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6.2: Equation of a Circle.

1) a) $C = (-5, 3) \quad r = 8$

$$(x+5)^2 + (y-3)^2 = 64$$

b) $C = (7, -8) \quad r = 10$

$$(x-7)^2 + (y+8)^2 = 100$$

c) $C = (-1, -4) \quad r = 3\sqrt{2}$

$$(x+1)^2 + (y+4)^2 = 18$$

2) a) $(x+2)^2 + (y-9)^2 = 144$

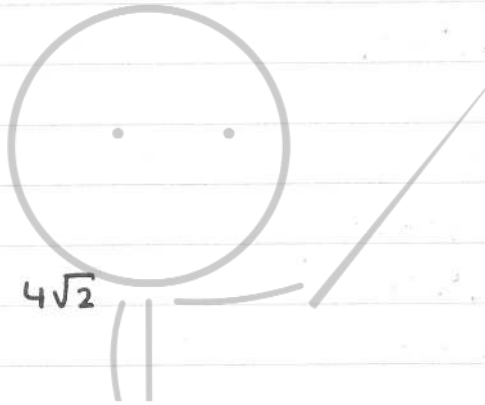
Centre: $(-2, 9)$

Radius: $\sqrt{144} = 12$

b) $(x-5)^2 + (y+2)^2 = 32$

Centre: $(5, -2)$

Radius: $\sqrt{32} \rightarrow \sqrt{16 \times 2} = 4\sqrt{2}$



c) $(x+6)^2 + y^2 = 45$

Centre: $(-6, 0)$

Radius: $\sqrt{45} \rightarrow \sqrt{9 \times 5} = 3\sqrt{5}$

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3) $x^2 + y^2 + 8x - 12y - 15 = 0$

$$x^2 + 8x + y^2 - 12y = 15$$

$$(x+4)^2 - 16 + (y-6)^2 - 36 = 15$$

$$(x+4)^2 + (y-6)^2 - 52 = 15$$

$$(x+4)^2 + (y-6)^2 = 67$$

Centre: $(-4, 6)$

Radius: $\sqrt{67}$

4) midpoint = Centre $(-1, 8)$ $(7, 20)$

$$\left(\frac{-1+7}{2}, \frac{8+20}{2} \right)$$

$$= \left(\frac{6}{2}, \frac{28}{2} \right)$$

$$= (3, 14)$$

Radius: $\sqrt{(7-3)^2 + (20-14)^2}$
 $= \sqrt{(4)^2 + (6)^2}$
 $= \sqrt{16 + 36}$
 $= \sqrt{52}$

$$(x-3)^2 + (y-14)^2 = 52$$

5) $(2, 3)$

$$(2-h)^2 + (3-k)^2 = 50$$

$$(1)^2 + (3-k)^2 = 50$$

$$1 + (3-k)^2 = 50$$

$$(3-k)^2 = 49$$

$$3-k = \sqrt{49}$$

$$3-k = \pm 7$$

$$3-k = 7$$

$$3-k = -7$$

$$k = -4$$

$$k = 10$$

$$k = 10 \text{ or } -4$$

6) a) $x^2 + y^2 - 6x + 10y - 16 = 0$

$$x^2 - 6x + y^2 + 10y = 16$$

$$(x-3)^2 - 9 + (y+5)^2 - 25 = 16$$

$$(x-3)^2 + (y+5)^2 - 34 = 16$$

$$(x-3)^2 + (y+5)^2 = 50$$

a) Centre: $(3, -5)$

b) Radius: $\sqrt{50} \rightarrow \sqrt{25} \times \sqrt{2} = 5\sqrt{2}$ $k = 5$

$$\begin{aligned}
 & (1, 6) \quad (-3, 4) \\
 & \begin{matrix} x & y \\ x & y \end{matrix} \\
 7) \text{ a) Radius: } & \sqrt{(-3-1)^2 + (4-6)^2} \\
 & = \sqrt{(-4)^2 + (-2)^2} \\
 & = \sqrt{16+4} \\
 & = \sqrt{20}
 \end{aligned}$$

$$(x-1)^2 + (y-6)^2 = 20$$

$$b) x=0$$

$$(0-1)^2 + (y-6)^2 = 20$$

$$(-1)^2 + (y-6)^2 = 20$$

$$1 + (y-6)^2 = 20$$

$$(y-6)^2 = 19$$

$$y-6 = \pm\sqrt{19}$$

$$y = 6 \pm\sqrt{19}$$

$$(0, 6+\sqrt{19}) \text{ or } (0, 6-\sqrt{19})$$

$$\begin{array}{c}
 8) \text{ a) } \begin{array}{ccc} P & M & Q \\ \hline \begin{matrix} (5, 8) \\ x & y \end{matrix} & \begin{matrix} (-2, 3) \\ x & y \end{matrix} & \end{array}
 \end{array}$$

$$5 - (-2) = 7$$

$$-2 - 3 = -5$$

$$x = -9$$

$$8 - 3 = 5$$

$$3 - 5 = -2$$

$$y = -2$$

$$(-9, -2)$$

$$a) p = -9$$

$$q = -2$$

$$b) (5, 8) \quad (-2, 3)$$

$$\begin{aligned}
 \text{radius} &= \sqrt{(5-(-2))^2 + (8-3)^2} \\
 &= \sqrt{(7)^2 + (5)^2} \\
 &= \sqrt{49+25} \\
 &= \sqrt{74}
 \end{aligned}$$

$$c) (x+2)^2 + (y-3)^2 = 74$$

$$(x+2)(x+2) + (y-3)(y-3)$$

$$x^2 + 4x + 4 + y^2 - 6y + 9$$

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

$$a) x^2 + y^2 + 4y - k = 0$$

$$x^2 + y^2 + 4y = k$$

$$(x-0)^2 + (y+2)^2 - 4 = k$$

$$(x-0)^2 + (y+2)^2 = 4+k$$

$$r^2 = 4+k$$

$$25 = 4+k$$

$$k = 25 - 4$$

$$k = 21$$

Centre: $(0, -2)$

$$b) \begin{matrix} (p, 2) \\ x \quad y \end{matrix} \begin{matrix} (-4, 1) \\ x \quad y \end{matrix}$$

$$r = \sqrt{(p+4)^2 + (2-1)^2}$$

$$2r = \sqrt{(p+4)^2 + (1)^2}$$

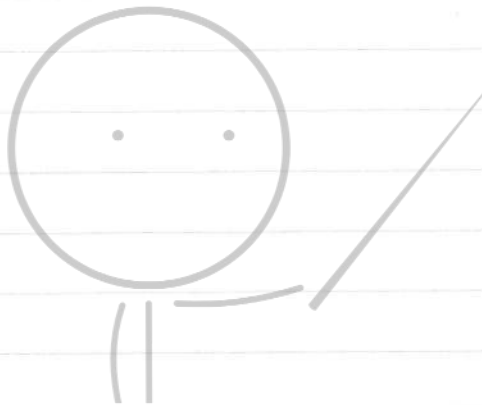
$$2 \times 5 = \sqrt{(p+4)^2 + 1}$$

$$100 = (p+4)^2 + 1$$

$$100 = p^2 + 8p + 16 + 1$$

$$p^2 + 8p - 83 = 0$$

$$p = 5\sqrt{2}$$



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