

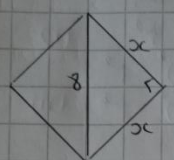
# Further Maths GCSE

## Circles Answers

1. Centre of circle A = (0, 0)  
 B = (-6, 8)

Distance between them  $\sqrt{(0 - (-6))^2 + (0 - 8)^2} = 10$

2. Centre = midpoint of AC = (5, 9)



$x^2 + x^2 = 8^2$   
 $x^2 = 32$   
 $x = \sqrt{32}$

So radius =  $\frac{1}{2}\sqrt{32}$   
 $= \frac{1}{2}\sqrt{16 \times 2}$   
 $= 2\sqrt{2}$        $r^2 = 8$

Equation of circle =  $(x-5)^2 + (y-9)^2 = 8$

3. Centre lies on the perpendicular bisector of Q and R  
 so  $x = 7$

Equation of circle is  $(x-7)^2 + (y-b)^2 = r^2$

(4, 0) lies on circle  $(-3)^2 + (-b)^2 = r^2$   
 $9 + b^2 = r^2$  (i)

(0, 4) " " "  $(-7)^2 + (4-b)^2 = r^2$   
 $49 + (4-b)^2 = r^2$  (ii)

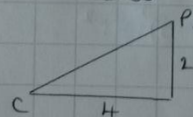
Both (i) and (ii) =  $r^2$   
 so  $9 + b^2 = 49 + (4-b)^2$   
 $9 + b^2 = 49 + 16 - 8b + b^2$   
 $-56 = -8b$   
 $b = 7$

Also  $9 + b^2 = r^2 \Rightarrow 56 = r^2$   
 so equation  $(x-7)^2 + (y-7)^2 = 56$

4. Gradient of tangent = -2 so gradient of CP =  $\frac{1}{2}$

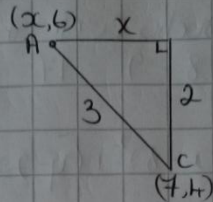
$y = mx + c$        $y = \frac{1}{2}x + c$       let  $x = 4, y = 5$   
 $5 = 2 + c \Rightarrow c = 3$

so centre is at (0, 3)  
 radius<sup>2</sup> =  $4^2 + 2^2 = 20$



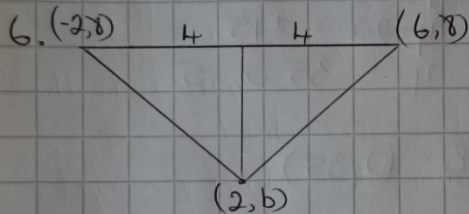
so  $x^2 + (y-3)^2 = 20$

5.  $C = (7, 4)$   
 $A = (x, 6)$   
radius = 3



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

$$\text{so } AB = 2x = 2\sqrt{5}$$



$$(x-a)^2 + (y-b)^2 = r^2 \quad \text{C lies on line } x=2$$

$$\text{so } (x-2)^2 + (y-b)^2 = r^2$$

$$\begin{array}{l} x \ y \\ (-2, 8) \Rightarrow (-4)^2 + (8-b)^2 = r^2 \\ (6, 8) \Rightarrow 4^2 + (8-b)^2 = r^2 \\ (2, 0) \Rightarrow 0 + (b)^2 = r^2 \end{array} \quad \left. \vphantom{\begin{array}{l} (-2, 8) \\ (6, 8) \\ (2, 0) \end{array}} \right\} (2, 0) \text{ lies on circle}$$

$$\text{so } 16 + (8-b)^2 = b^2 \quad (=r^2)$$

$$16 + 64 - 16b + b^2 = b^2$$

$$80 = 16b$$

$$5 = b \quad \text{and } r^2 = 25$$

$$\text{so } (x-2)^2 + (y-5)^2 = 25$$

7. tangent touches circle at  $(-9, 20)$   
radius =  $8 - (-9) = 17$

$$\text{so } (x-8)^2 + (y-20)^2 = 17^2$$

At A and B  $x=0$

$$\text{so } 64 + (y-20)^2 = 289$$

$$(y-20)^2 = 225$$

$$y-20 = \pm 15$$

$$y = 35 \text{ or } 5$$

$$\text{so } A = (0, 5) \quad B = (0, 35)$$

8.  $(x-1)^2 + (y-3)^2 - 1 - 9 = 0$   
 $(x-1)^2 + (y-3)^2 = 10$

Centre =  $(1, 3)$   
radius =  $\sqrt{10}$