BLE Model Question Set with Solution

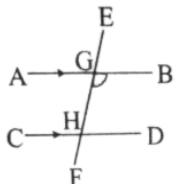
Subject: Mathematics F.M.: 100
Class: VIII Time: 3 hrs

Candidates are required to answer in their own words as far as practicable. The figures in the margin represent the full marks.

Attempt all the questions

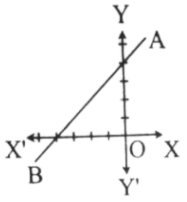
Group "A" [10 × 1=10]

1. a) Write the co-interior angle of ∡BGH from the given figure.

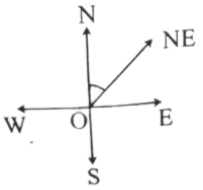


b) Find the area of a semi-circle with diameter 'd' cm.

2. a) Find the x-intercept of the line AB in the given graph.



b) Write the bearing angle of NE in the given figure.



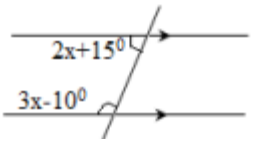
3. a) If A= { 0,4,8,12,18} and B={ 0,6,12,18} then find A – B .

b) Find the mode of given data: 2, 3, 5, 7, 3, 11

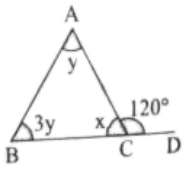
4. a) Factorise: $2a^2 - 6ab$
b) Write down 46000 in scientific notation.
5. a) Solve : $4x > 12$
b) What is the value of $2x^o$?

Group "B" [17×2=34]

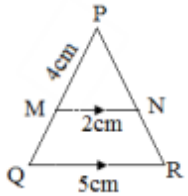
6. a) Find the value of x from the given figure.



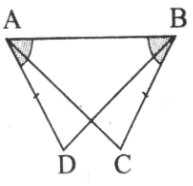
b) From given figure, Find the value of x and y.



c) In the given figure, if ΔPQR ~ ΔPMN then find the length of PQ.



7. a) In the given figure, AB= BC and ∡BAD=∡ABC, prove that ΔABD ≅ ΔACB.



b) If the area of circular pond is 144 m^2, Find the radius of its base.
c) Draw a net of cube.

8. a) If A(6,8) and B(7,4) are any two given points, Find the distance between AB.

b) A tank having length, breadth and height 12m , 10 m , 6m respectively. How much petrol does it hold?

c) If U= {1,2,3,4…..10}, P= {1,2,3,4,5} and R = {4,5,6,7} then find $P - (\overline{P \cap R})$

9. a) Convert the binary number $(101110111)_2$ into decimal number.

b) The monthly income of a family is Rs 30,000. The ratio of the expenditure and saving is 4:2 . Find the amount of expenditure and saving.

c) Find the median from the given data:

10,30,20,40,50,20,60

10. a) If $a+\frac{1}{a}=12$, find the value of $a^3+\frac{1}{a^3}$.

b) Find the value of: $\left(\frac{1}{64}\right)^{-1/6}$

c) Simplify: $\frac{3^{x+1}+3^x}{2\times 3^x}$

11. a) Solve: $a^2 - 4a = 0$

b) Solve the given inequality and show in a number line. : $3x+2 \leq 17$.

Group "C" [14× 4=56]

12. Construct a regular pentagon with a side 5 cm by using compass.

13. Verify experimentally that the sum of interior angles of a triangle is two right angles.(Two triangles of different size are necessary)

14. Plot the points P(2,7), Q(3,3) and R(6,7) on graph paper. Find the co-ordinates of image of the point P,Q and R when P,Q and R are rotated through $+90^0$ about the origin O(0,0) and show the image on the same graph paper.

15. In a group of 120 students, it was found that 80 students liked apple and 40 liked banana. If 20 of them liked both fruits then using Venn – diagram, find the number of students who did not like both fruits.

16. Simplify: $\frac{42}{\sqrt{28}}+\frac{60}{\sqrt{45}} - 2\sqrt{20} + 2\sqrt{175}$

17. If a cube has total surface area 150 cm^2, Find the volume of a cube.

18. 15 men can do a piece of work in 80 days. How long will it take to complete the work by 10 men?

19. What sum of money amounts to Rs 8700 in 3 years at the rate of 24% per annum.

20. What is the price of a mobile whose market price is Rs 15,000 and 13% VAT was levied after allowing 20% discount on it?

21. Find the arithmetic mean from the following data:

x	2	4	6	8	10	12	14
f	5	3	4	3	7	3	4

22. Factorize: $(a+b)^2+11(a+b)+30$

23. Find H.C.F.: $x^2 - 5x+6$, $x^2 - 6x+5$ and $x^2 - 9$.

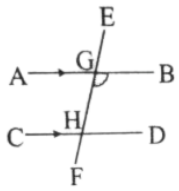
24. Simplify: Simplify: $\frac{1}{m-n}+\frac{1}{m+n}-\frac{2m}{m^2+n^2}$

25. Solve graphically : $x + y = 5$, $x - y = 1$

THE END

Group "A" **[10 ×1=10]**

1. a) Write the co-interior angle of ∠BGH from the given figure.



Solution:

Here,

The co-interior angle of ∠BGH is ∠DHG.

b) Find the area of a semi-circle with diameter 'd' cm.

Solution:

Here,

The area of semi-circle $= \frac{1}{2}\pi r^2 = \frac{1}{2}\pi\left(\frac{d}{2}\right)^2 = \frac{1}{8}\pi d^2 \text{ cm}^2$

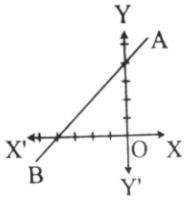
2. a) Find the x-intercept of the line AB in the given graph.

Solution:

Here,

The x-intercept of the line AB is – 4.

b) Write the bearing angle of NE in the given figure.

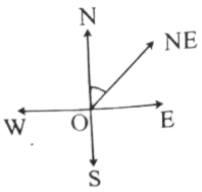


Solution:

Here,

The bearing of NE is 045°.

3. a) If A= { 0,4,8,12,18} and B={ 0,6,12,18} then find A – B .



Solution:

Here, A = {0, 4, 8, 12, 18} and B = {0, 6, 12, 18

A – B = {0, 4, 8, 12, 18} – {0, 6, 12, 18}

= {4, 8}

b) Find the mode of given data: 2,3,5,7,3,11

Solution:

Here,

The required mode is 3 because it has highest frequency.

4. a) Factorize: $2a^2 - 6ab$

Solution:

Here,

$2a^2 - 6ab = 2a\,(a - 3b)$

b) Write down 46000 in scientific notation.

Solution:

Here, $46000 = 4.6 \times 10^4$

5. a) Solve : $4x > 12$

Solution:

Here,

$4x > 12$

or, $x > 3$

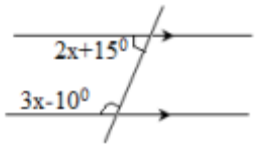
b) What is the value of $2x^0$?

Solution:

Here, $2x^0 = 2 \times 1 = 2$

Group "B" [17×2=34]

6. a) Find the value of x from the given figure.



Solution:

Here,

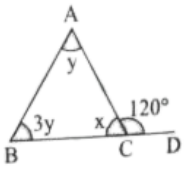
$3x - 10^o + 2x + 15^o = 180^o$ [Being co-interior angles]

or, $5x + 5^o = 180^o$

or, $5x = 175^o$

$\therefore x = \frac{175^o}{5} = 35^o$

b) From given figure, Find the value of x and y.



Solution:

Here,

$x + 120^o = 180^o$ [Being linear pair]

or, $x = 180^o - 120^o$

$\therefore x = 60^o$

Again,

$y + 3y + x = 180^o$ [Being the sum of angles of triangle]

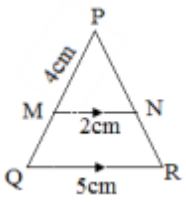
or, $4y + 60^o = 180^o$

or, $4y = 120^o$

or, $y = \frac{120^o}{4}$

$\therefore y = 30^o$

c) In the given figure, if ΔPQR ~ ΔPMN then find the length of PQ.



Solution:

Here,

QR = 5 cm, PM = 4 cm and MN = 2 cm, PQ =?

Now, ΔPQR ~ ΔPMN

So, $\frac{PQ}{PM} = \frac{QR}{MN} = \frac{PR}{PN}$ [The corresponding sides of similar triangles are proportional]

or, $\frac{PQ}{4\text{ cm}} = \frac{5\text{ cm}}{2\text{ cm}} = \frac{PR}{PN}$

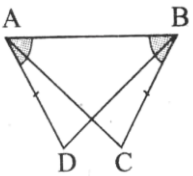
Taking 1st and 2nd ratios, we get

$\frac{PQ}{4\text{ cm}} = \frac{5\text{ cm}}{2\text{ cm}}$

or, 2 PQ = 20 cm

Hence, PQ =10 cm

7. a) In the given figure, AB= BC ∠BAD = ∠ABC, prove that: ΔABD ≅ ΔACB.



Solution:

Here,

In ΔABD and ΔACB;

(i)	AB = AB	(S)	[Common side]
(ii)	∠BAD = ∠ABC	(A)	[Given]
(iii)	AD = BC	(S)	[Given]

Hence, ΔABD ≅ ΔACB [By S.A.S. axiom]

b) If the area of circular pond is $144\pi m^2$, find the radius of its pond.

Solution:

Here,

Area of circular pond (A) $= 144\pi m^2$

or, $\pi r^2 = 144\pi$

or, $r^2 = 144$

or, $r^2 = 12^2$

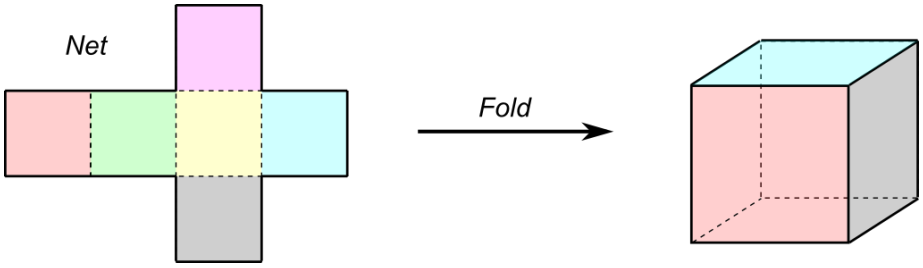
or, $r = 12$

Hence, the radius of the pond is 12 m.

c) Draw a net of cube.

Solution:

Here, the net of cube is



8. a) If A(6,8) and B(7,4) are any two given points, find the distance between AB.

Solution:

Here,

The given points are A (6, 8) $\rightarrow (x_1, y_1)$ and B (7, 4) $\rightarrow (x_2, y_2)$

Now, by using distance formula; we get

$$AB\ (d) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(7 - 6)^2 + (4 - 8)^2}$$
$$= \sqrt{(1)^2 + (-4)^2}$$
$$= \sqrt{1 + 16}$$
$$= \sqrt{17} \text{ units}$$

b) A tank having length, breadth and height 12m , 10 m , 6m respectively. How much petrol does it hold?

Solution:

Here, length of the tank (l) = 12 m, breadth (b) = 10 m and height (h) = 6 m

Now, volume (V) $= l \times b \times h$

$= 12\ m \times 10\ m \times 6\ m$

$= 720\ m^3$

We know, $1\ m^3 = 1000\ l$

$\therefore 720\ m^3 = 720 \times 1000\ l = 720000\ l$

Hence, the tank can hold 720000 liters of petrol.

c) If U= {1,2,3,4…..10}, P= {1,2,3,4,5} and R = {4,5,6,7} then find $P - (\overline{P \cap R})$

Solution:

Here, U = {1, 2, 3, 4, …, 10}, P = {1, 2, 3, 4, 5} and R = {4, 5, 6, 7}

Now, $P \cap R = \{1, 2, 3, 4, 5\} \cap \{4, 5, 6, 7\} = \{4, 5\}$

$\therefore \overline{P \cap R} = U - (P \cap R) = \{1, 2, 3, 6, 7, 8, 9, 10\}$

Again, $P - (\overline{P \cap R}) = \{1, 2, 3, 4, 5\} - \{1, 2, 3, 6, 7, 8, 9, 10\} = \{4, 5\}$

9. a) Convert the binary number $(101110111)_2$ into decimal number.

Solution:

Here, $(101110111)_2 = 1\times2^8 + 0\times2^7 + 1\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$

$= 1\times256+0\times128+1\times64+1\times32+1\times16+0\times8+1\times4+1\times2+1\times1$

$= 256 + 0 + 64 + 32 + 16 + 0 + 4 + 2 + 1$

$= 375$

b) The monthly income of a family is Rs 30,000. The ratio of the expenditure and saving is 4:2. Find the amount of expenditure and saving.

Solution:

Let, the expenditure= Rs 4x and the saving = Rs 2x.

Now, total income = Rs 30,000

or, Saving + Expenditure = Rs 30,000

or, 2x + 4x = Rs 30,000

or, 6x = Rs 30,000

or, $x = \frac{\text{Rs } 30000}{6}$

$\therefore x$ = Rs 5000

Hence, the amount of expenditure = 4x

= 4 × Rs 5,000

= Rs 20,000

And the amount of saving = 2x

= 2 × Rs 5,000

= Rs 10,000

c) Find the median from the given data:

10,30,20,40,50,20,60

Solution:

Here, the given data in ascending order is

10, 20, 20, 30, 40, 50, 60

No. of terms (N) = 7

Now, position of median $= \left(\frac{N+1}{2}\right)$ th item

$= \left(\frac{7+1}{2}\right)$ th item

$= 4^{th}$ item

Hence, the required median is 30.

10. a) If $a+\frac{1}{a}=12$, find the value of $a^3+\frac{1}{a^3}$.

Solution:

Here, $a+\frac{1}{a}=12$, $a^3+\frac{1}{a^3}=?$

We have, $a^3 + b^3 = (a + b)^3 - 3ab\,(a + b)$

$\therefore a^3+\frac{1}{a^3} = \left(a + \frac{1}{a}\right)^3 - 3\times a\times\frac{1}{a}\left(a + \frac{1}{a}\right)$

$= 12^3 - 3 \times 12$

$= 1728 - 36$

$= 1692$

b) Find the value of: $\left(\frac{1}{64}\right)^{-1/6}$

Solution:

Here, $\left(\frac{1}{64}\right)^{-1/6}$

$= \left(\frac{64}{1}\right)^{1/6}$ $\quad [\because \left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m}]$

$= (2^6)^{1/6}$

$= 2$

c) Simplify: $\frac{3^{x+1} + 3^x}{2\times 3^x}$

Solution:

Here, $\frac{3x+1 + 3x}{2\times 3x}$

$= \frac{3x\times 31 + 3x}{2\times 3x}$

$= \frac{3x(3 + 1)}{2\times 3x}$

$= \frac{4}{2}$

$= 2$

11. a) Solve: $a^2 - 4a = 0$

Solution:

Here, $a^2 - 4a = 0$

or, $a\,(a - 4) = 0$

Either, $a = 0$

OR, $a - 4 = 0 \ \therefore a = 4$

Hence, $a = 0$ or 4.

b) Solve the given inequality and show in a number line. :

$3x+2\leq 17.$

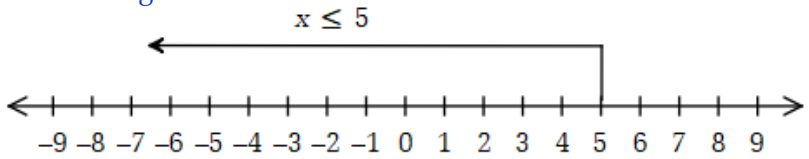
Solution:

Here, $3x + 2 \leq 17$

or, $3x \leq 15$

or, $x \leq 5$

Showing it in the number line



Group "C" [14 ×4=56]

12. Construct a regular pentagon with a side 5 cm by using compass.

Solution:

Here,

In regular pentagon, each side of regular pentagon = 5 cm.

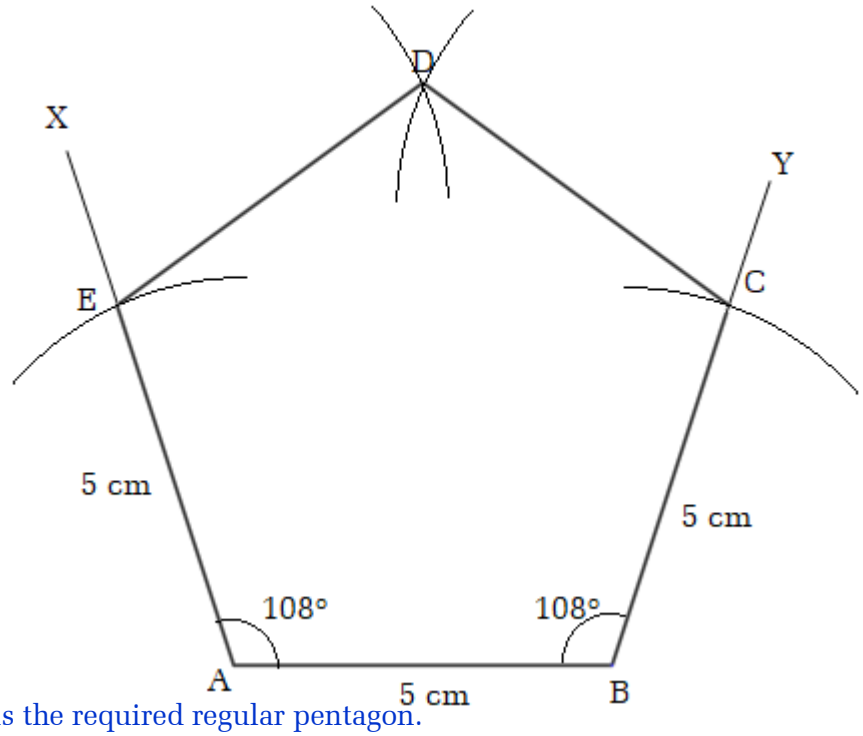
No. of sides (n) = 5

Now, each interior angle $= \frac{(n-2) \times 180^\circ}{n}$

$= \frac{(5-2) \times 180^\circ}{5}$

$= 3 \times 36^\circ$

$= 108^\circ$



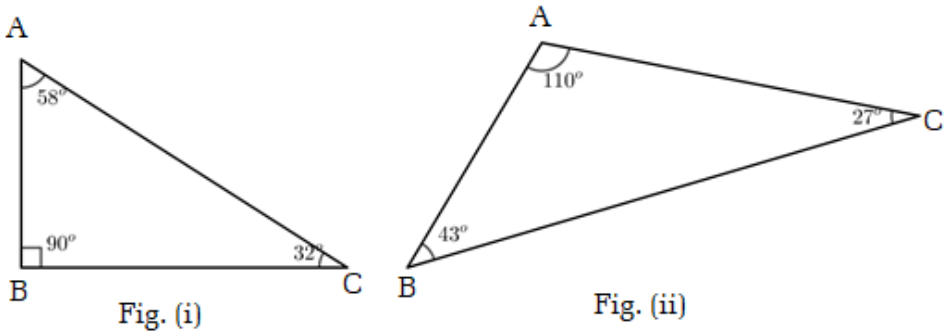
Hence, ABCDE is the required regular pentagon.

13. Verify experimentally that the sum of interior angles of a triangle is two right angles.(Two triangles of different size are necessary)

Solution:

Here,

Step 1: Two triangles ABC of different shapes and sizes are drawn.



Step 2: ∠A, ∠B and ∠C are measured in each figure and tabulated the result.

Fig.	∠A	∠B	∠C	∠A+∠B+∠C	Result
(i)	58°	90°	32°	180°	∠A + ∠B +∠C = 180°
(ii)	110°	43°	27°	180°	∠A + ∠B +∠C = 180°

Conclusion: From the above experiment, we came to know that the sum of interior angles of the triangle is always 180°.

14. Plot the points P (2,7), Q (3,3) and R (6,7) on graph paper. Find the co-ordinates of image of the point P, Q and R when P, Q and R are rotated through $+90^0$ about the origin O(0,0) and show the image on the same graph paper.

Solution:

Here,

The vertices of a triangle PQR are P (2, 7), Q (3, 3) and R (6, 7).

Now,

Rotating ΔPQR through 90° about (0, 0), we get

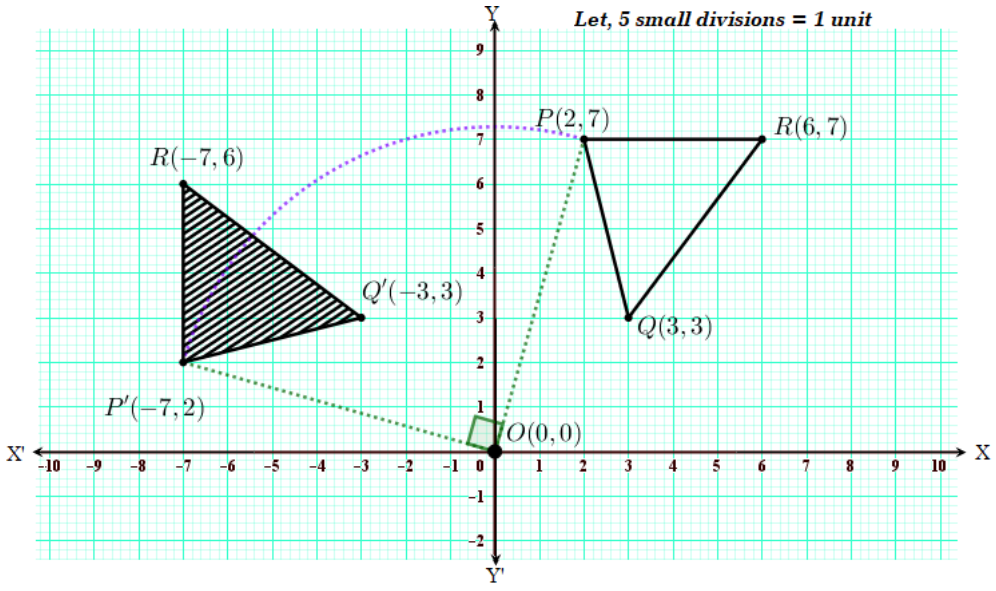
P (x, y) ⟶ P′(-y, x)

P (2, 7) ⟶ P′(-7, 2)

Q (3, 3) ⟶ Q′(-3, 3)

R (6, 7) ⟶ R′(-7, 6)

Plotting both the triangles on the same graph paper



15. In a group of 120 students, it was found that 80 students liked apple and 40 liked banana. If 20 of them liked both fruits then using Venn – diagram, find the number of students who did not like both fruits.

Solution:

Let, A and B denote the sets of students who liked apple and banana respectively.

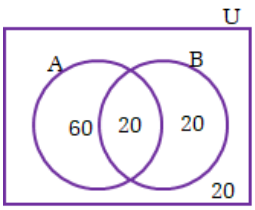
Then, n (U) = 120

n (A) = 80

n (B) = 40

n (A∩B) = 20

Now, drawing a Venn-diagram to show the above information



Also, n (n (A ∪ B) = n (A) + n (B) – n (A ∩B)

= 80 + 40 – 20

= 100

Again, n ($\overline{A \cup B}$) = n (U) – n (A ∪ B)

= 120 – 100

= 20

Hence, 20 students didn't like both fruits.

16. Simplify: $\frac{42}{\sqrt{28}} + \frac{60}{\sqrt{45}} - 2\sqrt{20} + 2\sqrt{175}$

Solution:

Here,

$$\frac{42}{\sqrt{28}} + \frac{60}{\sqrt{45}} - 2\sqrt{20} + 2\sqrt{175}$$

$$= \frac{42}{\sqrt{2\times2\times7}} + \frac{60}{\sqrt{3\times3\times5}} - 2\sqrt{2\times2\times5} + 2\sqrt{5\times5\times7}$$

$$= \frac{42}{2\sqrt{7}} + \frac{60}{3\sqrt{5}} - 2\times2\sqrt{5} + 2\times5\sqrt{7}$$

$$= \frac{21}{\sqrt{7}} + \frac{20}{\sqrt{5}} - 4\sqrt{5} + 10\sqrt{7}$$

$$= \frac{21}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} + \frac{20}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} - 4\sqrt{5} + 10\sqrt{7}$$

$$= \frac{21\sqrt{7}}{7} + \frac{20\sqrt{5}}{5} - 4\sqrt{5} + 10\sqrt{7}$$

$$= 3\sqrt{7} + 4\sqrt{5} - 4\sqrt{5} + 10\sqrt{7}$$

$$= 3\sqrt{7} + 10\sqrt{7}$$

$$= 13\sqrt{7}$$

17. If a cube has total surface area 150 cm^2, find the volume of a cube.

Solution:

Here, TSA of cube = 150 cm^2

or, $6l^2 = 150$

or, $l^2 = 25$

or, $l^2 = 5^2$

or, $l = 5$ cm

Again, volume (V) = l^3

$= (5 \text{ cm})^3$

$= 125 \text{ cm}^3$

18. 15 men can do a piece of work in 80 days. How long will it take to complete the work by 10 men?

Solution:

Let, 10 men can finish the work in x days.

Then,

No. of men	*Working days*
15 ↓	80 ↑
10	x

By the rule of indirect variation, we get

$$\frac{15}{10} = \frac{x}{80}$$

or, $10x = 1200$

or, $x = 120$

Hence, 10 men can complete the work in 120 days.

19. What sum of money amounts to Rs 8700 in 3 years at the rate of 24% per annum.

Solution:

Here,

Amount (A) = Rs 8,700

Time (T) = 3 years

Rate (R) = 24% p.a.

Sum of money (P) =?

We have, $P = \frac{A \times 100}{100 + TR}$

$= \frac{8700 \times 100}{100 + 3 \times 24}$

$= \frac{870000}{100 + 72}$

$= \frac{870000}{172}$

= Rs 5,058.14

Hence, the required sum is Rs 5,058.14

20. What is the price of a mobile whose market price is Rs 15,000 and 13% VAT was levied after allowing 20% discount on it?

Solution:

Here, M.P. of a mobile = Rs 15,000

Discount percent = 20%

VAT rate = 13%

S.P. with VAT =?

Now, discount amount = D% of M.P.

= 20% of Rs 15,000

$= \frac{20}{100} \times 15000$

= Rs 3000

Also, S.P. after discount = MP – Discount

= 15000 – 3000

= Rs 12000

Again, VAT amount = VAT% of S.P.

= 13% of Rs 12000

$= \frac{13}{100} \times 12000$

= Rs 1560

Thus, S.P. with VAT = S.P. + VAT

= Rs 12000 + Rs 1560

= Rs 13,560

21. Find the arithmetic mean from the following data:

x	2	4	6	8	10	12	14
f	5	3	4	3	7	3	4

Solution:

Here,

x	f	$f \times x$
2	5	10
4	3	12
6	4	24
8	3	24
10	7	70
12	3	36
14	4	56
	$N = 29$	$\Sigma fx = 232$

Now, mean $(\bar{x}) = \frac{\Sigma fx}{N}$

$$= \frac{232}{29}$$

$$= 8$$

Hence, the mean of the given data is 8.

22. Factorize: $(a+b)^2+11(a+b)+30$

Solution:

Here, $(a+b)^2+11(a+b)+30$

Let, $(a+b) = x$ then the expression becomes

$$x^2 + 11x + 30$$
$$= x^2 + (6+5)x + 30$$
$$= x^2 + 6x + 5x + 30$$
$$= x(x+6) + 5(x+6)$$
$$= (x+6)(x+5)$$

Replacing $x = a + b$, we get

$$(a+b+6)(a+b+5)$$

23. Find H.C.F.: $x^2 - 5x+6$, $x^2 - 6x+5$ and $x^2 - 9$

Solution:

Here,

The 1st expression $= x^2 - 5x + 6$
$= x^2 - (3+2)x + 6$
$= x^2 - 3x - 2x + 6$
$= x(x-3) - 2(x-3)$
$= (x-3)(x-2)$

The 2nd expression $= x^2 - 6x + 5$
$= x^2 - (5+1)x + 5$
$= x^2 - 5x - x + 5$
$= x(x-5) - 1(x-5)$
$= (x-5)(x-1)$

The 3rd expression $= x^2 - 9$
$= x^2 - 3^2$
$= (x+3)(x-3)$

Hence, H.C.F. = Common factor = 1

24. Simplify: $\frac{1}{m-n} + \frac{1}{m+n} - \frac{2m}{m^2+n^2}$

Solution:

Here, $\frac{1}{m-n} + \frac{1}{m+n} - \frac{2m}{m^2+n^2}$

$$= \frac{m+n+m-n}{(m-n)(m+n)} - \frac{2m}{m^2+n^2}$$

$$= \frac{2m}{m^2-n^2} - \frac{2m}{m^2+n^2}$$

$$= \frac{2m(m^2+n^2) - 2m(m^2-n^2)}{(m^2-n^2)(m^2+n^2)}$$

$$= \frac{2m^3 + 2mn^2 - 2m^3 + 2mn^2}{(m^2)^2 - (n^2)^2}$$

$$= \frac{4mn^2}{m^4 - n^4}$$

25. Solve graphically : $x + y = 5$, $x - y = 1$

Solution:

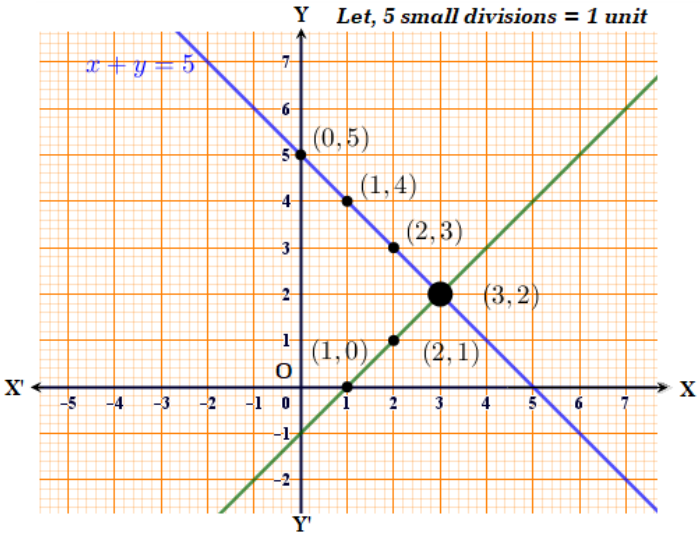
Here,

The given equations are $x + y = 5$ $\therefore y = 5 - x$

x	0	1	2
y	5	4	3

Also, $x - y = 1$ or, $x - 1 = y$ $\therefore y = x - 1$

x	1	2	3
y	0	1	2



In the graph, the lines intersect at (3, 2). So, x = 3 and y = 2.

THE END