Coordinate Geometry

1 Find the length of the interval AB in each of the following.
(Leave answers in surd form.)

a

b

c
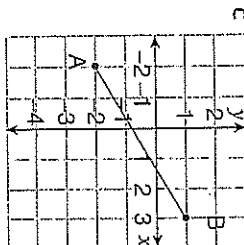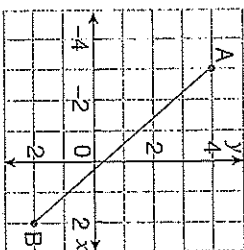
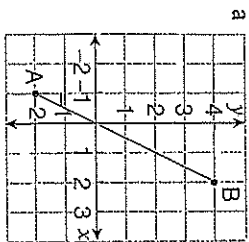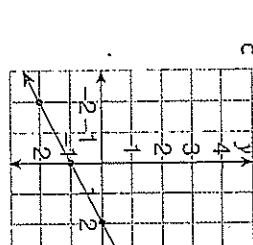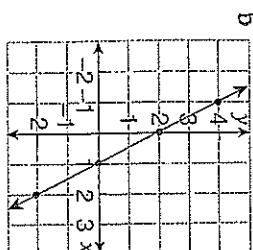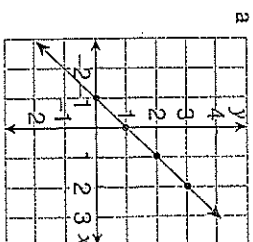**2** Use the distance formula to find the distance between the points:
a $(1, 2)$ and $(7, 10)$ b $(3, 0)$ and $(5, 3)$ c $(-3, -2)$ and $(1, -3)$

3 Find the midpoint of the interval joining:
a $(1, 2)$ and $(7, 10)$ b $(3, 0)$ and $(5, 3)$ c $(-3, -2)$ and $(1, -3)$

4 What is the gradient of each line?

a

b

c

5 Find the gradient of the line that passes through:
a $(1, 3), (2, 7)$ b $(-2, 8), (4, 5)$ c $(0, 3), (3, 5)$

6 a Does the point $(3, 2)$ lie on the line $x + y = 5$?
  b Does the point $(-1, 3)$ lie on the line $y = x + 2$?
  c Does the point $(2, -2)$ lie on the line $y = x - 4$?

7 Graph the lines:
a $y = 2x + 1$ b $2x - y = 3$ c $3x + 2y = 6$

8 State the x- and y-intercepts of the lines:
a $2x - y = 3$ b $x + 3y = 6$ c $x + 2y = 4$

9 Graph the lines:
a $x = 2$ b $y = -1$ c $x = -2$

10 Write down the equation of the line which has:
a a gradient of 3 and a y-intercept of 2
b a gradient of $\frac{1}{2}$ and a y-intercept of -3
c a y-intercept of 3 and a gradient of -1.

11 Write each of the answers to question 10 in general form.

12 What is the gradient and y-intercept of the lines:
a $y = 2x + 3$?   b $y = 3 - 2x$?   c $y = -x + 4$?

13 Rearrange these equations into gradient–intercept form.
a $4x - y + 6 = 0$ b $2x + 3y - 3 = 0$ c $5x + 2y + 1 = 0$

14 Find the equation of the line that:
a passes through $(1, 4)$ and has a gradient of 2
b has a gradient of -3 and passes through $(1, 3)$
c has a gradient of $\frac{1}{2}$ and passes through $(-2, 0)$

15 Find the equation of the line that:
a passes through the points $(1, 1)$ and $(2, 3)$
b passes through the points $(-1, 2)$ and $(1, -4)$
c passes through the origin and $(3, 4)$

16 Find the equation of the line that:
a has a y-intercept of 2 and is parallel to $y = 4x - 1$
b passes through $(1, 7)$ and is parallel to $y = -3x + 4$.
c is perpendicular to $y = \frac{2}{3}x + 1$ and passes through $(-1, 4)$
d is perpendicular to $y = 1 - 2x$ and passes through $(-1, 4)$

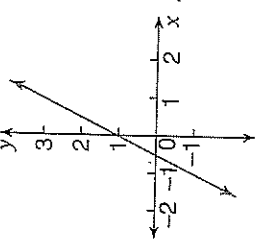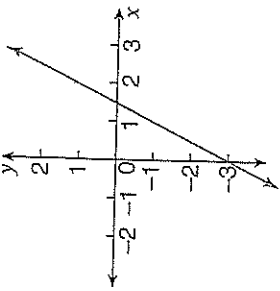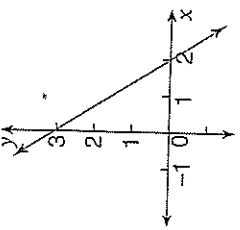**17** Write down the inequation for each region.

a

b

c
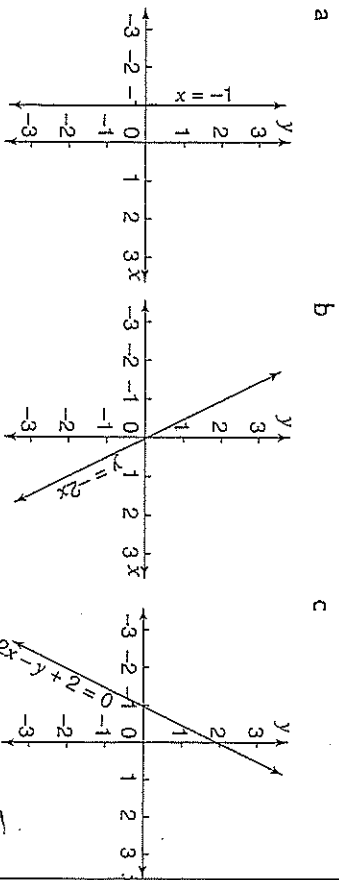
18 Graph a the union and b the intersection of the half planes representing the solutions of $x + 2y \geqslant 2$ and $y < 3x - 1$.

Coordinate geometry

1 Find:
 a the length AB as a surd
 b the slope of AB
 c the midpoint of AB.

(Graph with points A(6, 5) and B(2, −2))

2 A is the point (2, 5) and B is the point (7, 17).
 a What is the length AB (as a surd)?
 b What is the slope of AB?
 c What is the midpoint of AB?

3 A is the point (6, 5) and B is the point (2, −2).
 a What is the slope of the line AB?
 b The line AB passes through the point (100, b). What is the value of b?
 c AC is perpendicular to AB. Find its equation in general form.

4 a A line has an x-intercept of 3 and a gradient of 1. Find where the line crosses the y-axis and hence write down its equation.
 b A line has a slope of $-\frac{1}{2}$ and a y-intercept of 6. What is its equation?
 c A line has an x-intercept of 3 and a y-intercept of 6. What is its equation?

5 The points X(2, 2), Y(−2, 4) and Z(−4, 0) form a triangle. Show that the triangle is both isosceles and right-angled.

6 A line is drawn perpendicular to the line $2x - 3y + 4 = 0$ through its y-intercept. What is the equation of the line? Give the answer in general form.
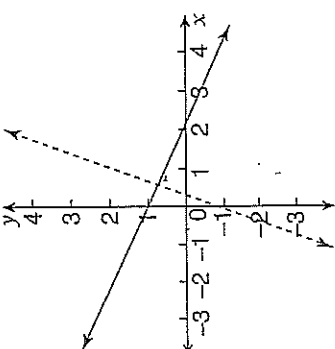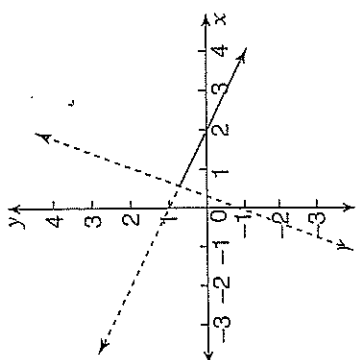
7 A median of a triangle is a line drawn from a vertex to the midpoint of the opposite side. Find the equation of the median through A of the triangle formed by the points A(3, 4), B(−2, −4) and C(−6, 8).

8 What inequalities describe the region shown?

Answers

1 a $\sqrt{45} = 3\sqrt{5}$ b $\sqrt{61}$ c $\sqrt{34}$
2 a 10 b $\sqrt{13}$ c $\sqrt{17}$
3 a (4, 6) b $(4, 1\frac{1}{2})$ c $(-1, -2\frac{1}{2})$
4 a 1 b −2 c $\frac{1}{2}$
5 a 4 b $-\frac{1}{2}$ c $\frac{2}{3}$
6 a yes b no c yes
7 a

1 a $\sqrt{65}$ b $\frac{7}{2}$ c $(4, 1\frac{1}{2})$
2 a 13 b $\frac{5}{12}$ c $(4\frac{1}{2}, 11)$

4 slope of XY = $-\frac{1}{2}$; slope of XZ = $\frac{1}{3}$...; slope of YZ = 2
 ∴ ∠YXZ = 90°.
 XY = XZ = $\sqrt{20}$ ∴ isosceles
 ∴ △XYZ is isosceles and right-angled.

6 $9x + 2y + 6 = 0$
7 $9x + 7y - 12 = 0$
8 $x \geqslant 0 \cup y \geqslant -x + 2$
 $x \geqslant 0 \cup y \geqslant x$

10 a $y = 3x + 2$ b $y = \frac{1}{2}x - 3$ c $y = 3 - x$
11 a $3x - y + 2 = 0$ b $x - 2y - 6 = 0$ c $x + y - 3 = 0$
12 a grad. = 2; y-int. = 3 b grad. = −2; y-int. = 3 c grad. = −1; y-int. = 4
13 a $y = 4x + 6$ b $y = -\frac{2}{3}x + 1$ c $y = -\frac{5}{2}x - \frac{1}{2}$
14 a $y = 2x + 2$ b $y = -3x + 6$ c $y = \frac{1}{2}x + 1$
15 a $y = 2x - 1$ b $y = -3x - 1$ c $y = \frac{4}{3}x$
16 a $y = 4x + 2$ b $y = -3x + 10$ c $y = -\frac{3}{2}x + \frac{5}{2}$ (or $3x + 2y - 5 = 0$)
 d $y = \frac{1}{2}x + 4\frac{1}{2}$ (or $x - 2y + 9 = 0$)
17 a $x \geqslant -1$ b $y \leqslant -2x$ c $2x - y + 2 \geqslant 0$