EQUATIONS OF CIRCLES

Class: IX, Mathematics

SOLUTIONS

TEACHING TASK

01.

$x + 2x = 360^\circ$

$\Rightarrow x = 120^\circ$

$d = \dfrac{|4(5)+3(3)-4|}{\sqrt{16+9}} = 5$

$\therefore \cos\theta = \dfrac{5}{r}$

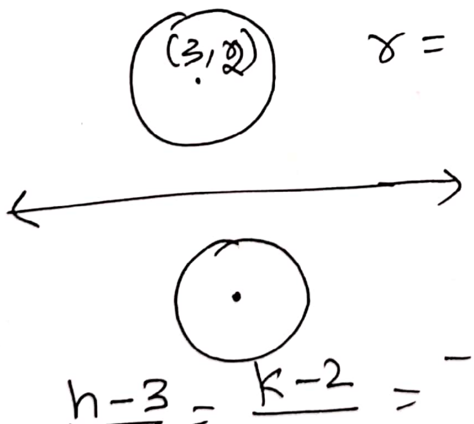
$\Rightarrow \cos 60^\circ = \dfrac{5}{r}$

$\Rightarrow r = 10.$

Eqn of the circle is $(x-5)^2 + (y-3)^2 = 100$

Ans: A

02



$r = \sqrt{9+4-12} = 1$

$x + y - 1 = 0$

$\dfrac{h-3}{1} = \dfrac{k-2}{1} = \dfrac{-2(3+2-1)}{1+1}$

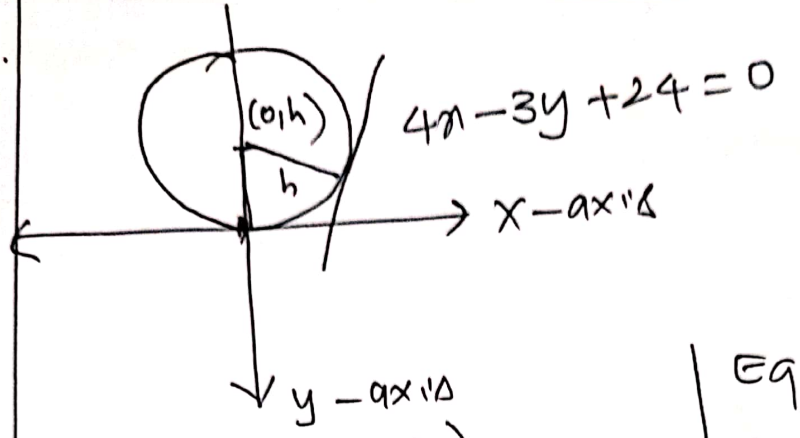
$\therefore (h, k) = (-1, -2)$

Eqn of the circle is $(x+1)^2 + (y+2)^2 = 1^2$

$\Rightarrow x^2 + y^2 + 2x + 4y + 4 = 0$

Ans: A

03.



Centre $= (0, h)$

$$h = \frac{|0 - 3h + 24|}{\sqrt{16+9}}$$

$\Rightarrow 5h = |24 - 3h|$

$\Rightarrow 24 - 3h = \pm 5h$

$\Rightarrow h = 3$ or -12

Eqn. of the circles

Centre $(0, 3)$, $r = 3$

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

$\Rightarrow x^2 + y^2 - 6y = 0$

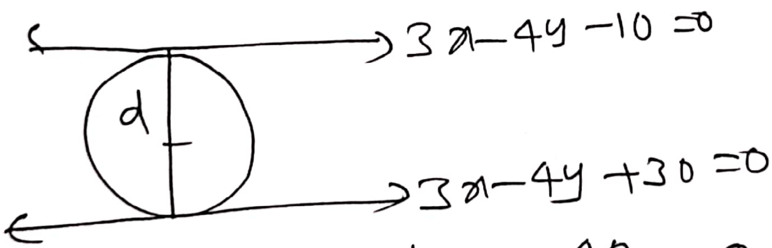
Also $C(0, -12)$, $r = 12$

$(x-0)^2 + (y+12)^2 = (-12)^2$

$\Rightarrow x^2 + y^2 + 24y = 0$

Ans: A

04.



$$\therefore d = \frac{|-10 - 30|}{\sqrt{9+16}} = \frac{40}{5} = 8$$

$\therefore r = 4.$

Option Verification: A) $x^2 + y^2 - 4x - 2y - 11 = 0$

$r = \sqrt{4+1+11} = 4.$

centre $(2, 1)$ lies on $x - 2y = 0$, which is true.

Ans: A

05 $x - 2y - 3 = 0$

$x - 2y = 3$

$\Rightarrow \frac{x}{3} + \frac{y}{\left(\frac{-3}{2}\right)} = 1$

Centre $(h, -h)$

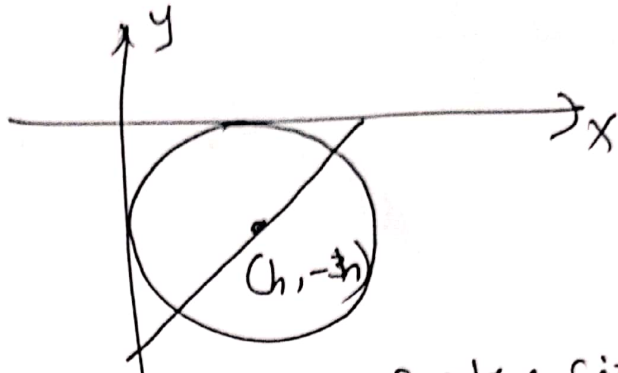
Lies on $x - 2y - 3 = 0$

$\Rightarrow h + 2h - 3 = 0$

$\Rightarrow h = 1$

$\therefore$ centre $(1, -1)$

radius $= 1$



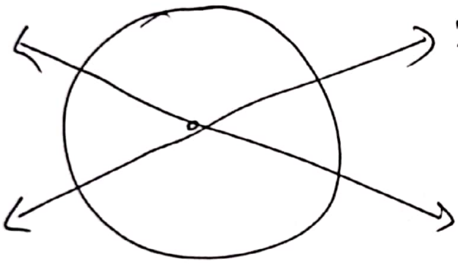
Eqn of the circle

$(x-1)^2 + (y+1)^2 = 1^2$

$\Rightarrow x^2 + y^2 - 2x + 2y + 1 = 0$

Ans: B

06



solving epuations, centre $(2, 3)$.

Circle also passes trough $(5, 7)$

$\therefore$ radius $= \sqrt{9 + 16} = 5$

Eqn of the circle $(x-2)^2 + (y-3)^2 = 5^2$

$\Rightarrow x^2 + y^2 - 4x - 6y - 12 = 0$

Ans: C

④

07. $3x-2y+6=0$

$\Rightarrow 3x-2y=-6$

$\Rightarrow \dfrac{3x}{-6}-\dfrac{2y}{-6}=1$

$\Rightarrow \dfrac{x}{-2}+\dfrac{y}{3}=1$

$\therefore A(-2,0),\ B(0,3)$

$AB=\sqrt{(0+2)^2+(3-0)^2}$

$=\sqrt{4+9}$

$=\sqrt{13}$

Eqn of the circle $(x+2)^2+(y-0)^2=(\sqrt{13})^2$

$\Rightarrow x^2+y^2+4x-9=0$

Ans: B

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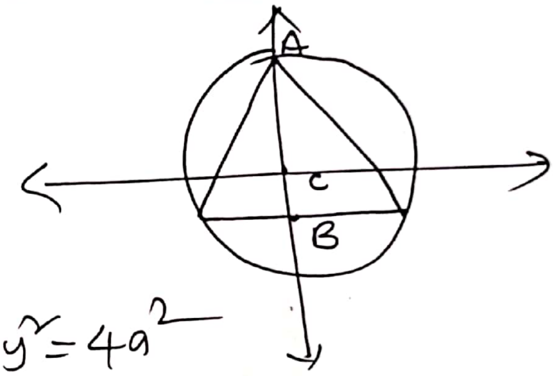
08 $AB=3a$

We know $AC:CB=2:1$

$\therefore AC=r=\frac{2}{3}\times 3a=2a$



$\therefore$ Eqn of the circle $\Rightarrow x^2+y^2=4a^2$

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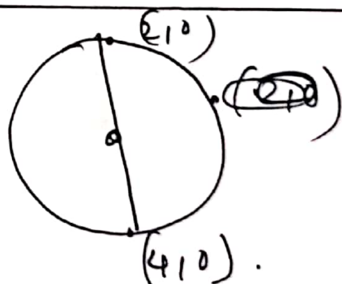
09. Circle passes through $(\cancel{4}\ 2, \cancel{0})$ and $(0,4)$



mid-point $=(1,2)$

Eqn of the circle $(x-1)^2+(y-2)^2=r^2$

Circle passes through $(2,0) \Rightarrow (2-1)^2+(0-2)^2=r^2$

$\Rightarrow 1+4=r^2 \Rightarrow r^2=5$

$\therefore$ Eqn of the circle $(x-1)^2+(y-2)^2=r^2=5$

$\Rightarrow x^2+y^2-2x-4y=0$

Ans: B

10. $x = \frac{2a(1-t^2)}{1+t^2}$, $y = \frac{4at}{1+t^2}$

put $t = \tan\theta$

$\therefore x = \frac{2a(1-\tan^2\theta)}{1+\tan^2\theta}$, $y = \frac{2a(2\tan\theta)}{1+\tan^2\theta}$

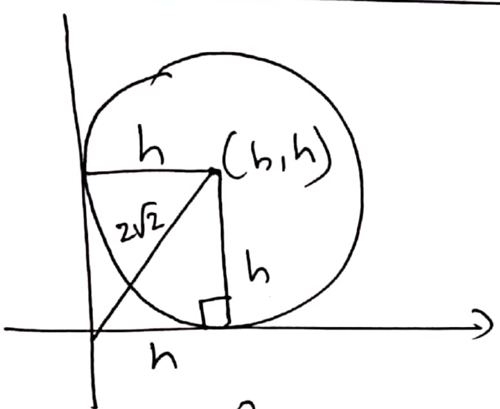
$\Rightarrow x = 2a\cdot\cos 2\theta$, $y = 2a\cdot\sin 2\theta$

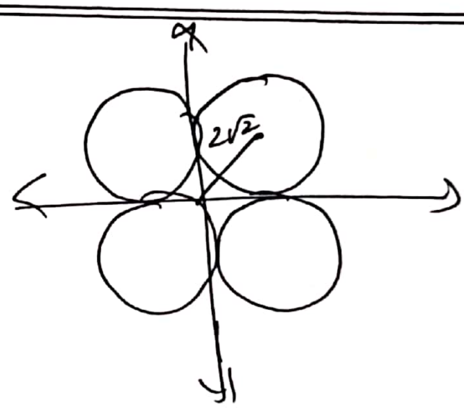
$\Rightarrow \frac{x}{2a} = \cos 2\theta$, $\frac{y}{2a} = \sin 2\theta$

$\Rightarrow x^2 + y^2 = (2a)^2$

hence radius $= 2a$ Ans :- B

11.





$h^2 + h^2 = (2\sqrt{2})^2$

$\Rightarrow h = \pm 2$

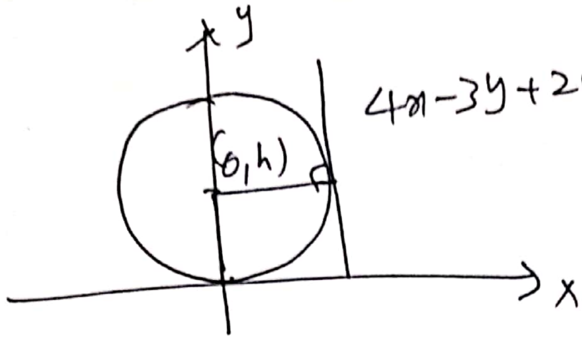
$\therefore$ The centres are $(2,2)$, $(2,-2)$, $(-2,2)$, $(-2,-2)$

radius $= r = 2$

Hence the equations of the circles are all the four options satisfies

Ans: A, B, C, D

12.



$4x-3y+24=0$

$$\text{radius} = h = \frac{|4\cdot 0-3h+24|}{\sqrt{16+9}}$$

$\Rightarrow 5h = |24-3h|$

$\Rightarrow \pm 5h = 24-3h$

$\Rightarrow h = 3$ or -12

Eqn of the circles (6)

Centre $(0,3)$, $r=3$

$\Rightarrow x^2+y^2-6y=0$

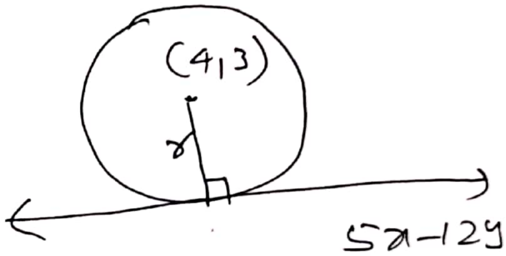
Also $c(0,-12)$, $r=12$

Eqn of the circle

$x^2+y^2+24y=0$

Ans: B, D

13. Statement I:



$5x-12y-10=0$

$$\therefore r = \frac{|5(4)-12(3)-10|}{\sqrt{5^2+(-12)^2}}$$

$\therefore r = 2.$

$\therefore$ Eqn of the circle $(x-4)^2+(y-3)^2=2^2$

$\Rightarrow x^2+y^2-8x-6y+21=0$. (True)

Statement II: Conceptual (True)

Ans: A

14. Statement I: $(4,-1)$ radius $= |k| = |-1| = 1$

(h, k)

$\therefore (x-4)^2+(y+1)^2 = 1^2 \Rightarrow x^2+y^2-8x+2y+16=0$ (True)

Statement II: Conceptual (True)

Ans: A

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15. $x^2+y^2=16$

Centre $=(0,0)$, $r=4$.

parametric Equations

$x=r\cos\theta$, $y=r\sin\theta$

$x=4\cos\theta$, $y=4\sin\theta$

Ans: A

16 $x^2+y^2+2x+4y-11=0$

Centre $=(-1,-2)$

radius $=r=\sqrt{1+4+11}=4$.

$\therefore$ parametric Equations

$x=h+r\cos\theta$, $y=k+r\sin\theta$

$\Rightarrow x=-1+4\cos\theta$, $y=-2+4\sin\theta$

Ans: C

17 $3x+4y=12$

$\Rightarrow \dfrac{x}{4}+\dfrac{y}{3}=1$

$\therefore A(\underset{x_1\ y_1}{4,0})$, $B=(\underset{x_2\ y_2}{0,3})$

Eqn of the circle

$(x-4)(x-0)+(y-0)(y-3)=0$

$\Rightarrow x^2-4x+y^2-3y=0$

$\Rightarrow x^2+y^2-4x-3y=0$

Ans: D

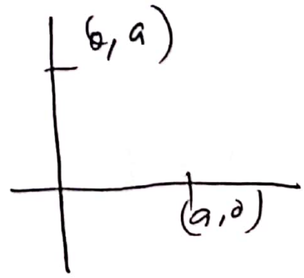
18 $A(0,a)$, $B(a,0)$, $AB=\sqrt{a^2+a^2}$

$=\sqrt{2a^2}$

$=\sqrt{2}a$

$\therefore$ Eqn of the Circle

$\left(x-\frac{a}{2}\right)^2+\left(y-\frac{a}{2}\right)^2=(\sqrt{2}a)^2$



18 $A(a,0)$, $B(0,a)$

$AB = \sqrt{a^2+a^2} = \sqrt{2a^2} = \sqrt{2}a$.

$\therefore$ Diameter $= \cancel{d} = \sqrt{2}a$

Mid-point of $AB = \left(\frac{a}{2}, \frac{a}{2}\right)$

Eq$^{\underline{n}}$ of the circle

$$\left(x-\frac{a}{2}\right)^2 + \left(y-\frac{a}{2}\right)^2 = \left(\frac{\sqrt{2}a}{2}\right)^2$$

$$\Rightarrow 2x^2+2y^2-2ax-2ay-3a^2=0$$

Ans - B

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19 $x^2-4x-6=0$

Let x_1, x_2 be the roots

We have $x_1+x_2=4$; $x_1 \cdot x_2 = -6$

Also, $y^2+2y-7=0$

Let y_1, y_2 be the roots

$\Rightarrow y_1+y_2=-2$, $y_1 \cdot y_2 = -7$

Eq$^{\underline{n}}$ of the Circle

$$(x-x_1)(x-x_2)+(y-y_1)(y-y_2)=0$$

$$\Rightarrow x^2+y^2-(x_1+x_2)x+x_1x_2+y^2-(y_1+y_2)y+y_1y_2=0$$

$$\Rightarrow x^2+y^2-4x-6+y^2+2y-7=0$$

$$\Rightarrow x^2+y^2-4x+2y-13=0$$

$$x^2+y^2+2ax+2by+c=0$$

$a=-2$, $b=1$, $c=-13$

$a+b-c = -2+1+13$

$= 12$

Ans: 12

20. $A(0,1)$, $B(\alpha,\beta)$
$\quad x_1\ y_1 \qquad x_2\ y_2$

Eqn of the circle is

$(x-0)(x-\alpha)+(y-1)(y-\beta)=0$

$\Rightarrow \quad x(x-\alpha)+(y-1)(y-\beta)=0$

This circle cuts the x-axis, put $y=0$

$\Rightarrow \quad x(x-\alpha)+\beta=0$

$\Rightarrow \quad x^2-\alpha x+\beta=0$

$\Rightarrow \quad x^2-5x+3=0$

$\Rightarrow \quad \alpha=5,\ \beta=3 \quad \therefore \quad \alpha+\beta=8$

Ans: 8

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21. a) ~~$x^2+y^2+ax+by+2b^2=0$ touches x-axis~~

~~Since $(x+\frac{a}{2})^2+(y+\frac{b}{2})^2=(\frac{b}{2})^2$~~

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21 a). $x^2+y^2+2ax-2by+a^2=0$ touching x-axis

Since $\boxed{g^2=c}$ i.e. $a^2=a^2$

b) $x^2+y^2-2ax+2by+b^2=0$ touches y-axis

Since $f^2=c$ i.e. $b^2=b^2$

c) $x^2+y^2+2ax+2ay+a^2=0$ touches both the axes

Since $g^2=f^2=c$ i.e. $a^2=a^2=a^2$

d) $x^2+y^2+ax-by-2a^2=0$ passes through (a,b)

Since $a^2+b^2+a^2-b^2-2a^2=0$

Ans: t, p, q, r

22 a) $x = \dfrac{2a(1-t^2)}{1+t^2}$, $y = \dfrac{4at}{1+t^2}$

put $t = \tan\theta$

$x = 2a\cdot\cos 2\theta$, $y = 2a\cdot\sin 2\theta$

$\Rightarrow x^2+y^2 = 4a^2 = (2a)^2$

$\therefore$ Radius $= 2a$

b) $x = 5\cos\theta$, $y = 5\sin\theta$

Eqn of the circle $\Rightarrow x^2+y^2 = 25 \rightarrow (1)$

$\theta = 135°$, slope $= m = \tan\theta = \tan 135° = -1$.

$C(-\sqrt{8}, \sqrt{8})$

Eqn of the circle $y - \sqrt{8} = -1(x+\sqrt{8})$

$\Rightarrow y - \sqrt{8} = -x - \sqrt{8}$

$\Rightarrow x + y = 0$.

$\Rightarrow x = -y \rightarrow (2)$

Solving (1) & (2) $x^2 + x^2 = 25 \Rightarrow 2x^2 = 25$

$\Rightarrow x = \pm 5/\sqrt{2}$

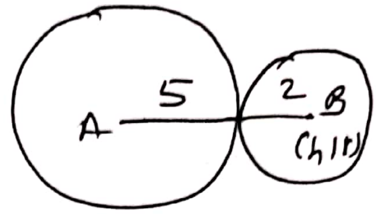
$\therefore y = \mp \frac{5}{\sqrt{2}}$

$\therefore A\left(\frac{5}{\sqrt{2}}, \frac{-5}{\sqrt{2}}\right), B\left(\frac{-5}{\sqrt{2}}, \frac{5}{\sqrt{2}}\right)$

$\therefore AB = \sqrt{\left(\frac{10}{\sqrt{2}}\right)^2 + \left(\frac{10}{\sqrt{2}}\right)^2} = 10$

c)

c) Circle eqn.



$x^2+y^2-4x-6y-12=0$

$C=(2,3)$, $B=(h,k)$

$r=\sqrt{4+9+12}$

$r=5$

$\therefore AB = 5+2 = 7$

$\Rightarrow (2-h)^2+(3-k)^2 = 49$

$\Rightarrow h^2+k^2-4h-6k-36=0$

$\therefore \Rightarrow x^2+y^2-4x-6y-36=0$ ~~Ans:~~ ✓

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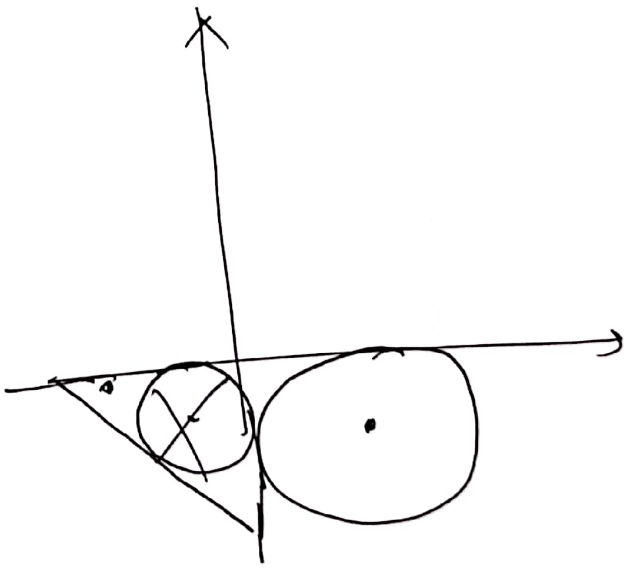
d) $3x-4y=12$

$\Rightarrow \frac{x}{4}+\frac{y}{-3}=1$

Centre $(h,-h)$



$h = \frac{|3h+4h-12|}{\sqrt{9+16}}$

$\Rightarrow 5h = |7h-12|$

$\Rightarrow \pm 5h = 7h-12$

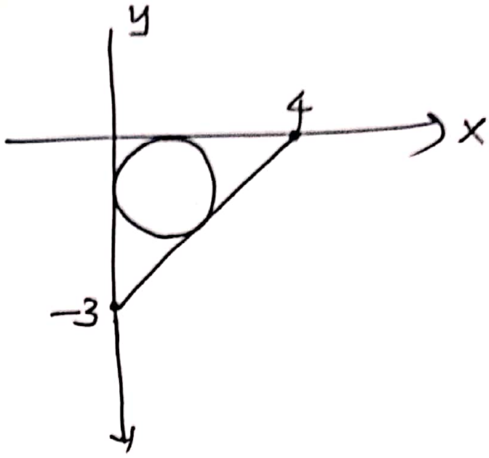
$\Rightarrow h = 6$ $\therefore$ centre $(6,-6)$, $r=6$

Eqn of $(x-6)^2+(y+6)^2=6^2$

$\Rightarrow x^2+y^2-12x+12y$

d) $3x-4y=12$

$\Rightarrow \frac{x}{4}+\frac{y}{-3}=1$



Centre $(h,-h)$, $r=h$

$$h=\frac{|3h+4h-12|}{\sqrt{9+16}}$$

$\Rightarrow 5h=|7h-12|$

$\Rightarrow 7h-12=\pm 5h$

$\Rightarrow h=6$ or 1

Centre $(6,-6)$, $r=6$

Eqn of the circle

$(x-6)^2+(y+6)^2=6^2$

$\Rightarrow x^2+y^2-12x+12y+36=0$

Centre $(1,-1)$, $r=1$

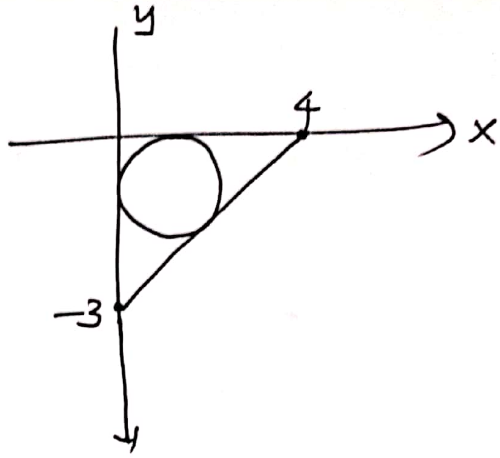
$(x-1)^2+(y+1)^2=1^2$

$\Rightarrow x^2+y^2-2x+2y+1=0$

12

d) $3x-4y=12$

$\Rightarrow \frac{x}{4}+\frac{y}{-3}=1$



Centre $(h,-h)$, $r=h$

$$h=\frac{|3h+4h-12|}{\sqrt{9+16}}$$

$\Rightarrow 5h=|7h-12|$

$\Rightarrow 7h-12=\pm 5h$

$\Rightarrow h=6$ or 1

Centre $(6,-6)$, $r=6$

Eqn of the circle

$(x-6)^2+(y+6)^2=6^2$

$\Rightarrow x^2+y^2-12x+12y+36=0$

Centre $(1,-1)$, $r=1$

$(x-1)^2+(y+1)^2=1^2$

$\Rightarrow x^2+y^2-2x+2y+1=0$

LEARNERS TASK

CUQ's

01. opt: B. $x^2+y^2-6x+12y-15=0$

$g=-3$, $f=6$, $c=-15$

$g^2+f^2-c\geq 0$

$\Rightarrow 9+36+15\geq 0$.

Ans: B

02. Conceptual (c) Ans: C

03. Conceptual (D) Ans: D

04. 

Eqn of the circle

$(x-\alpha)^2 + (y-\alpha)^2 = \alpha^2$ Ans: A

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05 $x^2+y^2-6x+12y+15=0 \rightarrow$ centre $(3,-6)$

$x^2+y^2-6x+12y-15=0 \Rightarrow$ centre $(3,-6)$ Ans: A

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06 $ax^2+ay^2+2gx+2fy+c=0$

$\Rightarrow x^2+y^2+\frac{2g}{a}x+\frac{2f}{a}y+\frac{c}{a}=0$

centre $= \left(-\frac{g}{a}, -\frac{f}{a}\right)$ Ans: C

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07 Conceptual (D) Ans: D.

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08 Conceptual (D) Ans: D

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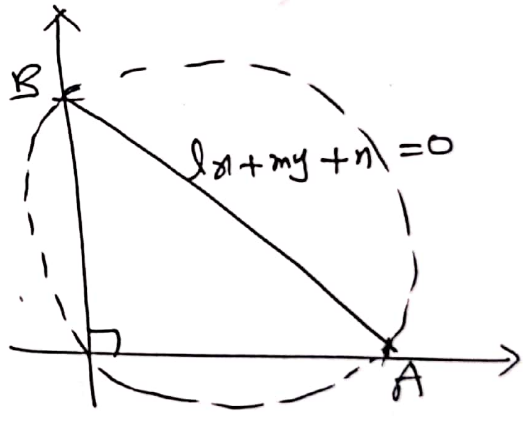
09 $lx+my+n=0$

$\Rightarrow lx+my=-n$

$\Rightarrow \dfrac{x}{\left(\frac{-n}{l}\right)}+\dfrac{y}{\left(\frac{-n}{m}\right)}=1$

$\therefore A\left(-\frac{n}{l}, 0\right)$, $B\left(0, \frac{-n}{m}\right)$

$\quad\; x_1 \quad y_1 \qquad\quad x_2 \quad y_2$



Eqn of the circle

$\left(x+\frac{n}{l}\right)(x-0)+(y-0)\left(y+\frac{n}{m}\right)=0$

$\Rightarrow x^2+\frac{n}{l}x+y^2+\frac{n}{m}y=0$

$\Rightarrow lm(x^2+y^2)+n(mx+ly)=0$ Ans: B

JEE MAINS QUESTIONS

~~Q1.~~ $\cancel{x^2+y^2-6x+12y+15=0}$

~~radius~~ $\cancel{= \sqrt{9+36-15} = \sqrt{30}}$ | ~~centre~~ $\cancel{= (3,-6)}$

~~Eqn of the Circle~~ $\cancel{(x-3)^2+(y+6)^2 = (2\sqrt{30})^2}$

$\cancel{\Rightarrow x^2+y^2-6x+12y+9+36-120=0}$

$\cancel{\Rightarrow x^2+y^2-6x+12y}$

01. $x^2+y^2-6x+12y+15=0$

radius $= \sqrt{9+36-15}$ | centre $= (3,-6)$

$= \sqrt{30}$

Area $= \pi r^2 = 30\pi$

Double Area $= 60\pi = \pi R^2 \Rightarrow R^2 = 60$.

Eqn of the Circle $(x-3)^2+(y+6)^2 = 60$

$\Rightarrow x^2+y^2-6x+12y+9+36-60=0$

$\Rightarrow x^2+y^2-6x+12y-15=0$ Ans. A

02 $3x-2y+6=0$ | $\therefore A(-2,0),\ B(0,3)$

$\Rightarrow 3x-2y=-6$ | $r = AB = \sqrt{4+9} = \sqrt{13}$

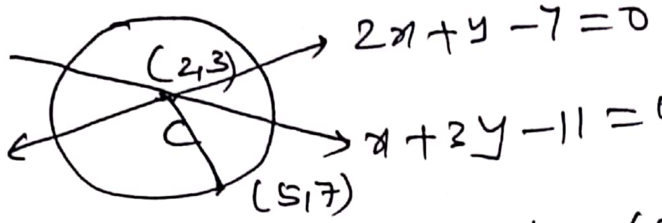
$\Rightarrow \frac{x}{-2}+\frac{y}{3}=1$

Eqn of the Circle $(x+2)^2+(y-0)^2 = (\sqrt{13})^2$

$\Rightarrow x^2+y^2+4x+4-13=0 \Rightarrow x^2+y^2+4x-9=0$

Ans. B

03



Solving equations, centre $(2,3)$

Circle passes through $(5,7)$

$\therefore$ radius $= \sqrt{(5-2)^2+(7-3)^2}$

$= \sqrt{9+16} = 5$

Eqn of the circle $(x-2)^2+(y-3)^2 = 5^2$

$x^2+y^2-4x-6y+4+9-25=0$

$\Rightarrow x^2+y^2-4x-6y-12=0$ Ans: C

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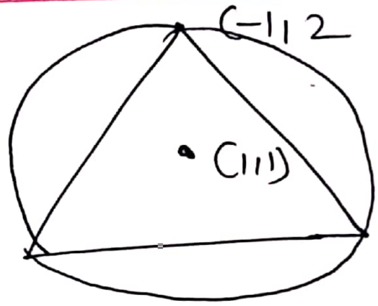
04 For equilateral triangle



Centroid = Circum centre $= C(1,1)$

$\therefore$ radius $= \sqrt{(1+1)^2+(1-2)^2}$

$= \sqrt{4+1} = \sqrt{5}$

Eqn of the circle $(x-1)^2+(y-1)^2 = (\sqrt{5})^2$

$\Rightarrow x^2+y^2-2x-2y+1+1-5=0$

$\Rightarrow x^2+y^2-2x-2y-3=0$

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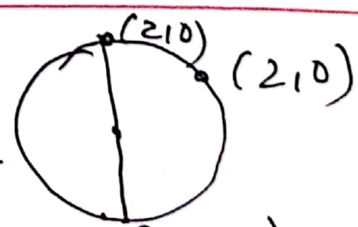
05 Circle passes through $(2,0),(0,4)$



mid-point $= (1,2)$.

Eqn of the circle $= (x-1)^2+(y-2)^2 = r^2$

Circle passes through $(2,0) \Rightarrow (2-1)^2+(0-2)^2 = r^2$

$\Rightarrow r^2 = 5$

$\therefore$ Eqn of the circle $\Rightarrow x^2+y^2-2x-4y=0$ Ans. B

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06 $(x-1)^2+(y+2)^2=9$ (16)

centre $=(1,-2)$, $r=3$

parametric point $=(h+r\cos\theta,\ k+r\sin\theta)$

$=(1+3\cos\theta,\ -2+r\sin\theta)$ Ans: B

07. $2x+3y+1=0$

$\Rightarrow 2x+3y=-1$

$\Rightarrow \dfrac{x}{\left(-\frac{1}{2}\right)}+\dfrac{y}{\left(-\frac{1}{3}\right)}=1$

$A\left(-\frac{1}{2},0\right), B\left(0,-\frac{1}{3}\right)$

$6x+4y+1=0$

$\Rightarrow \dfrac{x}{\left(-\frac{1}{6}\right)}+\dfrac{y}{\left(-\frac{1}{4}\right)}=1$

$\therefore C\left(-\frac{1}{6},0\right), B\left(0,-\frac{1}{4}\right)$.

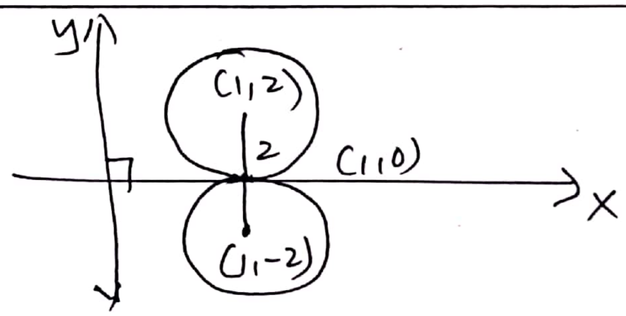
opt: A $\rightarrow$ $12x^2+12y^2+8x+7y+1=0$ satisfies the above points

Ans: A

08

Centres may be

$(1,2)$ & $(1,-2)$



09. $x-2=0$

$\Rightarrow x=2$

~~$x^2+y^2-8x-2y=0$~~

~~$4+y^2-16-2y=0$~~

~~$\Rightarrow y^2-2y-12=0$~~

~~$\Rightarrow (y+6)(y-2)=0$~~

09 $x-2=0$

$x=2$

$x^2+y^2-8x-2y=0$

$\Rightarrow 4+y^2-16-2y=0$

$\Rightarrow y^2-2y-12=0 \Rightarrow y=1\pm\sqrt{13}$

$\therefore A(2, 1+\sqrt{13}), B(2, 1-\sqrt{13})$ satisfies option: B

i.e $x^2+y^2-4x-2y=0$

Ans: B

(17)

10 $x = \frac{8t}{1+t^2}$ | $y = 4\left(\frac{1-t^2}{1+t^2}\right)$

$x = 4\left(\frac{2t}{1+t^2}\right)$

put $t = \tan\theta$

$\therefore x = 4\sin 2\theta,\quad y = 4\cos 2\theta$

$x^2 + y^2 = 16$

This is a circle with centre $(0,0)$, radius $= 4$

Ans. B

11 $ax^2 + bxy + 3y^2 - 5x + 2y - 3 = 0 \rightarrow$ Circle

$a = 3,\quad b = 0$

$\therefore 3x^2 + 3y^2 - 5x + 2y - 3 = 0$

$\Rightarrow x^2 + y^2 - \frac{5}{3}x + \frac{2}{3}y - 1 = 0$

Centre $= \left(\frac{5}{6}, -\frac{1}{3}\right)$

radius $= \sqrt{\frac{25}{36} + \frac{1}{9} + 1} = \frac{\sqrt{65}}{6}$

Ans A, B, C, D

12 $3x^2 + 3y^2 - 5x - 6y + 4 = 0$

$\Rightarrow x^2 + y^2 - \frac{5}{3}x - 2y + \frac{4}{3} = 0$

Centre $= \left(\frac{5}{6}, 1\right)$

radius $= \sqrt{\frac{25}{36} + 1 - \frac{4}{3}} = \frac{\sqrt{13}}{6}$

Ans: A, B

13 SI: $x + 3y - 1 = 0,\ x + y + 1 = 0,\ 2x + 3y + 4 = 0$

solving $A(-2,1), B(1,-2), C(-5,2)$

All these points satisfy $x^2 + y^2 + 12x + 12y + 7 = 0$

St. II: Conceptual (True)

Ans. A

14. <u>statement I:</u> Centre lies on X-axis

Let the centre be $c(h, 0)$

Let $A(-2, 3)$, $B(4, 5)$

We have $CA = CB$

$\Rightarrow CA^2 = CB^2$

$\Rightarrow (h+2)^2 + (0-3)^2 = (h-4)^2 + (0-5)^2$

$\Rightarrow h^2 + 4h + 4 + 9 = h^2 - 8h + 16 + 25$

$\Rightarrow 12h = 28 \Rightarrow h = \frac{7}{3}$

$\therefore$ Centre $= \left(\frac{7}{3}, 0\right)$.

Given eqn $3(x^2+y^2) - 14x - 67 = 0$

$\Rightarrow x^2 + y^2 - \frac{14}{3}x - \frac{67}{3} = 0$.

Centre $\left(\frac{7}{3}, 0\right)$ Also this eqn satisfies A and B.

Ans: A

<u>statement II:</u> Conceptual (true)

---

15 $(x+a)^2 + (y+b)^2 = a^2 - b^2$

Ans: B

$\Rightarrow x^2 + y^2 + 2ax + 2by + 2b^2 = 0$

---

16 $(x - \cos\theta) + (y - \sin\theta)^2 = 1^2$

Ans: D

$\Rightarrow x^2 + y^2 - 2\cos\theta\, x - 2\sin\theta\, y = 0$

---

17 Eqn of the circle passing through $(1, 2), (3, -4)$ and $(5, -6)$ is $x^2 + y^2 - 22x - 2y + 25 = 0$

$(c, 8) \Rightarrow c^2 + 64 - 22c - 16 + 25 = 0$

$\Rightarrow c^2 - 22c + 57 = 0 \Rightarrow c = 3, 19$

Ans: D

18. Eqn of the circle passing through $(2,0), (0,1), (4,5)$ is $3(x^2+y^2)-13x-17y+14=0$

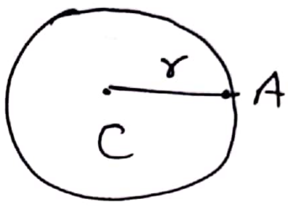
$(0,c) = 3(0+c^2)-13(0)-17c+14=0$

$\Rightarrow 3c^2-17c+14=0$

$\Rightarrow c = \frac{14}{3}$

Ans. C

19. $C(2,3)$, $A(2,-1)$



$r = CA$

$r^2 = CA^2 = (2-2)^2 + (3+1)^2$

$= 16$

$\therefore (x-2)^2 + (y-3)^2 = 16$

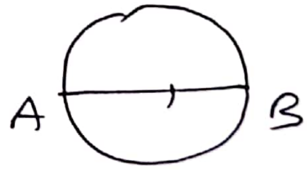
$\Rightarrow x^2+y^2-4x-6y+3=0$

$x^2+y^2+ax+by+c=0$

$\Rightarrow a+b+c = -4-6+3 = -13$

Ans: -13

20 $A(1,2)$, $B(2,a)$



$c = \left(\frac{1+2}{2}, \frac{2+a}{2}\right)$

$c = \left(\frac{3}{2}, \frac{2+a}{2}\right)$

Eqn of the circle

$(x-1)(x-2) + (y-2)(y-a) = 0$

$\Rightarrow x^2-3x+2+y^2-ay-2y+2a=0$

$\Rightarrow x^2+y^2-3x-(a+2)y+2+2a=0$

$x^2+y^2-3x-4y+6=0$

$\therefore (a+2)=4 \Rightarrow a=2$

Ans: 2

21 1) centre $\left(\frac{3}{2}, \frac{1}{2}\right)$

Circle $\Rightarrow x^2+y^2-3x-y+1=0$

2) centre $(0,0)$, passing through $(-1,2)$

$\therefore r=\sqrt{1+4}=\sqrt{5}$

$\therefore x^2+y^2=5$

3) $x^2+y^2+3x+4y+6=0$

4) $(x-1)^2+(y+1)^2=49.$

centre $(1,-1) \Rightarrow$ ~~x+y~~ satisfies

$2x-3y=5$

$3x-4y=7$

radius $=7$

Area $=\pi r^2$

$=\frac{22}{7}\times 7^2=154$

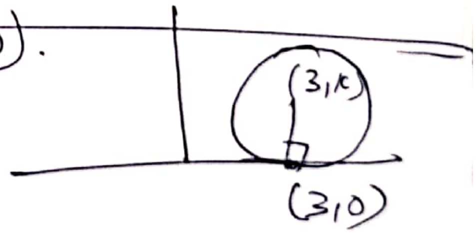
---

22 1) Circle touches x-axis at $(3,0)$.

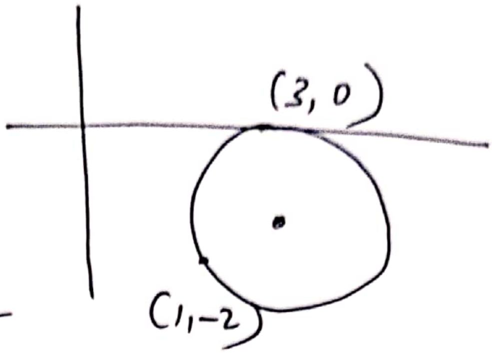
$\therefore$ centre $(3,k)$, $A(1,-2)$

radius $r=\sqrt{(3-1)^2+(k+2)^2}$

$=\sqrt{}$

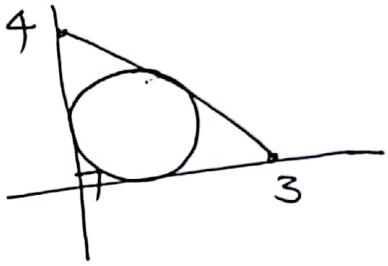


1) centre $(3, k)$
radius $= k$.
Eqn of the circle



$(x-3)^2 + (y-k)^2 = k^2$
This circle passes through $(1,-2)$
$(1-3)^2 + (-2-k)^2 = k^2$
$\Rightarrow \quad k = -2$
$\therefore$ Eqn of the circle $(x-3)^2 + (y+2)^2 = 4$.
$\therefore$ $(5,-2)$ satisfies the above eqn.

2) $4x + 3y = 12$



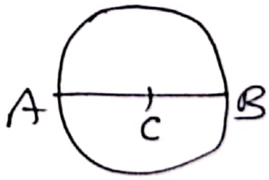
$\Rightarrow \frac{x}{3} + \frac{y}{4} = 1$
centre (r, r), radius $= r$

$r = \frac{|4r + 3r - 12|}{\sqrt{9+16}}$

$\Rightarrow \quad 5r = |7r - 12|$

$\Rightarrow \pm 5r = 7r - 12$
$\Rightarrow \quad r = 6$.

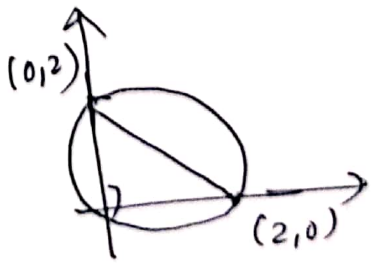
3) $A(2,3), C(4,4), B(x,y)$



$\frac{2+x}{2} = 4 \quad \Big| \quad \frac{3+y}{2} = 4$

$\therefore (x,y) = (6,5)$

4) $A(2,0)$, $B(0,2)$



mid-point $= (1,1)$

$\Rightarrow$ THE END $\in$

Ans: r, p, t, q