

### 3.3 Mid-points and distances

- 1 a (6,4)    b (2,3)    c  $(-\frac{3}{2}, \frac{15}{2})$     d  $(2, \frac{11}{12})$
- 2 a  $(\frac{3+p}{2}, \frac{2+q}{2})$     b  $p = 5, q = 0$
- 3 a  $(\frac{k+2}{2}, k+2)$     b  $(-k, k+3)$     c  $(2k, 2k+1)$
- 4 (3,8)
- 5 a  $(-2,10)$     b  $(-1,13)$
- 6 a Hint: Solve  $\frac{p+14}{2} = 8, q = 19$   
b (5,7)    c 15
- 7 a (1,7)    b (1,11)
- 8 a  $\sqrt{29}$     b  $3\sqrt{10}$     c  $2\sqrt{26}$     d  $\frac{5}{4}$
- 9 Hint: Calculate each distance  $AB, AC$  and  $BC$ . You will see that exactly two of these distances are equal.
- 10 a  $(6, \frac{1}{2})$     b Hint: Find the midpoint of  $AB$ .
- 11 a Hint: Find the length  $AC$ .    b  $(-3, -15)$
- 12 a  $AB = \sqrt{45}, BC = \sqrt{5}, AC = \sqrt{50}$   
b Hint: Use the distance formula.  
c It is a right-angled triangle (with the right-angle at vertex B).
- 13 a Hint: Solve the equation  $\sqrt{(p-1)^2 + 9} = p$   
b  $(3, \frac{9}{2})$     c  $5\pi$

### 3.4 Parallel and perpendicular lines

- 1 a -3    b  $-\frac{1}{4}$
- 2 a  $\frac{5}{2}$     b  $\frac{3}{4}$
- 3 a common gradient 2    b common gradient  $\frac{3}{2}$   
c common gradient  $-\frac{1}{2}$
- 4 a  $3 \times -\frac{1}{3} = -1$     b  $-\frac{3}{2} \times \frac{2}{3} = -1$   
c  $-\frac{5}{3} \times \frac{3}{5} = -1$
- 5 a  $y = -4x + 3$     b  $y = \frac{1}{4}x + 2$
- 6 a  $\frac{3}{4}$     b  $3y + 4x = 6$
- 7 a Hint: Substitute  $x = -1, y = k$  into the equation.  
b  $3y + x = 7$

- 8 a  $Grad_{AB} = \frac{5}{4}, Grad_{BC} = -\frac{4}{5}$     b  $\angle ABC = 90^\circ$   
c Hint: Find the lengths  $AB$  and  $BC$   
 $\angle BAC = 45^\circ$
- 9 a -2  
b Hint: Find an expression for the gradient of  $BC$  in terms of  $k$ .  
c  $8y - 14x + 37 = 0$
- 10 a  $-\frac{1}{3}$     b  $3y + x = 19$  (or any equivalent form)  
c Hint: Find the gradient of  $CM$  where  $M$  is the midpoint of  $AB$ . You will find a sketch helpful.  
d Hint: Find the distance  $CM$ .