

$=(2x+3x+6x)+(4y+5y+y)$

(Like terms combined)

$=(2+3+6)x+(4+5+1)y$

(Coefficient added)

$=11x+10y$

(iii) $x^2+y^2+z^2, 6x^2+2y^2+3z^2$

Solution:

$(x^2+y^2+z^2)+(6x^2+2y^2+3z^2)$

$=(x^2+6x^2)+(y^2+2y^2)+(z^3+3z^2)$

(Like terms combined)

$=(1+6)x^2+(1+2)y^2+(1+3)z^2$

(Coefficient added)

$=7x^2+3y^2+4z^2$

(iv) $x^2+2x+3, 4x^2+6x-5$

Solution:

$(x^2+2x+3)+(4x^2+6x-5)$

$=(x^2+4x^2)+(2x+6x)+(3-5)$

(Like terms combined)

$=(1+4)x^2+(2+6)x+(-2)$

(Coefficient added)

$=5x^2+8x-2$

2. Find the sums of the following expressions.

(i) $2x^2+3x+2,\ 4x^2-5x+4,$

$6x^2+8x-1$

Solution:

$$\begin{array}{r} 2x^2+3x+2 \\ 4x^2-5x+4 \\ \hline 6x^2+8x-1 \\ \hline 12x^2+6x+5 \end{array}$$

(ii) $7a^2-ab+b^2, 8a^2-3ab-2b^2, 4a^2+8ab+4b^2$

Solution:

$$\begin{array}{r} 7a^2-ab+b^2 \\ 8a^2-3ab-2b^2 \\ \hline 4a^2+8ab+4b^2 \\ \hline 19a^2+4ab+3b^2 \end{array}$$

(iii) $p^2+4pq+q^2, 2p^2-3pq+5q^2, 3p^2+pq-2q^2$

Solution:

$$\begin{array}{r} p^2+4pq+q^2 \\ 2p^2-3pq+5q^2 \\ \hline 3p^2+pq-2q^2 \\ \hline 6p^2+2pq+4q^2 \end{array}$$

3. Subtract the first expression from the second in the following.

(i) $x+3y$ from $4x-y$

Solution:

$$\begin{array}{r} 4x-y \\ \pm\ x\pm 3y \\ \hline 3x-4y \end{array}$$

(ii) $x^2+3xy+y^2$ from $3x^2-5xy-2y^2$

Solution:

$$\begin{array}{r} 3x^2-5xy-2y^2 \\ \pm\ x^2\pm 3xy\pm y^2 \\ \hline 2x^2-8xy-3y^2 \end{array}$$

(iii) $a^2b+b^2c+ac^2$ from $4a^2b-2b^2c+6ac^2$

Solution:

$$\begin{array}{r} 4a^2b-2b^2c+6ac^2 \\ \pm\ a^2b\pm b^2c\pm ac^2 \\ \hline 3a^2b-3b^2c+5ac^2 \end{array}$$

4. Simplify:

(i) $(x+y)+(2x-y)$

Solution:

$(x+y)+(2x-y)$

$=(x+2x)+(y-y)$

$=3x+0$

$=3x$

(ii) $(a^2b-b^2)-(2a^2b+3b^2)$

Solution:

$(a^2b-b^2)-(2a^2b+3b^2)$

$=a^2b-b^2-2a^2b-3b^2$

$=(a^2b-2a^2b)+(-b^2 3b^2)$

$=-a^2b-4b^2$

(iii) $(x^2y+2)-(2x^2y+5y^2+6)$

Solution:

$(x^2y+2)-(2x^2y+5y^2+6)$

$=x^2y+2-2x^2y-5y^2-6$

$=x^2y-2x^2y-5y^2+2-6$

$=-x^2y-5y^2-4$

(iv) $(6m^2+3n)-(2m^2+5n)$

Solution:

$(6m^2+3n)-(2m^2+5n)$

$=6m^2+3n-2m^2-5n$

$=(6m^2-2m^2)+(3n-5n)$

$=4m^2-2n$

EXERCISE 8.4

1. Find the value of the following if $x=6, y=5$ and $z=2$

(i) $x+y$

Solution:

$x+y$

Put $x=6$ and $y=5$, we have

$x+y=6+5$

$=11$

(ii) $2x$

Solution:

$2x$

Put $x=6$, we have

$2x=2\times6$

$=12$

(iii) $3x+y$

Solution:

Put $x=6, y=5$, we have

$3x+y=3\times6+5$

$=18+5$

$=23$

2. If $x=4$, evaluate the following.

(i) $4x^2$

Solution:

$4x^2$

Put $x=4$

$4x^2=4(4)^2$

$=4(16)$

$=64$

(ii) $3x^2-4x$

Solution:

$3x^2-4x$

Put $x=4$, we have

$3x^2-4x=3(4)^2-4(4)$

$=3(16)-16$

$=48-16$

$=32$

(iii) $x+\frac{1}{x}$

Solution:

$x+\frac{1}{x}$

Put $x=4$

$x+\frac{1}{x}=4+\frac{1}{4}$

$=\frac{4\times4+1}{4}$

$=\frac{10+1}{4}$

$=\frac{17}{4}$

3. If $x=1, y=2$ find the value of the following algebraic expressions.

(i) x^2y+2

Solution:

x^2y+2

Put $x=1, y=2$, we have.

$x^2y+2=(1)^2(2)+2$

$=2+2$

$=4$

(ii) $x^2-2x+3y$

Solution:

$x^2-2x+3y$

Put $x=1, y=2$

$x^2-2x+3y=1^2-2(1)+3(2)$

$=1-2+6$

$=7+2$

$=5$

(iii) $\frac{1}{2}x+\frac{1}{3}y$

Solution:

Put $x=1, y=2$

$$\frac{1}{2}x+\frac{1}{3}y=\frac{1}{2}(1)+\frac{1}{3}(2)$$

$$=\frac{1}{2}+\frac{2}{3}$$

$$=\frac{3\times1+2\times2}{6}$$

$$=\frac{3+4}{6}=\frac{7}{6}$$

$$\frac{1}{2}x+\frac{1}{3}y=\frac{7}{6}$$

4. If $x=1, y=2$ and $z=-1$ then find the value of the following.

(i) $4xyz$

Solution:

$4xyz$

Put $x=1, y=2, z=-1$, we have

$4xyz=4(1)(2)(-1)$

$=-8$

(ii) $x+2x+3z$

Solution:

$x+2x+3z$

Put $x=1, y=2, z=-1$, we have

$x+2y-3z=1+2(2)-3(-1)$

$=1+4+3$

$=8$

(iii) $(x+y)^2-(y-z)^2$

Solution:

$(x+y)^2-(y-z)^2$

Put $x=1, y=2, z=-1$ we have

$(x+y)^2-(y-z)^2=(1+2)^2\pm(2-(-1))$

$=(3)^2\pm(2+1)^2$

$=9-3^2$

$=9-9$

$=0$

5. Evaluate the following by taking $a=1, b=0, c=-1$

(i) $ab-c$

Solution:

$ab-c$

Put $a=1, b=0, c=-1$

$ab-c=1(0)-(-1)$

$=0+1=1$

(ii) $\left[\frac{a-c}{a+b}\right]+ab$

Solution:

$$\left[\frac{a-c}{a+b}\right]+ab$$

Put $a=1, b=0, c=1$

$$\left[\frac{a-c}{a+b}\right]+ab=\left[\frac{1-1}{1+0}\right]+(1)(0)$$

$$=\left[\frac{0}{1}\right]+0$$

$$=0+0$$

$$=0$$

(iii) $a^3+b^3+c^3$

Solution:

$a^3+b^3+c^3$

Put $a=1, b=0, c=-1$

$a^3+b^3+c^3=1^3+0^3+(-1)^3$

$=1+0-1$

$=0$

Review Exercise 8

1. Fill in the blanks.

(i) The number '5' is called constant.

(ii) 'x' is called variable

(iii) In $a+b$ number of terms equal to two.

(iv) The coefficient in $3x$ is 3.

2. Encircle T if the statement is correct and encircle F if it is false.

(i) The number of terms in x^2+3x is two. T✓/F

(ii) $7<16$ is true sentence. T✓/F

(iii) $6x-4x=2x$ is true sentence. T✓/F

(iv) x^2 and x are like terms. T/F✓

3. Choose the correct answer.

(i) $x+y$ is an algebraic

(a) Expression✓

(b) Sentence
(c) Equation
(ii) $3<0$
(a) True sentence
(b) False sentence ✓
(c) Open sentence
(iii) x^2y and xy^2 are
(a) Like terms
(b) Unlike terms ✓
(c) Constants
(iv) Number of terms in the expression $2x^2+3x+4$ is/ are
(a) One (b) Two
(c) Three ✓

4. Simplify each of the following algebraic expressions by combining like terms.

(i) $5x-8x$

Solution:

$5x-8x=-3x$

(ii) $5y-2-8y-6$

Solution:

$5y-2-8y-6$

$=(5y-8y)+(-2-6)$

(Like term combined)

$=-3y+(-8)$

$=-3y-8$

(iii) $2(3a-6)-4(4a+6)$

Solution:

$2(3a-6)-4(4a+6)$

$=6a-12-16a-24$

$=(6s-16a)+(-12-24)$

(Like term combined)

$=-10a+(-36)$

$=-10a-36$

(iv) $(6-t)=-4(4t-7)$

Solution:

$6-t-4(4t-7)$

$=6-t-16t+28$

$=(-t-16t)+(6+28)$

(Like term combined)

$=-17t+34$

5. Evaluate each of the following algebraic expressions.

(i) $3x-4y+z$ **when** $x=2, y=-3, z=-5$

Solution:

Put $x=2, y=-3, z=-5$

$3x-4y+z=3(2)-4(-3)+(-5)$

$=6+12-5$

$=18-5$

$=13$

(ii) $8(x-6y)$ **when** $x=5$ **and** $y=3$

Solution:

$8(x-6y)$

Put $x=5, y=3$

$8(x-6y)=8(5-6(3))$

$=8(5-18)$

$=-104$

UNIT 9
LINEAR EQUATION
EXERCISE 9.1

1. Solve the following equations to show that they are linear equations in one variable:

(i) $4x+13=0$

Solution:

$4x+13=0$

$4x+13-13=-13$

Subtract – 13 from both side.

$4x+0=-13$

$4x=-13$

$\frac{4x}{4}=\frac{-13}{4}$

Divide both side by 4

$x=\frac{-13}{4}$

As 'x' is a variable and exponent of 'x' is 1, so the given equation is linear.

(ii) $\frac{5}{7}x-\frac{7}{3}=0$

Solution:

$\frac{5}{7}x-\frac{7}{3}=0$

$\frac{5}{7}x-\frac{7}{3}+\frac{7}{3}=\frac{7}{3}$

Add $\frac{7}{3}$ both side

$\frac{5}{7}x+0=\frac{7}{3}$

$\frac{5}{7}x=\frac{7}{3}$

$\left(\frac{5}{7}x\right)7=\left(\frac{7}{3}\right)7$

Multiplying both side by 7

$5x=\frac{49}{3}$

$\frac{5x}{5}=\frac{49}{5\times 3}$

Dividing both side by 5

$x=\frac{49}{15}$

As 'x' is a variable and their exponent is 1, So the given equation is linear.

(iii) $\frac{3}{2}x-5=2x+4$

Solution:

$\frac{3}{2}x-5=2x+4$

$\frac{3}{2}x-5+5=2x+4+5$ (Add b/s 5)

$\frac{3}{2}x=2x+9$

$\frac{3}{2}x-2x=2x-2x+9$ Subtract $2x$ from b/s

$\frac{3}{2}x-2x=9$

$\frac{3x-(2x)2}{2}=9$

$\frac{3x-4x}{2}=9$

$\left(-\frac{x}{2}\right)2=2\times 9$

Multiplying b/s by 2

$-x=18$

$x=-18$

As 'x' is variable and their exponent is '1'. So the given equation is linear.

2. What should be the values of × which balance the following equations:

(i) $x=0$

Solution:

$x=0$

The given value should be balance if $x=0$.

(ii) $x-5=0$

Solution:

$x-5=0$

$x+5-5=5$ Adding 5 b/c

$x=5$

So the given equation should be balance if $x=5$.

(iii) $2x+1=3$

Solution:

$2x+1=3$

$2x+1-1=3-1$ Subtract b/s 1

$2x=2$

$\frac{2x}{2}=\frac{2}{2}$ Dividing b/s by 2.

$x=1$

So the given equation should be balanced if $x=1$.

3. Which of the following equations are true of false for the given values.

(i) $x+5=9$ **when** $x=3$

Solution:

$x+5=9$, When $x=3$

Put $x=3$ in L.H.S

$3+5=9$

$8=9$

Which is false.

(ii) $y-7=0$ **when** $y=7$

Solution:

$y-7=0$, when $y=7$

Put $y=7$ in L.H.S

$7-7=0$

$0=0$

Which is true.

EXERCISE 9.2

1. Write any two equivalent equations of the following equations:

(i) $x+3=0$

Solution:

$x+3=0\rightarrow(1)$

Multiplying both side 2

$2(x+3)=0\times 2$

$2x+6=0$

Again Multiplying Equation (1) by 3

$3(x+3)=3\times 0$

$3x+9=0$

(ii) $2x-5=0$

Solution:

$2x-5=0 \longrightarrow (1)$

Multiplying both side by 2

$2(2x-5)=2\times 0$

$4x-10=0$

Again multiplying both side by 3.

$3(2x-5)=3\times 0$

$6x-15=0$

(iii) $3x+1=2x$

Solution:

$3x+1=2x \longrightarrow (1)$

Multiplying both side by 2

$2(3x+1)=2(2x)$

$6x+2=4x$

Again multiplying Equation (1) by 3.

$3(4x-7)=3(x+5)$

$12x-21=3x+15.$

2. Solve the following equations and find the values of the variables.

(i) $x-5=2$

Solution:

$x-5=2$

$x-5+5=2+5$ (Adding both side '5')

$x=7$

(ii) $x+9=11$

Solution:

$x+9=11$

$x+9-9=11-9$

Subtract 9 to both side.

$x=2$

(iii) $x-4=-9$

Solution:

$x-4+4=-9+4$

Adding 4 to both side.

$x=-5$

(iv) $3x+1=7$

Solution:

$3x+1=7$

$3x+1-1=7-1$

Subtract 1 from both side

$3x=6$

$\frac{3x}{3}=\frac{6}{3}$ Dividing both side by 3

$x=2$

(v) $2x-7=-8$

Solution:

$2x-7=-8$

$2x-7+7=-8+7$

Adding 7 to both side

$2x=-1$

$\frac{2x}{2}=-\frac{1}{2}$

Dividing both side by 2

$x=\frac{1}{2}$

(vi) $2x-3=x+1$

Solution:

$2x-3=x+1$

$2x-3+3=x+1+3$

Adding 3 to both side

$2x=x+4$

$2x-x=4+x-x$

Subtract x to both side.

$x=4$

(vii) $\frac{2}{3}x+5=x-\frac{1}{3}$

Solution:

$\frac{2}{3}x+5=x-\frac{1}{3}$

$\frac{2}{3}x+5-5=x-\frac{1}{3}-5$

Subtract 5 from both side

$\frac{2}{3}x=x-\frac{1}{3}-5$

$\frac{2}{3}x-x=x-x-\frac{1}{3}-5$

Subtract x from both side

$\frac{2}{3}x-x=-\frac{1}{3}-5$

$\frac{2x-3x}{3}=\frac{-1-5\times 3}{3}$

$\frac{-x}{3}=\frac{-1-15}{3}$

$$\frac{-x}{3}=\frac{-16}{3}$$

$$\left(\frac{-x}{3}\right)(-3)=\left(\frac{-16}{3}\right)(-3)$$

Multiplying both side by -3

$x=16$

(viii) $\frac{2}{3}x-\frac{5}{2}=-\frac{1}{3}x+1$

Solution:

$$\frac{2}{3}x-\frac{5}{2}=-\frac{1}{3}x+1$$

$$\frac{2}{3}x-\frac{5}{2}+\frac{5}{2}=-\frac{1}{3}x+\frac{5}{2}+1$$

Adding $\frac{5}{2}$ to both side.

$$\frac{2}{3}x-\frac{1}{3}x+\frac{5}{2}+1$$

$$\frac{2}{3}x+\frac{1}{3}x=-\frac{1}{3}x+\frac{5}{2}+1$$

Adding $\frac{1}{3}x$ to both side

$$\frac{2}{3}x+\frac{1}{3}x=\frac{5}{2}+1$$

$$\frac{2x+x}{3}=\frac{5+2\times1}{2}$$

$$\frac{3x}{3}=\frac{5+2}{2}$$

$$x=\frac{7}{2}$$

(ix) $5+11y=13y+1$

Solution:

$5+11y=13y+1$

$5-5+11y=13y+1-5$

Subtract 5 from both side

$11y=13y-4$

$11y-13y=13y-13y-4$

Subtract 13y from both side

$-2y=-4$

$-2y=-4$

Dividing both side by -2

$$\frac{-2y}{-2}=\frac{-4}{-2}$$

$y=2$

(x) $\frac{5}{7}y+3=y+2$

Solution:

$$\frac{5}{7}y+3=y+2$$

$$\frac{5}{7}y+3-3=4+2-3$$

Subtract 3 from both side.

$$\frac{5}{7}y=y-1$$

$$\frac{5}{7}y-y=y-y-1$$

Subtract y from both side

$$\frac{5}{7}y-y=-1$$

$$\frac{5y-7y}{7}=-1$$

$$\frac{-2y}{7}=-1$$

$$\left(\frac{-2y}{7}\right)7=(-1)(7)$$

Multiplying both side by 7.

$-2y=-7$

$$\frac{-2y}{-2}=\frac{-7}{-2}$$

Dividing both side by -2

$y=\frac{7}{2}$

(xi) $0.4x+0.3=0.8x-0.7$

Solution:

$0.4x+0.3=0.8x-0.7$

$0.4x+0.3-0.3=0.8x-0.7-0.3$

Subtract 0.3 from both side

$0.4x=0.8x-1$

$0.4x-0.8x=0.8x-0.8x-1$

Subtract $0.8x$ from both side

$-0.4x=-1$

$$\frac{-0.4x}{-0.4}=\frac{-1}{-0.4}$$

Dividing both side by -0.4

$$x=\frac{1}{0.4}$$

$$x=\frac{1\times10}{4}=\frac{5}{2}=2.5$$

$x=2.5$

(xii) $0.4x+0.3=0.8x-0.7$

Solution:

$0.7x+1.2=1.8x-2.1$

$0.7x+1.2-1.2=1.8x-2.1-1.2$

Subtract 1.2 from both side

x

Subtract $1.8x$ from both side

$\frac{-1.1x}{-1.1}=\frac{-3.3}{-1.1}$

Dividing both side by -1.1

$x=\frac{33\times10}{10\times11}$

$x=\frac{33}{11}$

$x=3$

3. If 5 is added to a number then the number becomes 12. Find the number.

Solution:

Suppose required number = x

Adding 5 = $x+5$

According to given condition

$x+5=12$

$x=12-5$

$x=7$

Required number = 7

4. If 9 is added to a number then the number becomes 25. Find the number.

Solution:

Suppose number = x

Adding 9 = $x+9$

According to given condition

$x+9=25$

$x=25-9$

$x=16$

Number = 16

5. If 5 is subtracted from a number it becomes 13, find the number.

Solution:

Suppose number = x

Subtract 5 = $x-5$

According to given condition

$x-5=13$

$x=13+5$

$x=18$

Number = 18

6. Find the number whose 3 times when subtracted from 9 becomes 12.

Solution:

Suppose number = x

3 times, $3x$

Subtraction from 9, $9-3x$

According to given condition

$9-3x=12$

$-3x=12-9$

$-3x=3$

$x=\frac{-3}{3}$

$x=-1$

Number = -1

7. If 5 is subtracted from 3 times a number the result is 16. Find the number.

Solution:

Suppose number = x

3 times, $3x$

According to given condition

$3x-5=16$

$3x=16+5$

$3x=21$

$x=\frac{21}{3}$

$x=7$

Number = 7

8. The length of a rectangular farm is twice its breadth. If the perimeter of the rectangular farm is 321 meters, find the length and breadth of the farm.

Solution:

Suppose breadth = x

Length = $2x$

Perimeter = 321m

As perimeter = 321 m

As perimeter = 2 (length + breadth)

$321=2(2x+x)$

$2(3x)=321$

$6x=321$

$x=\frac{321}{6}=53.5m$

As length = $2x$

$= 2\times53.5$

$= 107m$

So

Length = 107 meters

Breadth = 53.5

9. Age of a father is twice the age of his son. If father is 16 year older than his son, find the age of father and his son.

Solution:

Suppose age of son = x

Age of father = $2x$

As father is 16 year older,

So

$2x = x + 16$

$2x - x = 16$

$x = 16$

So age of son = 16 years

And

Age of Father = 32 years

REVIEW EXERCISE 9

1. Find the value of the variable, which balance the following Equations.

(*i*) $3x + 5 = 8$

Solution:

$3x + 5 = 8$

$3x + 5 - 5 = 8 - 5$

Subtract 5 from both side

$3x = 3$

$\frac{3x}{3} = \frac{3}{3}$

Dividing both side by 3.

$x = 1$

(*ii*) $0.4y - 2.5 = 5.5$

Solution:

$0.4y - 2.5 = 5.5$

$0.4y + 2.5 - 2.5 = 5.5 + 2.5$

Adding 2.5 to both side

$0.4y = 8$

$\frac{0.4y}{0.4} = \frac{8}{0.4}$

Dividing both side by 0.4

$y = \frac{8 \times 10}{4}$

$y = 2 \times 10$

$y = 20$

2. Evaluate the following expressions.

(*i*) $2x - 5$ **when** $x = 2$

Solution:

$2x - 5$

Put $x = 2$

$2x - 5 = 2 \times 2 - 5$

$= 4 - 5 = -1$

$2x - 5 = -1$

(*ii*) $2x^3 + 3x^2 + 5x - 3$ **when** $x = 1$

Solution:

$2x^3 + 3x^2 + 5x - 3$

Put $x = 1$

$2x^3 + 3x^2 + 5x - 3$

$= 2(1)^3 + 3(1)^2 + 5(1) - 3$

$= 2 + 3 + 5 - 3$

$= 7$

3. Evaluate the following expressions for given values of the variables.

(*i*) $3(x + y)$, **when** $x = 5, y = -2$

Solution:

$3(x + y)$, $x = 5$, $y = -2$

$3(x + y) = 3(5 - 2)$

$= 3(3)$

$= 9$

(*ii*) $8xy$, **when** $x = \frac{-7}{2}$ **and** $y = \frac{3}{2}$

Solution:

$8xy$

Put $x = \frac{-7}{2}$, $y = \frac{3}{2}$

$8xy = 8\left(\frac{-7}{2}\right)\left(\frac{3}{2}\right)$

$= 2(-7)(3)$

$= 42$

4. What should be the value of t which balance the following equations.

(*i*) $0.4t + 0.5 = 0.3t$

Solution:

$0.4t + 0.5 = 0.3t$

$0.4t + 0.5 - 0.5 = 0.3t - 0.5$

Subtracting 0.5 both side.

$0.4t = 0.3t - 0.5$

$0.4 - 0.3t = 0.3t - 0.3t - 0.5$

Subtracting 0.3t from both side

$0.1t = -0.5$

$\frac{0.1t}{0.1} = \frac{-0.5}{0.1}$

$t = 5$

(ii) $\frac{5}{2}t-3=1$

Solution:

$\frac{5}{2}t-3=1$

$\frac{5}{2}t-3+3=1+3$

Adding 3 to both side

$\frac{5}{2}t=4$

$\left(\frac{5t}{2}\right)2=4\times 2$

Multiplying 2 both side

$5t=8$

$\frac{5t}{5}=\frac{8}{5}$

Dividing both side by 5.

$t=\frac{8}{5}$

5. Determine whether the following equations are true or false for given values of the variables.

(i) $y-3=7$, when $y=10$

Solution:

$y-3=7$, when $y=10$

Put y = 10

$10-3=7$

$7=7$

So the given equation is true for the given value.

(ii) $\frac{3}{2}+\frac{5}{2}t=1$, when $t=-\frac{1}{5}$

Solution:

$\frac{3}{2}+\frac{5}{2}t=1$, when $t=\frac{-1}{5}$

Put $t=\frac{-1}{5}$

$\frac{3}{2}+\frac{5}{2}\left(\frac{-1}{5}\right)=1$

$\frac{3}{2}-\frac{1}{2}=1$

$\frac{3-1}{2}=1$

$\frac{1}{2}=1$

Which is impossible so the equation is false for the given value.

6. Solve the following equations and find their roots.

(i) $\frac{3}{2}x-\frac{5}{2}=\frac{1}{2}$

Solution:

$\frac{3}{2}x-\frac{5}{2}=\frac{1}{2}$

$\frac{3}{2}x-\frac{5}{2}+\frac{5}{2}=\frac{5}{2}+\frac{1}{2}$

Adding $\frac{5}{2}$ both side

$\frac{3}{2}x=\frac{5+1}{2}$

$\frac{3}{2}x=\frac{6}{2}$

$\frac{3}{2}x=3$

$\left(\frac{3}{2}x\right)2=3\times 2$

Multiplying 2 both side

$3x=6$

$\frac{3x}{3}=\frac{6}{3}$

Dividing both side by 3

$x=2$

(ii) $2(x-3)=4$

Solution:

$\frac{2}{2}(x-3)=\frac{4}{2}$

Dividing both side by 2

$(x-3)=2$

$x-3=2$

$x-3+3=2+3$

Adding 3 both side

$x=5$

(iii) $4(x+2)=3(x-1)$

Solution:

$4(x+2)=3(x-1)$

$4x+8=3x-3$

$4x+8-8=3x-3-8$

Subtracting 8 from both side

$4x=3x-11$

$4x-3x=3x-3x-11$

Subtracting $3x$ from both side

$x = -11$

(iv) $0.37 - 0.5 = 0.2y$

Solution:

$0.37 - 0.5 = 0.2y$

$-0.13 = 0.2y$

$0.2y = -0.13$

Dividing 0.2 both side

$\frac{0.2y}{0.2} = \frac{-0.13}{0.2}$

$y = -0.65$

7. The sum of a number and 9 is −2. Find the number.

Solution:

Suppose number = x

According to given condition

$x + 9 = -2$

$x = -2 - 9$

$x = -11$

8. The sum of −5 and a number −15. Find the number.

Solution:

Suppose number = x

According to given condition

$-5 + x = -15$

$x = -15 + 5$

$x = -10$

9. The difference of a number and 3 is −16. Find the number.

Solution:

Suppose number = x

According to given condition

$x - 3 = -6$

$x = -6 + 3$

$x = -3$

10. When 5 is subtracted from a number, the result is 16. Find the number.

Solution:

Suppose age of brother = x

According to given condition

$x - 5 = 16$

$x = 16 + 5$

$x = 21$

11. Nadia is five years older than her brother Najam. The sum of their ages is 37. How old is Nadia?

Solution:

Suppose age of brother = x

So age of sister Nadia = $x + 5$

According to given condition

$x + x + 5 = 37$

$2x + 5 = 37$

$2x = 37 - 5$

$2x = 32$

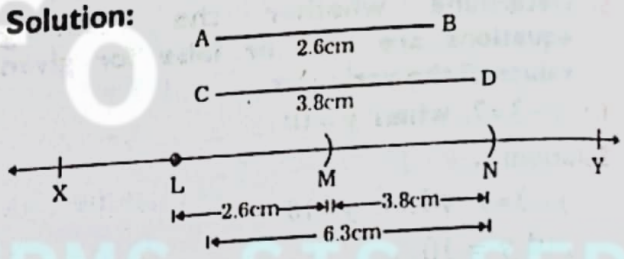
$x = \frac{32}{2} = 16$

So age of Nadia = $x + 5 = 16 + 5 = 21$

UNIT 10
GEOMETRY
EXERCISE 10.1

1. Draw two line segments 3.8cm and 2.6cm long. Draw a line segment whose length is equal to the sum of the lengths of these two line segments.

Solution:



Given:

Two line segments $\overline{AB}$ and $\overline{CD}$ measuring 2.6cm and 3.8cm respectively.

Required:

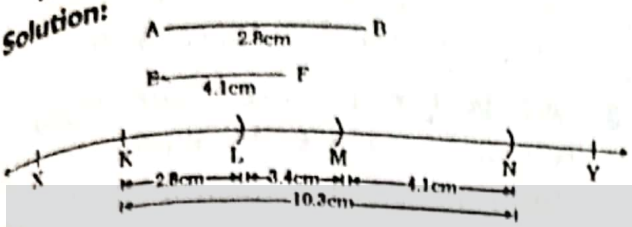
To draw a line segment whose measure is equal to the sum of measures of $\overline{AB}$ and $\overline{CD}$.

Steps of construction:

1. Draw a line $\overleftrightarrow{XY}$
2. Take a point L on $\overleftrightarrow{XY}$.
3. With L as center draw an arc of length 2.6cm, which cuts $\overleftrightarrow{XY}$ at M.
4. With M as centre draw another arc of 3.8cm which cuts $\overleftrightarrow{XY}$ at N.
5. $\overline{LN}$ is a line segment such that $m\overline{LN} = m\overline{AB} + m\overline{CD}$.
6. With the help of ruler we see that $m\overline{LM} = 6.3cm$.

2. Draw three line segments 2.8cm, 3.4cm and 4.1cm long. Draw a line segment whose length is equal to the sum of the lengths of these three line segments.

Solution:



Given:

$\overline{AB}, \overline{CD}$ and $\overline{EF}$ are three line segments whose measures are 2.8cm, 3.4cm and 4.1cm respectively.

Required:

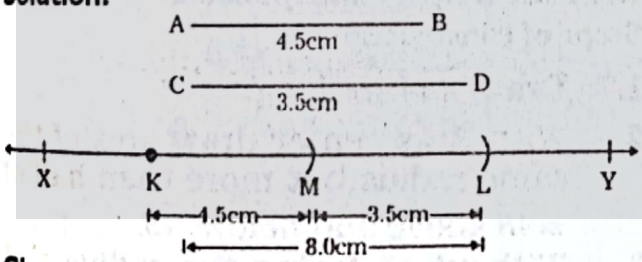
To draw line segment whose length is equal to the sum of measures of $\overline{AB}, \overline{CD}$ and $\overline{EF}$.

Steps of construction:

1. Draw a line $\overleftrightarrow{XY}$.
2. Take a point K on $\overleftrightarrow{XY}$.
3. With K as centre draw an arc of radius 3.4cm which cuts $\overleftrightarrow{XY}$ at L.
4. With L as centre draw an arc of radius 3.4cm which cuts $\overleftrightarrow{XY}$ at M.
5. With M as centre draw an arc of radius 4.1cm which cuts $\overleftrightarrow{XY}$ at N.
6. $\overline{KN}$ is the required line segment. Hence $m\overline{KN} = m\overline{KL} + m\overline{LM} + m\overline{MN}$.
7. With the help of ruler we see that $m\overline{KN} = 10.3cm$.

3. Draw $\overline{AB}$ and $\overline{CD}$ where $m\overline{AB} = 4.5cm$ and $m\overline{CD} = 3.5cm$. Draw $\overline{KL}$ such that $m\overline{KL} = m\overline{AB} + m\overline{CD}$.

Solution:



Given:

Two line segments $\overline{AB}$ and $\overline{CD}$ measuring 4.5cm and 3.5cm respectively.

Required:

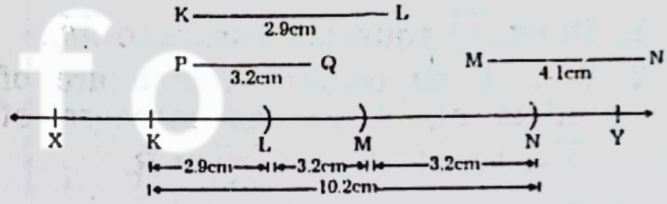
To draw a line segment whose measure is equal to the sum of measures of $\overline{AB}$ and $\overline{CD}$.

Steps of construction:

1. Draw a line $\overleftrightarrow{XY}$
2. Take a point K on $\overleftrightarrow{XY}$.
3. With K as center draw an arc of length 4.5cm, which cuts $\overleftrightarrow{XY}$ at M.
4. With M as centre draw another arc of 3.5cm which cuts $\overleftrightarrow{XY}$ at L.
5. $\overline{KL}$ is a line segment such that $m\overline{KL} = m\overline{AB} + m\overline{CD}$.
6. With the help of ruler we see that $m\overline{KL} = 8.0cm$.

4. Draw $\overline{KL}, \overline{PQ}$ and $\overline{MN}$ such that $m\overline{KL} = 2.9cm$, $m\overline{PQ} = 3.2cm$ and $m\overline{MN} = 4.1cm$. Draw $\overline{AB}$ where $m\overline{AB} = m\overline{KL} + m\overline{PQ} + m\overline{MN}$

Solution:



Given:

$\overline{KL}, \overline{PQ}$ and $\overline{MN}$ are three line segments whose measures are 2.9cm, 3.2cm and 4.1cm respectively.

Required:

To draw line segment whose length is equal to the sum of measures of $\overline{KL}, \overline{PQ}$ and $\overline{MN}$.

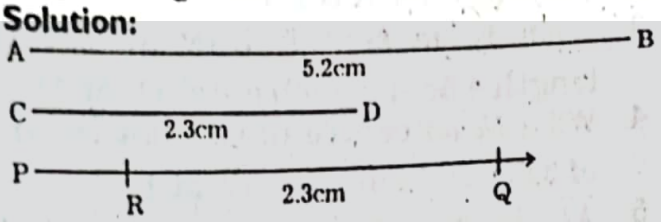
Steps of construction:

1. Draw a line $\overleftrightarrow{XY}$.
2. Take a point K on $\overleftrightarrow{XY}$.
3. With K as centre draw an arc of radius 2.9cm which cuts $\overleftrightarrow{XY}$ at L.
4. With L as centre draw an arc of radius 3.2cm which cuts $\overleftrightarrow{XY}$ at M.
5. With M as centre draw an arc of radius 4.1cm which cuts $\overleftrightarrow{XY}$ at N.
6. $\overline{KN}$ is the required line segment. Hence $m\overline{KN} = m\overline{KL} + m\overline{LM} + m\overline{MN}$.

7. With the help of ruler we see that $m\overline{KN} = 10.2cm$.

5. Draw a line segment 5.2cm long. Cut off a segment 2.3cm long from it. Find the measure of the remaining part of the given segment.

Solution:



Given:

Two line segments $\overline{AB}$ and $\overline{CD}$ measuring 5.2cm and 2.3cm respectively.

Required:

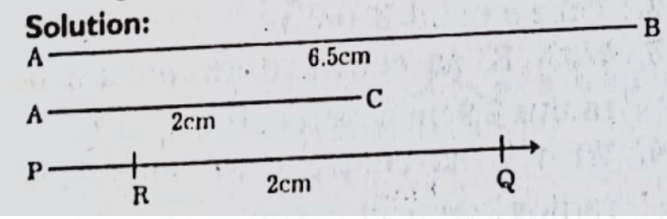
To draw a line segment whose measure is equal to the difference of the measures of $\overline{AB}$ and $\overline{CD}$.

Steps of construction:

1. Draw $\overline{PQ}$ equal is measure to $\overline{AB}$.
2. With P as center draw a arc of radius equal to the measure of $\overline{CD}$ *i.e.*3.2 which cuts $\overline{PQ}$ at R.
3. $\overline{RQ}$ is the required line segment whose measure is equal to the difference of $\overline{AB}$ and $\overline{CD}$ i.e. $m\overline{AB} - m\overline{CD}$.
4. With the help of ruler we see that $m\overline{RQ} = 2.9cm$.

6. Draw $\overline{AB}$ such that $m\overline{AB} = 6.5cm$. Cut off $\overline{AC}$ such that $m\overline{AC} = 2cm$. What is the length of $\overline{CB}$?

Solution:



Given:

Two line segments $\overline{AB}$ and AC measuring 6.5cm and 2cm respectively.

Required:

To draw a line segment whose measure is equal to the difference of the measures of $\overline{AB}$ and AC.

Steps of construction:

1. Draw $\overline{PQ}$ equal is measure to $\overline{AB}$.
2. With P as center draw a arc of radius equal to the measure of AC *i.e.* 2cm which cuts $\overline{PQ}$ at R.
3. $\overline{RQ}$ is the required line segment whose measure is equal to the difference of $\overline{AB}$ and AC i.e. $m\overline{AB} - mAC$.
4. With the help of ruler we see that $m\overline{RQ} = 4.5cm$.

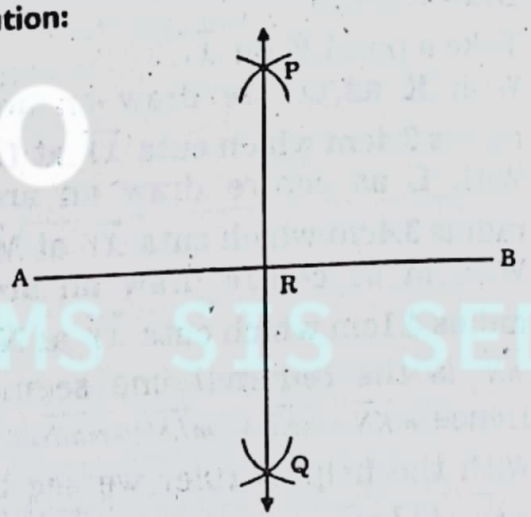
7. Draw line segments of the following lengths.

(i) 4.8cm (ii) 5.4cm (iii) 6.6cm

Draw their right bisectors by using compasses and ruler.

(i) 4.8cm

Solution:



Given:

$\overline{AB}$ is line segment measuring 4.8cm.

Required:

Draw the right bisector of $\overline{AB}$ with the help of compasses.

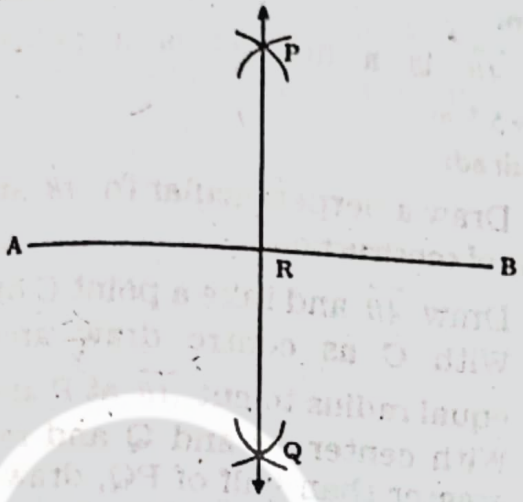
Steps of construction:

1. Draw $\overline{AB}$ 4.8*cm* long.
2. With A as center draw arcs of the same radius but more than half of $m\overline{AB}$ above and below $\overline{AB}$.
3. Without changing the radius and taking B as centre draw arcs that cuts side of $\overline{AB}$ cutting the arcs already drawn arcs at P and Q.

4. Draw line $\overleftrightarrow{PQ}$ which intersects $\overline{AB}$ at R.
5. $\overleftrightarrow{PQ}$ is the right bisector of $\overline{AB}$ i.e makes an angle of 90° at R, and divides $\overline{AB}$ into two equal parts $\overline{AR}$ and $\overline{BR}$

(ii) 5.4cm

Solution:



Given:

$\overline{AB}$ is line segment measuring 5.4cm.

Required:

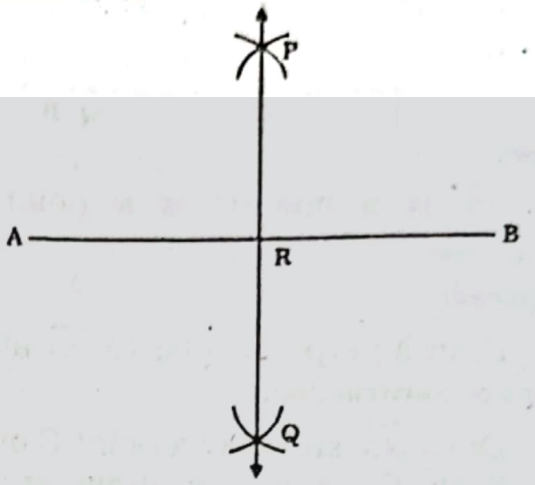
Draw the right bisector of $\overline{AB}$ with the help of compasses.

Steps of construction:

1. Draw $\overline{AB}$ 5.4cm long.
2. With A as center draw arcs of the same radius but more than half of $m\overline{AB}$ above and below $\overline{AB}$.
3. Without changing the radius and taking B as centre draw arcs that cuts side of $\overline{AB}$ cutting the arcs already drawn arcs at P and Q.
4. Draw line $\overleftrightarrow{PQ}$ which intersects $\overline{AB}$ at R.
5. $\overleftrightarrow{PQ}$ is the right bisector of $\overline{AB}$ i.e makes an angle of 90° at R, and divides $\overline{AB}$ into two equal parts $\overline{AR}$ and $\overline{BR}$

(iii) 6.6cm

Solution:



Given:

$\overline{AB}$ is line segment measuring 6.6cm.

Required:

Draw the right bisector of $\overline{AB}$ with the help of compasses.

Steps of construction:

1. Draw $\overline{AB}$ 6.6cm long.
2. With A as center draw arcs of the same radius but more than half of $m\overline{AB}$ above and below $\overline{AB}$.
3. Without changing the radius and taking B as centre draw arcs that cuts side of $\overline{AB}$ cutting the arcs already drawn arcs at P and Q.
4. Draw line $\overleftrightarrow{PQ}$ which intersects $\overline{AB}$ at R.
5. $\overleftrightarrow{PQ}$ is the right bisector of $\overline{AB}$ i.e makes an angle of 90° at R, and divides $\overline{AB}$ into two equal parts $\overline{AR}$ and $\overline{BR}$

8. Draw line segments of the following lengths.

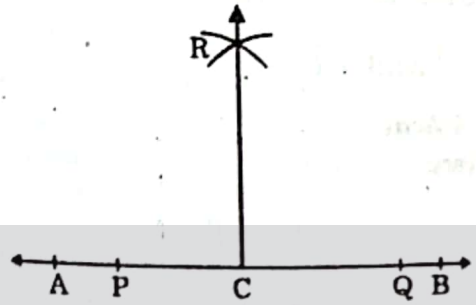
(i) 3.5cm (ii) 4.4cm

(iii) 5.5cm

Take a point on each segment and draw perpendiculars to the given line segments. (Use ruler and compasses only).

(i) 3.5cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line. C is a point on $\overleftrightarrow{AB}$. $= 3.5cm$

Required:

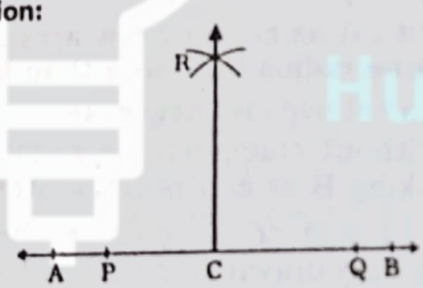
Draw a perpendicular to $\overleftrightarrow{AB}$ at C.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take a point C on it.
2. With C as centre draw arcs of equal radius to cut $\overleftrightarrow{AB}$ at P and Q.
3. With centers P and Q and radius greater than half of PQ, draw two arcs to cut each other at R.
4. Join C to R.
5. $\overleftrightarrow{CR}$ is perpendicular to $\overleftrightarrow{AB}$ at C.

(ii) 4.4cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line. C is a point on $\overleftrightarrow{AB}$. $= 4.4cm$

Required:

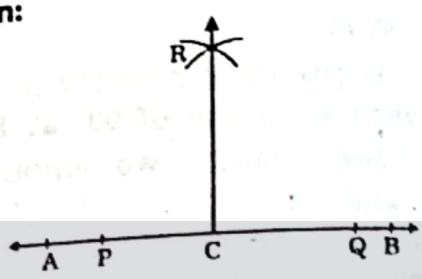
Draw a perpendicular to $\overleftrightarrow{AB}$ at C.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take a point C on it.
2. With C as centre draw arcs of equal radius to cut $\overleftrightarrow{AB}$ at P and Q.
3. With centers P and Q and radius greater than half of PQ, draw two arcs to cut each other at R.
4. Join C to R.
5. $\overleftrightarrow{CR}$ is perpendicular to $\overleftrightarrow{AB}$ at C.

(iii) 5.5cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line. C is a point on $\overleftrightarrow{AB}$. $= 5.5cm$

Required:

Draw a perpendicular to $\overleftrightarrow{AB}$ at C.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take a point C on it.
2. With C as centre draw arcs of equal radius to cut $\overleftrightarrow{AB}$ at P and Q.
3. With centers P and Q and radius greater than half of PQ, draw two arcs to cut each other at R.
4. Join C to R.
5. $\overleftrightarrow{CR}$ is perpendicular to $\overleftrightarrow{AB}$ at C.

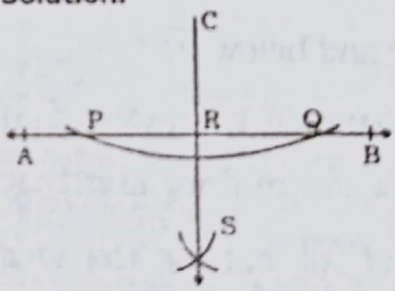
9. Draw line segments of the following lengths.

(i) 4.5cm (ii) 5.2cm (iii) 3.8cm

Take a points outside each segment and draw perpendicular to the given segments from that point. (Use ruler and compasses only).

(i) 4.5cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line and C is a point outside $\overleftrightarrow{AB} = 4.5cm$.

Required:

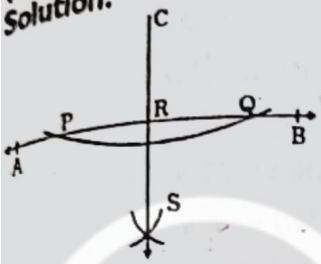
Draw perpendicular with the help of compasses, from C to $\overleftrightarrow{AB}$.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take C, a point outside $\overleftrightarrow{AB}$.
2. With C as centre, draw an arc of suitable radius to intersect $\overleftrightarrow{AB}$ at P and Q.
3. With P and Q draw arcs of equal radius to intersect each other at S.
4. Draw $\overleftrightarrow{CS}$ intersecting $\overleftrightarrow{AB}$ at R.
5. $\overleftrightarrow{CR}$ is the required perpendicular.

(ii) 5.2cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line and C is a point outside $\overleftrightarrow{AB} = 5.2cm$.

Required:

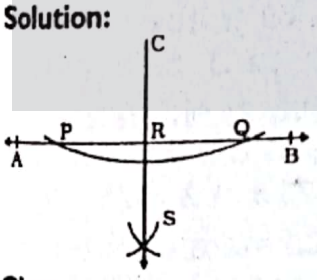
Draw perpendicular with the help of compasses, from C to $\overleftrightarrow{AB}$.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take C, a point outside $\overleftrightarrow{AB}$.
2. With C as centre, draw an arc of suitable radius to intersect $\overleftrightarrow{AB}$ at P and Q.
3. With P and Q draw arcs of equal radius to intersect each other at S.
4. Draw $\overleftrightarrow{CS}$ intersecting $\overleftrightarrow{AB}$ at R.
5. $\overleftrightarrow{CR}$ is the required perpendicular.

(iii) 3.8cm

Solution:



Given:

$\overleftrightarrow{AB}$ is a line and C is a point outside $\overleftrightarrow{AB}$ 3.8cm.

Required:

Draw perpendicular with the help of compasses, from C to $\overleftrightarrow{AB}$.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take C, a point outside $\overleftrightarrow{AB}$.
2. With C as centre, draw an arc of suitable radius to intersect $\overleftrightarrow{AB}$ at P and Q.
3. With P and Q draw arcs of equal radius to intersect each other at S.
4. Draw $\overleftrightarrow{CS}$ intersecting $\overleftrightarrow{AB}$ at R.
5. $\overleftrightarrow{CR}$ is the required perpendicular.

EXERCISE 10.2

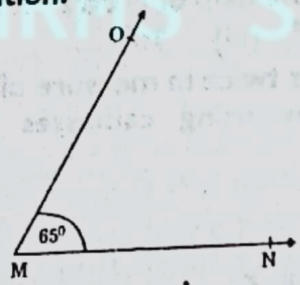
1. Construct angle of the following measures with the help of protraction.

(i) 65^0 (ii) 73^0 (iii) 55^0

Construct angles equal in measure to these angles by using compasses and ruler.

(i) 65^0

Solution:



Step of construction:

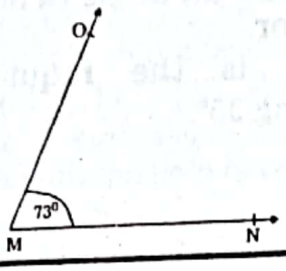
(i) Draw $\overleftrightarrow{MN}$.

(ii) At M, draw an angle of 65^0 by using protractor.

(iii) $\angle OMN$ is the required angle measuring 65^0.

(ii) 73^0

Solution:



Step of construction:

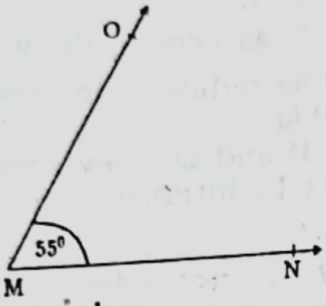
(i) Draw $\overrightarrow{MN}$

(ii) At M, draw an angle of 73^0 by using protractor.

(iii) $\angle OMN$ is the required angle measuring 73^0.

(iii) 55^0

Solution:



Step of construction:

(i) Draw $\overrightarrow{MN}$

(ii) At M, draw an angle of 55^0 by using protractor.

(iii) $\angle OMN$ is the required angle measuring 55^0.

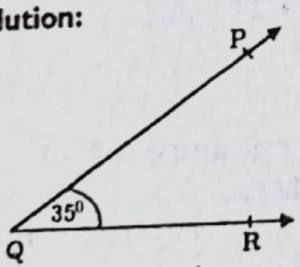
2. Construct angles of the following measures with the help of protraction

(i) 35^0 (ii) 42^0 (iii) 70^0

Construct angles twice in measure of the given angles by using camasses and ruler.

(i) 35^0

Solution:



Step of construction:

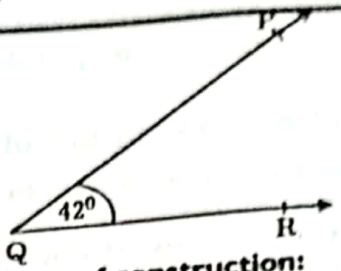
(i) Draw $\overrightarrow{QR}$

(ii) At Q, draw an angle of 35^0 by using protractor.

(iii) $\angle PQR$ is the required angle measuring 35^0.

(ii) 42^0

Solution:



Step of construction:

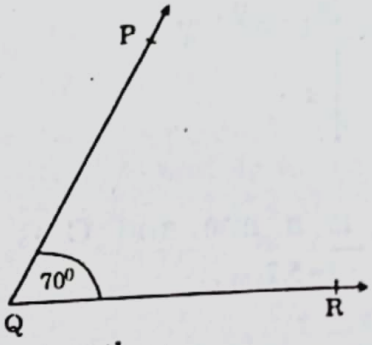
(i) Draw $\overrightarrow{QR}$

(ii) At Q, draw an angle of 42^0 by using protractor.

(iii) $\angle PQR$ is the required angle measuring 42^0.

(iii) 70^0

Solution:



Step of construction:

(i) Draw $\overrightarrow{QR}$

(ii) At Q, draw an angle of 70^0 by using protractor.

(iii) $\angle PQR$ is the required angle measuring 70^0.

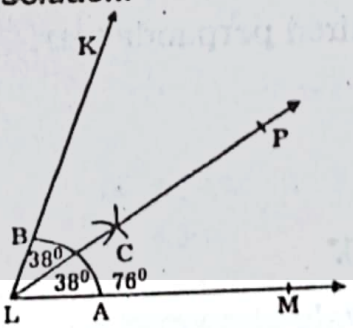
3. Construct angles of the following measures with the help of protraction.

(i) 76^0 (ii) 68^0 (iii) 98^0

Bisect these angles with the help of compasses. Measure each part.

(i) 76^0

Solution:



Given:

$\angle KLM = 76^0$

Required:

Bisect an angle $\angle KLM$

Step of construction:

(i) Draw $\overrightarrow{LM}$

(ii) At L, draw an angle of 76° by using protractor.

(iii) $\angle KLM$ is the required angle measuring 76°.

(iv) With L as cetre draw an arc of suitable radius to cut $\overrightarrow{LM}$ and $\overrightarrow{KL}$ at A and B respectively.

(v) With A is a centre draw an arc with radius more half of $\overrightarrow{AB}$.

(vi) With B as centre draw an arc with the same radius to cut the former arc at C.

(vii) Trough C, draw $\overrightarrow{LP}$

(viii) $\overrightarrow{LP}$ is the required bisector of

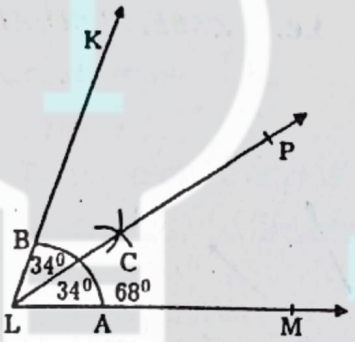
$\angle KLM = 76^0$ *i.e.* $m\angle KLP$

$= m\angle PLM$

$= 38^0$

(*ii*) 68^0

Solution:



Given:

$\angle KLM = 68^0$

Required:

Bisect an angle $\angle KLM$

Step of construction:

(i) Draw $\overrightarrow{LM}$

(ii) At L, draw an angle of 68^0 by using protractor.

(iii) $\angle KLM$ is the required angle measuring 68^0.

(iv) With L as cetre draw an arc of suitable radius to cut $\overrightarrow{LM}$ and $\overrightarrow{KL}$ at A and B respectively.

(v) With A is a centre draw an arc with radius more half of $\overrightarrow{AB}$.

(vi) With B as centre draw an arc with the same radius to cut the former arc at C.

(vii) Trough C, draw $\overrightarrow{LP}$

(viii) $\overrightarrow{LP}$ is the required bisector of

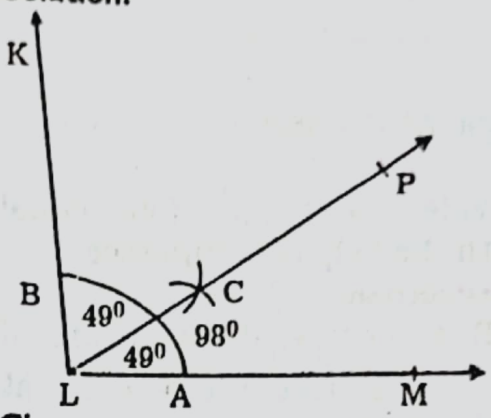
$\angle KLM = 68^0$ *i.e.* $m\angle KLP$

$= m\angle PLM$

$= 34^0$

(*iii*) 98^0

Solution:



Given:

$\angle KLM = 98^0$

Required:

Bisect an angle $\angle KLM$

Step of construct:

(i) Draw $\overrightarrow{LM}$

(ii) At L, draw an angle of 98° by using protractor.

(iii) $\angle KLM$ is the required angle measuring 98°.

(iv) With L as cetre draw an arc of suitable radius to cut $\overrightarrow{LM}$ and $\overrightarrow{KL}$ at A and B respectively.

(v) With A is a centre draw an arc with radius more half of $\overrightarrow{AB}$.

(vi) With B as centre draw an arc with the same radius to cut the former arc at C.

(vii) Trough C, draw $\overrightarrow{LP}$

(viii) $\overrightarrow{LP}$ is the required bisector of

$\angle KLM = 98^0$ *i.e.* $m\angle KLP$

$= m\angle PLM$

$= 49^0$

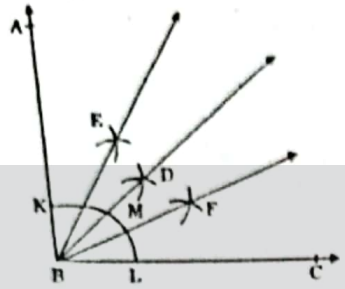
4. Construct angles of the following measures with the help of protraction.

(i) 96° (ii) 112° (iii) 128°

Divide these angles into four equal angles with the help of compasses.

(i) 76^0

Solution:



Given:

An angle ABC = 960

Required:

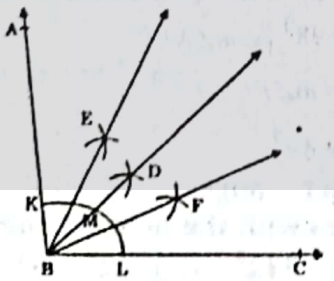
To divide $\angle ABC$ into four equal angles with the help of compasses.

Step of construction:

1. With B as centre, draw an arc of suitable radius to cut $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at K and L respectively.
2. With centre L, draw an arc with radius more than half of $\overline{LK}$.
3. With center K, and without changing the radius, draw an arc to cut the former arc at D.
4. Draw $\overrightarrow{BD}$, which cuts the arc KL at M.
5. With L and M as centers draw arcs of suitable radius to cut each other at F.
6. Which M and K as centers draw arcs of suitable radius for cut each other at E.
7. Draw $\overrightarrow{BF}$ and $\overrightarrow{BE}$.
8. $\angle ABC$ is divided into four equal angles i.e. $\angle ABE, \angle EBD, \angle EBF$ and $\angle FBC$.

(ii) 112^0

Solution:



Given:

$\angle ABC = 112^0$

Required:

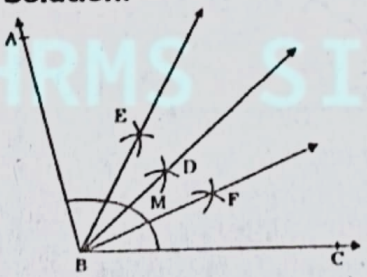
To divide $\angle ABC$ into four equal angles with the help of compasses.

Steps of construction:

1. With B as centre, draw an arc of suitable radius to cut $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at K and L respectively.
2. With centre L, draw an arc with radius more than half of $\overline{LK}$.
3. With center K, and without changing the radius, draw an arc to cut the former arc at D.
4. Draw $\overrightarrow{BD}$, which cuts the arc KL at M.
5. With L and M as centers draw arcs of suitable radius to cut each other at F.
6. Which M and K as centers draw arcs of suitable radius for cut each other at E.
7. Draw $\overrightarrow{BF}$ and $\overrightarrow{BE}$.
8. $\angle ABC$ is divided into four equal angles i.e. $\angle ABE, \angle EBD, \angle EBF$ and $\angle FBC$.

(iii) 128^0

Solution:



Given:

$\angle ABC = 128^0$

Required:

To divide $\angle ABC$ into four equal angles with the help of compasses.

Steps of construction:

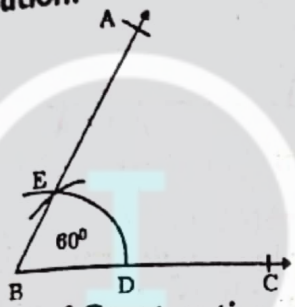
1. With B as centre, draw an arc of suitable radius to cut $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at K and L respectively.
2. With centre L, draw an arc with radius more than half of $\overline{LK}$.
3. With center K, and without changing the radius, draw an arc to cut the former arc at D.

4. Draw $\overrightarrow{BD}$, which cuts the arc KL at M.
5. With L and M as centers draw arcs of suitable radius to cut each other at F.
6. Which M and K as centers draw arcs of suitable radius for cut each other at E.
7. Draw $\overrightarrow{BF}$ and $\overrightarrow{BE}$.
8. $\angle ABC$ is divided into four equal angles i.e. $\angle ABE, \angle EBD, \angle EBF$ and $\angle FBC$.

5. Construct angles of the following measures by using compasses and ruler.

(*i*) 60^0

Solution:

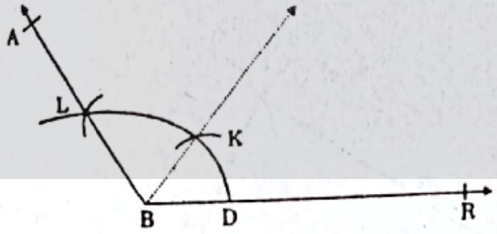


Steps of Construction:

1. Take a ray $\overrightarrow{BC}$
2. With B as centre draw an arc of suitable radius, to intersect $\overrightarrow{BC}$ at D.
3. With D as centre and without changing the radius, draw an arc to cut the former arc at E.
4. Through E, draw $\overrightarrow{BA}$
5. ABC is the required angle i.e. $m\angle ABC = 60^0$

(*ii*) 120^0

Solution:

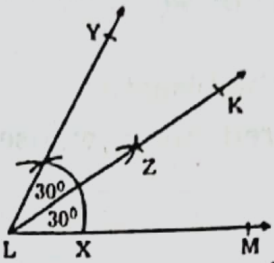


Step of construction:

1. Draw $\overrightarrow{BC}$
2. At B, construct $\angle KBC$ whose measure is 60^0.
3. Construct $\angle ABK$ at B equal in measure to $\angle KBC$ and adjacent to it.
4. Measure of $\angle ABC$ is twice the measure of $\angle KBC$.
5. ABC is the required angle whose measure is 120^0.

(*iii*) 30^0

Solution:

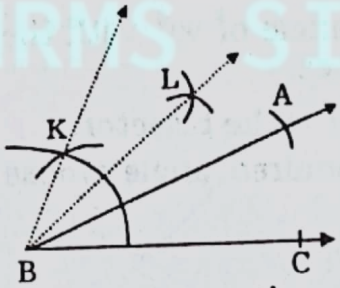


Steps of Construction:

1. Take any ray $\overrightarrow{LM}$
2. At L, construct an angle YLM measuring 60^0.
3. Bisect $\angle YLM$ and draw $\overrightarrow{LK}$ the bisector of $\angle YLM$.
4. $\angle KLM$ is the required angle whose measure is 30^0.

(*iv*) 15^0

Solution:

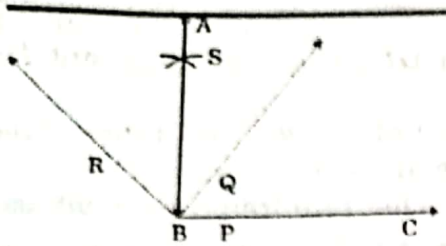


Steps of construction:

1. Draw $\overrightarrow{BC}$.
2. At B draw an angle KBC whose measure is 60^0.
3. Draw $\overrightarrow{BL}$, the bisector of $\angle KBC$ i.e. $mLBC = 30^0$
4. Draw $\overrightarrow{BA}$, the bisector of $\angle LBC$.
5. $\angle ABC$ is the required angle whose measure is 15^0.

(*v*) 90^0

Solution:

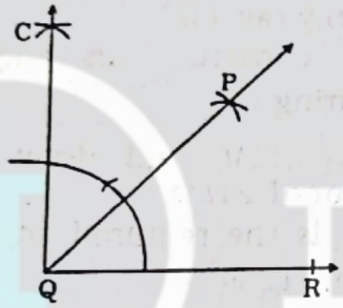


Step of construction:

1. Take a ray $\overrightarrow{QR}$
2. At Q, draw an angle of 90^0 with the help of compasses.
3. Bisect $\angle CQR.\overrightarrow{QP}$ is the bisector.
4. $\angle PQR$ is the required angle whose measure is 45^0.

(vi) 45^0

Solution:

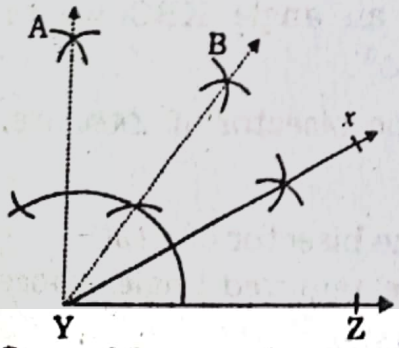


Steps of Construction:

1. Take a ray $\overrightarrow{QR}$.
2. At Q, draw an angle of 90^0 with the help of compasses.
3. Bisect $\angle CQR$. $\overrightarrow{QP}$ is the bisector.
4. $\angle PQR$ is the required angle whose measure is 45^0.

(vii) $22\frac{1^0}{2}$

Solution:

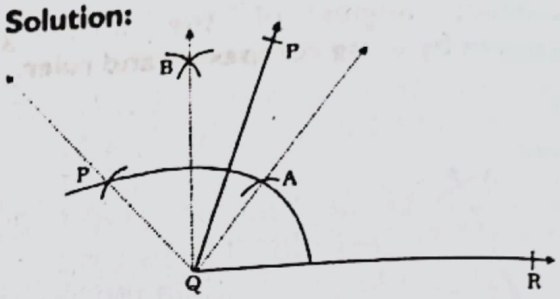


Steps of Construction:

1. Draw $\overrightarrow{YZ}$.
2. AT Y, draw an angle = 900 by using compasses $m\angle AYZ = 90^0$.
3. Bisect $\angle AYZ.\overrightarrow{YB}$ is the bisector of $\angle AYZ.m\angle BYZ = \frac{1}{2}(90^0) = 45^0$.
4. Bisect $\angle BYZ.\overrightarrow{YX}$ is the bisector of $\angle BYZ.m\angle XYZ = \frac{1}{2}(45^0) = 22\frac{1^0}{2}$.
5. XYZ is the required angle measuring $22\frac{1^0}{2}$.

(viii) 75^0

Solution:



Steps of Construction:

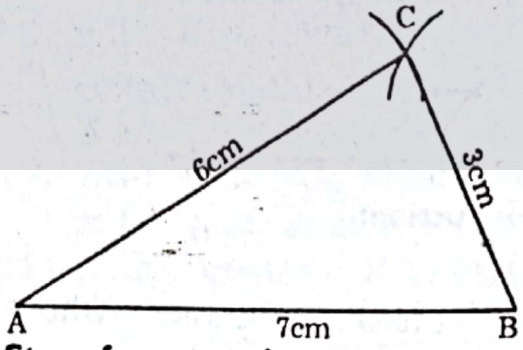
1. Draw $\overrightarrow{QR}$
2. At Q, draw angle $\angle AQR$ and $\angle BQR$ measuring 60^0 and 90^0 respectively.
3. $m\angle BQA = m\angle BQR - m\angle AQR$
$= 90^0 - 60^0 = 30^0$
4. Bisect $\angle BQA.\overrightarrow{QP}$ is the bisector.
$m\angle PQA = \frac{1}{2}(30^0) = 15^0$.
5. $\angle PQR$ is the required angle measuring 75^0
$\because m\angle PQR = m\angle PQA + m\angle AQR$
$= 15^0 + 60^0 = 75^0$

EXERCISE 10.3

1. Construct ΔABC, when:

(i) $m\overline{AB} = 7cm, m\overline{BC} = 3cm$ and $m\overline{CA} = 6cm$

Solution:

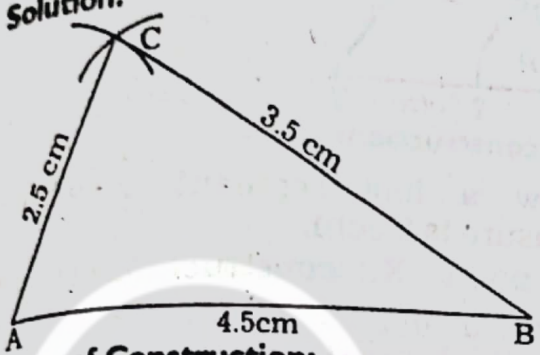


Step of construction:

1. Draw a line segment $\overline{AB}$ measuring 5cm.
2. With B as centre draw an arc of radius equal in measure to $\overline{BC}$ i.e. 4cm.
3. With C as centre draw another arc of radius equal in measure to $\overline{CA}$ i.e. 3.5cm to cut the pervious arc at C.
4. Draw $\overline{BC}$ and $\overline{CA}$.
5. ABC is the required triangle.

(ii) $m\overline{AB} = 4.5cm, m\overline{BC} = 3.5cm$ and $m\overline{CA} = 2.5cm$

Solution:



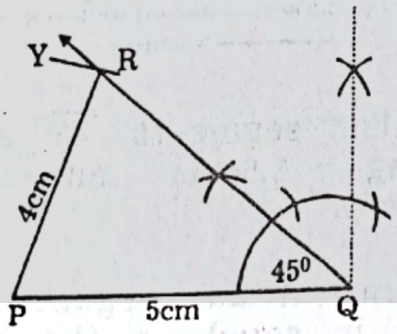
Step of Construction:

1. Draw a line segment $\overline{AB}$ measuring 4.5cm.
2. With B as centre draw an arc of radius equal in measure to $\overline{BC}$ i.e. 3cm.
3. With C as centre draw another arc of radius equal in measure to $\overline{CA}$ i.e. 6cm to cut the pervious arc at C.
4. Draw $\overline{BC}$ and $\overline{CA}$.
5. ABC is the required triangle.

2. Construct ΔPQR, when

(i) $m\overline{PQ} = 5cm, m\angle Q = 45^0$ **and** $m\overline{QR} = 4cm$

Solution:

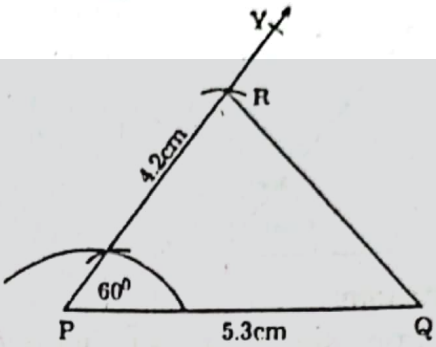


Step of Construction:

1. Draw a line segment $\overline{PQ}$ whose measure is 5cm.
2. A point Q, construct an angle $\angle PQR$ measuring 45^0.
3. With P is a centre, draw an arc of radius 4cm to cut $\overrightarrow{QY}$ at R.
4. Join P to R.
5. PQR is the required triangle.

(ii) $m\overline{PQ} = 5.3cm, m\angle P = 60$ **and** $m\overline{PR} = 4.2cm$

Solution:



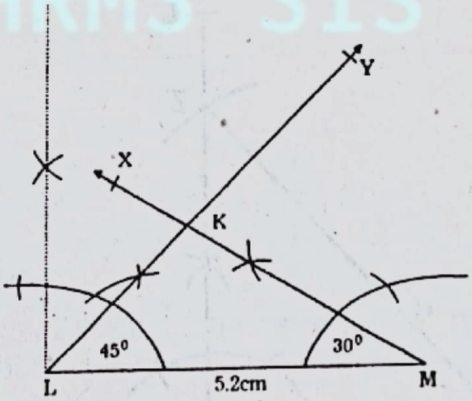
Step of construction:

1. Draw a line segment $\overline{PQ}$ who measure is 5.3cm.
2. At point P, construct an angle QPR measuring 60^0.
3. With P as centre, draw an arc of radius of 4.2cm to cut $\overrightarrow{PY}$ at R.
4. Join R to Q.
5. PQR is the required triangle.

3. Construct ΔKLM, when:

(i) $m\overline{LM} = 5.2cm, m\angle L = 45^0$ **and** $m\angle M = 30^0$

Solution:

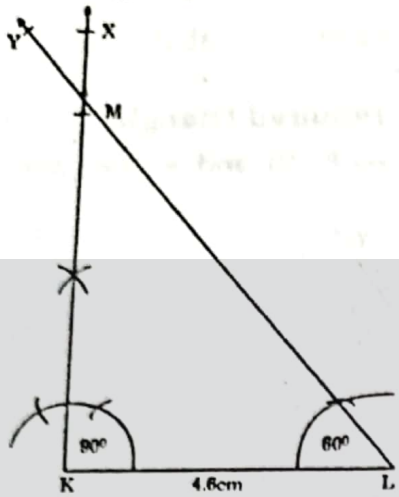


Step of construction:

1. Draw a line segment $\overline{LM}$ whose measure is 5.2cm.
2. At L, construct $\angle LMX$ measuring 30^0.
3. At L, construct $\angle MLY$ whose measure is 45^0.
4. $\overrightarrow{KX}$ and $\overrightarrow{LY}$ intersect each other at M.
5. KLM is the required triangle.

(ii) $m\overline{KL} = 4.6cm, m\angle K = 90^0$ **and** $m\angle L = 60^0$

Solution:



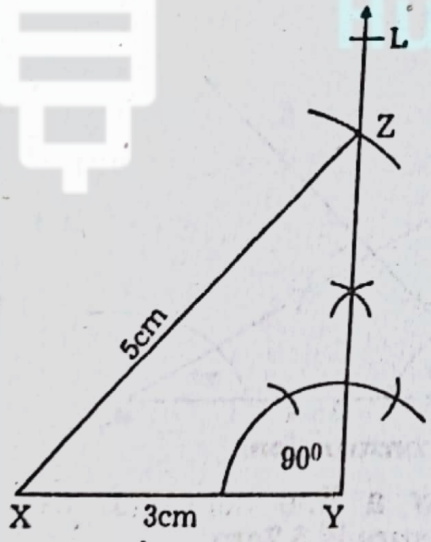
Step of construction:

1. Draw a line segment $\overline{KL}$ whose measure is 4.6cm
2. At K, construct $\angle LKX$ measuring 90^0.
3. At L, construct $\angle KLY$ whose measure is 60^0.
4. $\overrightarrow{KX}$ and $\overrightarrow{LY}$ intersect each their at M.
5. KLM is the required triangle.

4. Construct ΔXYZ, when:

(i) $m\overline{XY} = 3cm, m\overline{XZ} = 5cm$ **and** $m\angle Y = 90^0$

Solution:

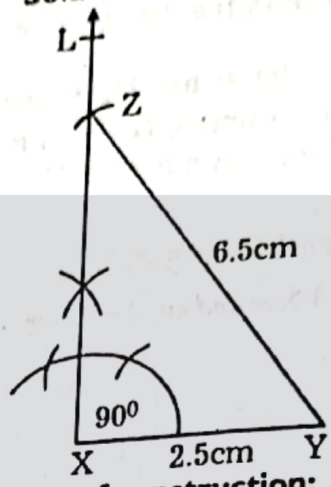


Step of construction:

1. Draw a line segment $\overline{XY}$ whose measure is 3cm.
2. At point Y, construct $\angle XYZ$ of measure 90^0.
3. With X as centre draw an arc of radius 5cm to intersect $\overrightarrow{YL}$ at Z.
4. Join Z to X.
5. ΔXYZ is the required triangle.

(ii) $m\overline{YZ} = 6.5cm, m\overline{XY} = 2.5cm$ **and** $m\angle X = 90^0$

Solution:



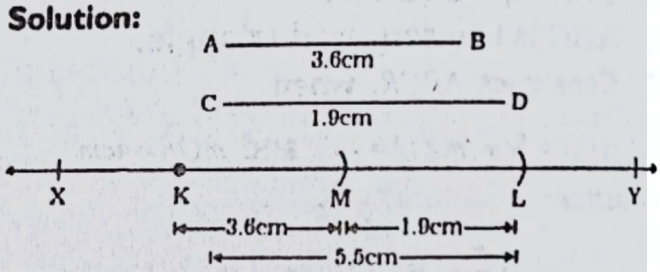
Step of construction:

1. Draw a line segment $\overline{XY}$ whose measure is 2.5cm.
2. At point X, construct $\angle YXL$ of measure 90^0.
3. With Y as centre draw an arc of radius 6.5cm to intersect $\overrightarrow{XL}$ at Z.
4. Join Z to Y.
5. ΔXYZ is the required triangle.

REVIEW EXERCISE 10

1. Draw $\overline{AB}$ and $\overline{CD}$ such that $m\overline{AB} = 3.6cm$ and $m\overline{CD} = 1.9cm$. Draw $\overline{KL}$ where $m\overline{KL} = m\overline{AB} + m\overline{CD}$. Measure the length of $\overline{KL}$.

Solution:



Given:

Two line segments $\overline{AB}$ and $\overline{CD}$ measuring 3.6cm and 1.9cm respectively.

Required:

To draw a line segment whose measure is equal to the sum of measures of $\overline{AB}$ and $\overline{CD}$.

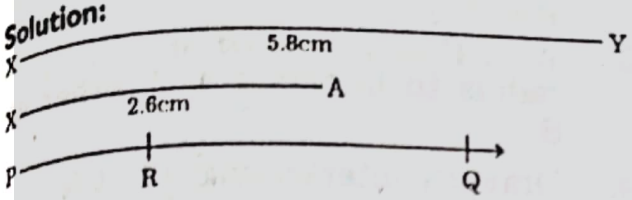
Steps of construction:

1. Draw a line $\overleftrightarrow{XY}$
2. Take a point K on $\overleftrightarrow{XY}$.

3. With K as center draw an arc of length 3.6cm, which cuts $\overrightarrow{XY}$ at M.
4. With M as centre draw another arc of 1.9cm which cuts $\overrightarrow{XY}$ at L.
5. $\overline{KL}$ is a line segment such that $m\overline{KL} = m\overline{AB} + m\overline{CD}$.
6. With the help of ruler we see that $m\overline{KL} = 5.5cm$.

2. **Draw $\overline{XY}$ 5.8cm long. Cut off $\overline{XA}$ where $m\overline{XA} = 2.6cm$. Measure the length of $\overline{AY}$.**

Solution:



Given:

Two line segments $\overline{XY}$ and $\overline{XA}$ measuring $\overline{XY} = 5.8cm$ and $\overline{XA} = 2.6$ cm respectively.

Required:

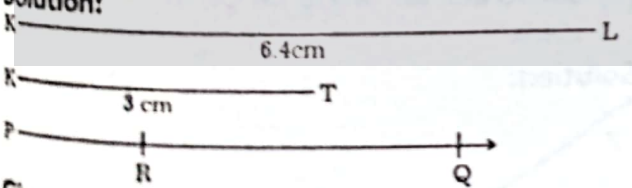
To draw a line segment whose measure is equal to the difference of the measures of $\overline{AB}$ and $\overline{CD}$.

Steps of construction:

1. Draw $\overline{PQ}$ equal is measure to $\overline{XY}$.
2. With P as center draw a arc of radius equal to the measure of $\overline{XA} = 2.6cm$ which cuts $\overline{PQ}$ at R.
3. $\overline{RQ}$ is the required line segment whose measure is equal to the difference of $\overline{XY}$ and $\overline{XA}$ i.e. $\overline{XY} - \overline{XA}$.
4. With the help of ruler we see that $m\overline{RQ} = 3.2cm$.

3. **Draw $\overline{KL}$ such that $m\overline{KL} = 6.4cm$. Cut off $\overline{KT}$ where $m\overline{KT} = 3cm$. Measure the length of $\overline{TL}$.**

Solution:



Given:

Two line segments $\overline{KL}$ and $\overline{KT}$ measuring $\overline{KL} = 6.4cm$ and 3cm respectively.

Required:

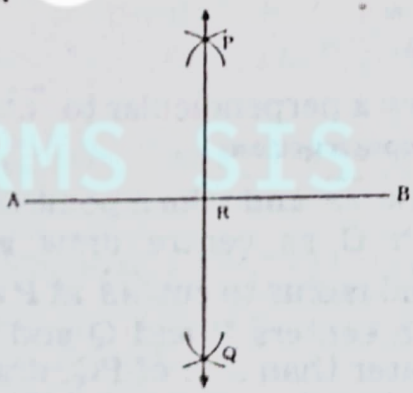
To draw a line segment whose measure is equal to the difference of the measures of $\overline{KL}$ and $\overline{KT}$.

Steps of construction:

1. Draw $\overline{PQ}$ equal is measure to $\overline{KL}$.
2. With P as center draw a arc of radius equal to the measure of $PR = 3cm$ which cuts $\overline{PQ}$ at R.
3. $\overline{RQ}$ is the required line segment whose measure is equal to the difference of $\overline{KL}$ and $\overline{KT}$ i.e. $m\overline{KL} - m\overline{KT}$.
4. With the help of ruler we see that $m\overline{RQ} = 3.4cm$.

4. **Draw $\overline{AB}$ 5.8cm long. Draw its right bisector with the help of ruler and compasses only.**

Solution:



Given:

$\overline{AB}$ is line segment measuring 5.8cm.

Required:

Draw the right bisector of $\overline{AB}$ with the help of compasses.

Steps of construction:

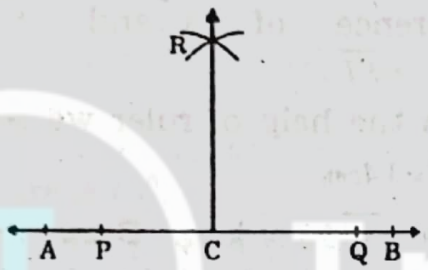
1. Draw $\overline{AB}$ 5.8cm long.
2. With A as center draw arcs of the same radius but more than half of $m\overline{AB}$ above and below $\overline{AB}$.
3. Without changing the radius and taking B as centre draw arcs that

cuts side of $\overline{AB}$ cutting the arcs already drawn arcs at P and Q.

4. Draw line $\overleftrightarrow{PQ}$ which intersects $\overline{AB}$ at R.
5. $\overleftrightarrow{PQ}$ is the right bisector of $\overline{AB}$ i.e makes an angle of 90^0 at R, and divides $\overline{AB}$ into two equal parts $\overline{AR}$ and $\overline{BR}$

5. Draw $\overline{AB}$ 4.8cm long. Take a point C on $\overline{AB}$ such that $m\overline{AC} = 1.6cm$. At C, draw a perpendicular to $\overline{AB}$ by using ruler and compasses only.

Solution:



Given:

$\overleftrightarrow{AB}$ is a line. C is a point on $\overline{AB}. = 4.8cm$

Required:

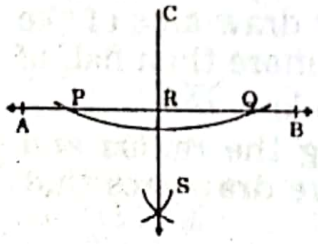
Draw a perpendicular to $\overleftrightarrow{AB}$ at C.

Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take a point C on it.
2. With C as centre draw arcs of equal radius to cut $\overleftrightarrow{AB}$ at P and Q.
3. With centers P and Q and radius greater than half of PQ, draw two arcs to cut each other at R.
4. Join C to R.
5. $\overleftrightarrow{CR}$ is perpendicular to $\overleftrightarrow{AB}$ at C.

6. Draw $\overline{AB}$ 3.9cm long. Take a point C outside $\overline{AB}$ and draw perpendicular to $\overline{AB}$ from C. (use ruler and compass only).

Solution:



Given:

$\overleftrightarrow{AB}$ is a line and C is a point outside $\overleftrightarrow{AB} = 3.9cm$.

Required:

Draw perpendicular with the help of compasses, from C to $\overleftrightarrow{AB}$.

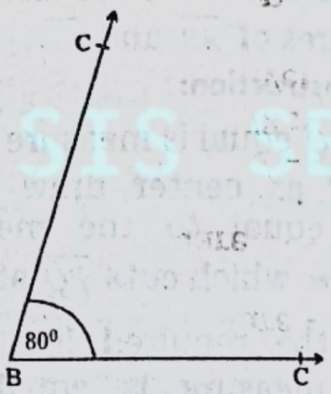
Steps of construction:

1. Draw $\overleftrightarrow{AB}$ and take C, a point outside $\overleftrightarrow{AB}$.
2. With C as centre, draw an arc of suitable radius to intersect $\overleftrightarrow{AB}$ at P and Q.
3. With P and Q draw arcs of equal radius to intersect each other at S.
4. Draw $\overleftrightarrow{CS}$ intersecting $\overleftrightarrow{AB}$ at R.
5. $\overleftrightarrow{CR}$ is the required perpendicular.

7. With the help of protractor, draw $\angle ABC$ such t that $m\angle ABC = 80^0$. Using ruler and compasses only.

(i) Construct an angle equal in measure to $\angle ABC$.

Solution:

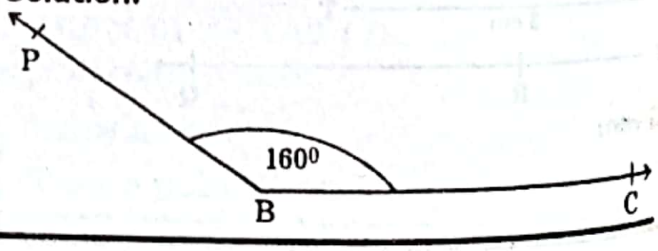


Step of construction:

1. Draw a line segment $\overline{BC}$.
2. Draw an angle by using protractor.
3. Hence $\angle ABC$ is required angle of measuring 80^0.

(ii) Construct an angle twice in measure of $\angle ABC$.

Solution:

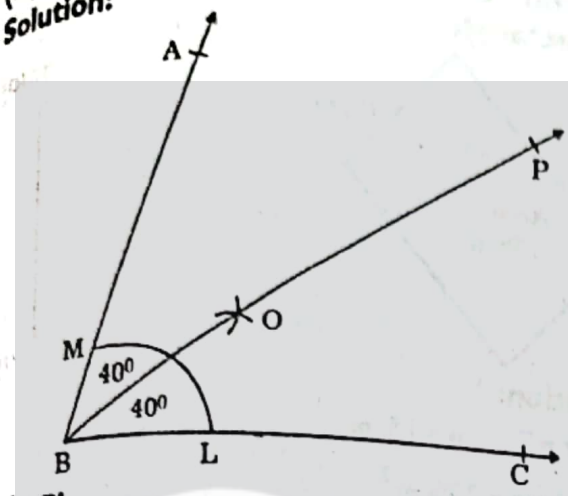


Step of construction:

1. Draw $\overrightarrow{BC}$.
2. At B, draw an angle of 160^0.
3. $\angle PBC$ is required angle which to wise of $\angle ABC$.

(iii) Draw the bisector of $\angle ABC$.

Solution:



Given:

$\angle ABC = 80^0$

Required:

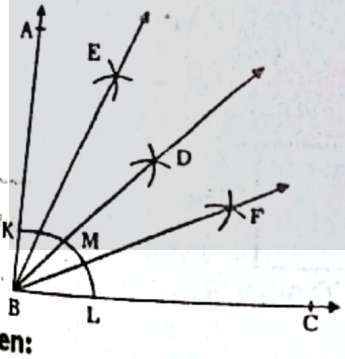
Bisect angle ABC.

Step of construction:

1. With B as center draw an arc of suitable radius to cut $\overrightarrow{BP}$ and $\overrightarrow{BA}$ at L and M respectively.
2. With L as centre draw an arc with radius more than half of $\overline{LM}$.
3. With M as centre draw an arc with the same radius to cut the former arc at O.
4. Through O, draw $\overrightarrow{BP}$.
5. $\overrightarrow{BP}$ is the required bisector of $\angle ABC$ i.e, $m\angle ABP = m\angle PBC$.

(iv) Divide $\angle ABC$ into four equal angles.

Solution:



Given:

An angle ABC is given of measure 80^0

Required:

To divide $\angle ABC$ into four equal angle with the help of compasses.

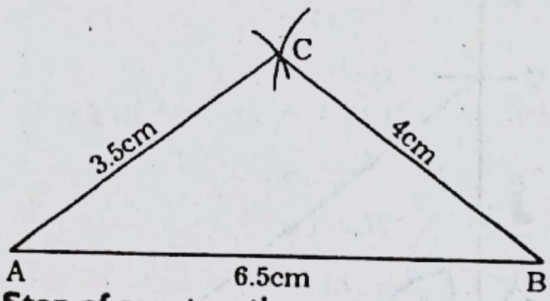
Step of construction:

1. With B as centre, draw an arc of suitable radius to cut $\overrightarrow{BC}$ and $\overrightarrow{BC}$ at K and L respectively.
2. With centre L, draw an arc with radius more than half of $\overline{LK}$
3. With centre K, and without changing the radius, draw an arc to cut the former arc at D.
4. Draw $\overrightarrow{BD}$, which cuts the arc KL at M.
5. With L and M as centers draw arcs of suitable radius to cut each other at F.
6. With M and K as centers draw arcs of suitable radius to cut each other at E.
7. Draw $\overrightarrow{BF}$ and $\overrightarrow{BE}$.
8. $\angle ABC$ is divided into four equal angles i.e. $\angle ABE, \angle EBD, \angle DBF$ and $\angle FBC$.

8. Using ruler and compasses only, construct ΔABC, where.

(i) $m\overline{AB} = 6.5cm, m\overline{BC} = 4cm$ and $m\overline{CA} = 3.5cm$

Solution:



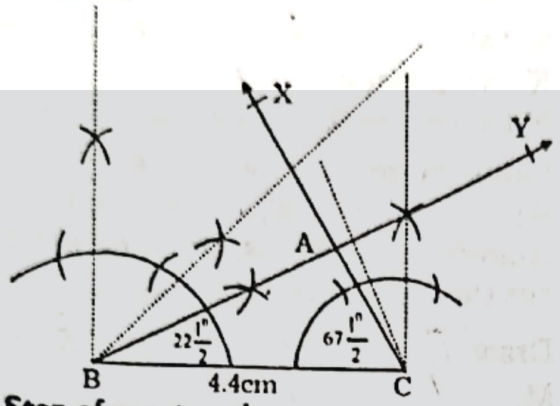
Step of construction:

1. Draw a line segment $\overline{AB}$ measuring 5cm.
2. With B as centre draw an arc of radius equal in measure to $\overline{BC}$ i.e. 4cm.
3. With C as centre draw another arc of radius equal in measure to $\overline{CA}$ i.e. 3.5cm to cut the pervious arc at C.

4. Draw $\overline{BC}$ and $\overline{CA}$.
5. ABC is the required triangle.

(ii) $m\overline{BC} = 4.4cm, m\angle B = 22\frac{1^0}{2}$ and $m\angle C = 67\frac{1^0}{2}$

Solution:

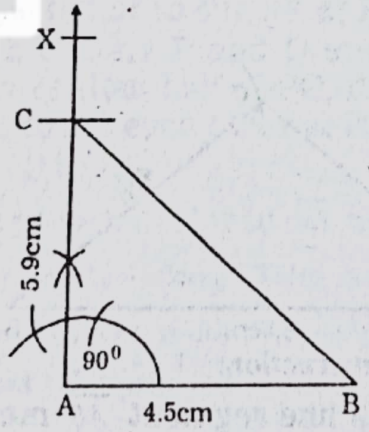


Step of construction:

1. Draw a line segment $\overline{BC}$ whose measure is 4.4cm.
2. At B, construct $\angle CBY$ measuring $22\frac{1^0}{2}$.
3. At C, construct $\angle BCX$ whose measuring is $67\frac{1^0}{2}$
4. $\overrightarrow{BY}$ and $\overrightarrow{CX}$ intersect each other at A.
5. ABC is the required triangle.

(iii) $m\overline{AB} = 4.5cm, m\angle B = 90^0$ and $m\overline{AC} = 5.9cm$

Solution:



Step of construction:

1. Draw a line segment $\overline{AB}$ whose measuring is 4.5cm.
2. At pint B, construct $\angle BAX$ of measure 90^0.
3. With A as center draw an arc of radius 5.9cm to intersect $\overrightarrow{AX}$ at C.
4. Join A to C.
5. ΔABC is the required triangle.

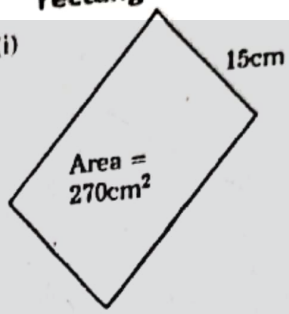
Unit 11

PERIMETER AND AREA

EXERCISE 11.1

1. Find the missing dimension in each rectangle.

(i)



Solution:

$\ell = ?, \quad w = 15cm,$

$Area = 270cm^2$

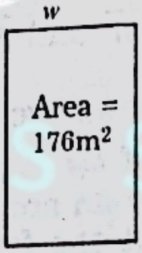
As Area of rectangle = ℓw

$270 = \ell(15)$

$\ell = \frac{270}{15}$

$\ell = 18cm$

(ii)



Solution:

$w = ?, \ \ell = 16m, \ Area = 176m^2$

As we know

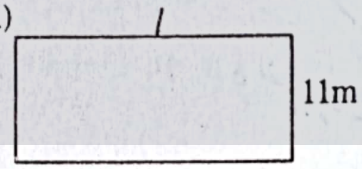
Area of rectangle = ℓw

$176 = 16(w)$

$\Rightarrow w = \frac{176}{16}$

$w = 11m$

(iii)



Perimeter = 70m

Solution:

$\ell = ?, w = 11m,$ Perimeter $= 70m$

As we know that

Perimeter $= 2(\ell + w)$

$70 = 2(\ell + 11)$

$70 = 2\ell + 2\times 11$

$70 = 2\ell + 22$

$2\ell = 70 - 22$

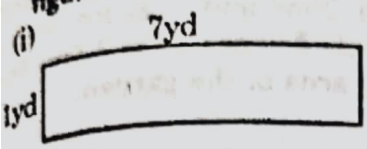
$2\ell = 48$

$\ell = \frac{48}{2}$

$\ell = 24m$

2. Find the perimeter and area of each figure.

(i)



Solution:

$\ell = 7yd$, $w = 1yd$

Perimeter =?, Area =?

As we know that

Perimeter $= 2(\ell + w)$

$= 2(7 + 1)$

$= 2(8)$

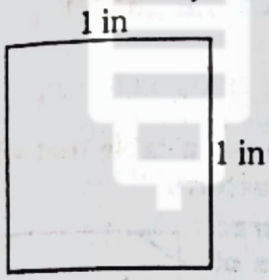
$= 16yd$

Now Area $= \ell w$

$= 7 \times 1$

$= 7\,yd^2$

(ii)



Solution:

$\ell = 1in$, $w = 1in$

As length and width are same,

So figure is square.

Perimeter $= 4 \times 1$

$= 4$ in

And Area $= 1 \times 1$

$= 1\,in^2$

3. Find the perimeter and area of squares having one side equal to:

(i) $20cm$

Solution:

Length of one side of square = 20cm

Perimeter = ?

Area = ?

As perimeter of square = 4× length of side

$= 4 \times 20$

$= 80cm$

And

Area of square = (length of side)²

$= (20)^2$

$= 20 \times 20$

$= 400\,cm^2$

(ii) $3.6m$

Solution:

Length of one side of square = 3.6m

Perimeter =? , Area =?

As perimeter of square 4× length of side

$= 4 \times 3.6$

$= 14.4cm$

Now

Area of square = (length of side)²

$= (3.6)^2$

$= 3.6 \times 3.6$

$= 12.96\,cm^2$

(iii) $59cm$

Solution:

Length of one side = 59cm

Perimeter =? , Area =?

As

Perimeter of square = 4× length of side

$= 4 \times 59$

$= 236cm$

Area of square = (length of side)²

$= (59)^2$

$= 59 \times 59$

$= 3481\,cm^2$

4. Find the perimeter and area of rectangles having:

(i) Length = 9cm, Breadth = 5cm

Solution:

Length $= \ell = 9cm$

Breadth $= w = 5cm$

Perimeter =? , Area =?

As

Perimeter of rectangle $= 2(\ell + w)$

$= 2(9+5)$

$= 2(14)$

$= 28cm$

Now

Area of rectangle $= \ell \times w$

$= 9 \times 5$

$= 45cm^2$

(ii) Length = 40.2m, Breadth = 27.8m

Solution:

Length $= \ell = 40.2m$

Breadth $= w = 27.8m$

Perimeter = ?, Area = ?

As

Perimeter of rectangle $= 2(\ell + w)$

$= 2(40.2+27.8)$

$= 2(68)$

$= 136m$

Now

Area of square $= \ell \times w$

$= 40.2 \times 27.8$

$= 1117.56m^2$

5. Assembly ground of a school is 150m long and 100m wide. Find the cost of its brick flooring if the rate is Rs. 1500 per 100m².

Solution:

Length of Assembly ground = 150m

Width of Assembly ground = 100m

Now

Area $= \ell \times w$

$= 150 \times 100$

$= 15000m^2$

As cost of brick flooring per $100m^2$ = Rs. 1500

$1m^2 = \frac{1500}{100}$

So cost of brick flooring of $15000m^2$

$= \frac{1500}{100} \times 15000$

$= Rs.225000$

6. A room having 5m length and 3.5m breadth is to be carpeted. Find the total cost, if the rate is 545 rupees per square mater.

Solution:

Length of room $= \ell = 5m$

Breadth of room $= w = 3.5m$

Now

Area $= \ell \times w$

$= 5 \times 3.5$

$= 17.5m^2$

As per square meter rate = Rs. 545

So $17.5m^2$ rate $= 17.5 \times 545$

$= Rs.9537.5$

7. A gardener made 6 square shaped flower beds in a rectangular garden having length 20m and breadth 6m. If the side of each flower bed is 2.5m, find the remaining area of the garden.

Solution:

Length of garden = 20m

Width = 6m

Now Area of garden $= 20 \times 6$

$= 120m^2$

Length of side of each flower bed = 2.5

So Area of one flower bed $= 2.5 \times 2.5$

$= 6.25$

As number of flower beds = 6

So total area of flower beds

$= 6 \times 6.25$

$= 37.5$

So remaining area of the garden

$= 120 - 37.5$

$= 82.5m^2$

8. The illustration shows a table mat which has a decorative pattern. If each coloured square has an area of 1 cm² can you find.

(a) The total area which is coloured?

Solution:

As total number of coloured square = 10

And area of each coloured square = 1

So total area of coloured square $= 10 \times 1$

$= 10m^2$

(b) The area of the whole mat?

Solution:

As total possible square in mat = 36

And per square area = $1m^2$

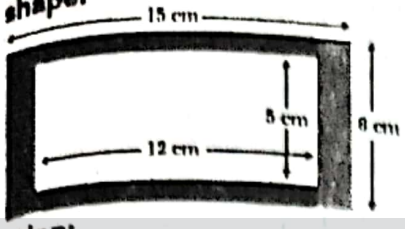
So Area of the whole mat $= 1 \times 36$

$= 36m^2$

EXERCISE 11.2

1. **Find the area of the shaded part of each shape.**

(i)

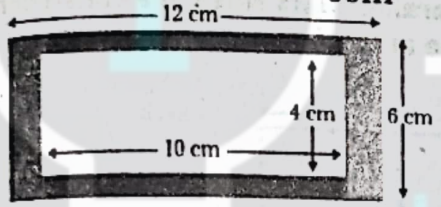


Solution:
As in given shape form two rectangles.
Length of shaded part = 15cm
Width of shaded part = 8cm
Area = 15×8
$= 120\ cm^2$

Now
Length of un shaded part = 12cm
Width of un shaded part = 5cm
Area $= 12 \times 5$
$= 60\ cm^2$

So
Area of shaded part $= 120 - 60$
$= 60m^2$

(ii)

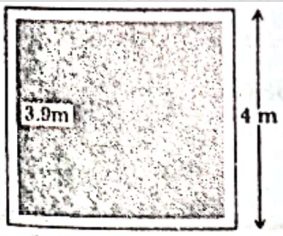


Solution:
Length of shaded part = 12cm
Width of shaded part = 6cm
Area $= 12 \times 6$
$= 72cm^2$

Now
Length of unshaded part = 10cm
Width of unsahded part = 4cm
Area $= 10 \times 4$
$= 40cm^2$

So area of shaded part $= 72 - 40$
$= 32cm^2$

2. **A square carpet of side length 3.9m is laid in a room measuring 4 m by 4m. Find the area of floor left uncovered.**

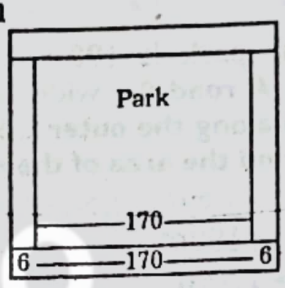


Solution:
Length of one side of carpet $= 3.9m$
Area $= 3.9 \times 3.9$
$= 15.21m^2$
Length of one side of room $= 4m$
Area of room $= 4 \times 4$
$= 16m^2$

So uncovered are $= 16 - 15.21$
$= 0.79m^2$

3. **A square shaped park is 170 m long. A road 6 m wide has been constructed along the outer side of the boundary. Find the area of the road.**

Solution:
Length of one side of a square park
= 170m

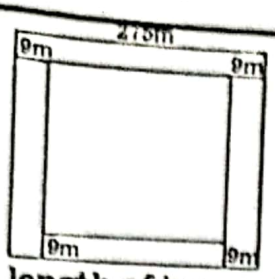


Area $= 170 \times 170$
$= 28900m$
Length of road $= 170 + 6 + 6 = 182m$
So total area $= 182 \times 182$
$= 33124m^2$
So area of road $= 33124 - 28900$
$= 4224m^2$

4. **A park is of square shape and one side of he park is 275 m long. A road 9m wide has been constructed along the inner side of the boundary. Find the area of the road.**

Solution:
One side of a square shaped park = 275m
So area of park $= 275 \times 275$
$= 75625m^2$

As length of road which is inner side =
9



So length of inner side square
$= 275 - 9 - 9$
$= 275 - 18$
$= 257m$

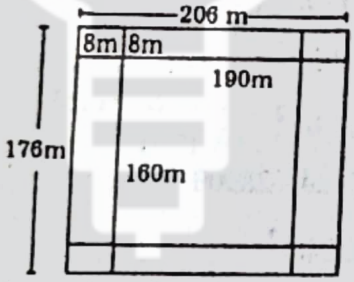
Area of inner square $= 257 \times 257$
$= 66049m^2$

So area of road = Area of park – Area of inner square
$= 75625 - 66049$
$= 9576m^2$

5. A rectangular park is 190m long and 160m wide. A road 8m wide has been constructed along the outer side of the boundary. Find the area of the road.

Solution:

Length of park = 190m
Width of park = 160m
Area = 190×160
$= 30400m^2$



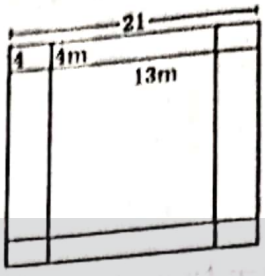
Length of outer rectangle = 206m
Width outer rectangle = 176m
Area $= 206 \times 176$
$= 36256$

So
Area of road = 36256 – 30400
= $5856m^2$

6. A pavement 4m wide is constructed along the outer side of the boundary of a square shaped ground having its side of 13m length. Find the cost of leveling the pavement at the rate of Rs. 1.25 per square meter.

Solution:

Length of pavement = 4m
Length of inner square = 13m
Area of square $= 13 \times 13$
$= 169m^2$

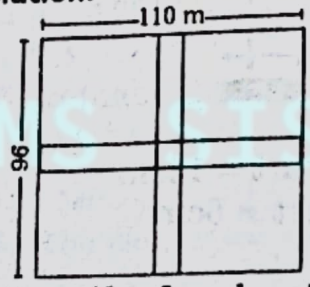


Now
Length of outer side square $= 13 + 4 + 4$
$= 21m$
Area of outer side square $= 21 \times 21$
$= 441m^2$
So area of pavement = 441 – 169
= $272\ m^2$

As cost of leveling the pavement = Rs 1.25 per square
So cost of leveling the pavement of $272m^2 = 1.25 \times 272$
= Rs 340

7. A park is 110 m long and 96m wide. In the middle of the park two roads 4m wide parallel to its sides are constructed. Find the area of the roads.

Solution:



Length of park = 110m
Width of park = 96m
Area of park $= 110 \times 96$
$= 10560$

Area of road parallel to length $= 110 \times 4$
$= 440\ m^2$

Area of road parallel to width $= 96 \times 4$
$= 384\ m^2$

Area of the inner square $= 4 \times 4$
$= 16m^2$

So Area of the roads

$=440+384-16$

$=824-16$

$=808\,m^2$

EXERCISE 11.3

1. Find the area of the following triangles:

(i)

Solution:

Length of base = 10cm

Height = 4cm

As

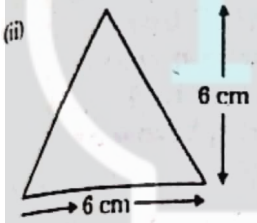
Area of a triangle $=\frac{1}{2}\times$ (length of base) × (height)

$=\frac{1}{2}\times(10\times4)$

$=\frac{40}{2}$

$=2cm^2$

(ii)



Solution:

Length of base = 6cm

Height = 6cm

As

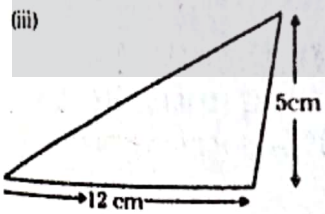
Area of a triangle $=\frac{1}{2}\times$ (length of base) × (height)

$=\frac{1}{2}\times(6\times6)$

$=\frac{36}{2}$

$=18\,cm^2$

(iii)



Solution:

Length of base = 12cm

Height = 5cm

As

Area of a triangle $=\frac{1}{2}\times$ (length of base) × (height)

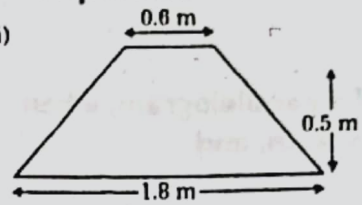
$=\frac{1}{2}\times12\times5$

$=\frac{60}{2}$

$=30cm^2$

2. Find the area of each of the following trapezium.

(i)



Solution:

Base of trapezium are 0.6m and 1.8m and height = 0.5m

As

$\text{Area}=\frac{1}{2}h(b_1+b_2)$

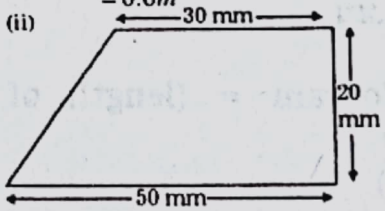
$=\frac{1}{2}(0.5)\,(0.6+1.8)$

$=\frac{1}{2}(0.5)(2.4)$

$=(0.5)(1.2)$

$=0.6m^2$

(ii)



Solution:

Bases of trapezium are 30mm and 50mm and height = 20 mm

As

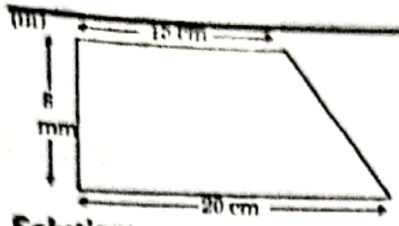
$\text{Area}=\frac{1}{2}h(b_1+b_2)$

$=\frac{1}{2}(20)(30+50)$

$=\frac{1}{2}(20)(80)$

$=(10)(80)$

$=800(mm)^2$



Solution:

Bases of trapezium are 15cm and 20cm and height = 8cm

As

$$\text{Area} = \frac{1}{2}(h)(b_1 + b_2)$$

$$= \frac{1}{2}(8)(15+20)$$

$$= 4(35)$$

$$= 140\,cm^2$$

3. Find the area of a parallelogram, when

(i) Length of base = 6cm, and altitude = 4cm

Solution:

Length of base = 6cm

Altitude = 4cm

As

Area of parallelogram = (length of base) × (Altitude)

$$= 6 \times 4$$

$$= 24\,cm^2$$

(ii) Length of base = 3.8cm and altitude = 2.2cm

Solution:

Length of base = 3.8cm

Altitude = 2.2cm

As

Area of parallelogram = (length of base) × (altitude)

$$= (3.8) \times (2.2)$$

$$= 8.36\,cm^2$$

4. Find the area of a triangle whose:

(i) Base = 8cm and altitude = 6cm

Solution:

Base = 8cm, Altitude = 5cm

As

$$\text{Are of triangle} = \frac{1}{2}(\text{Base}) \times \text{Altitude}$$

$$= \frac{1}{2}(8 \times 5)$$

$$= 4 \times 5$$

$$= 20\,cm^2$$

(ii) Base = 7.5cm and altitude = 2.2cm.

Solution:

Base = 7.5cm

Altitude = 4cm

As

$$\text{Area to triangle} = \frac{1}{2}(\text{Base})(\text{Altitude})$$

$$= \frac{1}{2}(7.5) \times (4)$$

$$= 15\,cm^2$$

5. Find the area of a trapezium when:

(i) Length of base 1 = 6cm, Length of base 2 = 4cm, and Altitude = 4cm

Solution:

Length of base 1 = 6cm

Length of base 2 = 4cm

Altitude = 3cm

As

$$\text{Length of trapezium} = \frac{1}{2}(\text{altitude})(b_1 + b_2)$$

$$= \frac{1}{2}(3)(6+4)$$

$$= \frac{1}{2}(3)(10)$$

$$= 3 \times 5$$

$$= 15\,cm^2$$

(ii) Length of base 1 = 9.2cm, Length of base 2 = 6.8cm, and altitude = 4cm

Solution:

Length of base 1 = 9.2cm

Length of base 2 = 6.8cm

Altitude = 4cm

As

$$\text{Area of trapezium} = \frac{1}{2}(\text{Altitude})(b_1 + b_2)$$

$$= \frac{1}{2}(4)(9.2+6.8)$$

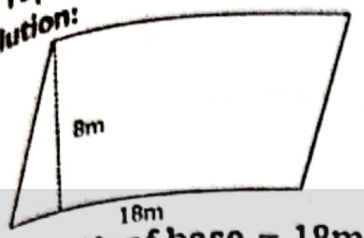
$$= \frac{1}{2}(4)(16)$$

$$= 32\,cm^2$$

6. Aslam prepared parallelogram piece of land having base 18m and altitude

8m. Findthe expenditure on planting grass when the rate of plantation is 0.35 rupees per square meter.

Solution:



Length of base = 18m
Altitude = 8m

As Area of parallelogram = base × altitude

$$=18\times 8$$
$$=144\,m^2$$

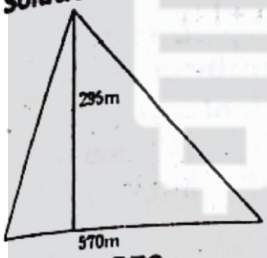
As Rate of plantation per meter square = 0.35

So for $144\ m^2 = 0.35\times 144$

Rs. 50.40

7. Base and altitude of a triangle farm are 570m and 295m respectively. If the rate of wheat production per square meter is 6 kg, find the total yield of wheat the farm would give.

Solution:

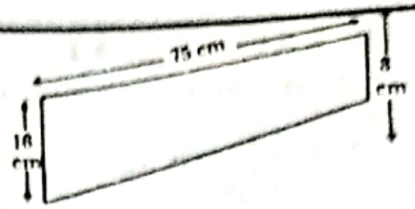


Base = 570,
Altitude = 295m
As

$$\text{Area} = \frac{1}{2}\ (\text{Altitude}) \times (\text{Base})$$
$$=\frac{1}{2}(295)(570)$$
$$=(295)(285)$$
$$=84075m^2$$

As production per square meter = 6kg
So production $84075m^2 = 684075$
$$=504450\,kg$$

8. The diagram shows a piece of metal which is to be used for making a saw blade. Find its area.



Solution:

The given diagram is a trapezium, and its area is find by the following formula.

$$\text{Area} = \frac{1}{2}(h)(b_1 + b_2)$$
$$=\frac{1}{2}(75)(8+16)$$
$$=\frac{1}{2}(75)(24)$$
$$=(75)(12)$$
$$=900\,cm^2$$

REVIEW EXERCISE 11

1. Perimeter of a square having one side equal to 15cm is:

(i) Perimeter of a square having one side equal to 15cm is:

(a) 225 cm² (b) 60 cm✓
(c) 225 cm (d) 60 cm²

(ii) Perimeter of a square is 16.8 cm. Length of its side is:

(a) 4.2cm✓ (b) 0.42
(c) 8.4cm (d) 67.2 cm

(iii) Perimeter of a rectangle having length 11 cm and width 8cm is:

(a) 76 cm² (b) 88 cm
(c) 19 cm (d) 38 cm✓

(iv) Perimeter of a rectangle is 208cm. its length is 57cm. It width is:

(a) 47cm✓ (b) 151cm
(c) 94cm (d) 52cm

(v) Area of a square having one side 15cm is:

(a) 60 cm² (b) 225 cm²✓
(c) 11.5 cm² (d) 155 cm²

(vi) Area of a rectangle having length 0.9m and width 0.5m is:

(a) 4.5m² (b) 2.8m²
(c) 0.045m² (d) 0.45m²✓

(vii) Base of a parallelogram is 10 cm. What will be the area of the parallelogram if the length of its altitude is 7cm?

(a) 34 cm² (b) 68 cm²
(c) 70 cm²✓ (d) 35 cm²

(viii) Area of a triangle having its base 9cm and altitude 10cm is:

(a) 90 cm² (b) 45 cm²✓
(c) 76 cm² (d) 19 cm²

(ix) Bases of a trapezium are 9cm and 6cm. If its altitude is 5cm, its area is:

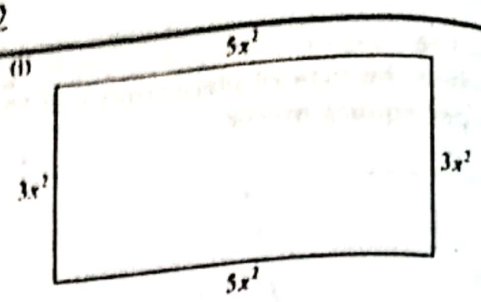
(a) 30 cm² ✓ (b) 60 cm²
(c) 36 cm² (d) 24 cm²

(x) Area of a parallelogram is 36m². If the length of its attitude is 4m, what is its base:

(a) 6m (b) 32m²
(c) 18m (d) 9m✓

2. Write an expression for the area and the perimeter of each figure. Simplify each expression.

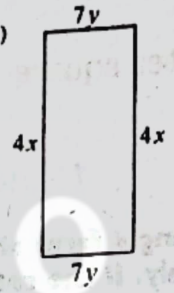
(i)



Solution:

$$\text{Area} = (5x^2) \times (3x^2)$$
$$= 15x^{2+2}$$
$$= 15x^4$$
$$\text{Perimeter} = 2(3x^2 + 5x^2)$$
$$= 2(8x^2)$$
$$= 16x^2$$

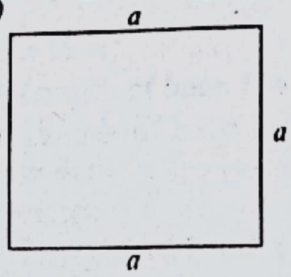
(ii)



Solution:

$$\text{Area} = (4x) \times (7x)$$
$$= 25xy$$
$$\text{Perimeter} = 2(4x + 7y) = 8x + 14y$$

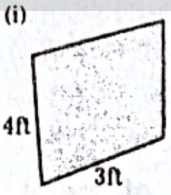
(iii)



$$\text{Area} = (a) \times (a)$$
$$= a^2.$$
$$\text{Perimeter} = 2(a + a)$$
$$= 2(2a)$$
$$= 4a$$

3. Find the area of each figure.

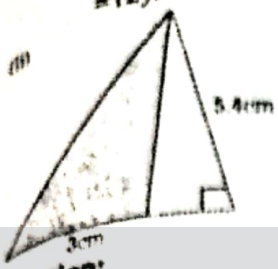
(i)



Solution:

Area = 4 × 3
= 12 ft²

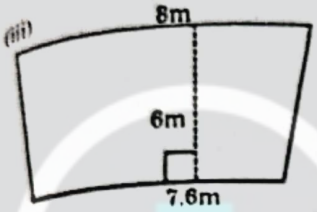
(ii)



Solution:

$$\text{Area} = \frac{1}{2}(h)\times(B)$$
$$= \frac{1}{2}(5.4)\times(3)$$
$$= 2.7\times 3$$
$$= 8.1 cm^2$$

(iii)



Solution:

$$\text{Area} = \frac{1}{2}(height)(b_1 + b_2)$$
$$= \frac{1}{2}(6)(7.6+8)$$
$$= 3\times 15.6 = 46.8 m^2$$

4. Area of a right-angled triangle is 21 bc square centimeter. If the area is equal to 15 sq. cm, and b=5, then find c.

Solution:

Given Area of right angled triangle $= 21bc$

If Area = 15 cm²

So

$$21bc = 15$$
$$21\times 5(c) = 15$$
$$c = \frac{15}{21\times 5}$$
$$c = \frac{3}{21}$$
$$c = 1/7$$

5. If the perimeter of an equilateral triangle is 15 cm, find the length of each side.

Solution:

Let length of equilateral triangle = x

Then

Perimeter = x + x + x

$$3x = 15cm$$
$$x = \frac{15}{3}$$
$$x = 5$$

So length of each side = 5cm

6. Perimeter of a rectangle is 125 cm. if the breadth of the rectangle is 25cm, find its length.

Solution:

Perimeter of rectangle = 125cm
Breadth = 25cm
Length = ?

As perimeter = 2 (breadth + length)
125 = 2 (25 + length)
125 = 2 × 25 + 2 length
125 = 50 + 2 (length)
2 (length) = 125 – 50
2 (length) = 75

$$\text{length} = \frac{75}{2}$$

length = 37.5cm

7. Perimeter of a rectangle is 50 meter. If the length of the rectangle is 15 metre, find its breadth.

Solution:

Perimeter of rectangle = 50m
Length = 15m, breadth =?

As
Perimeter = 2 (length + breadth)
50 = 2 (15 + breadth)
50 = 30 + 2 (breadth)
2 (breadth) = 50 – 30

Breadth = $20/2$
= 10 m

8. Area of a rectangular field is 90 square meter. If its length is 12 meter, find its breadth.

Solution:

Area of rectangle = 90m²
Length = 12m, Breadth =?

As
Area = length × breadth
90 = 12 × breadth

$$\text{Breadth} = \frac{90}{12} = 7.5m$$

9. Area of a square field is 225 sq meter. Find the length of its sides.

Solution:

Area of square = 225 m2

Length of side =?

As

$\text{Area} = (\text{length})^2$

$225 = (\text{length})^2$

Taking square root on both side

$$\sqrt{(\text{length})^2} = \sqrt{225}$$

$$\text{length} = \sqrt{15 \times 15}$$

$$= \sqrt{(15)^2}$$

$$\text{length} = 15$$

10. Perimeter of a square is 14cm. Find length of its side.

Solution:

Perimeter of a square = 14cm

Length of side =?

As

Perimeter = 4 (length of a side)

14=4 (length of a side)

$$\text{Length of a side} = \frac{14}{4}$$

Length of a side = 3.5cm

Unit 12
THREE DIMENSIONAL SOLIDS
EXERCISE 12

1. Find the surface area of a cube whose one side is:

(i) 5cm

Solution:

Let 'a' be the side of square face,

So $a = 5cm$

As we know that

$$\text{Surface area} = 6 \times a^2$$
$$= 6 \times 5^2$$
$$= 6 \times 25$$
$$= 150\,cm^2$$

(ii) 4.5 cm

Solution:

Let 'a' be the side of squared face,

so $a = 4.5cm$

As we know that

$$\text{Surface area} = 6 \times a^2$$
$$= 6 \times (4.5)^2$$
$$= 6 \times 20.25$$
$$= 121.5\,cm^2$$

(iii) 7.8 cm

Solution:

Let 'a' be the side a squared face, so $a = 7.8cm$

As we know that

$$\text{Surface area} = 6 \times a^2$$
$$= 6 \times (7.8)^2$$
$$= 6 \times 60.84$$
$$= 365.04\,cm^2$$

(iv) 6.9m

Solution:

Let 'a' be the side of a squared face,

so $a = 6.9cm$

As we know that

$$\text{Surface area} = 6 \times a^2$$
$$= 6 \times (6.9)^2$$
$$= 6 \times 47.61$$
$$= 285.66\,cm^2$$

2. Find the surface areas of the following cuboids.

(i) Length 4cm Breadth 3cm Height 2cm

Solution:

Here length $= \ell = 4cm$

Breadth $= w = 3cm$ and

Height $= h = 2cm$

As we know that

Surface area of cuboid

$$= 2\ell w + 2wh + 2h\ell$$
$$= 2 \times 4 \times 3 + 2 \times 3 \times 2 + 2 \times 2 \times 4$$
$$= 24 + 12 + 16$$
$$= 52\,cm^2$$

(ii) Length 5cm Breadth 4cm Height 2cm

Solution:

Here length $= \ell = 5cm$

Breadth $= w = 4cm$ and

Height $= h = 9cm$

As we know that

Surface area of Cuboid

$$= 2\ell w + 2wh + 2h\ell$$
$$= 2 \times 5 \times 4 + 2 \times 4 \times 9 \times + 2 \times 9 \times 5$$
$$= 40 + 72 + 90$$
$$= 202\,cm^2$$

(iii) Length 7.5cm Breadth 3.4cm Height 2 cm

Solution:

Here length $= \ell = 7.5cm$

Breadth $= w = 3.4cm$

Height $= h = 2cm$

As we know that

Surface area of cuboid

$$= 2\ell w + 2wh + 2h\ell$$
$$= 2 \times 7.5 \times 3.4 + 2 \times 3.4 \times 2 + 2 \times 2 \times 7.5$$
$$= 51 + 13.5 + 30$$
$$= 94.6cm^2$$

3. Find volume of the cube whose one side is

(i) 1cm

Solution:

Let 'a' be the one side of a cube, so a = 1cm

As we know that

Volume of cube $= a^3$

$=(1)^3$

$=1cm^3$

(ii) 6cm

Solution:

Let 'a' be one side of a cube, so $a=6cm$

As we know that

Volume of cube $=a^3$

$=(6)^3$

$=6\times6\times6$

$=216cm^3$

(iii)4.5m

Solution:

Let 'a' one side of a cube, so $a=5.4m$

As we know that

Volume of cube $=a^3$

$=(4.5)^3$

$=4.5\times4.5\times4.5$

$=91.125m^3$

(iv)5.4m

Solution:

Let 'a' one side of a cube, so a = 5.4m

As we know that

Volume of cube $=a^3$

$=(5.4)^3$

$=5.4\times5.4\times5.4$

$=157.464cm^3$

4. Find volume of the cuboids whose length, breadth, and height are given in question 2 above.

(i) Length = 4cm, Breadth = 3cm, Height = 2cm

Solution:

As we know that volume of cuboid = Length × breadth × height

$=4\times3\times2$

$=24cm^3$

(ii) Length = 5cm, Breadth = 4cm, Height = 9cm

Solution:

As we know that Volume of cuboid = length × breadth × height

$=5\times4\times9$

$=180cm^3$

(iii)Length = 7.5cm, Breadth = 3.4cm height = 2cm

Solution:

As we know that

Volume of cuboid = length × breadth × height

$=7.5\times3.4\times2$

$=51cm^3$

5. The side of a cubical pool is 5 meters. Find its

(i) Surface area

Solution:

Surface area =?

Let 'a' be side of a cubical pool

Since pool is open, so surface area will be sum of surface areas of 5 faces

So surface area $=5a^2$

$=5\times5^2$

$=5\times5\times5$

$=125m^2$

(ii) Volume

Solution:

Volume = ?

Let 'a' be side of a cubical, so a=5

Volume = a^3

$=5^3$

$=5\times5\times5$

$=125m^2$

6. A rectangular room is 4.5 m long, 3.5m wide and 5m deep. Find its

(i) Surface area

Solution:

Length of rectangle room $=\ell=4.5m$

Width $=w=3.5m$

Height = 5m

So surface area of rectangular room

$=2\ell w+2wh+2\ell h$

$=2\times4.5\times3.4+2\times3.5\times5+2\times4.5\times5$

$=31.5+35+45$

$=111.5m^2$

(ii) Volume

Solution:

Volume = ?

ℓ = length = 4.5m

w = width = 3.5m

h = height = 5m

As volume = $\ell \times w \times h$

$= 4.5 \times 3.5 \times 5$

$= 78.75\, m^3$

7. Volume of a box is 60 cm^3. If its base area is 20 cm^2. Find its depth.

Solution:

Volume of a box = $60cm^3$

Base area = $20cm^2$

Depth = ?

As Volume = Base area × depth

$60 = 20 \times$ depth

$$\text{depth} = \frac{60}{20}$$

depth = 3cm

8. Give 2 examples of a sphere and draw their figures.

Solution:

To examples of sphere

(i) Cricket ball

(ii) Football

9. Given 2 examples of a cylinder and draw their figures.

Solution:

Two examples of cylinder:

(i) Pencil:

(ii) An ampty tin of ghee:

10. Give 2 examples of a cone and draw their figures.

Solution:

Two examples of cone:

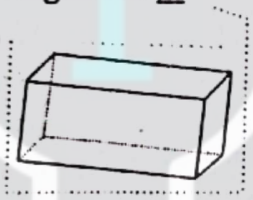
(i) Ice cream is a cone:

(ii) Henna is a cone:

REVIEW EXERCISE 12

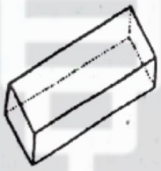
1. D is a triangle which lies in a plane.
2. Figures which lie in plane are called 2 dimensional.
3. ☐ is a 2 dimensional figure.
4. A cuboid is a 3 D- figure.
5. Surface area of cube of a cm side = $6a^2cm^2$.
6. Volume of a cube of $a\,cm$ side = a^3cm^2
7. Surface area of cuboid of side $a\,cm, bcm$ and $c\,cm =$ $2ab + 2bc + 2ca\,cm^2$
8. Volume of cube of side 1m = $1m^3$
9. Volume of cuboid of sides 3 cm, 2cm, 1cm = $6cm^3$
10. Which figure does not have the same dimensions as the other figures? D

(A)

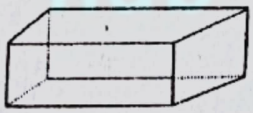


(B)

(C)



(D)



UNIT 13
INFORMATION HANDLING
EXERCISE 13.1

1. Define grouped data and give one example.

Solution:

Grouped data:

Raw data when put in some order or arranged in different groups is called grouped data.

Example of Grouped data:

50 students of class 6th may be divided into 5 groups according to their scores out of 100 in the subject of Mathematics as given below.

Solution:

Scores	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100
No of Students	5	10	15	5	15

2. Define ungrouped data and give one example.

Solution:

Ungrouped data:

Numerical of facts which are obtained as such, are known as ungrouped data. 5 students of class 6th obtained 95, 94, 93, 92 and 91 marks out of 100 in Mathematics.

3. The number of patients of kidney problems admitted in hospital during a week according to their ages given below.

40, 36, 17, 25, 12, 13, 31, 36, 47, 32, 26, 10, 15, 6, 45, 20, 9, 60, 19, 4, 14.

Identify the type of this data.

Solution:

Ungrouped data:

The given data is a ungroup data.

4. Given below are the marks out of 50 obtained by 40 students of class 6 in a test of mathematics.

Marks obtained	No.of students
15 – 20	10
21 – 26	7
27 – 32	6
33 – 38	8
39 – 44	6
45 – 50	3

Total	40

Is this grouped data or ungrouped data?

Solution:

Grouped data:

Solution:

The given data is a group data.

EXERCISE 13.2

1. Draw a vertical bar graph to represent speed of a car in first four hours given below.

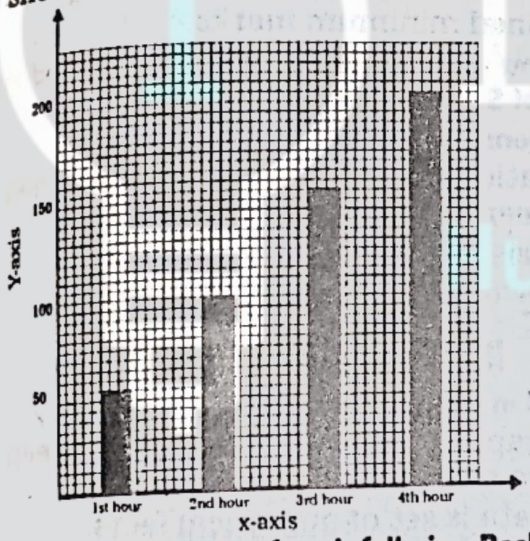
Time	1st hour	2nd hour	3rd hour	4th hour
Speed	50 km	1000 km	150 km	200 km

Solution:

Draw two mutually perpendicular rays $\overrightarrow{OX}$ and $\overrightarrow{OY}$. Select a suitable scale.

Scale:

One big square along $\overrightarrow{OY}$ represents 50km speed. Time are shown $\overrightarrow{OX}$.



2. The amount of rainfall in Peshawar recorded from April to September is given below. Draw vertical bar graph.

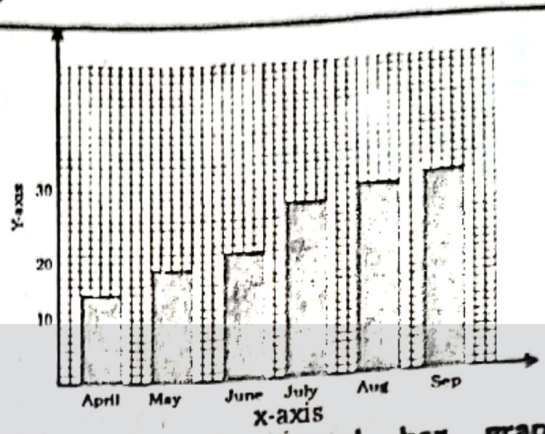
Months	April	May	June	July	August	September
Rain fall in mm	15	18	20	25	28	30

Solution:

Draw two mutually perpendicular rays $\overrightarrow{OX}$ and $\overrightarrow{OY}$. select a suitable scale.

Scale:

One big square along $\overrightarrow{OY}$ represents 10mm rain. Months are shown on $\overrightarrow{OX}$.



3. Draw a horizontal bar graph to represent the product of wheat in charsadda during the year 1990 to 1994.

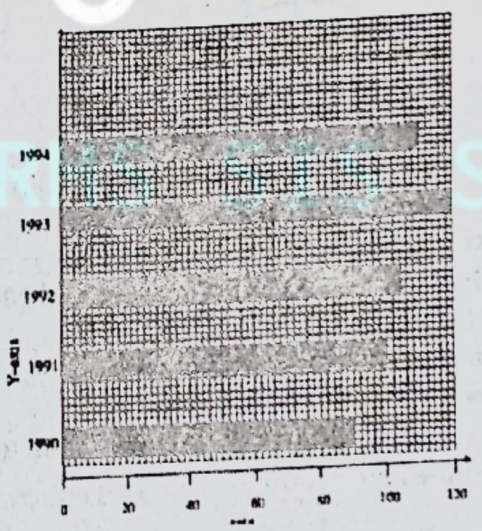
Years	1990	1991	1992	1993	1994
Production in tons	90	100	115	120	110

Solution:

Draw two mutually perpendicular rays $\overrightarrow{OX}$ and $\overrightarrow{OY}$. Select a suitable scale.

Scale:

One big square long $\overrightarrow{OX}$ represents 20 tons production. Year are shown on $\overrightarrow{OY}$



4. Draw a horizontal bar graph to represent monthly income of Alsam, Akram, Ahmed and Hamza given below.

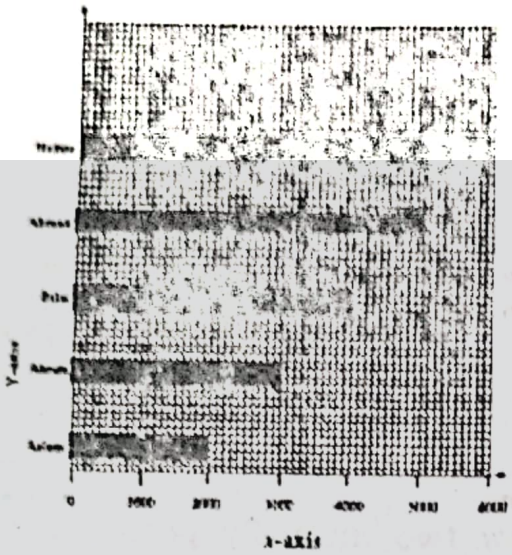
Person	Aslam	Akram	Bilal	Ahmad	Hamza
Income (in Rupees)	2000	3000	4000	5000	6000

Solution:

Draw two mutually perpendicular ray $\overrightarrow{OX}$ and $\overrightarrow{OY}$. Select a suitable scale.

Scales:

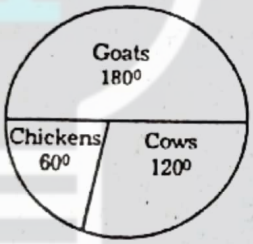
One big square along OX represents 1000 rupees incomes persons are shown on $\overrightarrow{OY}$.



EXERCISE 13.3

1. Different types of animals are shown in pie graph, read the graph and answer the following questions.

(i) Which type of animal is greatest in number?



Solution:

Goats of animal is greatest in number.

(ii) Find percentage of chickens.

Solution:

As total numbers of animals are = 180+60+120 = 360

So,

$$\text{Percentage of chickens} = \frac{60}{360} \times 100\%$$

$$= \frac{1}{6} \times 100\%$$

$$= 6\sqrt{100}\%$$

$$\frac{96}{4}$$

$$= 16\frac{4}{6}\%$$

$$= 16\frac{2}{3}\%$$

(iii) Find ratio of goats and cows.

Solution:

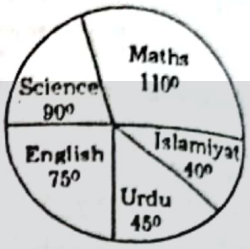
Ratio of goats and cows

= 18 : 120

= 18 : 12 (Dividing by 10)

= 3 : 2 (Dividing by 6).

2. Aslam obtained marks in different subjects as given in the pie graph. Read the graph and answer the following questions.



(i) In which subject did the obtain maximum marks?

Solution:

In Maths subjects did he obtained maximum marks.

(ii) In which subject did he obtain minimum marks?

Solution:

In Islamiyat subjects did he obtained minimum marks.

(iii) Find between the marks he obtained in of Science and Urdu?

Solution:

Ratio of marks he obtained between Science and Urdu.

= 90 : 45

= 2 : 1 (*Dividing by* 45)

REVIEW EXERCISE 13

1. Fill in the blanks.

(i) Graph shows relationship between two different quantities.

(ii) Data is set of numerical facts.

(iii) There are two types of data.

(iv) Pie-Graph is also called circular graph.

(v) Sum of measures of angles in pie-graph = 360^0.

2. Choose the correct answer.

1. Numerical facts obtained from observation and experiments are called.

a. Figure

b. Data✓

c. Frequency

d. Classes

2. Data is of

a. One type

b. Two types✓
c. Three types
d. Four types

3. In bar graph width of bars is
a. Equal
b. Greater than first bar
c. Less than first bar✓
d. Unequal

4. Pie-graph is also known as
a. Bar graph✓
b. Circular graph
c. Rectangular graph
d. Line graph

5. Sum of measures of angles in pie-graph is
a. 90^0 b. 180^0
c. 270^0 d. 360^0✓

6. Pie-graph is divided into
a. Sectors✓ b. Rectangles
c. Chords d. Squares

3. Following are the ages (years) of 30 students of a school.
16,13,12,14,8,9,15,4,7,6,11,10,7,5,6,14,13,10,9,8,7,5,4,16,13,12,9,6,5,7
Identify the type of data.

Solution:

Ungrouped data:

Numerical of facts which are obtained as such, are known as ungrouped data. 5 students of class 6th obtained 95, 94, 93, 92 and 91 marks out of 100 in Mathematics.

4. Draw a vertical bar graph to represent number. of admission in a school in different classes in different years. Detail is given below.

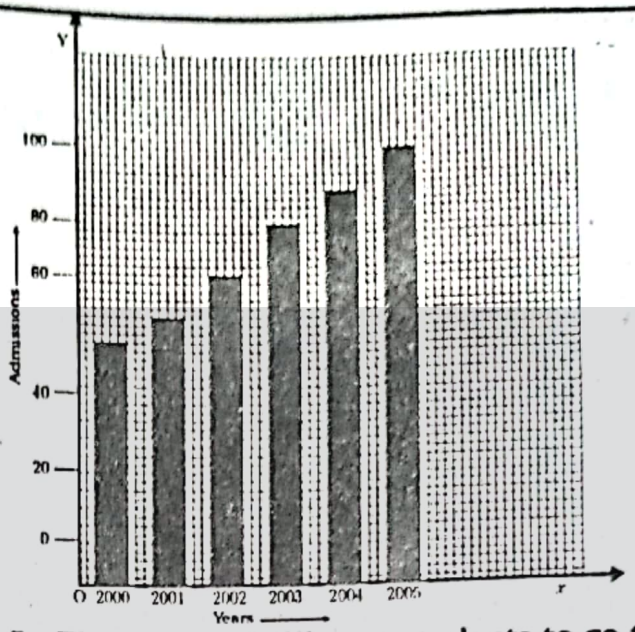
Years	2000	2001	2002	2003	2004	2005
No. of Admission	50	60	70	80	90	100

Solution:

Draw two mutually perpendicular rays $\overrightarrow{OX}$ and $\overrightarrow{OY}$. Select a suitable scale.

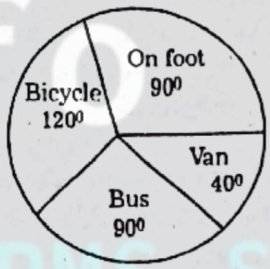
Scale:

One big square along $\overrightarrow{OY}$ represent 20 No.of admission years are show along $\overrightarrow{OX}$.



5. The means of different students to go to school are shown in pie graph, read the graph and answer the following questions.

(i) In how many sectors pie graph has been divided?



Solution:

The pie graph has been divided 4 sectors.

(ii) Which means is mostly for going to school?

Solution:

Bicycle.

(iii) Find percentage of students who go through bus.

Solution:

As total number of students
$= 90 + 120 + 90 + 40$
$= 340$

Now

Percentage of students who got

Through bus $= \frac{90}{340} \times 100\%$
$= 26.47\%$