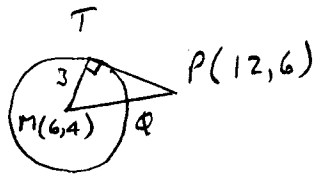


8) a) Centre (6,4) Radius 3 $(x-6)^2 + (y-4)^2 = 3^2$

b)



$$PM = \sqrt{(12-6)^2 + (6-4)^2}$$

$$PM = \sqrt{40}$$

$$\cos \angle TMA = \frac{3}{\sqrt{40}}$$

$$\angle TMA = \cos^{-1} \left(\frac{3}{\sqrt{40}} \right) = 1.0766 \text{ rad.}$$

c) Shaded Area = Area of Δ - Area of sector

$$= \frac{1}{2} \times 3 \times \sqrt{40} \sin 1.0766 - \frac{1}{2} \times 3^2 \times 1.0766$$

$$= 3.507 \text{ units}^2 \quad \text{to 3 d.p.}$$

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5)

Centre (3,1) passes through P(8,3)

$$\text{Radius} = \sqrt{(8-3)^2 + (3-1)^2} = \sqrt{29}$$

a)

$$(x-3)^2 + (y-1)^2 = 29$$

b)

$$\text{Gradient CP} = \frac{3-1}{8-3} = \frac{2}{5} \quad (\text{radius})$$

$$\text{Gradient of } \text{tgt} = -\frac{5}{2}$$

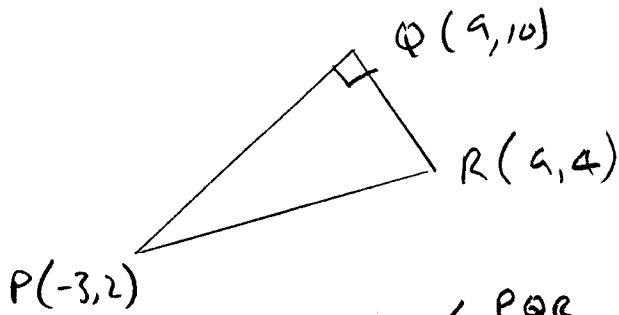
$$y - y_1 = m(x - x_1)$$

$$y - 3 = -\frac{5}{2}(x - 8)$$

$$2y - 6 = -5x + 40$$

$$5x + 2y - 46 = 0$$

5)



$\angle PQR = 90^\circ$ (angle in semi-circle)

Pythagoras

$$QR^2 + QP^2 = PR^2$$

$$(a-9)^2 + (4-10)^2 + (9-(-3))^2 + (10-2)^2 = (a-(-3))^2 + (4-2)^2$$

$$\cancel{a^2} - 18a + 81 + 36 + 144 + 64 = \cancel{a^2} + 6a + 9 + 4$$

$$-18a + 325 = 6a + 13$$

$$312 = 24a$$

$$a = \frac{312}{24} = 13$$

b) Centre is midpoint of PR = $\left(\frac{-3+13}{2}, \frac{2+4}{2} \right)$

$$= (5, 3)$$

$$\text{Radius} = \sqrt{(13-5)^2 + (4-3)^2} = \sqrt{65}$$

$$\text{Circle is } (x-5)^2 + (y-3)^2 = 65$$

b) a)

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

$$(x-3)^2 - 9 + (y+2)^2 - 4 = 12$$

$$(x-3)^2 + (y+2)^2 = 25$$

Centre $(3, -2)$ radius 5

b)

$P(-1, 1)$

$Q(7, -5)$

$$PQ = \sqrt{(7-(-1))^2 + (-5-1)^2}$$

$$= \sqrt{64+36} = \sqrt{100} = 10$$

PQ is twice radius ($10 = 2 \times 5$) so a diameter

c)

if $\angle PRQ = 90^\circ$

R is on circle as it is angle in semi-circle

On circle and $x = 0$

$$(0-3)^2 + (y+2)^2 = 25$$

$$9 + (y+2)^2 = 25$$

$$(y+2)^2 = 16$$

$$y+2 = \pm 4$$

$$y = \pm 4 - 2$$

$$y = 2 \text{ or } y = -6$$

R on positive y -axis so $R(0, 2)$

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8) a) $(x-2)^2 + (y+1)^2 = \frac{169}{4}$ Centre $N(2, -1)$

b) Radius $= \sqrt{\frac{169}{4}} = \frac{13}{2}$

c) $N(2, -1)$



B has x-coord $2+6=8$

A has x-coord $2-6=-4$

$$(8-2)^2 + (y+1)^2 = \frac{169}{4}$$

$$36 + (y+1)^2 = \frac{169}{4}$$

$$(y+1)^2 = \frac{25}{4}$$

$$y+1 = \pm \frac{5}{2}$$

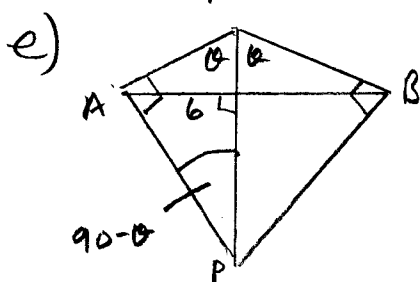
$$y = \pm \frac{5}{2} - 1 = \frac{3}{2} \text{ or } -\frac{7}{2}$$

A, B below x-axis so $A(-4, -\frac{7}{2})$

$B(8, -\frac{7}{2})$

d) In diagram $\sin \theta = \frac{6}{6.5}$ $\theta = \sin^{-1}\left(\frac{6}{6.5}\right) = 67.38^\circ$

$\angle ANB = 2\theta = 134.8^\circ$
to 1 dp.



$\angle NPA = 90 - \theta$ (\angle sum of $\triangle PAN$)

$\sin(90 - \theta) = \frac{6}{AP}$

$AP = \frac{6}{\sin(90 - \theta)} = \frac{6}{\sin 22.62} = 15.6$

to 3 s.f.

(6)

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10)

a)

Centre $A(2,1)$ through $B(10,7)$

$$\text{Radius} = \sqrt{(10-2)^2 + (7-1)^2} = \sqrt{64+36} = 10$$

$$\text{Circle } (x-2)^2 + (y-1)^2 = 10^2$$

b)

$$\text{Gradient of radius } AB = \frac{7-1}{10-2} = \frac{6}{8} = \frac{3}{4}$$

$$\text{Gradient of tgt} = -\frac{4}{3} \quad \text{through } (10,7)$$

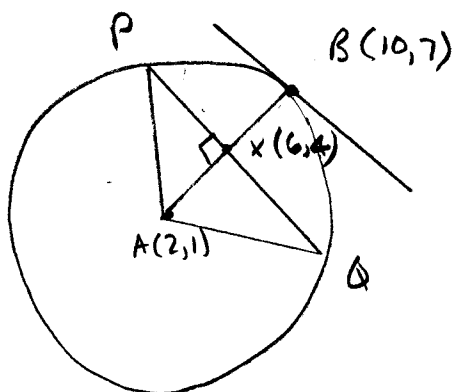
$$y-y_1 = m(x-x_1)$$

$$y-7 = -\frac{4}{3}(x-10)$$

$$y-7 = -\frac{4}{3}x + \frac{40}{3}$$

$$y = -\frac{4}{3}x + \frac{61}{3}$$

c) Mid point of $AB = \left(\frac{2+10}{2}, \frac{1+7}{2} \right) = (6, 4)$



$$AX = \sqrt{(6-2)^2 + (4-1)^2} = 5$$

$$AP = 10 \quad (\text{radius})$$

$$\begin{aligned} PX^2 &= AP^2 - AX^2 \\ &= 100 - 25 = 75 \end{aligned}$$

$$PX = \sqrt{75} = 5\sqrt{3}$$

$$PQ = 2PX = 10\sqrt{3}$$
