1. Find the equation of the line through the point $(-1, 4)$ which is parallel to the line with equation $3x - y + 2 = 0$. **3**

2. Find the equation of the line which passes through the point (-1,3) and is perpendicular to the line with equation $4x + y - 1 = 0$.

3

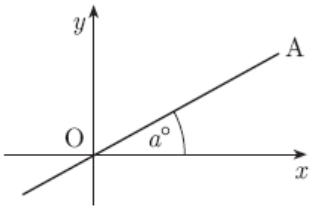
3 (a) The diagram shows line OA with equation $x - 2y = 0$.

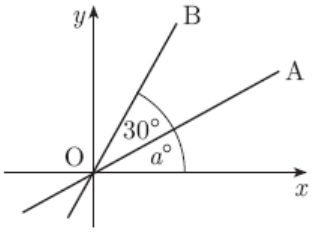
The angle between OA and the x-axis is $a°$.

Find the value of a. **3**

(b) The second diagram shows lines OA and OB. The angle between these two lines is 30°.

Calculate the gradient of line OB correct to 1 decimal place. **1**





4. The point A has coordinates (7, 4). The straight lines with equations $x + 3y + 1 = 0$ and $2x + 5y = 0$ intersect at B.

(a) Find the gradient of AB. **3**

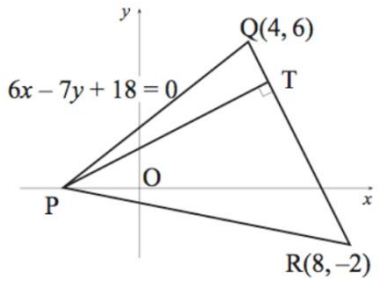
(b) Hence show that AB is perpendicular to only one of these two lines. **5**

5. Triangle PQR has vertex P on the x-axis.
Q and R are the points $(4,6)$ and $(8,-2)$ respectively.
The equation of PQ is $6x-7y+18=0$.

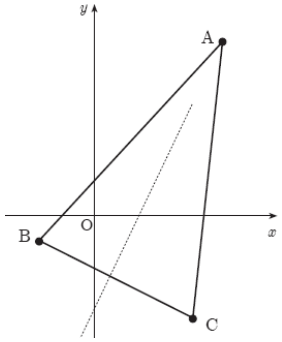
(a) State the coordinates of P 1

(b) Find the equation of the altitude of the triangle from P. 3

(c) The altitude from P meets the line QR at T.
Find the coordinates of T. 4



6. The vertices of triangle ABC are A(7, 9), B(–3, –1) and C(5, –5) as shown in the diagram.
The broken line represents the perpendicular bisector of BC.



(a) Show that the equation of the perpendicular bisector of BC is $y = 2x - 5$. 4

(b) Find the equation of the median from C. 3

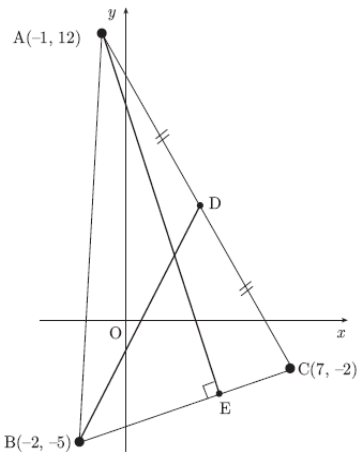
(c) Find the coordinates of the point of intersection of the perpendicular bisector of BC and the median from C. 3

7. Triangle ABC has vertices A(–1,12), B(–2, –5) and C(7, –2).

(a) Find the equation of the median BD. **3**

(b) Find the equation of the altitude AE. **3**

(c) Find the coordinates of the point of intersection of BD and AE. **3**



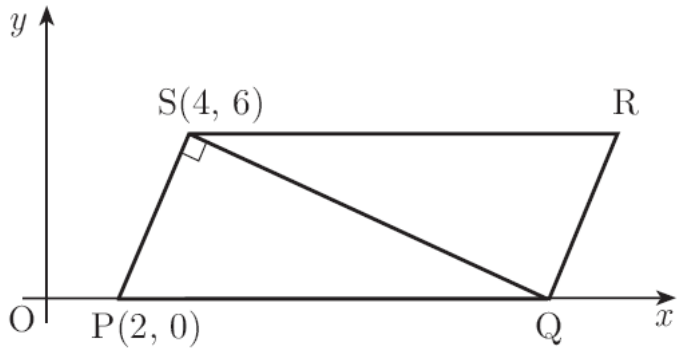
8. A line l has equation $3y + 2x = 6$.
What is the gradient of any line parallel to l?

9. PQRS is a parallelogram. P is the point (2, 0), S is (4, 6) and Q lies on the x-axis, as shown.

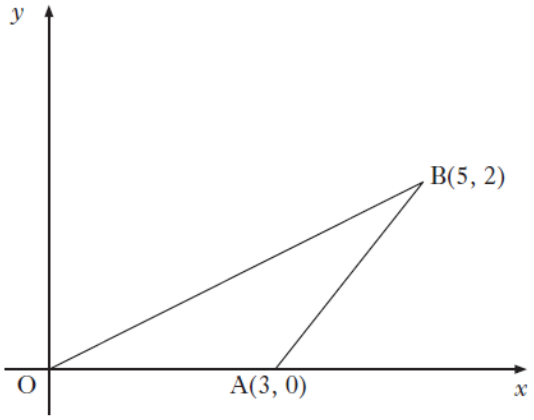
The diagonal QS is perpendicular to the side PS.

(a) Show that the equation of QS is $x + 3y = 22$. **4**

(b) Hence find the coordinates of Q and R. **2**



10. A(3, 0), B(5, 2) and the origin are the vertices of a triangle as shown in the diagram.



(a) Obtain the equation of the perpendicular bisector of AB. **4**

(b) The median from A has equation $y + 2x = 6$.

Find T, the point of intersection of this median and the perpendicular bisector of AB. **2**

(c) Calculate the angle that AT makes with the positive direction of the x-axis. **2**

11. The line L passes through the point (–2, –1) and is parallel to the line with equation $5x + 3y - 6 = 0$.

What is the equation of L?

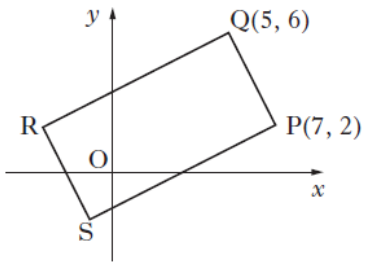
A $3x + 5y - 11 = 0$

B $3x + 5y + 11 = 0$

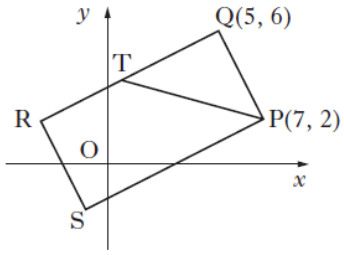
C $5x + 3y - 13 = 0$

D $5x + 3y + 13 = 0$

12 The diagram shows rectangle PQRS with P(7, 2) and Q(5, 6).



(*a*) Find the equation of QR. **3**



Find the coordinates of T. **3**

(*c*) Given that T is the midpoint of QR, find the coordinates of R and S. **3**

13 The line L passes through the point (–2, –1) and is parallel to the line with equation $5x + 3y - 6 = 0$.

What is the equation of L?

A $3x + 5y - 11 = 0$

B $3x + 5y + 11 = 0$

C $5x + 3y - 13 = 0$

D $5x + 3y + 13 = 0$

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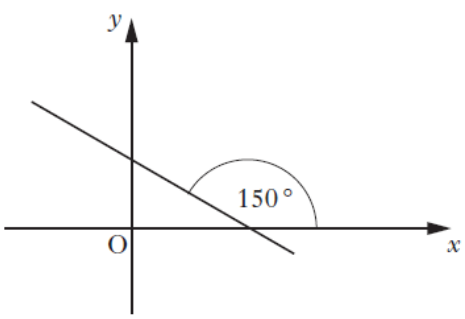
14 (*a*) Find the equation of ℓ_1, the perpendicular bisector of the line joining P(3, –3) to Q(–1, 9). **4**

(*b*) Find the equation of ℓ_2 which is parallel to PQ and passes through R(1, –2). **2**

(*c*) Find the point of intersection of ℓ_1 and ℓ_2. **3**

(*d*) Hence find the shortest distance between PQ and ℓ_2. **2**

15 What is the gradient of the line shown in the diagram?



A $-\sqrt{3}$

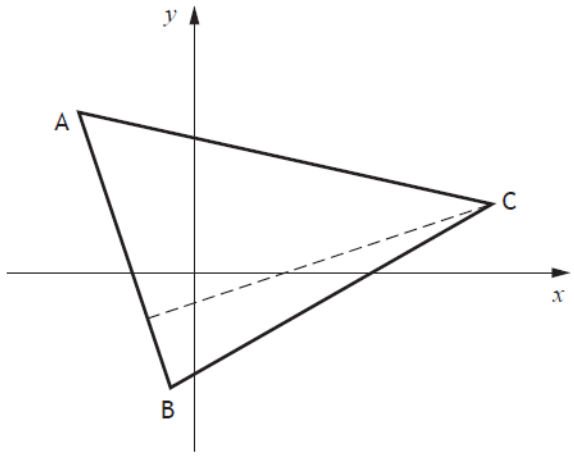
B $-\frac{1}{\sqrt{3}}$

C $-\frac{1}{2}$

D $-\frac{\sqrt{3}}{2}$

16. The vertices of triangle ABC are A(−5, 7), B(−1, −5) and C(13, 3) as shown in the diagram.

The broken line represents the altitude from C.

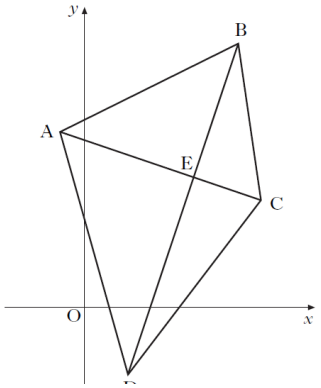


(a) Show that the equation of the altitude from C is $x - 3y = 4$. **4**

(b) Find the equation of the median from B. **3**

(c) Find the coordinates of the point of intersection of the altitude from C and the median from B. **2**

17 A quadrilateral has vertices A(−1, 8), B(7, 12), C(8, 5) and D(2, −3) as shown in the diagram.



(*a*) Find the equation of diagonal BD. **2**

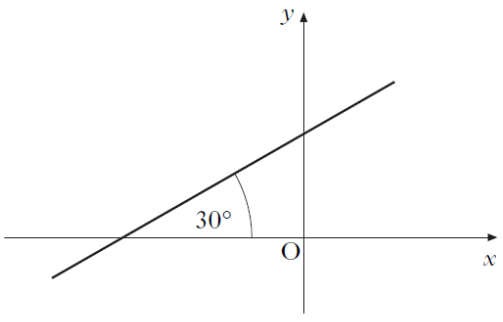
(*b*) The equation of diagonal AC is $x + 3y = 23$.

Find the coordinates of E, the point of intersection of the diagonals. **3**

(*c*) (i) Find the equation of the perpendicular bisector of AB.

(ii) Show that this line passes through E. **5**

18. A line makes an angle of 30° with the positive direction of the x-axis as sho



19.

A, B and C are points such that AB is parallel to the line with equation $y + \sqrt{3}x = 0$ and BC makes an angle of $150°$ with the positive direction of the x-axis.

Are the points A, B and C collinear? **3**

Solutions

1. y = 3x + 7

2. $y - 3 = \frac{1}{4}(x + 1)$

3(a) a = 26.6º
(b) 1.5

4(a) m = 3
(b) Find gradient of each and show $m_1 \times m_2 = -1$

5(a) (-3, 0)
(b) $y - 0 = \frac{1}{2}(x + 3)$
(c) T (5, 4)

6(a) $y + 3 = 2(x - 1)$
(b) $y + 5 = -3(x - 5)$
(c) (3, 1)

7(a) $y + 5 = 2(x + 2)$
(b) $y - 12 = -3(x + 1)$
(c) (2, 3)

8 $m = \frac{-2}{3}$

9(a) $y - 6 = \frac{-1}{3}(x - 4)$
(b) Q(22, 0) R(24, 6)

10(a) y = -x + 5
(b) (1, 4)
(c) 116.6º

11 3y = -5x – 13

12(a) 2y = x + 7
(b) (1, 4)
(c) R (-3, 2) S(-1, -2)

13 D

14(a) $y - 3 = \frac{1}{3}(x - 1)$
(b) $y + 2 = -3(x - 1)$
(c)
(d)

15 B

16(a) $y - 3 = \frac{1}{3}(x - 3)$
(b) y = 2x – 3
(c) (1, -1)

17(a) y = 3x -9
(b) (5, 6)
(c)(i) y = -2x + 16
(ii) sub (5, 6) into line

18 $m = \frac{1}{\sqrt{3}}$

19 Not collinear as gradients are not equal