SUMMATIVE ASSESSMENT – II, 2015, MATHEMATICS, Class – IX

SOLVED SAMPLE QUESTION PAPER

JST201502

Time allowed: 3 hours **Maximum Marks: 90**

General Instructions :

1. All questions are compulsory.
2. The question paper consists of **31 questions** divided into four **sections A, B, C** and **D. Section 'A'** comprises of **4 questions of 1 mark** each, **Section 'B'** comprises of **6 questions of 2 marks** each, **Section 'C'** comprises of **10 questions of 3 marks** each and **Section 'D'** comprises of **11 questions of 4 marks** each.
3. There is no overall choice.
4. Use of calculator is not permitted.

SECTION — A

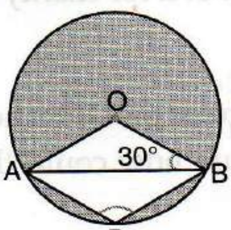
1. An equation of the form $ax + by + c = 0$ is a linear equation in two variables, find c of the form a and b when $x = -2$, $y = 3$.
2. Write down the linear equation whose solution is $x = 3$, $y = 2$.
3. Which angle is not possible to construct with the help of ruler and compass ?
4. Find the class mark of the class 130-150.

SECTION — B

5. Arithmetic mean of terms, 21, 16, 24, x, 29, 15 is 23. Find the value of x.
6. Two opposite angles of a parallelogram are $(3x - 2)°$ and $(63 - 2x)°$. Find all the angles of parallelogram.
7. Find the mean of the following distribution :

x	4	6	9	10	15
f	5	10	10	7	8

8. In the given figure, if O is the centre of circle, determine $\angle APB$.



9. The largest sphere is curved out of a cube of side 7 cm. Find the volume of the sphere. $\left(\text{Use } \pi = \frac{22}{7}\right)$
10. The record of a weather station shows that out of the part 300 consecutive days, its weather forecast was correct 175 times. What is the probability that on a given day :

(i) it was correct ? (ii) it was not correct ?

SECTION — C

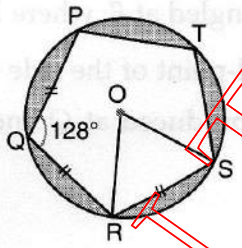
11. Find two different solutions to the equation $2x + 6y + 1 = 0$ and check whether $(-3, 2)$ is a solution of the given equation.

12. Find the points where the line $2x + 3y = 6$ cuts the x-axis and y-axis.

13. $PQRS$ is a parallelogram and O is a point in the interior of the parallelogram. Show that ar (POS) + ar (QOR) = $\frac{1}{2}$ ar $(PQRS)$

14. Draw a ΔABC in which $BC = 6$ cm, $AB = 5.2$ cm and $AC = 4.8$ cm. Draw the perpendicular bisector of BC. Does it pass through A ? (use ruler and compass only)

15. In the given figure $PQ = QR = RS$ and $\angle PQR = 128°$. Find $\angle PTQ$, $\angle PTS$ and $\angle ROS$.



16. The external and internal diameters of a hollow hemi-spherical vessels are 16 cm and 12 cm respectively. The cost of painting 1 sq. cm of surface is ₹ 2. Find the cost of painting the vessel all over. $\left(\text{Use } \pi = \frac{22}{7}\right)$

17. Find the area of the metal sheet required to make two closed hollow cones each of height 24 cm and slant height 25 cm.

18. Given below is the frequency distribution of salary (in Rs) of 100 workers in a factory :

Salary (in ₹)	1000 – 2000	2000 – 3000	3000 – 4000	4000 – 5000
Number of workers	10	30	20	40

Answer the following questions. How many workers :

(i) have salary below ₹ 3000 ?

(ii) have salary between ₹ 3000 and ₹ 5000 ?

(iii) from ₹ 1000 to ₹ 5000 ?

19. The given table shows the month of birth of 40 students :

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Number of Student	3	4	2	2	5	1	2	6	3	4	4	4

(i) Find the probability that a student was born in the month with 31 days.

(ii) Find the probability that a studnet was born in the month of February.

20. If the mean of the following distribution is 6, find the value of n.

x	2	4	6	10	$n+5$
f	3	2	3	1	2

SECTION — D

21. Check graphically which of the following points lie on the graph of linear equation $y = 9x - 7$

(a) $(-1, -16)$ (b) $(0, -7)$ (c) $(1, 2)$ (d) $\left(\frac{1}{2}, -\frac{5}{2}\right)$

22. A rectangular field has to be cut out and its boundary marked with fencing with a given wire of length 200 m.

(a) Represent the above situation using a linear equation.

(b) Also plot its graph.

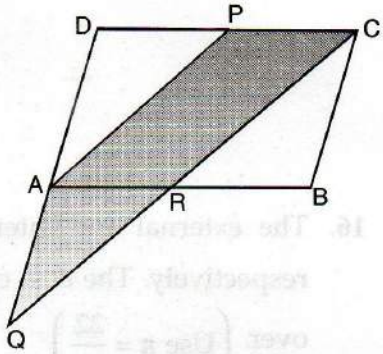
23. Construct a right triangle ABC, right angled at B, where $BC = 6$ cm and $AB + AC = 10$ cm.

24. $ABCD$ is a parallelogram. P is the mid-point of the side DC. A line through C parallel to AP meets DA produced at Q and AB at R.

Prove that :

(a) $DA = AQ$,

(b) $CR = QR$.



25. D and E are points on equal sides AB and AC of an isosceles $\Delta\, ABC$ such that $AD = AE$. Prove that the points B, C, E and D are concyclic.

26. Points A and B are on the same side of a line m. AD and BE are perpendiculars to m meeting at D and E, respectively. C is the mid-point of AB. Prove that $CD = CE$.

27. Prove that the area of a trapezium is equal to half of product of its height and sum of parallel sides.

28. Lead spheres of diameter 6 cm each are dropped into a cylindrical beaker containing some water and are fully submerged. If the diameter of the beaker is 18 cm and water level rises by 40 cm, find the number of lead spheres dropped in the water.

29. The area of three adjacent faces of cuboid are 15 sq cm, 20 sq cm and 12 sq cm. Find the volume of the cuboid.

30. The runs scored by two teams A and B on the first 42 balls in a cricket match are given below. Draw the frequency polygon on the same graph paper.

Number of balls	Team A	Team B
0 – 6	2	5
6 – 12	1	6
12 – 18	8	2
18 – 24	9	10
24 – 30	4	5
30 – 36	5	6
36 – 42	6	3

(i) Which mathematical concept is used in the above problem ?
(ii) What is its value ?

31. A cricle has radius $\sqrt{2}$ cm. It is divided into two segments by a chord of length 2 cm. Prove that the angle subtended by the chord at a point in major segment is 45°.

Solution

1.
$$ax + by + c = 0 \quad \text{...(i)}$$
Put $x = -2$ and $y = 3$ in equation (i)
$$a \times (-2) + b \times 3 + c = 0$$
$$-2a + 3b + c = 0 \quad 1$$
$$\boxed{c = 2a - 3b}$$

2. $3x + 2y = 13$ is a linear equation whose solution is $x = 3, y = 2$. 1

3. An angle 40° is not possible to construct with the help of ruler and compass ? 1

4. The class mark of the class 130 – 150 $= \dfrac{130+150}{2} = \dfrac{280}{2} = 140$ 1

5.
$$\text{A.M.} = \frac{21+16+24+x+29+15}{6} \quad 1$$
$$23 = \frac{105+x}{6}$$
$$\Rightarrow \quad 105 + x = 138 \Rightarrow x = 33 \quad 1$$

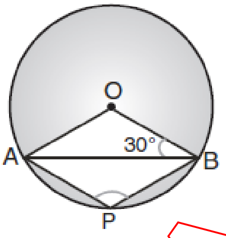
6. Since opposite angles of parallelogram are equal.
$$\therefore \quad 3x - 2 = 63 - 2x$$
$$3x + 2x = 63 + 2$$
$$5x = 65$$
$$x = \frac{65}{5} = 13°$$

Angles of parallelogram
$(3 \times 13 - 2)°$, $(180° - 37°)$, $(63 - 2 \times 13)°$, $(180° - 37°)$
i.e. 37°, 143°, 37°, 143°

7.

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{n} = \frac{360}{40} = 9$$

8. In ΔAOB,



$OA = OB$ (radii of circle)

$\therefore \quad \angle OAB = \angle OBA = 30°$

Again, $\angle AOB = 180° - \angle OAB - \angle OBA$

$= 180° - 30° - 30° = 120°$ **1**

Reflex $\angle AOB = 360° - 120° = 240°$

$\angle APB = \frac{1}{2}$ Reflex $\angle AOB$(Angle subtended by an arc at any point on the remaining part of the circle is half the angle subtended by it at the centre) **1**

$= \frac{1}{2} \times 240° = 120°$

9. Radius of the sphere $= \frac{1}{2} \times$ the edge of cube $= \frac{7}{2}$ cm **½**

Volume of sphere $= \frac{4}{3}\pi r^3$ **½**

$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$ **½**

$= 179{\cdot}66 \text{ cm}^3$ **½**

10. (i) Probability (it was correct) $= \frac{\text{Number of outcomes}}{\text{Total number of possibilities}}$

$= \frac{175}{300} = \frac{7}{12}$ **1**

(ii) Probability (it was not correct) $= 1 - \frac{7}{12}$

$= \frac{12 - 7}{12} = \frac{5}{12}$ **1**

11. Equation $2x + 6y + 1 = 0$ ...(i)

Put $x = 0$ in equation (i)

$2 \times 0 + 6y + 1 = 0$

$6y = -1$

$y = -\frac{1}{6}$

Solution is $\left(0, -\frac{1}{6}\right)$ **1**

Put $y = 0$ in equation (i) $\quad 2x + 0 + 1 = 0$

$x = -\frac{1}{2}$

Solution is $\left(-\frac{1}{2}, 0\right)$ **1**

Again, put $(-3, 2)$ in equation (i)

L.H.S. $= 2 \times (-3) + 6 \times 2 + 1 = -6 + 12 + 1$

$= -6 + 13 = 7 \neq$ R.H.S.

So, $(-3, 2)$ is not a solution of given equation. **1**

12. Equation $2x + 3y = 6$ ...(i)

Put $y = 0$ in equation (i)

$$2x + 0 = 6$$
$$x = 3$$

Point is (3, 0) **1**

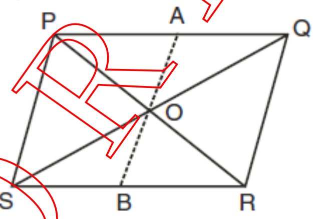
Put $x = 0$ in equation (i)

$$0 + 3y = 6$$
$$y = 2$$

Point is (0, 2) **1**

Hence, the line $2x + 3y = 6$, cut the x - axis at (3, 0) and y - axis at (0, 2). **1**

13. Through O, draw $AB \parallel PS$



Also $PA \parallel BS$ **1**

$\therefore$ $PABS$ is a parallelogram

$\therefore$ $$\text{ar}(POS) = \frac{1}{2}\text{ar}(PABS) \quad \text{...(i)}$$

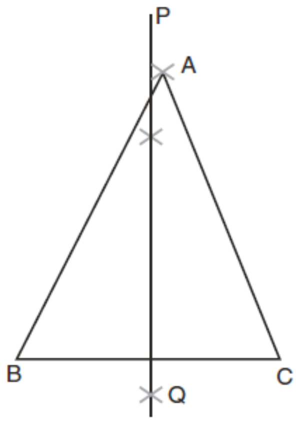
(ΔPOS and parallelogram $PABS$ are on same base and between same parallels) **1**

Similarly, $$\text{ar}(QOR) = \frac{1}{2}\text{ar}(QABR) \quad \text{...(ii)}$$

From (i) + (ii), we get

$$\text{ar}(POS) + \text{ar}(QOR) = \frac{1}{2}[\text{ar}(PABS) + \text{ar}(QABR)] = \frac{1}{2}\text{ar}(PQRS)$$ **1**

14. **Steps of construction :**



(i) Draw a line $BC = 6$ cm.

(ii) With B as center and 5·2 cm draw an arc.

(iii) With C as centre and radius 4·8 cm draw an arc to cut the previous arc at A.

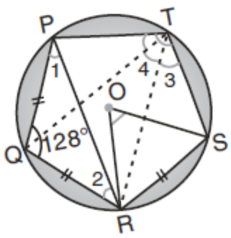
(iv) Join AB and AC.

(v) ABC is a required triangle.

(vi) Draw a perpendicular bisector PQS on side BC. **1½**

No, it does not passes through A. **1½**

15.



$$PQ = QR = RS, \angle PQR = 128^\circ$$
$$\angle 1 + \angle 2 = \frac{(180^\circ - 128^\circ)}{2} = \frac{52}{2} = 26^\circ$$
$$\angle PTQ = \angle QPR = 26^\circ$$ **1**
$$\angle PTS = 3\angle PTQ = 3 \times 26^\circ = 78^\circ$$ **1**
$$\angle ROS = 2\angle RTS = 2 \times 26^\circ = 52^\circ$$ **1**

16. External diameter = 16 cm

$$\text{Radius }(R) = \frac{16}{2} = 8 \text{ cm}$$ **½**

Internal diameter = 12 cm

$$\text{Radius }(r) = \frac{12}{2} = 6 \text{ cm}$$

$$\text{Total surface area is to be painted} = 2\pi R^2 + 2\pi r^2 + \pi R^2 - \pi r^2$$
$$= 3\pi R^2 + \pi r^2 = \pi[3R^2 + r^2]$$ **1**

Cost of painting the vessel all over $= 2 \times \pi[3R^2 + r^2]$ ½

$= 2 \times \frac{22}{7} [3 \times 8^2 + 6^2]$

$= 2 \times \frac{22}{7} [192 + 36]$

$= \frac{22}{7} \times 228 = ₹\ 1433{\cdot}14$ **1**

17. Hight of cone (h) = 24 cm

Slant height of cone (l) = 25 cm

Radius (r) $= \sqrt{l^2 - h^2} = \sqrt{25^2 - 24^2}$

$= \sqrt{625 - 576} = \sqrt{49}$

$= 7$ cm **1**

Area of metal sheet (to make two hollow cones)

$= 2 \times \pi r l = 2 \times \frac{22}{7} \times 7 \times 25$ **1**

$= 1100 \text{ cm}^2$ **1**

18. **(i)** No. of workers have salary below ₹ 3,000

$= 10 + 30 = 40$ **1**

(ii) No. of workers have salary between 3000 and ₹ 5,000

$= 20 + 40 = 60$ **1**

(iii) No. of workers have salary from ₹ 1000 to ₹ 5000

$= 10 + 30 + 20 + 40 = 100$ **1**

19. **(i)** Probability (a student was born in the month with 31 days)

$= \frac{3+2+5+2+6+4+4}{40} = \frac{26}{40} = 0{\cdot}65$ 1½

(ii) Probability (a student was born in month of Feb.) $= \frac{4}{40} = \frac{1}{10} = 0{\cdot}1$ 1½

20.

x	f	fx
2	3	6
4	2	8
6	3	18
10	1	10
$n + 5$	2	$2n + 10$
	$\Sigma f = n = 11$	$\Sigma fx = 52 + 2n$

2

Mean $(\bar{x}) = \frac{\Sigma fx}{n}$

$6 = \frac{2n+52}{11}$

$66 = 52 + 2n$

$2n = 66 - 52$

$2n = 14$

$n = \frac{14}{2}$

$n = 7$ **1**

21. **2**

Equation $y = 9x - 7$ ...(i)

Put $x = -1$ in equation (i)

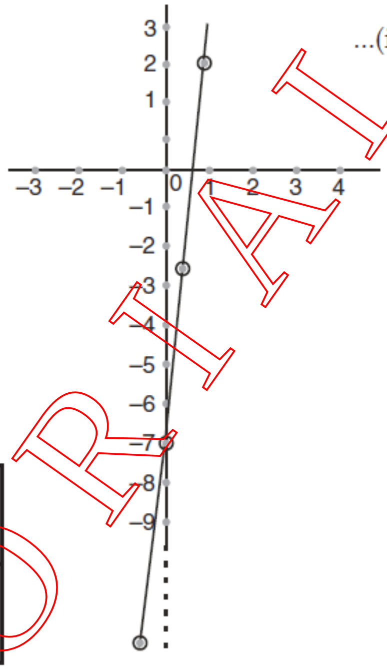
$y = -9 - 7 = -16$

Put $x = 0$ in equation (i) $y = 0 - 7 = -7$

Put $x = 1$ in equation (i) $y = 9 \times 1 - 7 = 9 - 7 = 2$

Put $x = \frac{1}{2}$ in equation (i) $y = 9 \times \frac{1}{2} - 7 = \frac{9-14}{2}$

$= \frac{-5}{2}$



x	–1	0	1	$\frac{1}{2}$
y	–16	–7	2	$-\frac{5}{2}$

Hence, point (– 1, – 16) and (0, – 7) lie on graph, but point (– 1, –2) and (2, – 9) are not lie on graph. **2**

22. Let the length and breadth of a rectangular field be x and y metre.

Then according to question, **2**

Perimeter of rectangular field $= 2(x + y)$

$200 = 2(x + y)$

$x + y = 100$

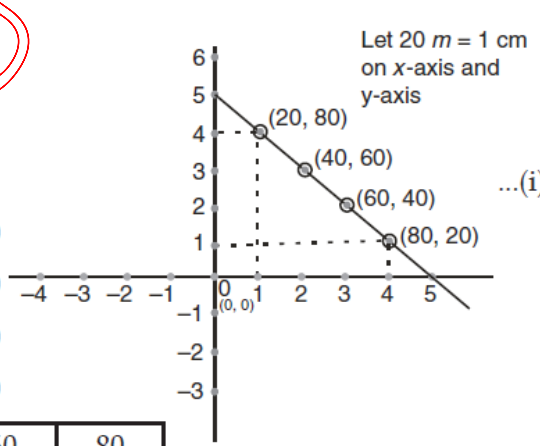
or $y = 100 - x$ ...(i) **1**

Put $x = 20$ in equation (i) $y = 100 - 20 = 80$

Put $x = 40$ in equation (i) $y = 100 - 40 = 60$

Put $x = 60$ in equation (i) $y = 100 - 60 = 40$

Put $x = 80$ in equation (i) $y = 100 - 80 = 20$



x	20	40	60	80
y	80	60	40	20

1

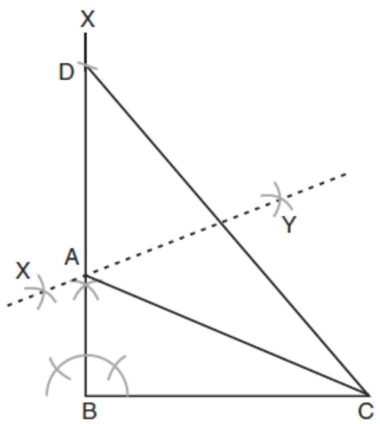
23. **Steps of Construction :**

(i) Draw BC = 6 cm. ½

(ii) Draw $\angle CBX = 90°$ and cut off BD = 10 cm. ½

(iii) Join CD and draw its perpendicular bisector meeting BD at A. ½

(iv) Join AC, then ABC is the required triangle. ½



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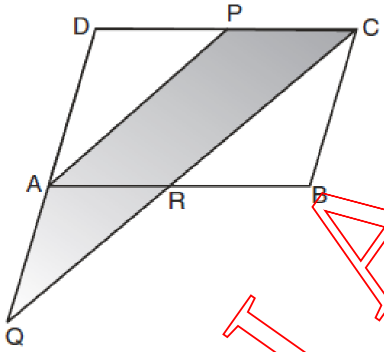
24. (a) $ABCD$ is a parallelogram



$\therefore$ $AB \parallel DC$ ...(i)

ar $AR \parallel PC$ ...(ii) **1**

P is the mid-point of CD and $AP \parallel CR$ (given)

From (i) and (ii),

opposite sides of a quadrilateral are parallel.

Hence $ARCP$ is a parallelogram. **1**

$\therefore$ $AP = CR$

In ΔDQC

P is the mid-point of DC and $AP \parallel CQ$.

$\therefore$ A is also the mid-point of DQ (mid-point theorem)

$\therefore$ $DA = AQ$ **1**

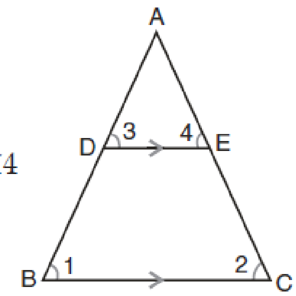
(b) Again, by mid-point theorem. $AP = \frac{1}{2} CQ$

$CR = \frac{1}{2}(CR + QR)$

$2\,CR = CR + QR$

$CR = QR$ **1**

25. We have to prove $\angle ECB + \angle EDB = 180°$



$AB = AC \Rightarrow \angle 1 = \angle 2$

$AD = AE \Rightarrow \angle 3 = \angle 4$ **1**

$\angle A + \angle 1 + \angle 2 = 180° = \angle A + \angle 3 + \angle 4$

$2\angle 1 = 2\angle 3$ **1**

$\angle 1 = \angle 3 = \angle 2 = \angle 4$ **1**

$\Rightarrow$ $DE \parallel BC$ (Corresponding angle)

$\therefore$ $\angle 1 + \angle BDE = 180°$ ($\angle BDE = \angle CED$, as $\angle 3 = \angle 4$) **1**

$\angle 1 + \angle CED = 180°$,

$\therefore$ B, C, E, D are concyclic **1**

26. Given : C is the mid-point of AB, AD and BE are perpendiculars to the line m meeting at D and E.

To prove : $CD = CE$,

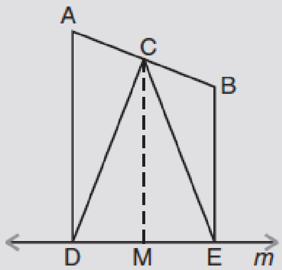
Construction : Draw $CM \perp M$

Proof : Since $AD \perp m$ and $BE \perp m$,

$\therefore$ $AD \parallel BE$ (transversal AB and DE intersect the parallels AD and BE)

and $AC = CB$ ($\because$ C is mid-point of AB) **1**

$\therefore$ $DM = ME$ **1**



In ΔCMD and ΔCME,

$DM = EM$

$\angle CMD = \angle CME$ (each 90°)

$CM = CM$ (common) **1**

$\Delta CDM \cong \Delta CEM$ (SAS congruency)

Then, $CD = CE$ (by C.P.C.T.) **Hence Proved.** **1**

27. Join A to C.

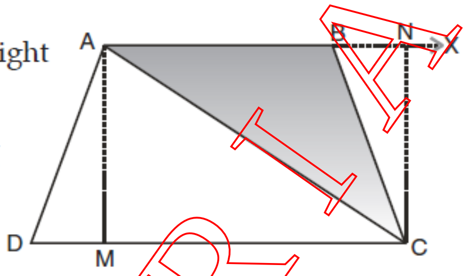
Draw $AM \perp DC$ and $CN \perp AX$

$\therefore \quad AB \parallel DC$

$\therefore \quad AM = CN$ **1**

$$\text{ar}(ADC) = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times DC \times AM \quad \text{...(i)}$$ **1**



Again, $$\text{ar}(ABC) = \frac{1}{2} \times AB \times CN \quad \text{...(ii)}$$

Add (i) and (ii), we get

$$\text{ar}(ADC) + \text{ar}(ABC) = \frac{1}{2}[DC \times AM + AB \times CN]$$ **1**

$$\text{ar}(ABCD) = \frac{1}{2}[DC \times AM + AB \times AM]$$

$$\text{Area of trapezium} = \frac{1}{2} \times AM\,(DC + AB)$$

$$= \frac{1}{2} \times \text{height} \times \text{sum of parallel side}$$ **1**

28. $$\text{Radius of lead sphere } (r) = \frac{6}{2} = 3 \text{ cm}$$

$$\text{Radius of beaker } (R) = \frac{18}{2} = 9 \text{ cm}$$

$$\text{Height of rised water level } (H) = 40 \text{ cm}$$ **1**

$$\text{No. of lead spheres dropped in the water} = \frac{\text{Volume of raised water level in cylindrical beaker}}{\text{Volume of one lead Sphere}}$$ **1**

$$= \frac{\pi R^2 H}{\frac{4}{3}\pi r^3} = \frac{9 \times 9 \times 40 \times 3}{4 \times 3 \times 3 \times 3}$$ **1**

$$= 90.$$ **1**

29. Area of three adjacent face of cuboid are lb, bh and hl, where l, b and h are length, breadth and height of cuboid respectively, then **1**

$$lb = 15 \text{ cm}^2,\ bh = 20 \text{ cm}^2,\ hl = 12 \text{ cm}^2$$ **1**

$$lb \times bh \times hl = 15 \times 20 \times 12$$

$$(lbh)^2 = 3 \times 5 \times 4 \times 5 \times 3 \times 4$$ **1**

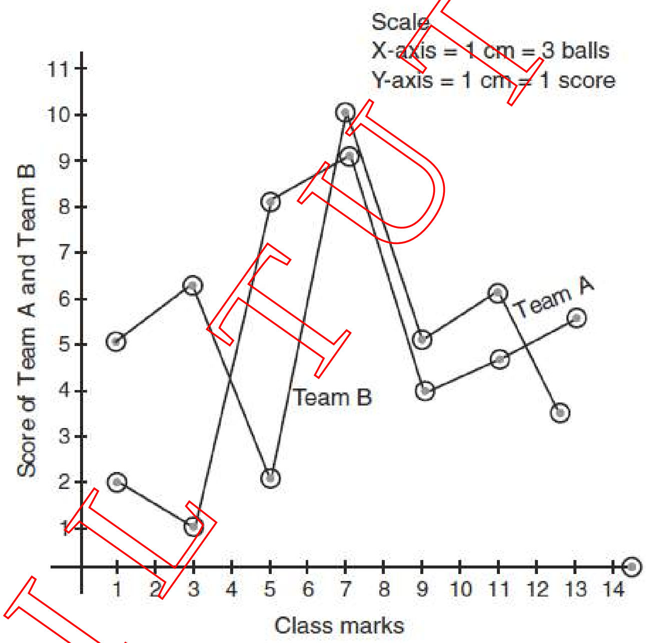
$$\text{Volume of cuboid} = lbh = 3 \times 4 \times 5 = 60 \text{ cm}^2$$ **1**

30.

Number of balls	Class Marks	Team A	Team B
0 — 6	$\frac{0+6}{2}=3$	2	5
6 — 12	$\frac{6+12}{2}=9$	1	6
12 — 18	$\frac{12+18}{2}=15$	8	2
18 — 24	$\frac{18+24}{2}=21$	9	10
24 — 30	$\frac{24+30}{2}=27$	4	5
30 — 36	$\frac{30+36}{2}=33$	5	6
36 — 42	$\frac{36+42}{2}=39$	6	3

1

2



(i) Statistics. ½

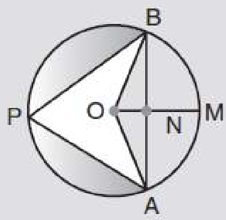
(ii) Honesty. ½

31. To prove : $\angle APB = 45°$

Proof : $AN = NB = 1$ cm

and $OB = \sqrt{2}$ cm

In ΔONB,



$OB^2 = ON^2 + NB^2$ (by pythagoras theorem)

$\Rightarrow \quad (\sqrt{2})^2 = ON^2 + 1^2$

$\Rightarrow \quad$ ON = 1 1

$\therefore$ ΔONB is an isoceles triangle.

$\angle ONB = 90°$. ($\because$ ON is the perpendicular bisector of chord AB)

$\therefore \quad \angle NOB = \angle NBO = 45°$

Similarly, $\angle AON = 45°$

$\angle AOB = \angle AON + \angle NOB$ 1

$= 45° + 45°$

$= 90°$

$\angle APB = \frac{1}{2} \angle AOB$

(chord subtends an angle is twice angle subtends by an *arc*.) 1

$= \frac{1}{2} \times 90 = 45°$ **Hence Proved.** 1