# Grade 10 Karnataka Math 2021
# QUESTION PAPER CODE 81-E

**Four choices are given for each of the following questions / incomplete statements. Choose the correct answer among them and shade the correct option in the OMR Answer Sheet given to you with a black / blue ball point pen.** $\mathbf{40 \times 1 = 40}$

Q1. The $n^{th}$ term of an Arithmetic Progression is $a_n = 4n + 5$. Then its 5th term is
(A) 20
(B) 14
(C) 25
(D) 24
**Solution:**
Correct Answer (C)
Given the $n^{th}$ term of an AP: $a_n = 4n + 5$ substitute $n = 5$:
$a_5 = 4(5) + 5 = 20 + 5 = 25$
Thus, the 5th term is 25.

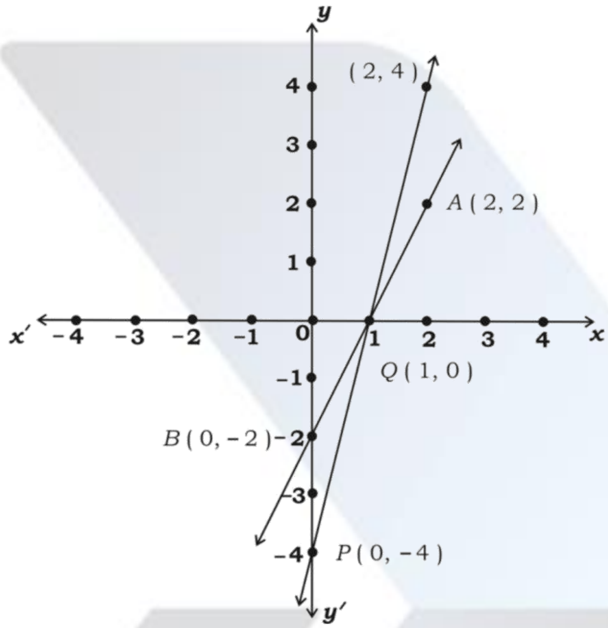
Q2. When the quadratic equation $5x^2 = 2(2x + 3)$ is expressed in the standard form, the constant term obtained is
(A) 5
(B) 6
(C) 4
(D) -6
**Solution:**
Correct Answer (B)
Given the equation $5x^2 = 2(2x + 3)$, expand and rearrange:
$5x^2 - 4x - 6 = 0$
The constant term is -6.

Q3. $x - 2y = 0$ and $3x + 4y - 20 = 0$ are
(A) Intersecting lines
(B) Coincident lines
(C) Parallel lines
(D) Perpendicular lines
**Solution:**
Correct answer: (A)
Given
$x - 2y = 0$ and $3x + 4y - 20 = 0$
So,
$a_1 = 1, \ b_1 = -2, \quad c_1 = 0, \ a_2 = 3, \ b_2 = 4, \quad c_2 = -20$

$\therefore \frac{1}{3} \neq \frac{-2}{4}$

Thus, the given question is intersecting line

Q4.




(A) $x + y = 1$ and $2x - y = 1$

(B) $2x + y = 2$ and $x + y = 2$

(C) $2x - y = 2$ and $4x - y = 4$

(D) $y - x = 0$ and $x - y = 1$

**Solution:**

Correct answer: (C)

Given

In the graph

$2x - y = 2$ and $4x - y = 4$ are satisfied with all the co-ordinate.

Q5. If the pair of linear equations in two variables $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel lines then the correct relation of their coefficients is

(A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(C) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

(D) $\frac{a_1}{b_2} = \frac{b_1}{a_2}$

**Solution:**

Correct answer: (B)

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

For parallel lines

Q6. If the pair of lines $2x+3y+7=0$ and $ax+by+14=0$ are coincident lines then the values of ' $a$ ' and ' $b$ ' are respectively equal to

(A) 2 and 3

(B) 3 and 2

(C) 4 and 6

(D) 1 and 2.

**Solution:**

Correct Answer (C)

For the lines $2x+3y+7=0$ and $ax+by+14=0$ to be coincident, their coefficients must be proportional:

$$\frac{2}{a}=\frac{3}{b}=\frac{7}{14}=\frac{1}{2}$$

$$\Rightarrow \frac{2}{a}=\frac{1}{2}$$

$$\Rightarrow a=4$$

$$\Rightarrow \frac{3}{b}=\frac{1}{2}$$

$$\Rightarrow b=6$$

Hence a = 4, b = 6.

Q7. Which of the following is an Arithmetic Progression ?

(A) $1,-1,-2,$

(B) $1,5,9,$

(C) $2,-2,2,-2,$

(D) $1,2,4,8$

**Solution:**

Correct Answer (B)

Arithmetic Progression : It is an arrangement of number where difference between two consecutive terms is same.

So. $5-1=9-5=4$

Q8. The 11th term of the Arithmetic Progression $-3,-1,1,3,$ is

(A) 23

(B) -23

(C) -17

(D) 17

**Solution:**

Correct Answer (B)

Given

$a=-3, \qquad d=-2$

$a_{11}=a+10d=-3+10(-2)=-3-20=-23$

Q9. The sum of the first 10 terms of an Arithmetic Progression is 155 and the sum of the first 9 terms of the same progression is 126 then the 10th term of the progression is

(A) 27
(B) 126
(C) 29
(D) 25

**Solution:**

Correct Answer (C)
Given $S_{10} = 155$ and $S_9 = 126$, the 10th term is:
$a_{10} = S_{10} - S_9 = 155 - 126 = 29$
Final Answer: $a_{10} = 29$.

Q10. If one root of the equation $2x^2 + ax + 6 = 0$ is 2, then the value of ' $a$ ' is

(A) 7
(B) $\frac{7}{2}$
(C) -7
(D) $-\frac{7}{2}$.

**Solution:**

Correct Answer (C)
Given that one root of the quadratic equation $2x^2 + ax + 6 = 0$ is $x = 2$, substitute $x = 2$ into the equation:
$2(2)^2 + a(2) + 6 = 0$
$2(4) + 2a + 6 = 0$
$8 + 2a + 6 = 0$
$2a + 14 = 0$
$2a = -14$
$a = -7$

Q11. The discriminant of the Quadratic equation $px^2 + qx + r = 0$ is

(A) $q^2 - 4pr$
(B) $q^2 + 4pr$
(C) $p^2 - 4pr$
(D) $p^2 + 4qr$.

**Solution:**

Correct Answer (A)
The discriminant of the quadratic equation $px^2 + qx + r = 0$ is given by:
$D = q^2 - 4pr$

Q12. If $4, x, 10$ are in Arithmetic Progression the value of $x$ is

(A) 14
(B) -6
(C) -7
(D) 7

**Solution:**

Correct Answer (D)

Given the terms: 4, $x$, 10, the common difference $d$ is:

$x-4=10-x$

Solving for $x$:

$2x=14$

$x=7$

Q13. The roots of the quadratic equation $ax^2+bx+c=0$ are

(A) $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

(B) $x=\frac{-b\pm\sqrt{b^2+4ac}}{2a}$

(C) $x=\frac{-b-\sqrt{b^2-4c}}{2a}$

(D) $x=\frac{-b+\sqrt{b^2-4ac}}{2a}$

**Solution:**

Correct Answer (A)

The roots of the quadratic equation $ax^2+bx+c=0$ are given by the quadratic formula:

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

where $b^2-4ac$ is the discriminant.

Q14. The roots of the equation $(x-3)(x+2)=0$ are

(A) $-3,2$

(B) $3,-2$

(C) $-3,-2$

(D) $3,2$

**Solution:**

Correct Answer (B)

Given the equation:

$(x-3)(x+2)=0$

Using the zero product property, set each factor to zero:

$x-3=0\Rightarrow x=3$

$x+2=0\Rightarrow x=-2$

Q15. If the sum of two consecutive integers is 27, then the integers are

(A) 7 and 20

(B) 13 and 14

(C) 1 and 26

(D) - 13 and - 14.

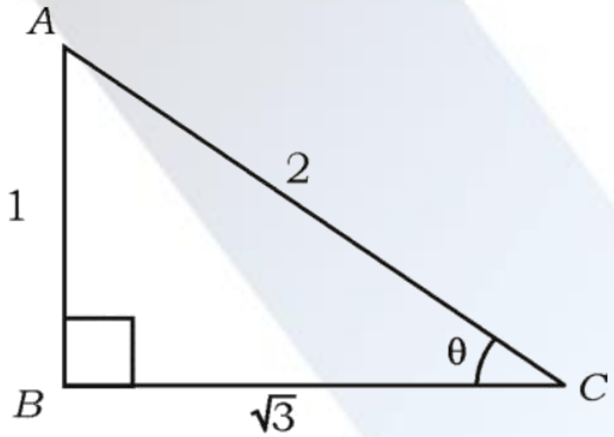
**Solution:**

Correct Answer (B)

Let the two consecutive integers be $x$ and $x+1$.

Given:
$x + (x + 1) = 27$
$2x + 1 = 27$
$2x = 26 \Rightarrow x = 13$
So, the integers are 13 and 14.

Q16. In the figure, the value of sin $\theta$ is.




(A) $\frac{1}{2}$
(B) $\frac{\sqrt{3}}{2}$
(C) $\sqrt{3}$
(D) $\frac{2}{\sqrt{3}}$
**Solution:**
Correct Answer (A)
In right triangle ABC
$\mathbf{sin\theta} = \frac{AB}{AC} = \frac{1}{2}$

Q17. The value of $(\sin\ 30^\circ + \cos\ 60^\circ - \tan\ 45^\circ)$ is
(A) 1
(B) -1
(C) 2
(D) 0
**Solution:**
Correct Answer (D)
We know the standard trigonometric values:
$sin30^\circ = \frac{1}{2}, cos60^\circ = \frac{1}{2}, tan45^\circ = 1$
Substituting in the given expression:
$sin30^\circ + cos60^\circ - tan45^\circ$
$= \frac{1}{2} + \frac{1}{2} - 1 = 0$

Q18. $3+\sec^2\ \theta$ is equal to

(A) $4+\tan^2\ \theta$

(B) $4+\cot^2\ \theta$

(C) $2+\cot^2\ \theta$

(D) $3+\cot^2\ \theta$

**Solution:**

Correct Answer (A)

Given

$3+\sec^2\theta=3+1+\tan^2\theta=4+\tan^2\theta$

Q19. The angle of elevation of the top of a tower from a point on the ground, which is 30 metres away from the foot of the tower, is $30^\circ$. Then the height of the tower is

(A) 10 m

(B) 30 m

(C) $10\sqrt{3}$ m

(D) $30\sqrt{3}$ m

**Solution:**

Correct Answer (C)

Let the height of the tower be $h$ meters.

Given that the distance from the observer to the tower's foot is 30 m and the angle of elevation is $30^\circ$,

we use the tangent formula:

$$\tan 30^\circ=\frac{\text{height of tower}}{\text{distance from the tower}}$$

$$\frac{h}{30}=\frac{1}{\sqrt{3}}$$

$h=\frac{30}{\sqrt{3}}=10\sqrt{3}$ meter

Q20. The value of $(\sin\ \theta\times\operatorname{cosec}\theta)$ is

(A) 2

(B) 1

(C) $-\frac{1}{2}$

(D) $\frac{\sqrt{3}}{2}$

**Solution:**

Correct Answer (B)

We know that cosec is the reciprocal of sin:

$$\operatorname{cosec}\theta=\frac{1}{\sin\theta}$$

Thus,

$$\sin\theta\times\operatorname{cosec}\theta=\sin\theta\times\frac{1}{\sin\theta}=1$$

Q21. The formula to find the mid-point of the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is

(A) $\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$

(B) $\left(\frac{x_2-x_1}{2}, \frac{y_2-y_1}{2}\right)$

(C) $\left(\frac{x_2+y_2}{3}, \frac{x_1+y_1}{3}\right)$

(D) $\left(\frac{x_2+x_1}{3}, \frac{y_2+y_1}{3}\right)$

**Solution:**

Correct Answer (B)

The mid-point of the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$$

Q22. The distance between the points $(x_1, y_1)$ and $(x_2, y_2)$ is

(A) $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

(B) $\sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$

(C) $\sqrt{(x_1 + x_2)^2 - (y_1 + y_2)^2}$

(D) $\sqrt{(x_2 + x_1)^2 + (y_2 + y_1)^2}$.

**Solution:**

Correct Answer (B)

The distance between two points $(x_1, y_1)$and $(x_2, y_2)$ is given by the distance formula

$$\sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$$

Q23. The value among the observations of most repeated scores of the data is

(A) the mean

(B) the mode

(C) the median

(D) the range.

**Solution:**

Correct Answer (B)

The value that appears most frequently in a given data set is called the mode.

Q24. The Mean of the following scores is

| Marks | 1 | 3 | 5 | 7 |
|---|---|---|---|---|

(A) 16

(B) 5

(C) 1.6

(D) 4

**Solution:**

Correct Answer (D)

$\text{Mean} = \frac{\text{Sum of all observation}}{\text{Number of observation}}$

$= \frac{1+3+5+7}{4}$

$= \frac{16}{4}$

$= 4$

Q25. The relation among the Mean, Mode and Median is

(A) 3 Median = 2 Mean + Mode

(B) 3 Mean = 2 Median + Mode

(C) Mean = 3 Median + Mode

(D) Mode = 3 Mean +2 Median.

**Solution:**

Correct Answer (A)

The relationship among Mean, Mode, and Median is given by the empirical formula:

3 Median = 2 Mean + Mode

Q26. A cylinder made of wax is melted and recast completely into a sphere. Then the volume of the sphere is

(A) two times the volume of the cylinder

(B) half the volume of the cylinder

(C) 3 times the volume of the cylinder

(D) equal to the volume of the cylinder

**Solution**

Correct Answer (D)

Since the cylinder is completely melted and recast into a sphere, their volumes remain equal.

The volume of the cylinder is: $V = \pi r^2 h$.

The volume of the sphere is: $V = \frac{4}{3}\pi R^3$.

Equating both, the volume of the sphere is $\pi r^2 h$.

Q27. The formula to find the mid-point of the class interval is

(A) $\frac{\text{Upperlimit - lowerlimit}}{2}$

(B) $\frac{\text{Upperlimit} \times \text{lowerlimit}}{3}$

(C) $\frac{\text{Upperlimit} + \text{lowerlimit}}{2}$

(D) $\frac{\text{Upper limit} + \text{lowerlimit}}{3}$

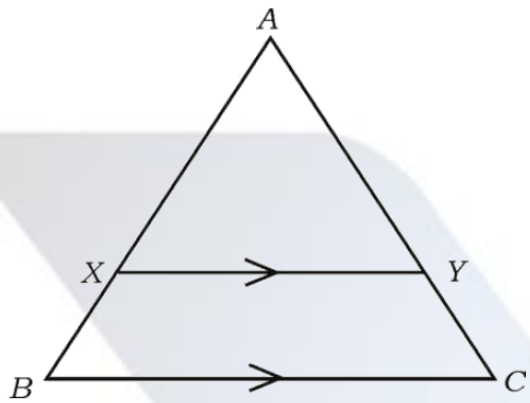
**Solution:**

Correct Answer (C)

The midpoint (or class mark) of a class interval is given by the formula:

$\frac{\text{Upperlimit} + \text{lowerlimit}}{2}$

Q28. In the $\triangle ABC, XY \| BC$ then




(A) $\frac{AX}{AB} = \frac{AC}{AY}$
(B) $\frac{AX}{BX} = \frac{AY}{CY}$
(C) $\frac{AX}{BX} = \frac{XY}{AY}$
(D) $\frac{AB}{BX} = \frac{AC}{AY}$

**Solution:**

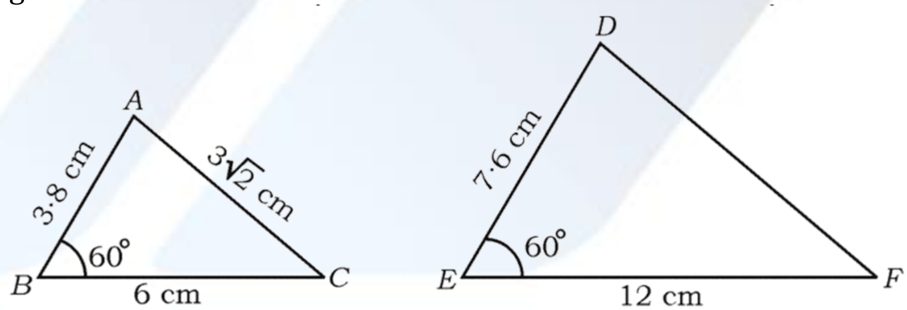
Correct Answer (B)

If a line is drawn parallel to one side of a triangle, intersecting the other two sides, then it divides those two sides proportionally

So,

$$\frac{AX}{BX} = \frac{AY}{CY}$$

Q29. Observe the given two triangles and then identify the length of $DF$ in the following:




(A) $6\sqrt{2}$ cm
(B) $3\sqrt{2}$ cm
(C) 4.2 cm
(D) 8.4 cm

**Solution:**

Correct Answer (A)

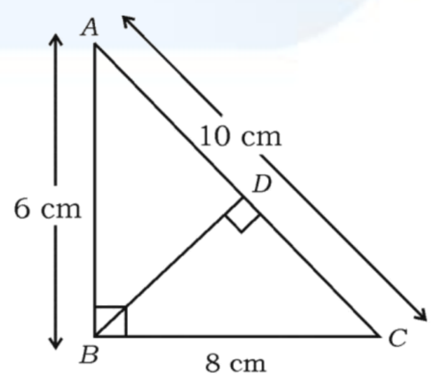
Given

In $\triangle ABC$ and $\triangle DEF$

$\frac{AB}{DE} = \frac{3.8}{7.6} = \frac{1}{2}$
$\angle ABC = \angle DEF = 60°$
$\frac{BC}{EF} = \frac{6}{12} = \frac{1}{2}$
So, by SAS criteria of similarity
$\triangle ABC \cong \triangle DEF$
$\therefore \frac{AC}{DF} = \frac{1}{2}$
$\Rightarrow \frac{3\sqrt{2}}{DF} = \frac{1}{2}$
$\Rightarrow DF = 6\sqrt{2}$

Q30. $\triangle ABC \sim \triangle PQR$. Area of $\triangle ABC = 64 \text{ cm}^2$ and the area of $\triangle PQR = 100 \text{ cm}^2$. If $AB = 8$ cm then the length of $PQ$ is
(A) 12 cm
(B) 15 cm
(C) 10 cm
(D) 8 cm
**Solution:**
Correct Answer (C)
Given that $\triangle ABC \sim \triangle PQR$, the ratio of their areas is equal to the square of the ratio of their corresponding sides:
$\frac{Area\ of\ \triangle ABC}{Area\ of\ \triangle PQR} = \left(\frac{AB}{PQ}\right)^2$
Substituting the given values:
$\frac{64}{100} = \left(\frac{8}{PQ}\right)^2$
$\frac{8}{10} = \frac{8}{PQ}$
$PQ = 10$ cm

Q31. In the $\triangle ABC, \angle B = 90°$ and $BD \perp AC$. If $AB = 6$ cm, $BC = 8$ cm then the length of $CD$ is



(A) 10 cm
(B) 6.4 cm
(C) 4.8 cm
(D) 3.6 cm

**Solution:**

Correct Answer (B)

In △ABC,

Given $\angle B = 90^\circ$ and $BD \perp AC$, we first find AC using the Pythagoras theorem:

$AC = \sqrt{AB^2 + BC^2} = \sqrt{6^2 + 8^2} = \sqrt{36 + 64} = \sqrt{100} = 10$ cm

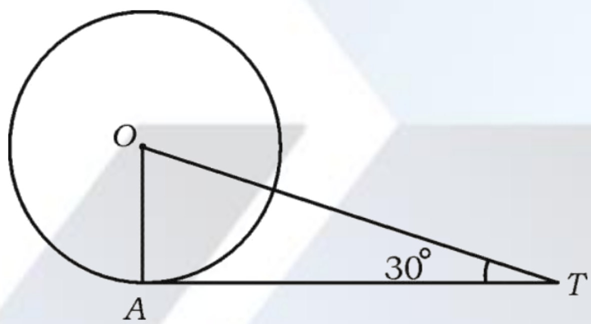
Using the formula for segment division in a right triangle:

$CD = AC - AD$

Since $AD = \frac{AB^2}{AC} = \frac{6^2}{10} = \frac{36}{10} = 3.6$ cm

$CD = 10 - 3.6 = 6.4$ cm

Q32. In the given figure $AT$ is a tangent drawn at the point $A$ to the circle with centre $O$ such that $OT = 4$ cm. If $\angle OTA = 30^\circ$ then $AT$ is.




(A) 4 cm
(B) 2 cm
(C) $2\sqrt{3}$ cm
(D) $4\sqrt{3}$ cm

**Solution:**

Correct Answer (D)

In the given figure, OT is the radius, and AT is the tangent at point A. Since the radius is perpendicular to the tangent at the point of contact, $\triangle OTA$ is a right-angled triangle at $A$.

Using the trigonometric ratio for $\tan\theta$ :

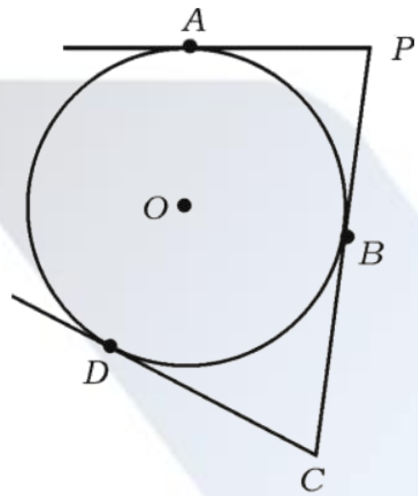
$\tan 30^\circ = \frac{OA}{AT}$

Substituting values:

$\frac{4}{\text{AT}} = \frac{1}{\sqrt{3}}$

$AT = 4\sqrt{3}$ cm

Q33. In the given figure $PA, \overline{PBC}$ and $CD$ are the tangents to a circle with centre $O$. If $PC = 8$ cm and $AP = 5$ cm, the length of the tangent $CD$ is.




(A) 5 cm
(B) 3 cm
(C) 8 cm
(D) 13 cm

**Solution:**

Correct Answer (B)

In the given figure, PA, PBC, and CD are tangents to the circle. By the tangent segment theorem, the lengths of tangents drawn from an external point to a circle are equal.

Thus, we have:

$PA = PB = 5$ cm, $PC = 8$ cm

$BC = PC - PB = 8 - 5 = 3$ cm

Since CD = BC, we get:

$CD = 3$ cm

Q34. The wrong statement in the following is

(A) a tangent to a circle touches the circle exactly at one point
(B) when a straight line is drawn to a circle it always passes through a point on the circle
(C) the point common to the circle and its tangent is called the point of contact
(D) the tangent drawn at any point to a circle is perpendicular to the radius drawn at the point of contact

**Solution:**

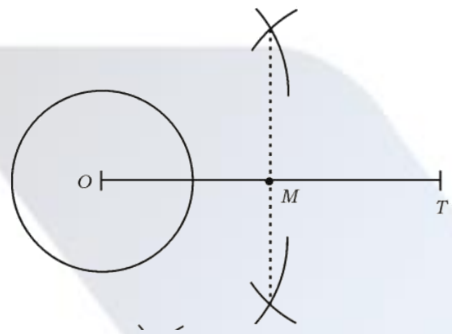
Correct Answer (B)

The wrong statement in the given options is:

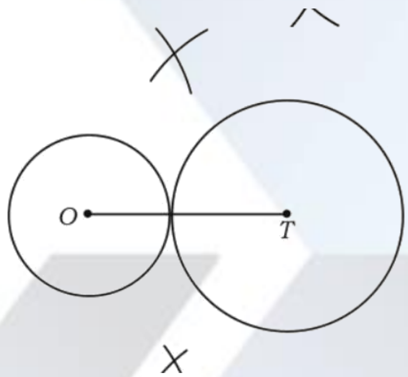
When a straight line is drawn to a circle, it always passes through a point on the circle

Q35. Which is the next step of construction while constructing a pair of tangents to a circle from an external point ' $T$ ', given in the figure.

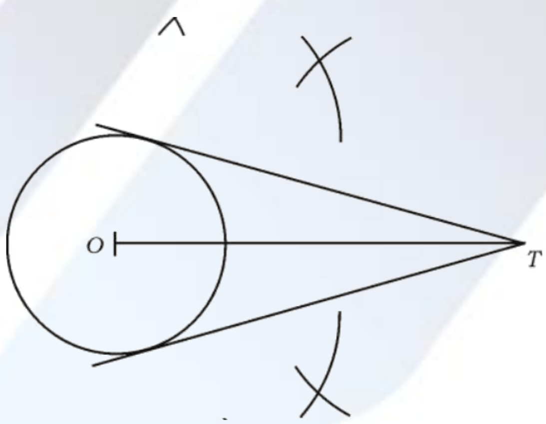
(A)



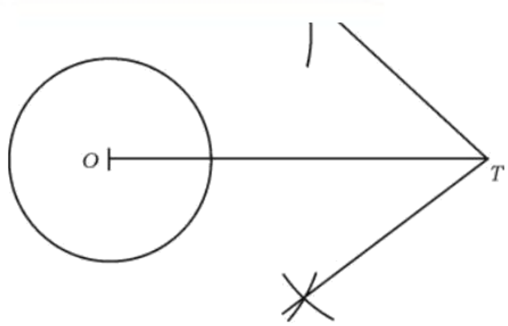

(B)



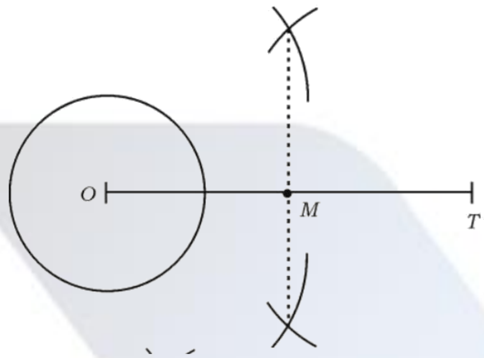

(C)




(D)



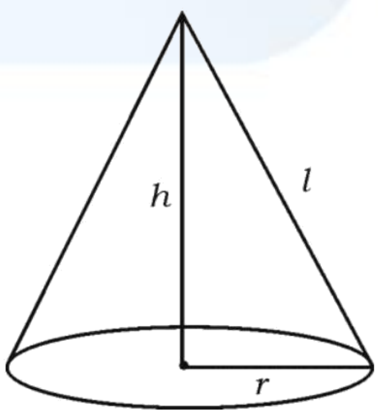
**Solution:**
Correct Answer (A)




Q36. The surface area of a sphere is 616 $\text{cm}^2$ . Then the radius of the same sphere is
(A) 49 cm
(B) 14 cm
(C) 21 cm
(D) 7 cm.

**Solution:**
Correct Answer (D)
The surface area of a sphere is given by the formula:
$A = 4\pi r^2$
Given that the surface area is 616 $\text{cm}^2$, we substitute:
$4\pi r^2 = 616$
Taking $\pi = \frac{22}{7}$
$4 \times \frac{22}{7} \times r^2 = 616$
$\Rightarrow r^2 = \frac{616 \times 7}{4 \times 22}$
$\Rightarrow r^2 = 49$
$\Rightarrow r = 7$ cm

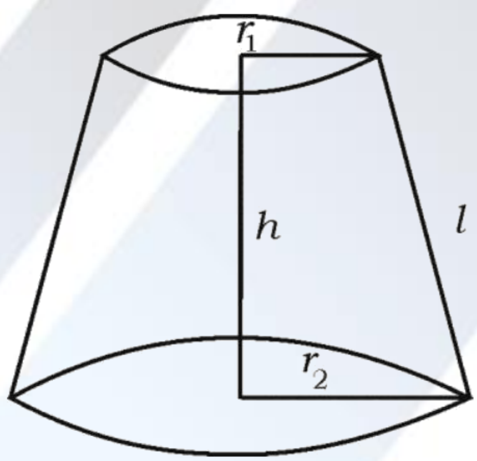
Q37. The volume of a cone as shown in the figure is



(A) $\pi r^2 h$
(B) $\pi r(r+l)$
(C) $\frac{1}{3}\pi r^2 h$
(D) $\pi r l$
**Solution:**
Correct Answer (C)
Volume of a cone $=\frac{1}{3}\pi r^2 h$

Q38. The formula to find the total surface area of a right circular based cylindrical vessel of base radius $r$ cm and height $h$ cm opened at one end is.
(A) $(\pi r^2+2\pi r h)\text{cm}^2$
(B) $2\pi r h\ \text{cm}^2$
(C) $\frac{1}{3}\pi r^2 h\ \text{cm}^3$
(D) $(\pi r^2+h)\text{cm}^2$
**Solution:**
Correct Answer (A)
The total surface area of a right circular cylinder that is open at one end includes $(\pi r^2+2\pi r h)\text{cm}^2$

Q39. To find the curved surface area of a frustum of a cone as shown in the figure the formula used is




(A) $\frac{1}{3}\pi l(r_1+r_2)$
(B) $\frac{1}{3}\pi h(r_1^2+r_2^2+r_1 r_2)$
(C) $\pi l(r_1+r_2)$
(D) $\pi l(r_1-r_2)$
**Solutions:**
Correct Answer (C)
The curved surface area of frustum of a cone is
$\pi l(r_1+r_2)$

Q40. The total surface area of solid hemisphere is 462 $cm^2$. If the curved surface area of it is 308 $cm^2$, then the area of the base of the hemisphere is

(A) 308 $cm^2$

(B) 231 $cm^2$

(C) 154 $cm^2$

(D) 1078 $cm^2$

**Solution:**

Correct Answer (C)

The total surface area (TSA) of a solid hemisphere is given by:

TSA = Curved Surface Area (CSA) + Base Area

Given TSA $=$ 462 $cm^2$ and CSA $=$ 308 $cm^2$, the Base Area is:

Base Area$= 462 - 308 = 154\ cm^2$