Sample Question Paper 05
Class -IX Mathematics
Summative Assessment – II

Time: 3 Hours **Max. Marks: 90**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper consists of **31** question divided into five **section A, B, C, D and E**. Section-A comprises of **4** question of **1 mark** each, **Section-B** comprises of **6** question of **2 marks** each, **Section-C** comprises of **8** question of **3 marks** each and **Section-D** comprises of **10** questions of **4 marks** each. **Section E** comprises of **two questions of 3 marks each** and **1 question** of **4 marks from Open Text theme.**

(iii) There is no overall choice.

(iv) Use of calculator is not permitted.

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. If the radius of a sphere is double what will happen to its surface area?
2. If the class marks in frequency distribution are 19.5, 26.5, 33.5, 40.5, then find the class corresponding to the class mark 33.5.
3. There are 500 tickets of a lottery out of which 10 are prize winning tickets. A person buys one ticket. Find the probability that he gets a prize winning ticket.
4. PQRS is a square. PR and SQ intersect at O. State the measure of ∠POQ.

SECTION-B

Question number **5** to **10** carry **two** marks each.

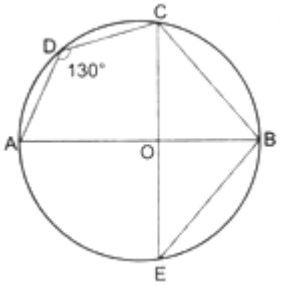
5. Solve for x: 5(4x +3) = 3(x – 2)
6. How many solution(s) of the equation 3x + 2 = 2x – 3 are there on the:
   (i) Number line?
   (ii) Cartesian plane?
7. Prove that cyclic parallelogram is a rectangle.
8. D, E, F are respectively the mid-points of the sides BC, CA and AB of ΔABC Prove that $(\Delta DEF) = \frac{1}{4} ar(\Delta ABC)$
9. Let y varies directly as x. If y = 12 when x = 4, then write a linear equation. What is the value of y when x = 5?

10. If the mean of 5 observation x, x + 4, x + 8, x + 12, x + 16 is 13, find the mean of the observations?

SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. In the liner equation y = 4x + 12, if x is the number of hours a labourer is on work and y = 4x + 13, if x is the number of hours a labourer is on work and y are his wages in rupees then draw the graph. Also find the wages when work is done for 6 hrs.
12. Find the solution of the linear equation x + 2y = 8 which represents a point on
    (i) the x – axis
    (ii) the y – axis
    (iii) the line parallel to x – axis and at a distance of 3 units above it
13. In given figure, $\angle ADC = 130°$ and chord BC = chord BE. Find $\angle CBE$.



14. A field is 70 m long and 40 m broad. In the corner of the field, a pit which is 10 m long, 8 m broad and 5 m deep, has been dug out. The earth taken out of it is evenly spread over the remaining part of the field. Find the rise in the level of the field.
15. A conical tent is 10m high and the radius of its base is 24 m. Find
    (i) slant height of the tent, and
    (ii) cost of the canvas required to make the tent, if the cost of 1 m^2 canvas is Rs **70.**
16. The volume of two spheres are in the ratio 64: 27. Find the ratio of their surface areas.
17. The means of 100 items was found to be 300. If at the time of calculation two items were wrongly taken as 32 and 12 instead of 23 and 11, find the correct mean.
18. A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shows the result of 1000 cases.

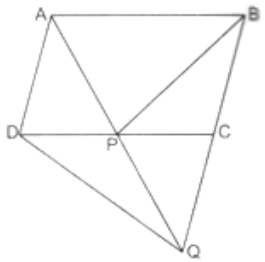
Distance	Less than 4,000	4,000 to 9,000	9,001 to 14,000	More than 14,00
Frequency	20	210	325	445

If someone buys a tyre of this company, what is the probability that:
(i) it will need to be replaced before it has covered 4000 km?
(ii) it will last more than 9000 km?
(iii) it will need to be replaced after it has covered somewhere between4000 km and 14000 km?

SECTION-D

Question numbers **19** to 28 carry **four** marks each.

19. Construct an equilateral triangle, given its side and justify the construction.
20. Construct an angle of 45° at the initial point of a given ray.
21. OP ⊥ AB, OQ ⊥ CD, AB||CD. AB=6cm and CD = 8 cm, Determine PQ, of circle of radius 5 cm.
22. A metal cube of edge 12 cm is melted and formed into three similar cubes. If the edge of two smaller cubes is 6cm and 8cm, find the edge of the third smaller cube (Assuming that there is no loss of metal during melting).
23. Half the perimeter of a rectangular garden in 36m. Write a linear equation which satisfies this data. Draw the graph for the same.
24. How many bricks, each measuring 18cm by 12cm by 10cm will be required to build a wall 15m long 6dm wide and 6.5m high when $\frac{1}{10}$ of its volumes occupied by mastar? Please find the cost of the bricks to the nearest rupees, at Rs1100per 1000bricks.
25. In Fig. 3.23,ABCD is a parallelogram and BC is produced to point Q such that BC = CQ. If AQ intersects DC at P. Show that $ar(\Delta BPC) = ar(\Delta DPQ)$.



26. Prove that if the diagonals of a quadrilateral are equal and bisect each other at right angles then it is a square.
27. If $x_1, x_2 \ldots\ldots x_n$ are n values of a variable x such that $\sum_{i=1}^{n}(x_i - 2) = 110$ and $\sum_{i=1}^{n}(x_i - 5)$. Find the value of and the mean.
28. The marks obtained by 30 students is given in the following table:

Marks	70	58	60	52	65	75	68
No. of Students	3	5	4	7	6	2	3

Find the Probability that a student secures
(i) 60 marks (ii) 75 marks (iii) Less than 60 marks

SECTION-E (10 Marks)

(Open Text from Chapter-8 Quadrilaterals)

(*Please ensure that open text of the given theme is supplied with this question paper.)

29. OTBA Question
30. OTBA Question
31. OTBA Question

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Solution

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. Surface area of sphere = $4\pi r^{2p}$

   When radius is doubled then new surface area = $4\pi(2r)^2 = 4\pi \times 4r^2$

   $= 4(4\pi r^2)$

   = 4 × original surface area.

   ∴ Surface area becomes 4 times.

2. The class size of the distribution is = 40.5 - 33.5 = 7

   The required class of the class mark 33.5 is $\left[33.5-\frac{7}{2}\right]-\left[33.5+\frac{7}{2}\right], i.e., 30-37.$

3. Total no. of lottery tickets = 500
   No. of prize winning tickets = 10
   P (Prize winning tickets) = $\frac{10}{500}=\frac{1}{50}$

4. Since the diagonal of a square intersect at right angle,
   ∴ ∠POQ = 90°

SECTION-B

Question number **5** to **10** carry **two** marks each.

5. 5(4x + 3)=3(x – 2)
   ⇒20x + 15 = 3x – 6
   ⇒20x – 3x = -6 – 15
   ⇒17x = -21
   $\Rightarrow x=\frac{-21}{17}$

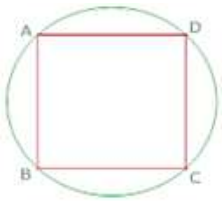
6. (i) 3x + 2 = 2x – 3
   ⇒ 3x – 2x = - 3 – 2

$\Rightarrow x = -5$

O, on a number line there is only one solution which is $x = -5$.

(ii) In a Cartesian plane there are infinitely many solutions.

7. Let ABCD be the given cyclic parallelogram



$\angle A + \angle C = 180° \ldots\ldots\ldots (i)$

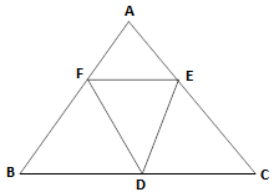
$\angle A = \angle C$ [Opposite angle of a parallelogram are equal]……..(ii)

From (i) and (ii)

$\angle A = \angle C = 90°$

$\angle ABCD$ is a rectangle

8.



$ar(\Delta BDF) = ar(\Delta DEF)$

Now, $(\| gram\ BDEF) = 2ar(\Delta DEF)$

$= 2 \times \frac{1}{2} ar(\Delta ABC)$

$= \frac{1}{2} ar(\Delta ABC)$

9. As y is 3 times of x, when y = 12 and x = 4

$\Rightarrow y = 3x$ … (1)

So required linear equation is $y = 3x$

When $x = 5$ the value of y will be $y = 3(5) = 15$

$\therefore$ Point is (5, 15).

10. $\bar{x} = \frac{\sum x_i}{n}$

$13 = \frac{x + (x+4) + (x+8) + (x+12) + (x+16)}{5}$

$x = 5$

$\therefore$ The given set of 5 observations are 5, 9, 13, 17, 21

$$\bar{x} = \frac{5+9+13+17+21}{5} = 13$$

SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. y = 4x + 13 ... (1)

x = Number of hours a labourer work

Y = Wages in rupees

Let x = -2, put in (i)

y = 4 (- 2) + 13

= - 8 + 13 = 5

Let x = +-3, put in (i)

y = 4(-3) + 13 = 1

Let x = -4, put in (i)

y = 4(-4) + 13

= -16 + 13 = -3

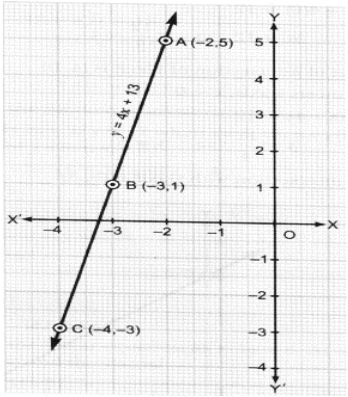
x	-2	-3	-4
y	5	1	-3
	A	B	C

When work is done for 6 hours means x = 6, the wages come out to be

y = 4(6) +13

y = 24 + 13

= 37, i.e., Rs 37



12. (i) On x – axis y = 0

⇒ x + 2 × 0 =8 ⇒ x = 8

Therefore, the required point is (8, 0).

(ii) On y – axis x = 0

⇒ 0 +2 y = 8 ⇒ y = 4

$y = \frac{8}{2}$

y = 4

Thus, the required point (0, 4).

(iii) The line parallel to x – axis, at a distance of 3 units above it is given by y = 3.

∴ x + 2 × 3 = 8 ⇒ x = 8 – 6 = 2

∴ The required point is (2, 3).

13. Consider the points A, B, C and D. They formed a cyclic quadrilateral.

$\angle ADC + \angle ABC = 180°$ (Opposite angles of cyclic quadrilateral)

$130° + \angle ABC = 180°$

$\angle ABC = 50°$

In ΔBOC and ΔBOE

BC = BE (Equal chords)

OC = OE (Radii)

OB = OB (Common)

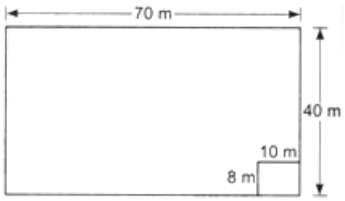
$\Delta BOC = \Delta BOE$ (SSS rule)

$\angle OBC = \angle OBE = 50°$ (CPCT)

$\angle CBE = \angle CBO + \angle EBO$

$50° + 50° = 100°$

14.



Area of the field on which earth taken out is to be spread

$= 70 \times 40 m^2 - 10 \times 8 m^2$

= 2800 m² - 80 m² = 2720 m²

Volume of the earth dug out = $10 \times 8 \times 5 m^3$ = 400 m³

Rise in level of the field $= \frac{\text{Volume of the earth dugout}}{\text{Area on which earth taken out is to be spread}}$

$= \frac{400}{2720}$

$= 0.147\, m = 14.7\, cm$

15. Radius of conical tent = r = 24 m

Height of conical tent = h = 10 m

(i) Let l be the slant height of the cone. Then $l = \sqrt{r^2 + h^2}$

$\Rightarrow l = \sqrt{24^2 + 10^2}$

$= \sqrt{576 + 100} = \sqrt{676}$

$l = 26\,m$

(ii) Canvas required to make the conical tent = Curved surface area of cone

$= \pi rl = \frac{22}{7} \times 24 \times 26\,cm^2$

Cost of 1 m^2 canvas = Rs. 70

$\therefore Cost\ of\ \frac{22}{7} \times 24 \times 26\,cm^2\ canvas = Rs.70 \times \frac{22}{7} \times 24 \times 26 = Rs.137280$

16. Let r_1 and r_2 be the radii of two spheres.

Then, the ratio of their volumes is given by

$$\frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{64}{27}$$

$$\left(\frac{r^1}{r^2}\right)^3 = \left(\frac{4}{3}\right)^3 \Rightarrow \frac{r_1}{r_2} = \frac{4}{3}$$

Now, ratios of surface areas of two spheres $= \frac{4\pi r_1^2}{4\pi r_2^2}$

$$= \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$$

Required ratio = 16:9

17. Here, n = 100, $\bar{X}$ = 30

So, $\bar{X} = \frac{1}{n}\left(\sum x_i\right) \Rightarrow \sum x_i = n\bar{X}$

$\Rightarrow \sum x_i = 100 \times 30$

$= 3000$

$\therefore$ Incorrect value of $\sum x_i = 3000$

$Now,$ correct value of $\sum x_i =$ Incorrect value of $\sum x_i - (\text{sum of incorrect value}) + (sum\ \text{of correct value})$

= 3000 - (32+12) + (23+11)=2990

$\therefore$ Correct mean = $\frac{Correct\ \text{value of}\ \sum x_i}{n} = \frac{2990}{100}$

$= 29.9$

18. The total number of trials = 1000

(i) P (tyre to be replaced before it covers 4000 km) $= \frac{20}{1000} = 0.02$

(ii) The frequency of a tyre that will last more than 9000 km = 325 + 445= 770

$\therefore$ P(tyre will last for more than 9000 km) $= \frac{770}{1000} = 0.77$

(iii) The frequency of a tyre that requires replacement between 4000 km and 14000 km
= 210 + 325 = 535

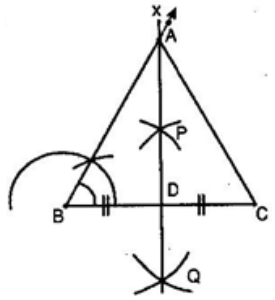
So, P (tyre requiring replacement between 4000 km and 14000 km)

$= \frac{535}{1000} = 0.535$

SECTION-D

Question numbers **19** to 28 carry **four** marks each.

19.



Steps of construction:

(a) Draw a line segment BC of length 6 cm.

(b) At B draw $\angle XBC = 60^\circ$.

(c) Draw perpendicular bisector PQ of line segment BC.

(d) Let A and D be the points where PQ intersects the ray BX and side BC respectively.

(a) Join AC.

Thus ABC is the required equilateral triangle.

Justification:

In right triangle ADB and right triangle ADC,

AD = AD	[Common]
$\angle ADB = \angle ADC = 90^\circ$	[By construction]
BD = CD	[By construction]
$\therefore \Delta ADB \cong \Delta ADC$	[By SAS congruency]
$\therefore \angle B = \angle C = 60^\circ$	[By CPCT]

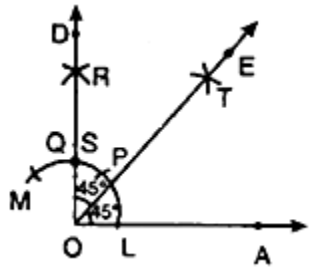
$\therefore \angle = 180^\circ - (\angle B + \angle C)$

$= 180^\circ - (60^\circ + 60^\circ) = 180^\circ - 120^\circ = 60^\circ$

$\because \angle A = \angle B = \angle C = 60^\circ$

$\therefore \Delta ABC$ is an equilateral triangle.

20.



Steps of construction:

(a) Draw a ray OA.

(b) With O as centre and convenient radius, draw an arc LM cutting OA at L.

(c) Now with L as centre and radius OL, draw an arc cutting the arc LM at P.

(d) Then taking P as centre and radius OL, draw an arc cutting arc PM at the point Q.

(e) Join OP to draw the ray OB. Also join O and Q to draw the OC. We observe that:

$\angle AOB = \angle BOC = 60°$

(f) Now we have to bisect $\angle$BOC. For this, with P as centre and radius greater than $\frac{1}{2}$PQ draw an arc.

(g) Now with Q as centre and the same radius as in step 6, draw another arc cutting the arc drawn in step 6 at R.

(h) Join O and R and draw ray OD. Then $\angle$AOD is the required angle of 90°.

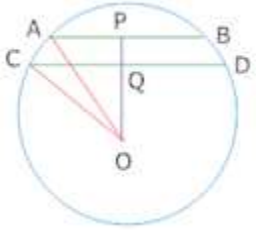
(i) With L as centre and radius greater than $\frac{1}{2}$LS, draw an arc.

(j) Now with S as centre and the same radius as in step 2, draw another arc cutting the arc draw in step 2 at T.

(k) Join O and T and draw ray OE.

Thus OE bisects $\angle$AOD and therefore $\angle$AOE = $\angle$DOE = 45°

21. Join OA and OC



$AB = 6cm$

$AP = \frac{1}{2} AB$

$AP = 3cm$

$CD = 8cm$

$CQ = \frac{1}{2} CD$

$CQ = 4cm$

In right angled triangle ΔAPQ

$AO^2 = PO^2 + AP^2$

$(5)^2 = PO^2 + (3)^2$

$PO^2 = 16$

$PO = \sqrt{16}$

$= 4cm$

In right ΔOQC

$CO^2 = CQ^2 + OQ^2$

$(5)^2 = (4)^2 + OQ^2$

$OQ = \sqrt{9}$

$= 3cm$

$AB \| CD$

$\angle APO = \angle CQO$

PO and QO are in the same line

PQ = PO – OQ = 4 – 3 = 1cm

22. *Volume* of cube with edge 12 cm. $=(12)^3$ cu cm.

= 1728 cu cm. ..... (i)

Volume of the first smaller cube with edge 6 cm = $(6)^3 cu\,cm$

= 216 cu cm. ..... (ii)

Volume of the second smaller cube with edge 8 cm = $(8)^3 cu\,cm$

= 512 cu cm ..... (iii)

Let the edge of the third smaller cube be a cm.

Therefore, Volume of the third smaller cube = $9^2 cm^3$ ..... (iv)

By the given condition.

216 + 512 + a^3 =1728 [using (i) and (ii)]

area $728a^3 = 1728$

area a^3 =1728 – 728

1000 = 10^3

Therefore, a =10

Thus the edge of the third required cube is 10 cm.

23. Let the length of rectangle be x and breadth be y.

∴ Perimeter of rectangle = 2 (x + y)

And half of perimeter of rectangle is $\frac{1}{2}[2(x+y)]$

According to question, x + y = 36

x	24	12	0
y	12	24	36
	A	B	C

x = 36 – y

Put y = 12 in equation (i), we get

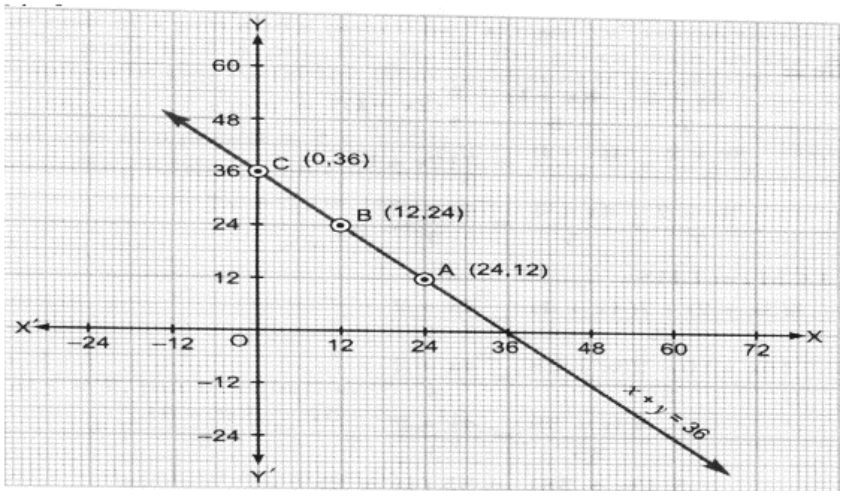
∴ x = 36 – 12 = 24

Put y = 24 in equation (i), we get

x = 36 – 24 = 12

Put y = v36 in equation (i), we get

∴ x = 36 – 36 = 0



24. Length of the wall =15 m. = 1500 cm.

Width of the wall = 6 dm. =60 cm.

Height of the wall = 6.5 m. = 650 cm.

∴ Volume of the wall = $(1500\times60\times650)\,cu\,cm.$

= 58500000 cu cm. …… (i)

Volume occupied by mastar = $\left(\frac{1}{10}\times58500000\right)$ cu cm.

= 5850000 cu cm. …… (ii)

$\therefore$ Volume occupied by bricks = (i) - (ii)

= (58500000 – 5850000) cu cm.

= 52650000 cu cm. ..... (iii)

Volume of a brick = $(18\times12\times10)$ cu cm.

$\therefore$ No of brick required = (iii) $\div$ (iv)

$= \frac{52650000}{2160}$

= 24375

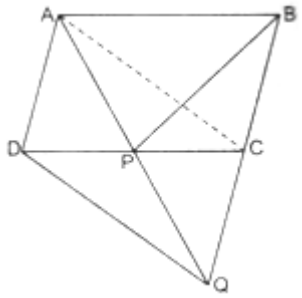
cost of 1000 bricks = Rs 1100

Total cost = Rs $\frac{24375\times1100}{1000}$

= Rs 26812.50

= Rs 26813.

25. Join AC. As triangles APC and BPC are on the same base PC and between the same parallels PC and AB.



Therefore,

In figure, $ar(\Delta APC) = ar(\Delta BPC)$ ... (i)

Since ABCD is a parallelogram,

$\therefore$ AD = BC (Opposite sides of parallelogram)

Also, CQ= BC (Given)

AD = CQ

Now, $AD \| CQ$ and AD =CQ

$\therefore$ ACQD is a parallelogram.

As diagonals of a parallelogram bisect each other.

$\therefore$ AP = PQ and CP = DP

In ΔAPC and ΔDPQ, we have

AP = PQ

$\angle APC = \angle DPQ$ (Vertically opposite angles)

and PC= PD

$\Delta APC = \Delta DPQ$ (SAS congruence criterion)

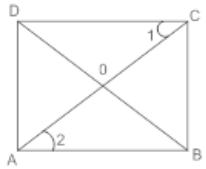
$ar(\Delta APC) = ar(\Delta DPQ)$ …… (ii)

From (i) and (ii) we get

$ar(\Delta BPC) = ar(\Delta DPQ)$

26. Given in a quadrilateral ABCD, AC = BD, AO = OC and BO = OD and $\angle AOB = 90^0$

To prove: ABCD is a square.



Proof: *In* ΔAOB *and* ΔCOD

$OA = OC$ [*given*]

$OB = OD$ [*given*]

and $\angle AOB = \angle COD$ [*vertically opposite angles*]

$\therefore$ $\Delta AOB \cong \Delta COD$ [*By SAS*]

$\therefore$ $AB = CD$ [*By CPCT*]

$\angle 1 = \angle 2$ [*By CPCT*]

But these are alternate angles therefore, $AB \| CD$

ABCD is a parallelogram whose diagonals bisects each other at right angles

Therefore, ABCD is a rhombus

Again in ΔABD and ΔBCA

AB = BC [Sides of a rhombus]

AD = AB [Sides of a rhombus]

and BD = CA [Given]

$\therefore$ $\Delta ABD \cong \Delta BCA$

$\therefore$ $\angle BAD = \angle CBA$ [*By CPCT*]

These are alternate angles of these same side of transversal

$\therefore$ $\angle BAD + \angle CBA = 180^0$ *or* $\angle BAD = \angle CBA = 90^0$

Hence ABCD is a square

27. We have: $\sum_{i=1}^{n} x_i - 2 = 110$ and $\sum_{i=1}^{n} X_i - 5 = 20$

$(x_1 - 2) + (x_2 - 2) + ... + (x_n - 2) = 110$

$(x_1 - 5) + (x_2 - 5) + ... + (x_n - 5) = 20$

$(x_1 + x_2 + ... + x_n) - 2n = 110$

$(x_1 + x_2 + ... + x_n) - 5n = 20$

$\Rightarrow \sum_{i=1}^{n} x_i - 2n = 110$ and $\sum_{i=1}^{n} x_i - 5n = 20$

S-2n = 110 and S-5n = 20

Thus, we have S-2n =20 ..... (i)

and S-5n = 20 ..... (ii)

subtracting (ii) from (i), we get:

3n-90 = 90

n = 30

putting n = 30 in (i), we get:

S-60 = 110

S = 170

$\sum_{i=1}^{n} x_i = 170$

$\therefore$ mean = $\frac{1}{n}\left[\sum_{i=1}^{n} x_i\right]$

$= \frac{170}{30} = \frac{17}{3}$

Hence, n = 30 and mean = $\frac{17}{3}$

28. Total no. of students = 30

No. of students securing 60 marks = 4

(i) $\therefore$ P (Students securing 60 marks) = $\frac{4}{30} = \frac{2}{15}$

(ii) No. of students securing 75 marks = 2

$\therefore$ P (Students securing 75 marks) = $\frac{2}{30} = \frac{1}{15}$

(iii) No. of students securing less than 60 marks = 5+7 = 12

P (Students securing less than 60 marks) = $\frac{12}{30} = \frac{2}{5}$