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

SOLVED SAMPLE QUESTION PAPER

JST201501

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. When will be the graph of the equation $x + a = 0$ is a line parallel to the y-axis and to the left of the y-axis ?

2. If the point (2, 3) lies on the line $4y = ax + 5$, find a.

3. In how many parts bisector of an angle divides it ?

4. Calculate the median of the given data :

   144, 145, 147, 148, 149, 150, 152, 155, 160.

SECTION — B

5. In the given fig., T is the mid-point of PS. Find $ar(QTR)$.
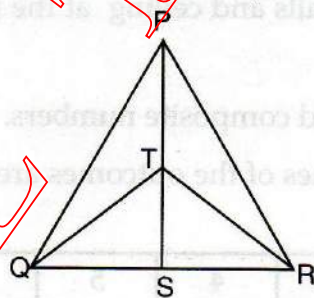
6. In a $\parallel$ gm $ABCD$, P and Q are the mid-point of sides DA and DC respectively. If $\angle DAC = 30°$, then find the values of x and y.
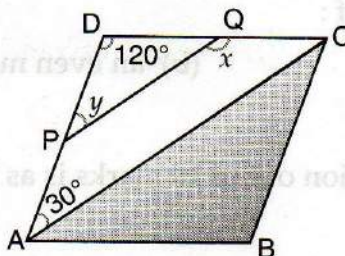
7. The edge of a cube is 10.5 mm. Find its total surface area in cm^2.

8. Find the mean of first 8 prime numbers.

9. A part of the frequency table is given below :

Class marks of weights in (kg)	33	38	43
No. of students	9	5	14

Rewrite the table with class limits.

10. A right circular cylinder is 3 m high and the circumference of its base is 22 m. Find its curved surface area.

SECTION — C

11. Draw the graph of the linear equation $3x - 5y - 15 = 0$. Write the co-ordinates of the points where the line intersects the two axes.

12. For what value of p; $x = 2$, $y = 3$ is a solution of $(p + 1) x - (2p + 3) y - 1 = 0$? Also write the equation.

13. Prove that the area of a quadrilateral formed by joining the mid-point of the sides of a parallelogram is half the area of the parallelogram.

14. Construct a $\triangle ABC$ in which $BC = 5$ cm, $\angle C = 60°$ and $AC - AB = 1.5$ cm.

15. $ABCD$ is trapezium in which $AB \parallel CD$ and $AD = BC$. Show that :
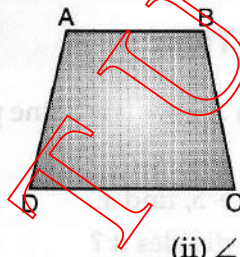
(i) $\angle A = \angle B$ (ii) $\angle C = \angle D$.

16. A toy is a in the form of a cone mounted on a hemisphere of base radius 3.5 cm. If the total height of the toy is 15.5 cm. Find its total surface area of the toy . $\left(\text{Use } \pi = \dfrac{22}{7} \right)$

17. The floor of a rectangular hall has a perimeter of 250 m and its length and breadth are in the ratio of 13 : 12. If the cost of painting the four walls and ceiling at the rate of ₹ 5 per m^2 is ₹ 27,000, find the height of the hall.

18. Find the Mean and Median of first 12 odd composite numbers.

19. A die is thrown 500 times. The frequencies of the outcomes are recorded in the following frequency distribution table :

Outcome	1	2	3	4	5	6
Frequency	120	50	65	70	80	115

Find the probability of the occurrence of :

(a) a number between 3 and 6, (b) an even number,

(c) an odd number.

20. The score of 15 students in an examination out of 10 marks is as below :

3, 9, 7, 5, 6, 3, 7, 6, 7, 4, 7, 7, 4, 8, 2.

Find the mean, mode and median.

SECTION — D

21. The co-ordinates of points given in the following table represent some of the solutions of the equation, $y - 5x = 2$

x_i	1	–	–	– 2	2	–
y_i	–	17	– 3	–	–	3

Find the missing values. Also find the co-ordinates of the points where the line cuts x- axis and y- axis.

22. Give the geometrical representation of the equation $3x + 15 = 0$ as the equation :
    (i) in one variable,   (ii) in two variables.

23. Construct ΔABC with $BC = 4$ cm, $\angle B = 75°$ and $AB + AC = 10$ cm.

24. Prove that of all the chords of a circle through a given point within it, the least is one which is bisected at that point.

25. PQ and RQ are chords of a circle equidistant from the centre. Prove that the diameter passing through Q is the bisector of $\angle PQR$.

26. ABC is an isosceles triangle in which $AB = AC$. A circle passing through B and C intersecting AB and AC at D and E respectively. Prove that $BC \parallel DE$.

27. Two parallel lines l and m are intersected by a transversal p. Show that quadrilaterals formed by the bisectors of interior angles is a rectangle.
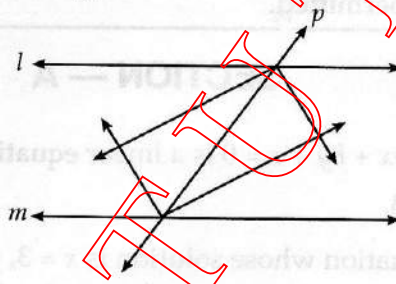
28. A wall of length 10 m was to be built across an open ground. The height of the wall is 9 m and thickness of wall is 36 cm. If this wall is to be built up with bricks whose dimensions are 36 cm × 15 cm × 9 cm, how many bricks would be required to build three fourth of this wall ?

29. A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius of the tank is 1 m, then find the volume of the iron used to make the tank. (use $\pi = 3.14$)

30. A game of chance consists of spinning an arrow which comes at rest pointing at one of the number 1, 2, 3, 4, 5, 6, 7, 8 (see figure) and these are equally likely outcomes. What is the probability that it will point at :
    (i)   8 ?
    (ii) an odd number ?
    (iii) a number greater than 2 ?
    (iv) a number less than 9 ?
    (v)   Which mathematical concept is used in the above problem ?
    (vi) What is its value ?

31. Two brothers have a triangular plot. They decide to distribute it equally amongst themselves but also want to give away a triangular part of it for charity to a school which is attached on the base side of 120 m of the triangular plot.
    Answer the following questions :
    (i)   What is the area of the triangular plot if its height is 90 m ?
    (ii) Explain with the help of figure how could this be possible and what type of parts do the brothers get.
    (iii) Which value of the two brothers is depicted here ?

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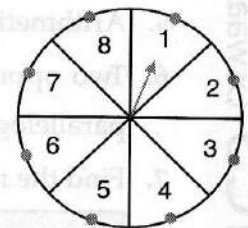
SECTION — 'A'

1. Equation $x + a = 0$ or $x = -a$ will be a line parallel to y-axis and to the left of the y-axis if and only if $a > 0$. **1**

2.
$$4y = ax + 5 \qquad \ldots\text{(i)}$$
∵ Point $(2, 3)$ lies on the line (i)
∴
$$4 \times 3 = a \times 2 + 5$$
$$12 - 5 = 2a$$
$$2a = 7$$
$$a = \frac{7}{2} \qquad \textbf{1}$$

3. Bisector of an angle divides it in two equal parts. **1**

4. Data : 144, 145, 147, 148, 149, 150, 152, 155, 160
   Here, $N = 9$ (odd)

   ∴
   $$\text{Median} = \left(\frac{N+1}{2}\right)^{\text{th}} \text{term} \qquad \tfrac{1}{2}$$

   $$= \left(\frac{9+1}{2}\right)^{\text{th}} \text{term} = 5^{\text{th}} \text{term} = 149. \qquad \tfrac{1}{2}$$

SECTION — B

5. Median QT and RT divide $\triangle PQS$ and $\triangle PRS$ in two triangles of equal area.
   ∴
   $$\text{ar}(QTS) = \frac{1}{2}\,\text{ar}(PQS) \qquad \ldots\text{(i)}$$
   $$\text{ar}(RTS) = \frac{1}{2}\,\text{ar}(RPS) \qquad \ldots\text{(ii) } \textbf{1}$$

   From (i) + (ii), we get
   $$\text{ar}(QTS) + \text{ar}(RTS) = \frac{1}{2}\,[\text{ar}(PQS) + \text{ar}(RPS)]$$
   $$\text{ar}(QTR) = \frac{1}{2}\,\text{ar}(PQR) \qquad \textbf{1}$$

6. In $\triangle ADC$, P and Q are mid-points of lines DA and DC respectively.
   So,
   $$PQ \parallel AC$$
   $$\angle DPQ = \angle PAC = 30° \text{ (corresponding)} \qquad \textbf{1}$$
   $$\angle y = 30°$$

   In $\triangle PDQ \Rightarrow y + 120° + \angle DQP = 180°$
   $$30° + 120° + \angle DQP = 180°$$
   $$\angle DQP = 30°$$
   $$\angle x = 180° - \angle DQP = 180° - 30° = 150° \qquad \textbf{1}$$

7.

$$\text{The edge of cube} = 10\cdot5 \text{ mm} = \frac{10\cdot5}{10} \text{ cm}$$

$$= 1\cdot05 \text{ cm} \qquad \tfrac{1}{2}$$

$$\text{Total surface area of cube} = 6a^2 = 6 \times 1\cdot05 \times 1\cdot05 \qquad 1$$

$$= 6\cdot615 \text{ cm}^2 \qquad \tfrac{1}{2}$$

8. First 8 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19 $\qquad \tfrac{1}{2}$

$$\text{Mean } (\bar{x}) = \frac{\text{Sum of 8 prime numbers}}{8} \qquad \tfrac{1}{2}$$

$$= \frac{2+3+5+7+11+13+17+19}{8} = \frac{77}{8} = 9\cdot6 \qquad 1$$

9.

$$\text{Difference of weight} = 38 - 33 = 5$$

$$\text{Half of difference} = \frac{5}{2} = 2\cdot5 \qquad \tfrac{1}{2}$$

$\therefore$ Table with class limits

Class Interval of Weight (in kg)	30·5 – 35·5	35·5 – 40·5	40·5 – 45·5	
No. of Students	9	5	14	1½

10.

$$\text{Height } h = 3 \text{ m}$$

$$\text{Circumference of base} = 2\pi r = 22 \qquad 1$$

$$\text{Curved surface area of right}$$

$$\text{Circular cylinder} = 2\pi rh$$

$$= 22 \times 3 = 66 \text{ m}^2. \qquad 1$$
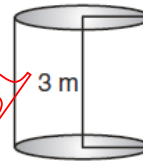
SECTION — 'C'

11. Equation

$$3x - 5y - 15 = 0$$

$$5y = 3x - 15$$

$$y = \frac{3x-15}{5} \Rightarrow y = \frac{3}{5}(x-5) \qquad 1$$

		A	B	C
x		0	5	–5
y		–3	0	–6
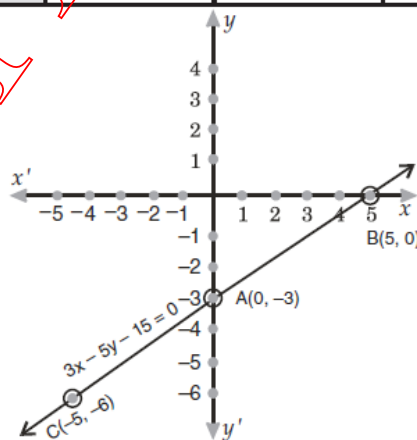
The graph of the line intersects x - axis at (5, 0) and y - axis at (0,– 3). $\qquad \tfrac{1}{2}$

12.   Solution $x = 2, y = 3$

$(p + 1) \times 2 - (2p + 3) \times 3 - 1 = 0$

$2p + 2 - 6p - 9 - 1 = 0$ **2**

$p = -2$

Equation $-x + y - 1 = 0$

$y = 1 + x$ **1**

13. **Given :** $ABCD$ is a parallelogram and points P, Q, R and S are the mid-points of sides AB, BC, CD and DA respectively.

To prove : $ar\ (PQRS) = \dfrac{1}{2}\ ar\ (ABCD)$

Construct : Join P to R.

Proof : Here P and R are the mid-points of sides AB and CD
        of parallelogram $ABCD$.

$\therefore$ $PR \parallel BC \parallel AD$ **1**

In parallelogram $APRD$,

$ar\ (PSR) = \dfrac{1}{2}\ ar\ (APRD)$ ...(i)
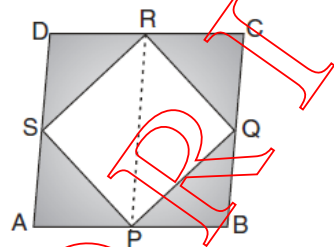
[$\because \triangle PSR$ and parallelogram $APRD$ are on same base PR and between same parallels PR and AD] **1**

Similarly in parallelogram $PBCR$

$ar\ (PQR) = \dfrac{1}{2}\ ar\ (PBCR)$ ...(ii)

From (i) + (ii), we get

$as\ (PSR) + ar\ (PQR) = \dfrac{1}{2}\ [ar\ (APRD) + ar\ (PBCR)]$

$ar\ (PQRS) = \dfrac{1}{2}\ ar\ (ABCD)$ **Proved. 1**

14. **Steps of construction.**

(i) Draw a line segment $BC = 5$ cm and at point C make an angle
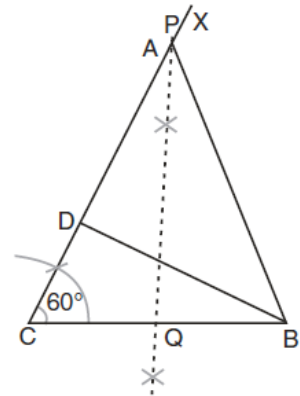   = 60°, $\angle XCB = 60°$.

(ii) Cut the line segment $CD = 15$ cm (equal $AC - AB = 1.5$ cm)   **1½**
    on ray CX.

(iii) Join DB and draw the perpendicular bisector PQ of DB.

(iv) The perpendicular bisector intersects CX at point A.

(v) Joint AC.

(vi) $\triangle ABC$ is the required triangle.   **1½**

15. Through C draw $CE \parallel AD$

$\therefore$ $AECD$ is a parallelogram

$\angle A + \angle 2 = 180°$ ...(i)

$AD = BC$ (given)   **1**

$AD = CE$ (by construction)

$BC = CE$

In $\triangle BCE$,

$BC = CE$

$\angle 1 = \angle 2$ **½**

Also,

$\angle B + \angle 1 = 180°$

$\angle B + \angle 2 = 180°$ ...(ii) **½**
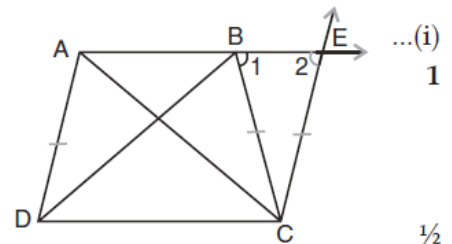
From (i) and (ii), we get

$$\angle A = \angle B \qquad \text{½}$$

Again, we get

$$\angle A + \angle D = \angle B + \angle C = 180° \qquad \text{(Corresponding Angle)}$$
$$\angle C = \angle D \qquad \text{½}$$

16.

Total height of toy = 15·5 cm

Radius of semi-sphere = radius of cone = 3·5 cm

Height of cone (h) = 15·5 – 3·5

= 12 cm

$$l = \sqrt{h^2 + r^2} = \sqrt{12^2 + 3·5^2}$$
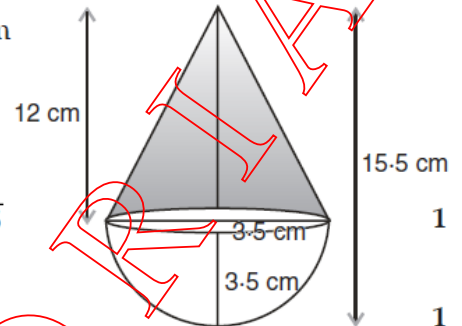
$$= \sqrt{144 + 12·25} = \sqrt{156·25}$$

= 12·5 cm

Total surface area of toy = $\pi r l + 2\pi r^2$

$$= \pi r (l + 2r) = \frac{22}{7} \times 3·5(12·5 + 2 \times 3·5)$$

$$= 22 \times 0·5 \times 19·5$$

$$= 214·50 \text{ cm}^2. \qquad 1$$

17. Let the length and breadth of a rectangular hall are $13x$ and $12x$.

Perimeter of rectangular hall = $2 (l + b)$

$$250 = 2 (13x + 12x)$$
$$125 = 25x$$
$$x = 5$$

∴ $l = 13 \times 5 = 65$ m, $b = 12 \times 5 = 60$ m $\qquad 1$

Area of four wall and ceiling = $2 (l + b)h + l \times b$ $\qquad$ ½

Cost of painting the four walls and ceiling at the rate of 5 per m^2

$$= [2 (l + b)h + lb] \times 5 \qquad \text{½}$$
$$27000 = [2 (65 + 60)h + 65 \times 60] \times 5$$
$$5400 = 250h + 3900$$
$$250h = 1500$$
$$h = 6 \text{ m} \qquad 1$$

18. First 12 odd composite numbers are, 9, 15, 21, 25, 27, 33, 35, 39, 45, 49, 51, 55.

$$\text{Mean} = \frac{\text{Sum of observation}}{n} \qquad \text{½}$$

$$= \frac{404}{12} = 33·6 \qquad 1$$

$$\text{Median} = \left[\frac{n^{\text{th}}\text{obs}}{2} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{obs}\right] \Big/ 2 \qquad \text{½}$$

$$= \frac{6^{\text{th}}\text{obs} + 7^{\text{th}}\text{obs}}{2}$$

$$= \frac{33 + 35}{2} = \frac{68}{2} = 34 \qquad 1$$

Mean = 33·6

Median = 34

19. **(a)** Probabiltity (a number between 3 and 6)

$$= \frac{70+80}{500} = \frac{150}{500} = \frac{3}{10}$$ 1

(b) Probability (an even number)

$$= \frac{50+70+115}{500} = \frac{335}{500} = \frac{47}{100}$$ 1

(c) Probability (an odd number)

$$= \frac{120+65+80}{500} = \frac{265}{500} = \frac{53}{100}$$ 1

20. Write the given data in ascending order 2, 3, 3, 4, 4, 5, 6, 6, 7, 7, 7, 7, 7, 8, 9

Here $n = 15$ (odd)

$$\text{Mean} = \frac{\Sigma x}{n}$$

$$= \frac{2+3+3+4+4+5+6+6+7+7+7+7+7+8+9}{15}$$

$$= \frac{85}{15} = 5 \cdot 6$$ 1

$$\text{Mode} = 7$$ 1

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{term} = \left(\frac{15+1}{2}\right)^{th} \text{term}$$

$$= 8\text{th term} = 6$$ 1

SECTION — D

21. Equation $\quad\quad y - 5x = 2 \quad\quad\quad$ ... (i)

x_i	1	3	−1	−2	2	$\frac{1}{5}$
y_i	7	17	−3	−8	12	3

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

$$y - 5 \times 1 = 2 \Rightarrow \boxed{y = 7}$$

(ii) Put $y = 17$ in equation (i)

$$17 - 5x = 2$$
$$-5x = -15 \Rightarrow \boxed{x = 3}$$

(iii) Put $y = -3$ in equation (i)

$$-3 - 5x = 2$$
$$-5x = 5 \Rightarrow \boxed{x = -1}$$

(iv) Put $x = -2$ in equation (i)

$$y - 5 \times (-2) = 2 \Rightarrow \boxed{y = -8}$$

(v) Put $x = 2$ in equation (i)

$$y - 5 \times 2 = 2 \Rightarrow \boxed{y = 12}$$

(vi) Put $y = 3$ in equation (i)

$$3 - 5x = 2$$

$$-5x = -1 \Rightarrow \boxed{x = \frac{1}{5}}$$

Put $x = 0$ in equation (i)

$$y - 0 = 2 \Rightarrow \boxed{y = 2}$$

Line cuts the y-axis at $(0, 2)$

Put $y = 0$ in equation (i) $(½+½+½+½+½+½+½+½)$

$$0 - 5x = 2 \Rightarrow x = \frac{-2}{5}$$

Line cuts the x-axis at $\left(\dfrac{-2}{5}, 0\right)$

22. (a) $3x + 15 = 0$ ½
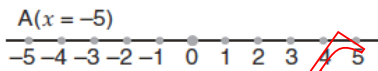
$$3x = -15$$

$x = -5$ is a point on the number line.   ½

(b) $3x = -15$
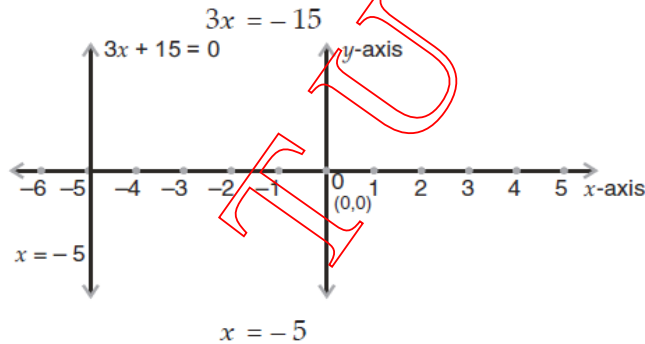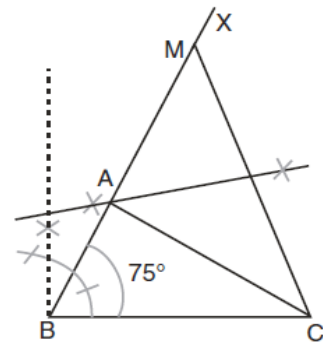

$$x = -5$$ 1

is a line parallel to y-axis in two variables.

23. Steps of Construction :

(i)   Draw a line segment $BC = 4$ cm.

(ii) Draw a ray BX such that $\angle CBX = 75°$.   2

(iii) From ray BX, cut off $BM = 10$ cm.

(iv) Join MC.

(v) Draw perpendicular bisector of MC. Intersecting BM at A.   2

(vi) Join AC, then $\triangle ABC$ is the required triangle.

24. O is centre of circle.

AB is a chord with mid-point M.

To prove : $AB < CD$ 1

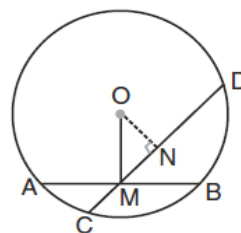Join OM and $ON \perp CD$

$\triangle ONM$ is right angled triangle   1

$\therefore OM > ON$, (OM is hypotenuse)

Chord CD is nearer to in comparison of AB,   1
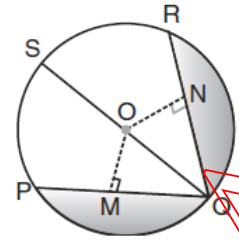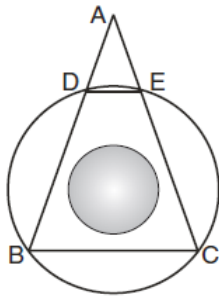
$\Rightarrow CD > AB$ or $AB < CD$ 1

25. O is centre of the circle. Chord PQ and RQ are equi-distance from the centre O.

Then $OM = ON$

i.e., $OM \perp PQ$, $ON \perp RQ$

In $\triangle OMQ$ and $\triangle ONQ$

$$OM = ON \text{ (given)}$$
$$OQ = OQ \text{ (common)}$$
$$\angle OMQ = \angle ONQ = 90°$$
$$\triangle OMQ \cong ONQ, \text{ (by RHS.)}$$
$$\therefore \quad \angle OQM = \angle OQN$$

i.e., diameter QS is a bisector of $\angle PQR$.

26. In $\triangle ABC$,

$$AB = AC$$
$$\angle C = \angle B \quad ...(i) \quad \text{(Angle opposite to equal sides of a triangle are equal)}$$

Again,

$$\angle ADE = \angle C \text{ and } \angle AED = \angle B$$

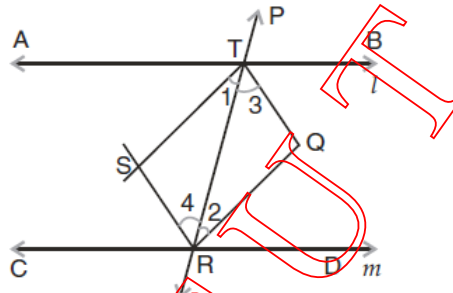(Exterior angle of cyclic quadrilateral BCED)

$$\angle ADE = \angle B \text{ and } \angle AED = \angle C \quad \text{[by equation (i)]}$$
$$BC \parallel DE.$$

$\therefore$

27.

$$l \parallel m \text{ (given)}$$
$$\angle ATR = \angle DRT \qquad \text{(Alternate interior angle)}$$
$$\frac{1}{2}\angle ATR = \frac{1}{2}\angle DRT$$
$$\angle 1 = \angle 2 \qquad (\because TS \text{ and } RQ \text{ are bisectors of interior angle)}$$

But these are alternative interior angle

$\therefore \qquad\qquad ST \parallel RQ \text{ and } SR \parallel TQ$

$\therefore$ RST is a parallelogram

Again, $\qquad\qquad \angle ATR + \angle BTR = 180° \qquad\qquad$ (Linear pair of angle)

$$\frac{1}{2}\angle ATR + \frac{1}{2}\angle BTR = \frac{1}{2} \times 180°$$
$$\angle 1 + \angle 3 = 90°$$
$$\angle SRT = 90°$$

$\therefore$ $QRST$ is a rectangle.

28.

$$\text{Length of wall } (l) = 10 \text{ m} = 1000 \text{ cm}$$
$$\text{Thickness of wall } (b) = 36 \text{ cm}$$
$$\text{Height of wall } (h) = 9 \text{ m} = 900 \text{ cm}$$

$$\text{No. of bricks (for three fourth of this wall)} = \frac{\dfrac{3}{4}\times\text{Area of wall}}{\text{Area of one brick}}$$

$$= \frac{3}{4}\times\frac{1000\times36\times900}{36\times15\times9}$$

$$= 5000 \text{ bricks}$$

29.

Inner radius of hemisphere (x) = 1 m = 100 cm

Outer radius of hemisphere (R) = 100 + 1 = 101 cm ½

Volume of hemisphere (used to make the tank)

$$= \frac{2}{3}\pi(R^3 - r^3)$$ 1

$$= \frac{2}{3} \times 3\cdot14 \times (101^3 - 100^3)$$ ½

$$= 63430\cdot09 \text{ cm}^3$$ 2

30. (i) Probability (getting a number 8) $= \dfrac{\text{Number of outcomes}}{\text{Total number of possibilities}} = \dfrac{1}{8}$

(ii) Probability (getting an odd number) $= \dfrac{4(1,3,5,7)}{8} = \dfrac{4}{8} = \dfrac{1}{2}$

(iii) Probability (getting a number greater than 2 which is 3, 4, 5, 6, 7, 8) $= \dfrac{6}{8} = \dfrac{3}{4}$

(iv) Probability (a number less than 9 which is 8, 7, 6, 5, 4, 3, 2, 1) $= \dfrac{8}{8} = 1$

(v) Probability (½+½+½+½+1+1)

(vi) Equal distribution.

31. (i)

Base BC = 120 m

Height AD = 90 m 2

Area of triangular plot $= \dfrac{1}{2} \times \text{base} \times \text{height}$

$$= \dfrac{1}{2} \times 120 \times 90$$

$$= 5400 \text{ m}^2$$
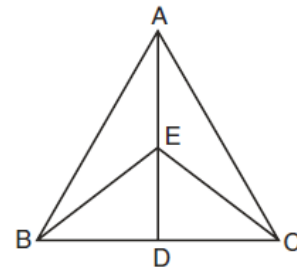
(ii) In $\triangle ABC$ they draw median AD on base BC and divide it into two equal areas ABD and ACD. Take any point E on AD and join BE and CE. 1

Two brothers get areas ar $(\triangle ABE)$ and ar $(\triangle ACE)$ and ar $(\triangle BCE)$ is donated to school.

(iii) Any positive value is acceptable. Both brothers know importance of education love their community. 1

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