Q. No. 2 Part (i)

Given:

$$5x - \frac{8}{x} + 6 = 0$$

Multiply by(x) on both sides:-

$$x \times 5x - \frac{8}{\cancel{x}} \times \cancel{x} + 6 \times x = 0$$

$5x^2 - 8 + 6x = 0$ or

$$\boxed{5x^2 + 6x - 8 = 0} \quad -(i)$$

Now by Quadratic Formula:-

As we know:-

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

Put values i.e $[a = 5, b = 6, c = -8]$ in(ii)

$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(5)(-8)}}{2(5)}$$

$$x = \frac{-6 \pm \sqrt{36 + 160}}{10}$$

$$x = \frac{-6 \pm \sqrt{196}}{10}$$

Now,

$$x = \frac{-6 \pm \sqrt{196}}{10}$$

$$x = \frac{-6 \pm 14}{10}$$

$x = \frac{-6 + 14}{10}$ or $x = \frac{-6 - 14}{10}$

$x = \frac{-6 + 14}{10}$ $\quad x = \frac{-20}{10}$

Verification:

Put $x = -2$ in (i)

$$5(-2)^2 + 6(-2) - 8 = 0$$

$$20 - 12 - 8 = 0$$

$$\cancel{20} - \cancel{20} = 0$$

$$0 = 0$$

True,

Now $x = \frac{4}{5}$

$$5\left(\frac{4}{5}\right)^2 + 6\left(\frac{4}{5}\right) - 8 = 0$$

$$\frac{16}{5} + \frac{20}{5} - 8 = 0$$

$$0 = 0$$

$\boxed{\text{True}}$

So

~~x = 1 or x = −4~~

or

$\boxed{S.S = \{-2, \frac{4}{5}\}}$

$\boxed{x = \frac{4}{5}}$ or

$\boxed{x = \frac{-20}{10}}$ or $\boxed{x = -2}$

ANSWER

$S.S = \{-2, \frac{4}{5}\}$

Q. No. 2 Part (ii)

$\sqrt{x-3}+5=x$

Solution:-

$\sqrt{x-3} = x-5$ —(i)

Squaring both sides of (i)

$(\sqrt{x-3})^2 = (x-5)^2$

$x-3 = x^2+25-10x$ $\quad \because (a-b)^2 = a^2+b^2-2ab$

$x^2+25+3-10x-x=0$

$x^2+28-11x=0$

$x^2-11x+28=0$

By quadratic formula

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $\quad \because a=1,\ c=28,\ b=-11$

$x = \frac{-(-11) \pm \sqrt{(-11)^2-4(1)(28)}}{2(1)}$

$x = \frac{11 \pm \sqrt{121-112}}{2}$

$x = \frac{11 \pm \sqrt{9}}{2}$

$x = \frac{11 \pm 3}{2}$

$x = \frac{11+3}{2}$ or $x = \frac{11-3}{2}$

$x = \frac{14}{2}$ or $x = \frac{8}{2}$

$x=7$ or $x=4$

verification:

Put $x=7$ in (i)

$\sqrt{7-3} = 7-5$

$\sqrt{4} = 2$

$2=2$

$\boxed{\text{True}}$

Now for $x=4$

$\sqrt{4-3} = 4-5$

$\sqrt{1} = -1$

$1 \neq -1$

so, it is $\boxed{\text{extraneous}}$ solution so

$\boxed{S.S = \{7\}}$

Q. No. 2 Part (iii)

Solution:

By (K-Method):

$$\frac{x}{p} = \frac{y}{q} = \frac{z}{r} = k$$

So, $x = pk$, $y = qk$, $z = rk$

Now put values of x, y, z in L.H.S

$$L.H.S = \frac{x^3 + y^3 + z^3}{p^3 + q^3 + r^3}$$

$$= \frac{(pk)^3 + (qk)^3 + (rk)^3}{p^3 + q^3 + r^3}$$

$$= \frac{p^3k^3 + q^3k^3 + r^3k^3}{p^3 + q^3 + r^3}$$

$$= \frac{k^3 \cancel{(p^3 + q^3 + r^3)}}{\cancel{(p^3 + q^3 + r^3)}}$$

$$= k^3 = L.H.S$$

Now for R.H.S:

$$R.H.S = \frac{xyz}{pqr}$$

$$= \frac{(pk)(qk)(rk)}{pqr}$$

$$= \frac{\cancel{pqr}.k.k.k}{\cancel{pqr}}$$

$$= k^3 = R.H.S$$

Answer:

As R.H.S = L.H.S

Hence Proved.

$$\boxed{\begin{array}{l} \text{or As} \\ R.H.S = K^3 \\ L.H.S = K^3 \\ K^3 = K^3 \\ R.H.S = L.H.S \end{array}}$$

Q. No. 2 Part (iv)

Solution:-

As $A = \{1,2,3,4\}$, $B = \{2,3,5,7\}$

Find:- $R = \{(x,y) \mid x \in A, y \in B \wedge y < x\}$

Now,

$$A \times B = \{(1,2),(1,3),(1,5),(1,7),$$
$$(2,2),(2,3),(2,5),(2,7),$$
$$(3,2),(3,3),(3,5),(3,7),$$
$$(4,2),(4,3),(4,5),(4,7)\}$$

So according to situation,

$R = \{(x,y) \mid x \in A, y \in B \wedge y < x\}$

Then,

$$\boxed{R = \{(3,2),(4,2),(4,3)\}}$$

ANSWER

Q. No. 2 Part (v)

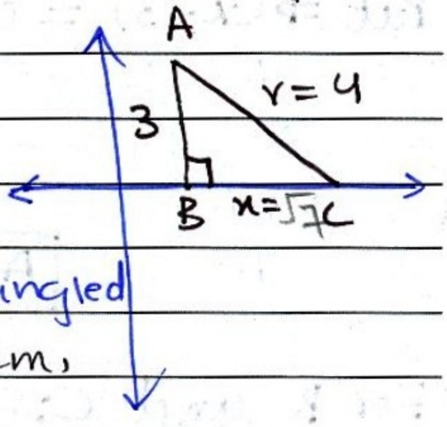
Given that terminal ray of θ lies in (I) quadrant and $\boxed{\sin\theta = \frac{3}{4}}$

So,

find remaining ratios = ?

S2	A1
T3	C4

Solution:



$\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

So, $y = 3$, $r = 4$, To find $x = ?$

Let's suppose that ABC is a right angled triangle. Then, By Pythagoras theorem,

$(hyp)^2 = (perp)^2 + (base)^2$

$(4)^2 = (3)^2 + x^2$

$16 - 9 = x^2 \longrightarrow 7 = x^2$ or $\boxed{x = \sqrt{7}}$

To find other ratios :-

$S = \frac{p}{h}$

Ratio	Formula	value
$\cos\theta$	$\cos\theta = \frac{\text{base}}{\text{hyp}}$	$\cos\theta = \frac{\sqrt{7}}{4}$
$\sec\theta$	$\sec\theta = \frac{1}{\cos\theta}$	$\sec\theta = \frac{4}{\sqrt{7}}$
$\tan\theta$	$\tan\theta = \frac{\text{perp}}{\text{base}}$	$\tan\theta = \frac{3}{\sqrt{7}}$
$\cot\theta$	$\cot\theta = \frac{1}{\tan\theta}$	$\cot\theta = \frac{\sqrt{7}}{3}$
and, $\text{cosec}\,\theta$	$\text{cosec}\,\theta = \frac{1}{\sin\theta}$	$\text{cosec}\,\theta = \frac{4}{3}$

$\cos\theta = \frac{b}{h}$

$t = \frac{p}{b}$

ANSWER

Q. No. 2 Part (vi)

Given: Let,

$$\frac{20}{(x-3)(x^2+1)} = \frac{A}{x-3} + \frac{Bx+C}{x^2+1} \quad —(i)$$

$$20 = A(x^2+1) + (Bx+C)(x-3) \quad —(ii)$$ [by taking L.C.M on b. sides]

Put $\Rightarrow (x-3) = 0$ or $x=3$ in (ii)

$20 = A((+3)^2+1) + (B(3)+C)(3-3)$

$20 = A(9+1) + (B(0)+C)(0)$

$20 = A(10)$

$\frac{20}{10} = A$ or $\boxed{A=2}$

For B and C:-

By Comparing co-efficients :-

~~Take~~ From (ii)

$20 = A(x^2+1) + (Bx+C)(x-3) \rightarrow$ $20 = A(x^2+1) + Bx(x-3) + C(x-3)$

$20 = Ax^2 + A + Bx^2 - 3Bx + Cx - 3C$

By Comparing co-effiuents of x^2:-

$0x^2 = Ax^2 + Bx^2$

$0 = A + B$

$B = -A$ or $B = -2$

By Comparing co-efficients of x:-

$-3B + C = 0$

$C = 3B$

$C = 3(-2)$

$C = -6$

$$\boxed{\frac{20}{(x-3)} = \frac{2}{(x-3)} - \frac{(2x+6)}{x^2+1}}$$

Answer

Put values of A, B, C in (i)

$$\frac{20}{(x-3)(x^2+1)} = \frac{2}{x-3} + \frac{(-2x)-6}{x^2+1}$$

Q. No. 2 Part (vii)

Given that:- A circle has centre at O and a chord $\overline{AB}$, which is bisected by $\overline{OM}$ i.e $\overline{OM} \perp \overline{AB}$, and,
radius = 10 , $\overline{OM} = 6$

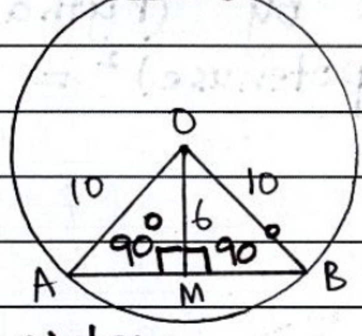
Find: length of chord $\overline{AB} = ?$

Solution:

As we know $\overline{OM} \perp \overline{AB}$ or $\angle OMB = 90°$,
So $\triangle OMB$ is a right-angled triangle.
Now by Pythagoras Theorem,
As we know

$$\boxed{\text{hypotenuse}^2 = \text{Base}^2 + \text{Perpendicular}^2}$$

Figure:-



$$(\overline{OB})^2 = (\overline{MB})^2 + (\overline{OM})^2$$
$$(10)^2 = (\overline{MB})^2 + (6)^2$$
$$(100)^{\cancel{2}} - (36)^{\cancel{2}} = (\overline{MB})^2$$
$$100 - 36 = (\overline{MB})^2$$
$$64 = (\overline{MB})^2$$

By Taking Square root on b. sides:-

$$\sqrt{64} = \sqrt{(\overline{MB})^2}$$
$$8 = \overline{MB}$$

So , $\overline{AB} = \overline{AM} + \overline{MB}$

and

$\overline{AB} = 2(\overline{MB})$ $\because$ $\overline{AM} = \overline{MB}$ or $\overline{OM}$ bisects $\overline{AB}$.

Then

$m\overline{AB} = 2(8)$

$m\overline{AB} = 16$ — Solution —

ANSWER

Q. No. 2 Part (viii)

Given :-

A $\overline{AB} = 12cm$ is a chord of a circle having radius i.e

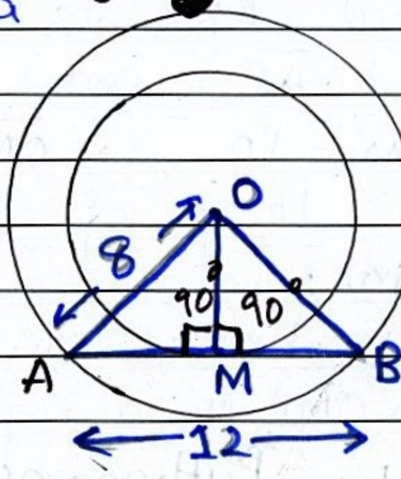
$\overline{OA} = \overline{OB} = 8cm$

m is mid-point of $\overline{AB}$ or

$m\overline{AM} = m\overline{MB} = \frac{1}{2} m\overline{AB}$

or $m\overline{AM} = 8.$

figure:-



Find: radius $\overline{OM} = ?$

Solution:

As $\overline{OM} \perp \overline{AB}$, then $m\angle OMA = 90°$ so

$\triangle OMA$ is a right-angled triangle.

Now By (Pythagoras Theorem):

$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

$(\overline{OA})^2 = (\overline{AM})^2 + (\overline{OM})^2$

$(\overline{OA})^2 - (\overline{AM})^2 = (\overline{OM})^2$

$(8)^2 - (6)^2 = (\overline{OM})^2$

$64 - 36 = (\overline{OM})^2$

$28 = (\overline{OM})^2$

By taking square root on b.sides:

$\sqrt{28} = \sqrt{(\overline{OM})^2}$

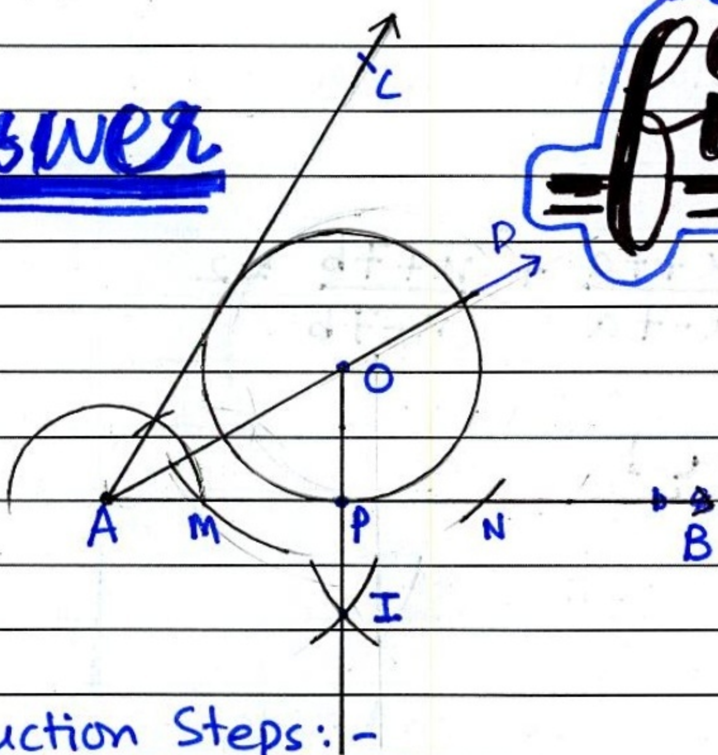
$2\sqrt{7} = \overline{OM}$

so $\boxed{\text{radius of circle} = 2\sqrt{7}}$

ANSWER

Q. No. 2 Part (ix)

Answer



figure

<u>Construction Steps:-</u>

- Take a line segment $\overline{AB}$ of suitable length.
- At A, make an angle of 60°, and produce it to a point C.
- Bisect the angle ∠A such that it is bisected into two angles of 30° each
- Take a point O on $\overrightarrow{AD}$ and draw perpendicular on $\overline{AB}$. by cutting line $\overline{AB}$ on two points M and N.
- By taking M as centre, draw an arc. Similarly by taking N as centre, draw an arc cutting previous arc at I.
- Join I to O such that it passes through $\overline{AB}$ at P.
- By taking O as centre and radius = $\overline{OP}$ construct a circle that touches both arms of an an angle of 60°.
- A circle has been "CONSTRUCTED".

ANSWER

Q. No. 3 (Page 1)

Solution:

According to situation given to us:

$$x = \frac{14ab}{a+b}$$

Prove: $$\frac{x+7a}{x-7a} + \frac{x+7b}{x-7b} = 2$$

Solution:

$$x = \frac{14ab}{a+b} \quad \text{—(i)}$$

$$x = \frac{(2a)(7b)}{a+b} \quad \text{—(ii)}$$

Divide (ii) by (7b) on b.sides

$$\frac{x}{7b} = \frac{(2a)(\cancel{7b})}{a+b(\cancel{7}b)}$$

$$\frac{x}{7b} = \frac{2a}{a+b}$$

By Componendo-Dividendo Theorem,

$$\frac{x+7b}{x-7b} = \frac{2a+(a+b)}{2a-(a+b)}$$

$$\boxed{\frac{x+7b}{x-7b} = \frac{3a+b}{a-b}} \quad \text{—(iii)}$$

Now divide (ii) by 7a on b.sides

$$x = \frac{(7a)(2b)}{a+b}$$

$$\frac{x}{7a} = \frac{(7\cancel{a})(2b)}{a+b(7\cancel{a})}$$

$$\frac{x}{7a} = \frac{2b}{a+b}$$

Q. No. 3 (Page 2)

By Componendo-Dividendo Theorem:-

$$\frac{x+7a}{x-7a} = \frac{2b+a+b}{2b-(a+b)}$$

$$\frac{x+7a}{x-7a} = \frac{3b+a}{b-a} \quad \text{—(iv)}$$

By adding (iii) and (iv)

$$\frac{x+7a}{x-7a} + \frac{x+7b}{x-7b} = \frac{3b+a}{b-a} + \frac{3a+b}{a+b}$$

$$= \frac{3b+a}{b-a} - \frac{3a+b}{b-a}$$

$$= \frac{3b+a-3a-b}{b-a}$$

$$= \frac{2b-2a}{b-a}$$

$$= \frac{2(\cancel{b-a})}{\cancel{(b-a)}}$$

$$= 2$$

As R.H.S = L.H.S = 2 So $\boxed{\text{Proved}}$

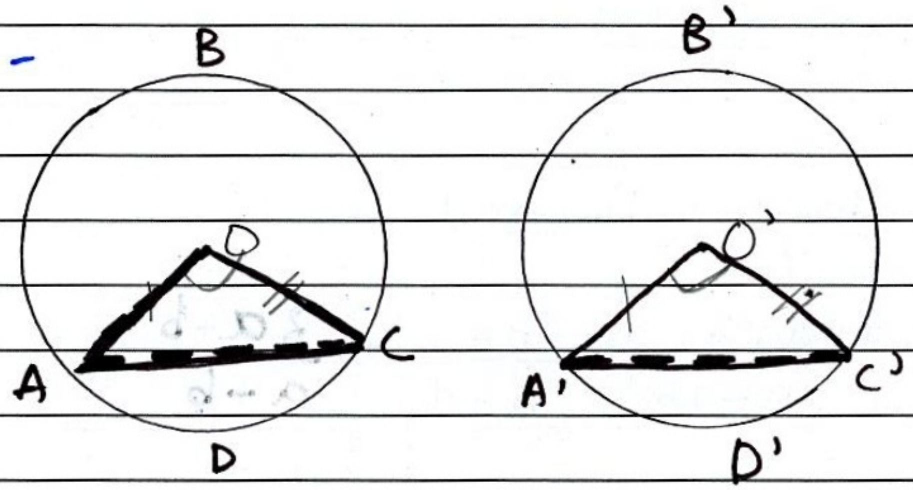
ANSWER

Q. No. 4 (Page 1)

Statement:-

If two arcs of a circle are congruent then the corresponding chords are equal.

Figure:-



Given:-

ABCD and A'B'C'D' are two congruent circles with centres O and O', The arc $\overset{\frown}{ADC}$ and $\overset{\frown}{A'D'C'}$ are congruent.

To Prove:-

$$m\overline{AC} = m\overline{A'C'}$$

Construction:

Join A to C and O to A and C. Join A' to C' and O' to A' and C'.

Proof:

Statements	Reasons
As, $m\overset{\frown}{ADC} = m\overset{\frown}{A'D'C'}$	given
So,	
$m\angle AOC = m\angle A'O'C'$	Congruent or equal arcs subtend equal central

Q. No. 4 (Page 2)

	angles
So in,	
$\triangle AOC \leftrightarrow \triangle A'O'C'$	
$m\overline{OA} = m\overline{O'A'}$	radii of congruent circles
$m\overline{OC} = m\overline{O'C'}$	radii of congruent circles
$m\angle AOC = m\angle A'O'C'$	already Proved
So,	
$\triangle AOC \cong \triangle A'O'C'$	S.A.S Postulate
Similarly,	
$m\overline{AC} = m\overline{A'C'}$	Corresponding sides of Congruent circles.

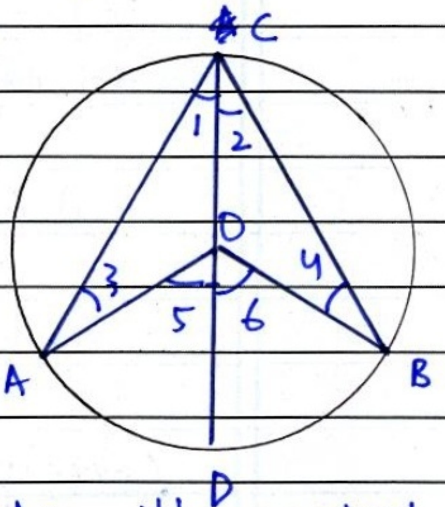
HENCE PROVED THAT:
$\boxed{m\overline{AC} = m\overline{A'C'}}$

ANSWER

Statement:

The measure of a central angle of minor arc of a circle is double that of angle subtended by corresponding major arc.

Figure:



Given:

ACBD is a circle with central angle $\angle AOB$ and circum angle $\angle ACB$, $\overline{CO}$ bisects $\angle ACB$.

To Prove: $m\angle AOB = 2\, m\angle ACB$

Construction: ~~Prodat~~ Produce CO to a point D and name angles as $\angle 1, \angle 2, \angle 3, \angle 4, \angle 5$ and $\angle 6$

Proof:

Statements	Reasons
In $\triangle AOC$:-	
$m\angle 1 = m\angle 3$ —(i)	angles opposite to equal sides are

Q. No. 5 (Page 2)

	equal or $\overline{OC} = \overline{OA}$
Similarly $m\angle 2 = m\angle 4$ —(iii)	angles opposite to equal sides are also equal.
And we also know that:	
$m\angle 5 = m\angle 1 + m\angle 3$ —(iv)	external angle is equal to sum of interior angles; (ii)
Similarly, $m\angle 6 = m\angle 2 + m\angle 4$ —(v)	By (ii)
Now $m\angle 5 = 2m\angle 1$ —(vi)	as $m\angle 1 = m\angle 3$
and $m\angle 6 = 2m\angle 2$ —(vii)	$m\angle 2 = m\angle 4$
Now by adding (vi) and (vii)	
$m\angle 5 + m\angle 6 = 2m\angle 1 + 2m\angle 2$	
$m\angle AOB = 2(m\angle 1 + m\angle 2)$	$\because m\angle 5 + m\angle 6 = m\angle AOB$
$m\angle AOB = 2(m\angle ACB)$	$\because m\angle ACB = \angle 1 + 2$
$m\angle AOB = 2m\angle ACB$	

" HENCE PROVED "

ANSWER

= -6

B = -2