

## Chapter 14

### Exercise 14A

- 1 **a**  $(x - 4)^2 + (y - 6)^2 = 25$   
**b**  $(x - 7)^2 + (y + 2)^2 = 16$   
**c**  $(x + 3)^2 + (y - 6)^2 = 4$   
**d**  $(x + 3)^2 + (y + 5)^2 = 36$   
**e**  $x^2 + (y + 3)^2 = 49$   
**f**  $(x + 4)^2 + y^2 = 9$   
**g**  $x^2 + y^2 = 5$   
**h**  $(x + 7)^2 + (y + 1)^2 = 13$
- 2 **a** (2, 3); 6  
**b** (-4, 1); 3  
**c** (7, -5); 10  
**d** (0, 9); 4  
**e** (-3, 0);  $2\sqrt{21}$   
**f** (1, -1); 1  
**g** (0, 0);  $\sqrt{17}$   
**h** (-4, 5);  $\sqrt{7}$
- 3  $(x - 5)^2 + (y - 5)^2 = 25$   
4  $x^2 + (y - 7)^2 = 25$   
5  $(x + 2)^2 + (y - 1)^2 = 25$   
6  $(x + 5)^2 + (y + 1)^2 = 20$   
7  $(x + 2)^2 + (y + 6)^2 = 25$   
8  $a = 6$   
 $(x - 4)^2 + (y - 6)^2 = 34$   
9  $d_{min} = 13$

### Exercise 14B

- 1 Equations  $a, b, e, f$  represent circles, because the radius squared is a positive number.  
 In equation  $c$  the radius is zero, while in equation  $d$  the radius squared is a negative number, hence in these cases the circles cannot exist.
- 2 **a** (-2, 1); 2  
**b** (3, -2); 3

- c** (-3, 2); 4  
**d** (3, 5);  $\sqrt{17}$   
**e** (0, 3);  $\sqrt{11}$   
**f**  $(-\frac{1}{2}, \frac{1}{4}), \frac{13}{16}$

- 3 (-2, 4); 5

$S$  lies inside the circle,  $U$  and  $V$  lie outside the circle,  $T$  is on the circle.

- 4  $k_1 = 1, k_2 = 7$

- 5  $m_1 = -7, m_2 = 3$

- 6  $c = -135$

- 7  $x^2 + y^2 + 14x - 4y - 271 = 0$

- 8  $\overline{ST} = 2$

- 9  $\overline{UV} = 2$

- 10 **a**  $k > -5$

- b**  $k < 4$

- c**  $k < -2$  and  $k > 2$

- d**  $k < -4$  and  $k > 4$

- 11  $x = 2, y = 3$

- 12  $x^2 + y^2 - 8x - 26y + 169 = 0$

- 13  $x^2 + y^2 - 10x - 10y + 45 = 0$

- 14  $x^2 + y^2 - 2x - 4y - 20 = 0$

### Exercise 14C

- 1  $2y - 7x + 57 = 0$

- 2  $2y + 9x = 72$

- 3  $3y + 4x + 25 = 0$

- 4 P(4, 6), Q(4, -2)

- 5 (7, 12)

- 6 The line is a tangent.

- 7 The line is a chord.

- 8 The line does not touch the circle.

- 9 (-1, 10); (11, 4)

$$y = 2x - 18, y = 2x + 12$$

- 10  $k = -\sqrt{10}, \sqrt{10}$

- 11  $k = -1, 3$

- 12  $x^2 + y^2 + 8x - 8y + 7 = 0$

$$13 \ x^2 + y^2 - 4x + 8y - 5 = 0$$

$$14 \ (1, 0)$$

**Exercise 14D**

1 a The circles do not touch:  $d > r_1 + r_2$ .

b, c The circles intersect:  $d < r_1 + r_2$ .

d, e The circles do not touch and one is contained in the other:  $d < r_1 - r_2$ .

2  $p = -1175$

$(21, 20)$