# Grade 10 Karnataka Math 2022
# QUESTION PAPER CODE 81-E

**General Instructions to the Candidates:**

1. This question paper consists of 38 questions in all.
2. This question paper has been sealed by reverse Jacket You have to cut on the right side to open the paper at the time of commencement of the examination (Follow the arrow). Do not cut the left side to open the paper. Check whether all the pages of the question paper are intact.
3. Follow the instructions given against the questions
4. Figures in the right hand margin indicate maximum marks for the questions
5. The maximum time to answer the paper is given at the top of the question paper It include 15 minutes for reading the question paper.
6. Ensure that the Version of the question paper distributed to you and the Version printed on your admission ticket is the same

**I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. $\mathbf{8 \times 1 = 8}$**

Q1. The graphical representation of the pair of lines $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ is

(A) Intersecting Lines
(B) Parallel Lines
(C) Coincident Lines
(D) Perpendicular Lines.

**Solution:**

Correct Answer: (B)
The pair of lines $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ are parallel because their coefficients are proportional.

Q2. The common difference of the Arithmetic progression $8, 5, 2, -1, \ldots$ is

(A) -3
(B) -2
(C) 3
(D) 8 .

**Solution:**

Correct answer: (A)
The common difference $d = 5 - 8 = -3$.

Q3. The standard form of $2x^2 = x - 7$ is

(A) $2x^2 - x = -7$
(B) $2x^2 + x - 7 = 0$
(C) $2x^2 - x + 7 = 0$
(D) $2x^2 + x + 7 = 0$.

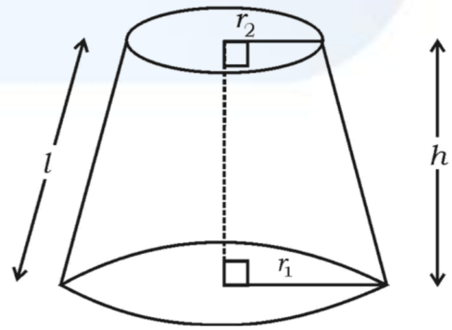
**Solution:**
Correct answer: (C)
The standard form is $2x^2 - x + 7 = 0$

Q4. The value of $\cos(90^\circ - 30^\circ)$ is
(A) -1
(B) $\frac{1}{2}$
(C) 0
(D) 1 .
**Solution:**
Correct answer: (B)
$\cos(90^\circ-30^\circ)=\cos(60^\circ)=\frac{1}{2}$.

Q5. The distance of the point $P(x, y)$ from the origin is
(A) $\sqrt{x^2 + y^2}$
(B) $x^2 + y^2$
(C) $x^2 - y^2$
(D) $\sqrt{x^2 - y^2}$
**Solution:**
Correct answer: (A)
The distance of point $P(x, y)$ from the origin is $\sqrt{x^2 + y^2}$.

Q6. In a circle, the angle between the tangent and the radius at the point of contact is
(A) $30^\circ$
(B) $60^\circ$
(C) $90^\circ$
(D) $180^\circ$.
**Solution:**
Correct answer: (C)
The angle between the tangent and the radius at the point of contact is $90^\circ$.

Q7. In the given figure, the volume of the frustum of a cone is




(A) $\pi(r_1 + r_2)l$
(B) $\pi(r_1 - r_2)l$

(C) $\frac{1}{3}\pi h(r_1^2 - r_2^2 - r_1 r_2)$
(D) $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$
**Solution:**
Correct answer: (D)
Volume of frustum = $\frac{1}{3}\pi({r_1}^2 + {r_2}^2 + r_1 \cdot r_2)h$

Q8. Surface area of a sphere of radius ' $r$ ' unit is
(A) $\boldsymbol{\pi r^2}$ sq.units
(B) $\boldsymbol{2\pi r^2}$ sq.units
(C) $\boldsymbol{3\pi r^2}$ sq.units
(D) $\boldsymbol{4\pi r^2}$ sq.units
**Solution:**
Correct answer: (D)
The surface area of a sphere is $4\pi r^2$ sq.units

**II. Answer the following questions** $\mathbf{8 \times 1 = 8}$

Q9. If the pair of linear equations in two variables are inconsistent, then how many solutions do they have ?
**Solution:**
Inconsistent equations have no solution.

Q10. In an Arithmetic progression if ' $a$ ' is the first term and ' $d$ ' is the common difference, then write its $n^{\text{th}}$ term.
**Solution:**
The $n^{\text{th}}$ term of an Arithmetic progression is $a_n = a + (n-1)d$.

Q11. Write the standard form of quadratic equation.
**Solution:**
The standard form of a quadratic equation is $ax^2 + bx + c = 0$..

Q12. Write the value of $\frac{\sin 18^\circ}{\cos 72^\circ}$.
**Solution:**
$\frac{\sin 18^\circ}{\cos 72^\circ}$ =1 because sin(90°−θ)=cosθ.

Q13. Write the distance of the point (4,3) from $x$-axis.
**Solution:**
The distance of the point (4,3) from the $x$-axis is 3 units.

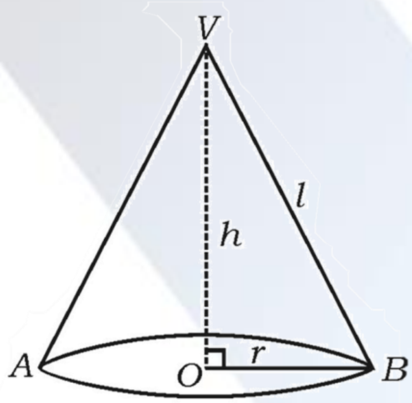
Q14. Find the median of the scores 6,4,2,10 and 7.
**Solution:**
The median of the scores 6, 4, 2, 10, and 7 is 6.

Q15. Write the statement of "Basic Proportionality" theorem (Thales theorem ).

**Solution:**

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

Q16. In the given figure, write the formula used to find the curved surface area of the cone.




**Solution:**

The curved surface area of a cone is $\boldsymbol{\pi r l}$.

**III. Answer the following questions** **$8 \times 2 = 16$**

Q17. Solve the given pair of linear equations by Elimination method:

$2x + y = 8$

$x - y = 1$

**Solution:**

Given equations:

$\boldsymbol{x + 2y = 6}$

$\boldsymbol{x + y = 5}$

Subtract the second equation from the first:

$\boldsymbol{y = 1}$

Substitute $\boldsymbol{y = 1}$ into the second equation:

$\boldsymbol{x = 4}$

Solution: $\boldsymbol{x = 4}$.

Q18. Find the 30th term of the arithmetic progression 5,8,11, .... by using formula

**Solution:**

Given AP: 5, 8, 11, ...

First term $a = 5$, common difference $d = 3$

$a_{30} = a + (30 - 1)d = 5 + 29 \times 3 = 92$

Q19. Find the sum of first 20 terms of the Arithmetic progression $10, 15, 20 \ldots$ by using formula.

**Solution:**

Given,

$\mathbf{10, 15, 20, \ldots}$

Here,

First term = $a$ = 10

Common difference $= \boldsymbol{d = 15 - 10 = 5}$

Sum of first $\boldsymbol{n}$ terms is

$\boldsymbol{S_n = \frac{n}{2}[2a + (n-1)d]}$

$\boldsymbol{S_{20} = \frac{20}{2} \times [2(10) + (20-1)\ 5]}$

$\boldsymbol{= 10 \times [20 + 19(5)]}$

$\boldsymbol{= 10 \times [20 + 95]}$

$\boldsymbol{= 10 \times\ 115}$

$\boldsymbol{= 1150}$

Hence, the sum of the first twenty terms of the given arithmetic series is 780.

Or

Find the sum of first 20 positive integers using formula.

**Solution:**

Given,

$\mathbf{1, 2, 3, \ldots}$

Here

First term = $a$ = 1

Common difference $= \boldsymbol{d = 2 - 1 = 1}$

Sum of first $\boldsymbol{n}$ terms is

$\boldsymbol{S_n = \frac{n}{2}[2a + (n-1)d]}$

$\boldsymbol{S_{20} = \frac{20}{2} \times [2(1) + (20-1)\ 1]}$

$\boldsymbol{= 10 \times [2 + 19(1)]}$

$\boldsymbol{= 10 \times [2 + 19]}$

$\boldsymbol{= 10 \times\ 21}$

$\boldsymbol{= 210}$

Hence, the sum of the first twenty positive integers is 210.

Q20. Find the roots of $x^2 + 5x + 2 = 0$ by using quadratic formula

**Solution:**

Given quadratic equation is $\boldsymbol{x^2 + 5x + 2 = 0}$

Comparing with the standard form $\boldsymbol{ax^2 + bx + c = 0}$,

$\boldsymbol{a = 1, b = 5}$ and $\boldsymbol{c = 2}$

Discriminant $= \mathbf{D}$

$\boldsymbol{= b^2 - 4ac}$

$\boldsymbol{= (5)^2 - 4(1)(2)}$

$\boldsymbol{= 25 - 8}$

$\boldsymbol{= 17}$

Using quadratic formula,

$$\boldsymbol{x}=\frac{\left(-\boldsymbol{b}\pm\sqrt{\boldsymbol{D}}\right)}{\mathbf{2}\boldsymbol{a}}$$

$$=\frac{\left(-(\mathbf{5})\pm\sqrt{\mathbf{17}}\right)}{\mathbf{2}(\mathbf{1})}$$

$$=\frac{-\mathbf{5}\pm\sqrt{\mathbf{17}}}{\mathbf{2}}$$

$$\boldsymbol{x}=\frac{-\mathbf{5}+\sqrt{\mathbf{17}}}{\mathbf{2}},\qquad \boldsymbol{x}=\frac{-\mathbf{5}-\sqrt{\mathbf{17}}}{\mathbf{2}}$$

Q21. Find the value of the discriminant and hence write the nature of roots of the quadratic equation $x^2+4x+4=0$.

**Solution:**

Given quadratic equation is $x^2+4x+4=0$

Comparing with the standard form $ax^2+bx+c=0$,

$a=1, b=4$ and $c=4$

Discriminant $=$ D

$=b^2-4ac$

$=(4)^2-4(1)(4)$

$=16-16$

$=0$

Q22. Find the distance between the points $A(2,6)$ and $B(5,10)$ by using distance formula.

**Solution:**

In this given graph,

$P(2,6)$ and $Q(5,10)$

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

$PQ=\sqrt{(5-2)^2+(10-6)^2}$

$PQ=\sqrt{3^2+4^2}$

$PQ=\sqrt{9+16}$

$PQ=\sqrt{25}$

$PQ=5$ units

Or

Find the coordinates of the mid-point of the line segment joining the points $P(3,4)$ and $Q(5,6)$ by using 'mid-point' formula.

**Solution:**

Given

$P(3,4)$ , $Q(5,6)$

Using mid-point formula

$$\text{Mid}-\text{point}=\left(\frac{x_2+x_1}{2},\frac{y_2+y_1}{2}\right)$$

Where

$x_1 = 4, \quad y_1 = -3, \quad x_2 = 8, \quad y_2 = 5$

$x = \frac{3+5}{2}, y = \frac{4+6}{2}$

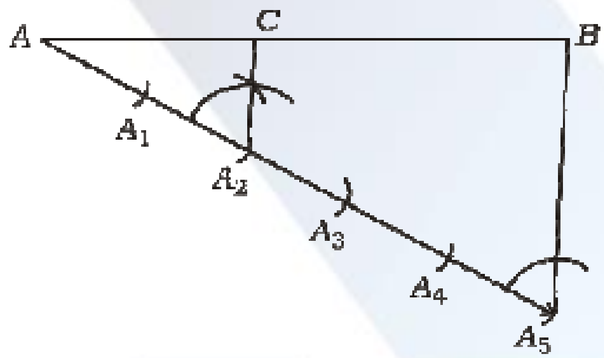
$x = \frac{8}{2}, y = \frac{10}{2}$

$x = 4, y = 5$

The co-ordinates of the required point $P(x, y)$ is $(4, 5)$

Q23. Draw a line segment of length 10 cm and divide it in the ratio $2:3$ by geometric construction.

**Solution:**




Drawing line segment ( 10 cm )

Constructing acute angle at $A$

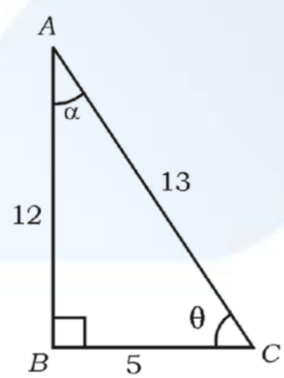
Marking 5 arcs

Constructing $A_2C \| A_5B$

Q24. In the given figure find the values of

(i) $\sin\theta$

(ii) $\tan\alpha$




**Solution:**

(i) $\sin\theta = \frac{AB}{AC} = \frac{12}{13}$

(ii) $\tan\alpha = \frac{BC}{AB} = \frac{5}{12}$

**IV. Answer the following questions** $\mathbf{9 \times 3 = 27}$

Q25. The sum of first 9 terms of an Arithmetic progression is 144 and its 9th term is 28. Then find the first term and common difference of the Arithmetic progression.

**Solution:**

$S_n = \frac{n}{2}[a + l]$

$S_9 = \frac{9}{2}[a + 28]$

$144 = \frac{9}{2}[a + 28]$

$\frac{144 \times 2}{9} = a + 28$

$32 = a + 28$

$a = 32 - 28$

$a = 4$

$a_n = a + (n - 1)\text{d}$

$a_9 = 4 + (9 - 1)\text{d}$

$28 = 4 + 8\text{ d}$

$24 = 8d$

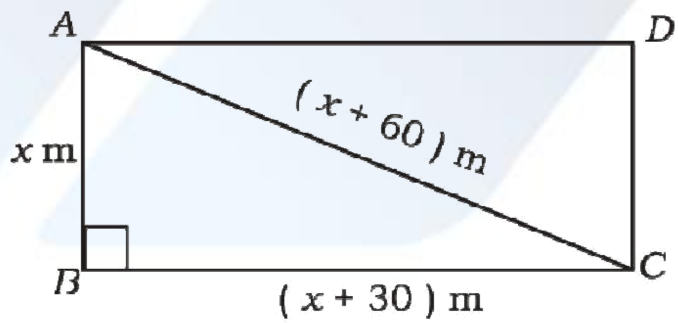
$d = \frac{24}{8}$

$d = 3$

Or

Q26. The diagonal of a rectangular field is 60 m more than its shorter side. If the longer side is 30 m more than the shorter side, then find the sides of the field.

**Solution:**




$ABCD \rightarrow$ rectangular field

Let $AB = x$ m then $BC = (x + 30)$m, $AC = (x + 60)$m

$AC^2 = AB^2 + BC^2$

$(x + 60)^2 = x^2 + (x + 30)^2$

$x^2 + 60^2 + 2 \times x \times 60 = x^2 + x^2 + 30^2 + 2 \times x \times 30$

$3600 + 120x = x^2 + 900 + 60x$

$x^2 + 900 + 60x - 3600 - 120x = 0$

$x^2 - 60x - 2700 = 0$
$x^2 - 90x + 30x - 2700 = 0$
$x(x - 90) + 30(x - 90) = 0$
$(x - 90)(x + 30) = 0$
$x - 90 = 0$ or $x + 30 = 0$
$x = 90$ or $x = -30$ (not considered)
$\therefore\ x = 90$
$AB = x = 90$ m
$BC = (x + 30) = 90 + 30 = 120$ m

Or

In a right angled triangle, the length of the hypotenuse is 13 cm . Among the remaining two sides, the length of one side is 7 cm more than the other side. Find the sides of the triangle.

**Solution:**

Let $ABC$ be a right angled triangle.
Let $AC = 13$ cm, $AB = x$ cm and $BC = (x + 7)$cm
$AC^2 = AB^2 + BC^2$
$13^2 = x^2 + (x + 7)^2$
$\Rightarrow 169 = x^2 + x^2 + 49 + 14x$
$\Rightarrow 169 = 2x^2 + 49 + 14x$
$\Rightarrow 2x^2 + 49 + 14x - 169 = 0$
$\Rightarrow 2x^2 + 14x - 120 = 0$
$x^2 + 7x - 60 = 0 (\div 2)$
$\Rightarrow x^2 + 12x - 5x - 60 = 0$
$\Rightarrow x(x + 12) - 5(x + 12) = 0$
$\Rightarrow (x + 12)(x - 5) = 0$
$x + 12 = 0$ or $x - 5 = 0$
$x = -12$ or $x = 5$
$AB = x = 5$ cm
$BC = (x + 7) = 5 + 7 = 12$ cm

Q27. Prove that

$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

**Solution:**

LHS

$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= \sin^2 A + \operatorname{cosec}^2 A + 2\sin A \cdot \operatorname{cosec} A + \cos^2 A + \sec^2 A + 2\cos A \cdot \sec A$

$= \sin^2 A + \cos^2 A + \operatorname{cosec}^2 A + 2\sin A \cdot \frac{1}{\sin A} + \sec^2 A + 2cosA.\frac{1}{\cos A}$

$= 1 + (1 + \cot^2 A) + 2 + (1 + \tan^2 A) + 2$

$= 7 + \tan^2 A + \cot^2 A$

LHS = RHS

Or

Prove that $\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)=1$.

**Solution:**

LHS

$$=\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)$$
$$=\frac{1}{\cos\theta}(1-\sin\theta)\left(\frac{1}{\cos\theta}+\frac{\sin\theta}{\cos\theta}\right)$$
$$=\frac{(1-\sin\theta)}{\cos\theta}\times\frac{(1+\sin\theta)}{\cos\theta}$$
$$=\frac{1-\sin^2\theta}{\cos^2\theta}$$
$$=\frac{\cos^2\theta}{\cos^2\theta}\ [\because 1-\sin^2\theta=\cos^2\theta]$$
$$=1$$

Q28. Find the coordinates of the point on the line segment joining the points $A(-1,7)$ and $B(4,-3)$ which divides $AB$ internally in the ratio 2:3.

**Solution:**

Given

$A(-1,7),\ \ B(4,-3)$

Using section formula

$$P(x,y)=\left(\frac{m_1x_2+m_2x_1}{m_1+m_2},\frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$$

Where

$x_1=-1,\quad y_1=7,\quad x_2=4,\quad y_2=-3, m_1=2, m_2=3$

$$=\left(\frac{2(4)+3(-1)}{2+3},\frac{2(-3)+3(7)}{2+3}\right)$$
$$=\left(\frac{8-3}{5},\frac{-6+21}{5}\right)$$
$$=\left(\frac{5}{5},\frac{15}{5}\right)$$
$$=(1,3)$$

Or

Find the area of triangle $PQR$ with vertices $P(0,4), Q(3,0)$ and $R(3,5)$.

**Solution:**

Given

$P(0,4),\ \ Q(3,0),\ \ R(3,5)$.

Area of triangle $=\frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]$

Where

$x_1=0,\quad y_1=4,\quad x_2=3,\quad y_2=0,\quad x_3=3,\quad y_3=5,$

$= \frac{1}{2}[0(0-5)+3(5-4)+3(4-0)]$

$= \frac{1}{2}[0(-5)+3(1)+3(4)]$

$= \frac{1}{2}[0+3+12]$

$= \frac{1}{2} \times 15$

$= \frac{15}{2}$ or 7.5 sq. units

Q29. Find the mean for the following grouped data by Direct method:

| Class-interval | Frequency |
|---|---|
| $10-20$ | 2 |
| $20-30$ | 3 |
| $30-40$ | 5 |
| $40-50$ | 7 |
| $50-60$ | 3 |

**Solution:**

| C-I | $f_i$ | $x_i$ | $f_i x_i$ |
|---|---|---|---|
| 10-20 | 2 | 15 | 30 |
| 20-30 | 3 | 25 | 75 |
| 30-40 | 5 | 35 | 175 |
| 40-50 | 7 | 45 | 315 |
| 50-60 | 3 | 55 | 165 |
| | $N = 20$ | | $\sum f_i x_i = 760$ |

Mean, $\bar{x} = \frac{\sum f_i x_i}{N}$

$= \frac{760}{20}$

$\bar{x} = 38$

Or

Find the mode for the following grouped data

| Class-interval | Frequency |
|---|---|
| $5-15$ | 3 |
| $15-25$ | 4 |
| $25-35$ | 8 |
| $35-45$ | 7 |
| $45-55$ | 3 |

**Solution:**

In the given frequency distribution

$f_0=4, f_1=8, f_2=7, h=5, l=25$

$$\text{Mode}=l+\left[\frac{f_1-f_0}{2f_1-f_0-f_2}\right]\times h$$

$$=25+\left[\frac{8-4}{2\times 8-4-7}\right]\times 5$$

$$=25+\left[\frac{4}{16-11}\right]\times 5$$

$$=25+\left[\frac{4}{5}\times 5\right]$$

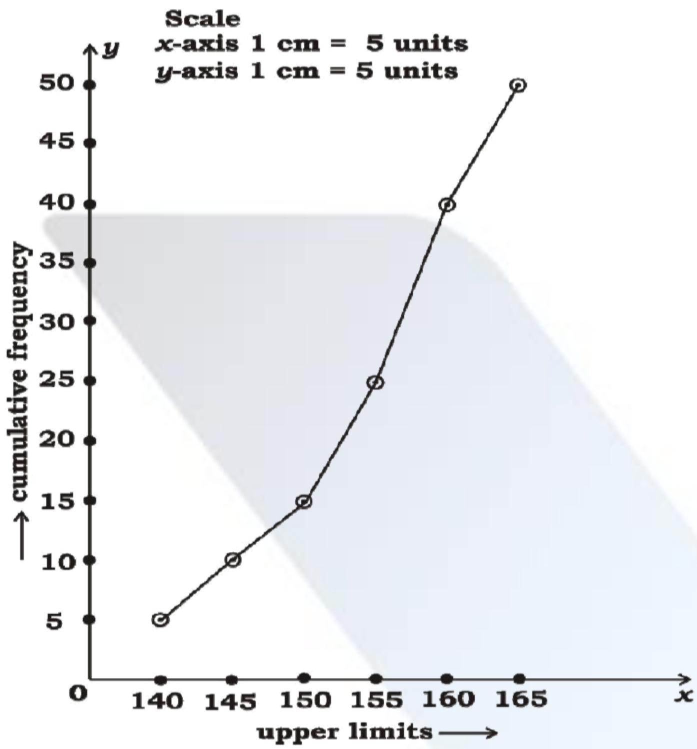
$$=25+4$$

$$=29$$

Q30. During a medical check-up of 50 students of a class, their heights were recorded as follows. Draw "less than type" ogive for the given data.

| *Height in cm* | *Number of students (Cumulative frequency)* |
|---|---|
| Less than 140 | 5 |
| Less than 145 | 10 |
| Less than 150 | 15 |
| Less than 155 | 25 |
| Less than 160 | 40 |
| Less than 165 | 50 |

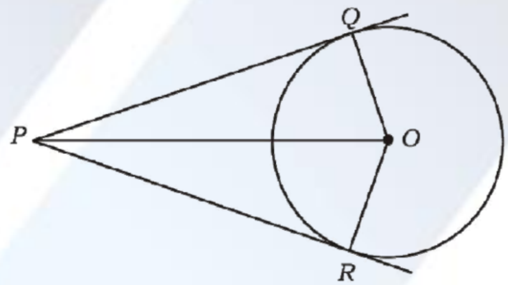
**Solution:**




Drawing axes and writing scale
Marking points
Drawing Ogives

Q31. Prove that "the lengths of tangents drawn from an external point to a circle are equal".

**Solution:**




Data: O is the centre of the circle. PQ and PR are tangents drawn from external point ‘P.

To prove: PQ=PR

Construction: Join OP, OQ and OR.

Proof In the figure

$\angle OQP = \angle ORP = 90^\circ$ $\begin{bmatrix} OQ \perp PQ \\ OR \perp PR \end{bmatrix}$

OQ=OR [radii of same circle]

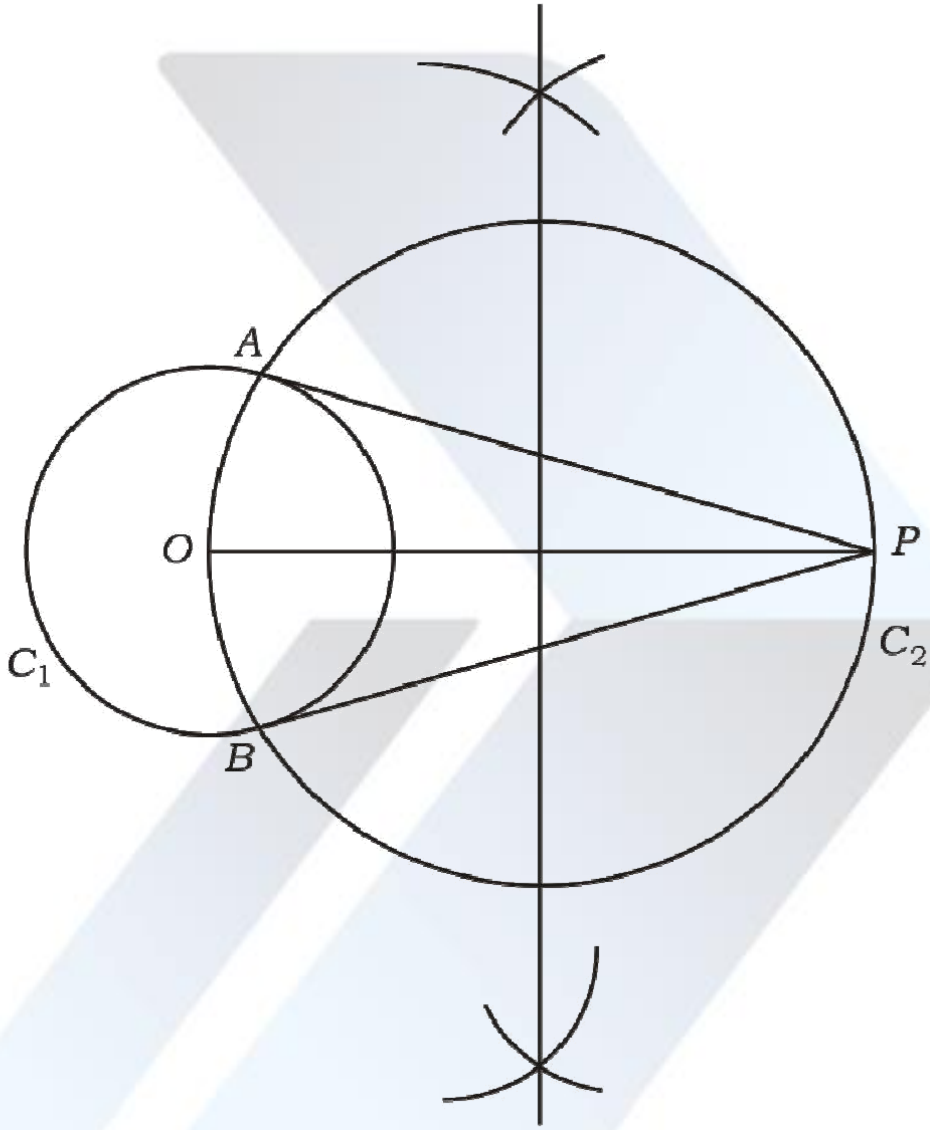
OP=OP [common side]

$\triangle$ OQP $\cong$ $\triangle$ ORP

PQ=PR [CPCT]

Q32. Construct two tangents to a circle of radius 3 cm from a point 8 cm away from its centre.

**Solution:**




Drawing a circle $C_1$ of radius 3 cm
Drawing $OP = 8$ cm
Constructing perpendicular bisector of $OP$ 1
Drawing $C_2$ circle
Joining PA and PB

Q33. The volume of a solid right circular cylinder is $2156 \text{ cm}^3$. If the height of the cylinder is 14 cm , then find its curved surface area. [ Take $\pi = \frac{22}{7}$ ]

**Solution:**

Given
Volume of cylinder = 2156 $cm^3$
Height$(h)$ = 14 cm
Radius $(r)$ = ?
CSA = ?
Volume of cylinder $= \pi r^2 h$
$2156 = \frac{22}{7} \times r^2 \times 14$
$2156 = 44r^2$
$r^2 = \frac{2156}{44}$
$r^2 = 49$
$r = \sqrt{49}$
$r = 7$ cm
Curved surface area of cylinder $= 2\pi rh$
$= 2 \times \frac{22}{7} \times 7 \times 14$
$= 2 \times 22 \times 7$
$= 616$ $cm^2$

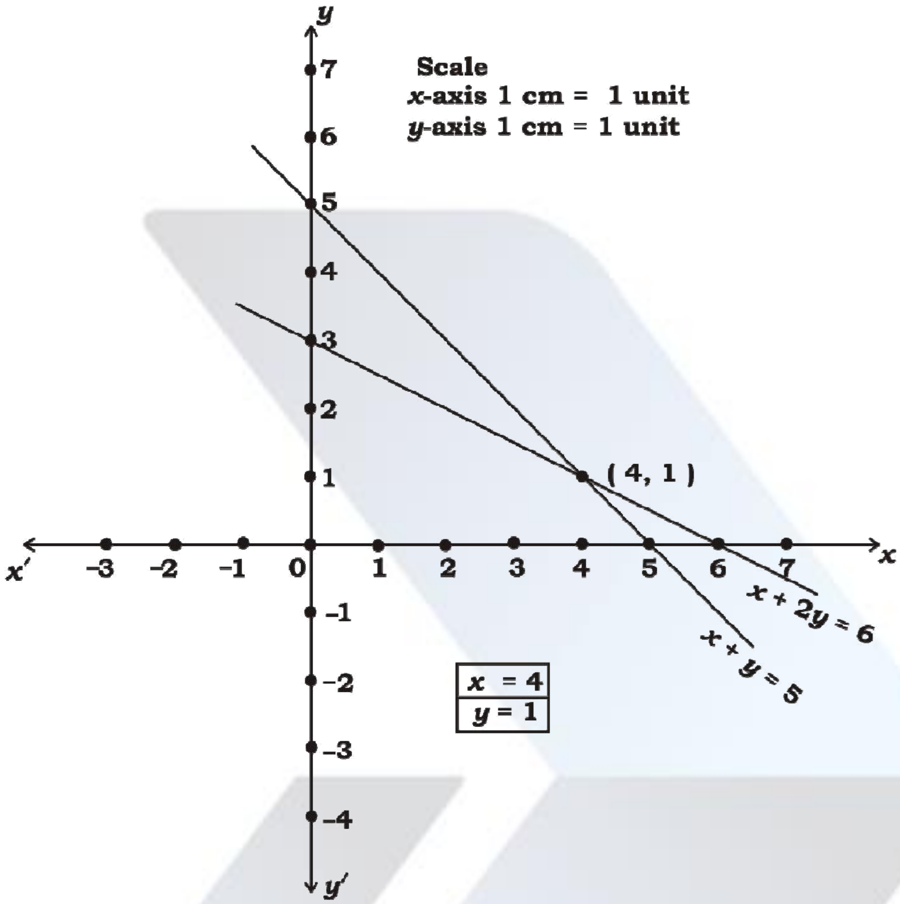
**V. Answer the following questions** $\mathbf{4 \times 4 = 16}$

Q34. Find the solution of the given pair of linear equations by graphical method :
$x + 2y = 6$
$x + y = 5$
**Solution:**
Given
$x + 2y = 6$

| | | |
|---|---|---|
| $x$ | 0 | 6 |
| $y$ | 3 | 0 |

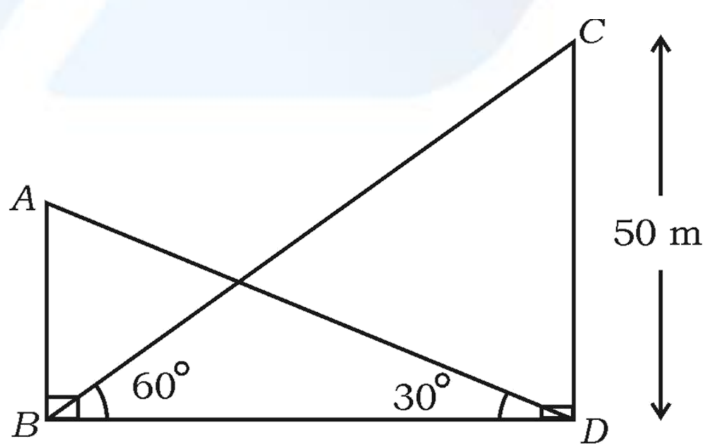
$x + y = 5$

| | | |
|---|---|---|
| $x$ | 0 | 5 |
| $y$ | 5 | 0 |




For table construction
Drawing two lines by marking points
Marking point of intersection and writing values of $x$ and $y$

Q35. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. Both the tower and building are on the same level ground. If the height of the tower is 50 m , then find the height of the building.



**Solution:**

In $\triangle BDC$,

$\tan\ 60^\circ = \frac{CD}{BD}$

$\sqrt{3} = \frac{50}{BD}$

$\therefore BD = \frac{50}{\sqrt{3}}$ ... ... ... 1

In $\triangle ABD$,

$\tan\ 30^\circ = \frac{AB}{BD}$

$\frac{1}{\sqrt{3}} = \frac{AB}{BD}$

$\therefore BD = \sqrt{3} \times AB$ .....2

From 1 and 2

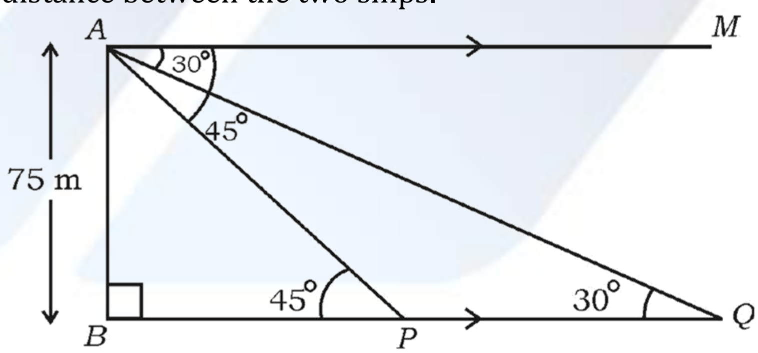
$\sqrt{3} \times AB = \frac{50}{\sqrt{3}}$

$AB = \frac{50}{\sqrt{3} \times \sqrt{3}}$

$B = \frac{50}{3}$ or $16\frac{2}{3}$ m

OR

As observed from the top of a 75 m high light house from the sea level, the angles of depression of two ships are 30° and 45°. If one
ship is exactly behind the other on the same side of the light house,
then find the distance between the two ships.




**Solution:**

Distance between the two ships is $PQ$

In $\triangle ABP$,

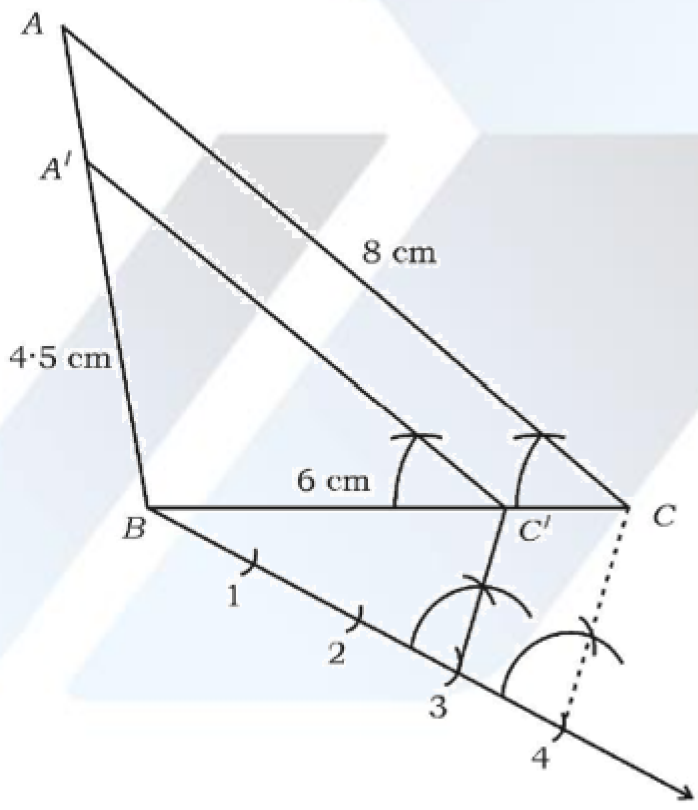
$\tan\ 45^\circ = \frac{AB}{BP}$

$1 = \frac{75}{BP}$

$\therefore BP = 75$
In $\triangle ABQ$,
$\tan\ 30^\circ = \frac{AB}{BQ}$
$\frac{1}{\sqrt{3}} = \frac{75}{BP + PQ}$
$\frac{1}{\sqrt{3}} = \frac{75}{75 + PQ}$
$75 + PQ = 75\sqrt{3}$
$PQ = 75\sqrt{3} - 75$
$PQ = 75(\sqrt{3} - 1)\text{m}$

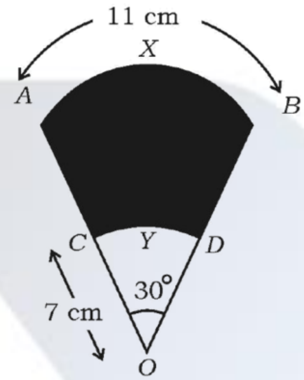
Q36. Construct a triangle with sides 4.5 cm, 6 cm and 8 cm. Then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the first triangle.

**Solution:**




Construction of given triangle 1
Construction of acute angle with division 1
Drawing parallel lines 1
Obtaining required triangle 1

Q37. In the figure $AXB$ and $CYD$ are the arcs of two concentric circles with centre $O$. The length of the arc $AXB$ is 11 cm . If $OC = 7$ cm and $\angle AOB = 30^\circ$, then find the area of the shaded region. [ Take $\pi = \frac{22}{7}$ ]




**Solution:**

Length of the arc $= \frac{\theta}{360^\circ} \times 2\pi r$

$11 = \frac{30^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times r$

$11 = \frac{11r}{21}$

$r = \frac{11 \times 21}{11}$

$r = 21$ cm

Area of the sector $OAXB = A_1 = \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times 21^2$

$= \frac{1}{12} \times \frac{22}{7} \times 21 \times 21$

$= \frac{231}{2}$ cm$^2$

Area of the sector $OCYD = A_2 = \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times 7^2$

$= \frac{1}{12} \times \frac{22}{7} \times 7 \times 7$

$A_2 = \frac{77}{6}$ cm$^2$

Area of the shaded region $= A_1 - A_2$

$= \frac{231}{2} - \frac{77}{6}$

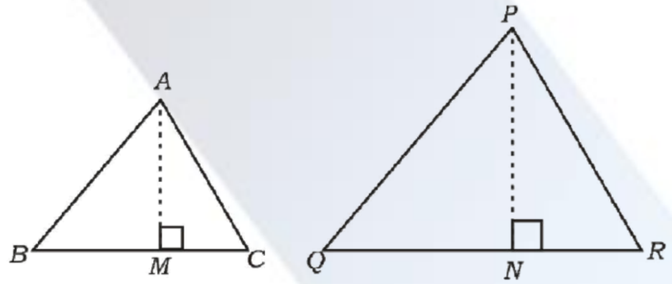
$= \frac{693 - 77}{6}$

$= \frac{616}{6}$

$= \frac{308}{3}\ \text{cm}^2$
$= 102.66$ or $102.7\ \text{cm}^2$

**VI. Answer the following questions** **$1 \times 5 = 5$**

Q38. Prove that "the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides".




**Solution:**

Given

$\triangle ABC \sim \triangle PQR$

$\therefore \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$

To prove:

$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{BC^2}{QR^2}$

Construction: Draw $AM \perp BC$ and $PN \perp QR$

Proof:

$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{\frac{1}{2} \times BC \times AM}{\frac{1}{2} \times QR \times PN}$

$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{BC}{QR} \times \frac{AM}{PN}$ ………1

In $\triangle ABM$ and $\triangle PQN$

$\angle B = \angle Q$

$\angle M = \angle N = 90°$ [by construction]

by AA criterion of similarity

$\triangle ABM \sim \triangle PQN$

$\frac{AM}{PN} = \frac{AB}{PQ}$ ………..2

But $\frac{BC}{QR} = \frac{AB}{PQ}$ ……………3

From 2 and 3

$\frac{AM}{PN} = \frac{BC}{QR}$ ………… 4

Substituting 4 in 1

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{BC}{QR} \times \frac{BC}{QR}$$

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{BC^2}{QR^2}$$

Hence proved