



## Straight Lines

### Higher Maths Exam Questions

Source: 2019 P1 Q5 Higher Maths

- (1)
- (a) Show that the points  $A(1,5,-3)$ ,  $B(4,-1,0)$  and  $C(8,-9,4)$  are collinear.
  - (b) State the ratio in which  $B$  divides  $AC$ .

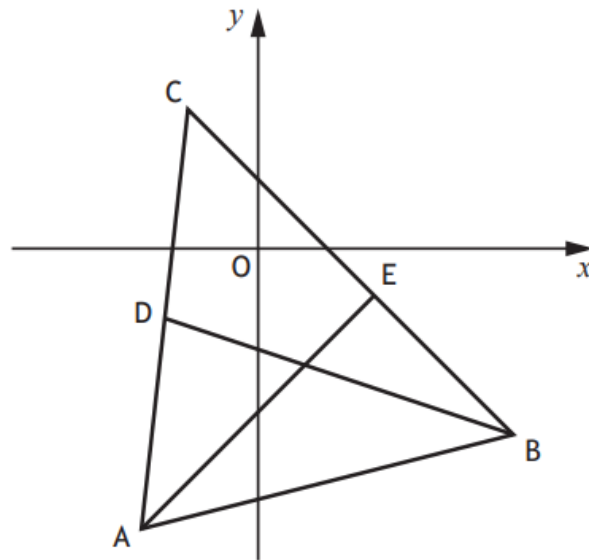
Source: 2019 P1 Q7 Higher Maths

- (2)
- The line,  $L$ , makes an angle of  $30^\circ$  with the positive direction of the  $x$ -axis.  
Find the equation of the line perpendicular to  $L$ , passing through  $(0,-4)$ .

Source: 2019 P2 Q1 Higher Maths

(3)

Triangle ABC has vertices  $A(-5, -12)$ ,  $B(11, -8)$  and  $C(-3, 6)$ .

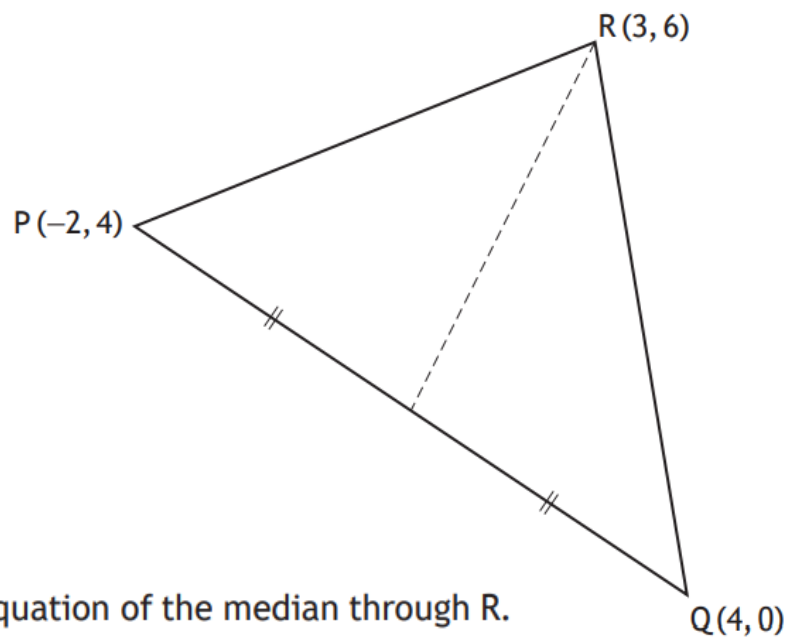


- Find the equation of the median  $BD$ .
- Find the equation of the altitude  $AE$ .
- Find the coordinates of the point of intersection of  $BD$  and  $AE$ .

Source: 2018 P1 Q1 Higher Maths

(4)

$PQR$  is a triangle with vertices  $P(-2, 4)$ ,  $Q(4, 0)$  and  $R(3, 6)$ .



Find the equation of the median through  $R$ .

Source: 2018 P1 Q8 Higher Maths

- (5) A line has equation  $y - \sqrt{3}x + 5 = 0$ .  
Determine the angle this line makes with the positive direction of the  $x$ -axis.

Source: 2017 P1 Q7 Higher Maths

- (6) A(-3, 5), B(7, 9) and C(2, 11) are the vertices of a triangle.  
Find the equation of the median through C.

Source: 2017 P1 Q11 Higher Maths

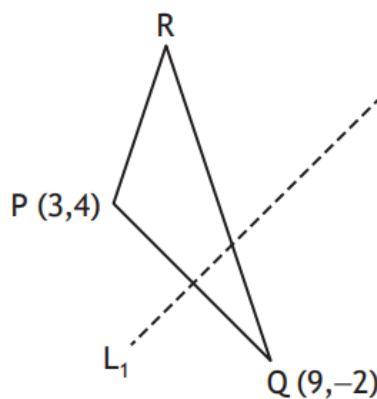
- (7) A and B are the points (-7, 2) and (5,  $a$ ).  
AB is parallel to the line with equation  $3y - 2x = 4$ .  
Determine the value of  $a$ .

Source: 2015 P1 Q9 Higher Maths

- (8) 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  $150^\circ$  with the positive direction of the  $x$ -axis.  
Are the points A, B and C collinear?

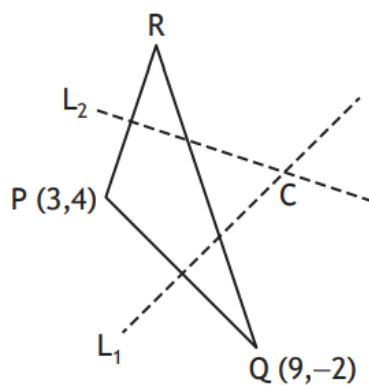
(9)

PQR is a triangle with  $P(3,4)$  and  $Q(9,-2)$ .



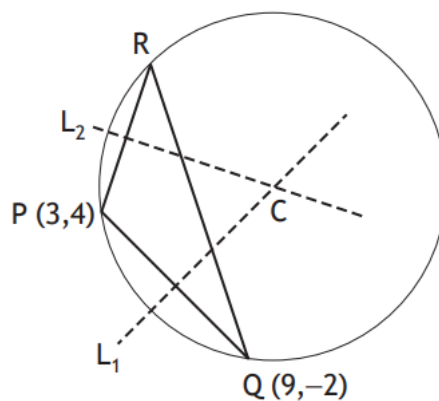
(a) Find the equation of  $L_1$ , the perpendicular bisector of  $PQ$ .

The equation of  $L_2$ , the perpendicular bisector of  $PR$  is  $3y + x = 25$ .



(b) Calculate the coordinates of  $C$ , the point of intersection of  $L_1$  and  $L_2$ .

$C$  is the centre of the circle which passes through the vertices of triangle  $PQR$ .



(c) Determine the equation of this circle.

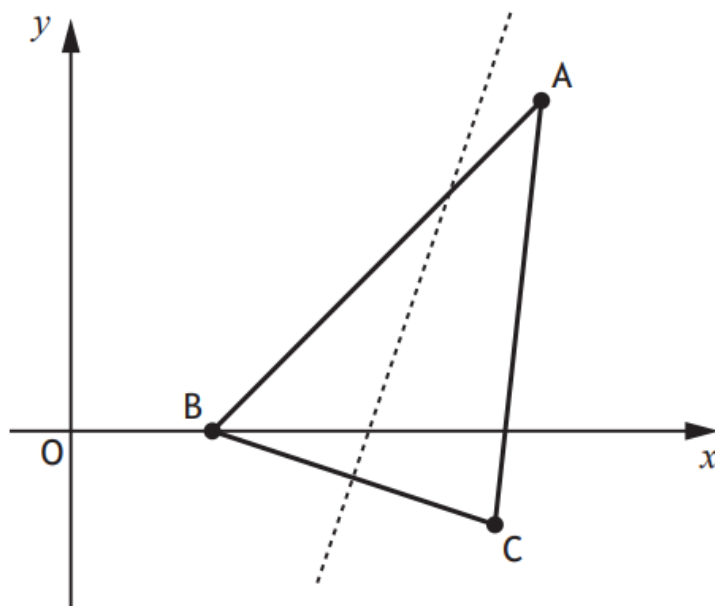
Source: 2017 P2 Q1 Higher Maths

(10)

Triangle ABC is shown in the diagram below.

The coordinates of B are (3,0) and the coordinates of C are (9,-2).

The broken line is the perpendicular bisector of BC.



- Find the equation of the perpendicular bisector of BC.
- The line AB makes an angle of  $45^\circ$  with the positive direction of the  $x$ -axis.  
Find the equation of AB.
- Find the coordinates of the point of intersection of AB and the perpendicular bisector of BC.

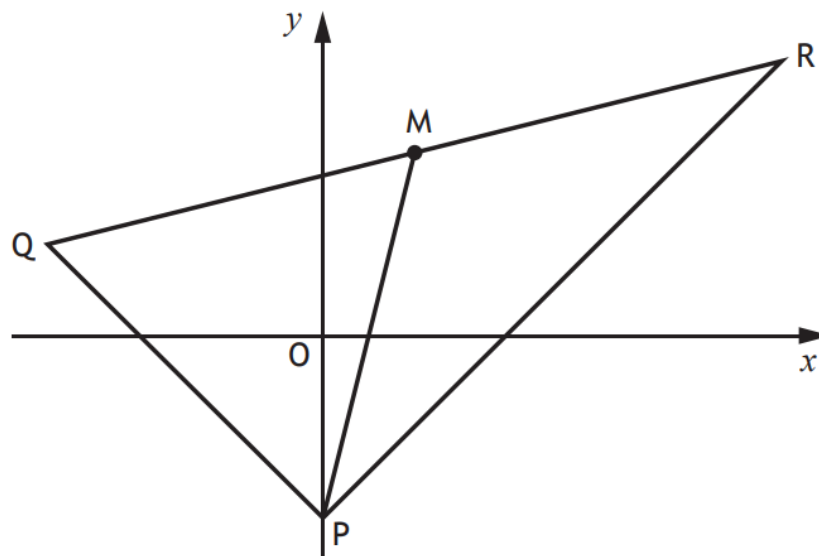
Source: 2016 P1 Q1 Higher Maths

(11)

Find the equation of the line passing through the point  $(-2, 3)$  which is parallel to the line with equation  $y + 4x = 7$ .

(12)

PQR is a triangle with vertices  $P(0, -4)$ ,  $Q(-6, 2)$  and  $R(10, 6)$ .



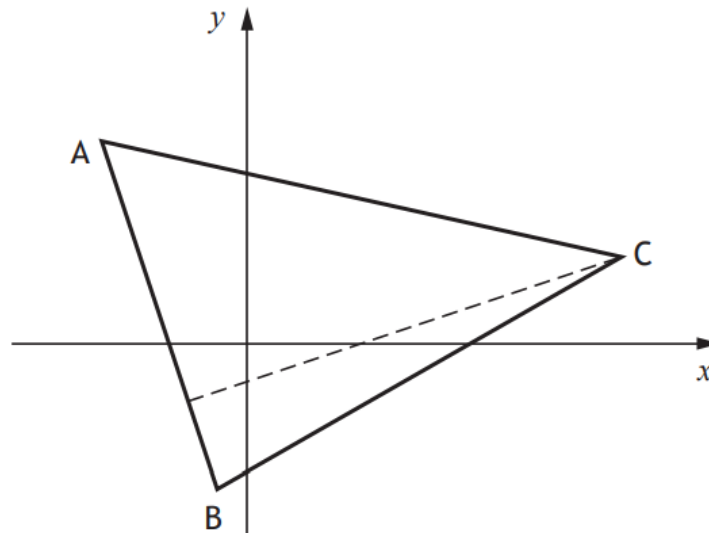
- (a) (i) State the coordinates of  $M$ , the midpoint of  $QR$ .  
(ii) Hence find the equation of  $PM$ , the median through  $P$ .
- (b) Find the equation of the line,  $L$ , passing through  $M$  and perpendicular to  $PR$ .
- (c) Show that line  $L$  passes through the midpoint of  $PR$ .

Source: 2015 P2 Q1 Higher Maths

(13)

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.



- Show that the equation of the altitude from C is  $x - 3y = 4$ .
- Find the equation of the median from B.
- Find the coordinates of the point of intersection of the altitude from C and the median from B.

Source: Specimen P1 Q2 Higher Maths

(14)

Find the coordinates of the points of intersection of the curve  $y = x^3 - 2x^2 + x + 4$  and the line  $y = 4x + 4$ .

Source: Specimen P1 Q5 Higher Maths

- (15) Line  $l_1$  has equation  $\sqrt{3}y - x = 0$ .
- (a) Line  $l_2$  is perpendicular to  $l_1$ . Find the gradient of  $l_2$ .
- (b) Calculate the angle  $l_2$  makes with the positive direction of the  $x$ -axis.

Source: Specimen P1 Q9 Higher Maths

- (16) (a) AB is a line parallel to the line with equation  $y + 3x = 25$ .  
A has coordinates  $(-1, 10)$ .  
Find the equation of AB.
- (b)  $3y = x + 11$  is the perpendicular bisector of AB.  
Determine the coordinates of B.

Source: Exemplar P1 Q6 Higher Maths

- (17) (a) Find the equation of  $l_1$ , the perpendicular bisector of the line joining P  $(3, -3)$  and Q  $(-1, 9)$ .
- (b) Find the equation of  $l_2$  which is parallel to PQ and passes through R  $(1, -2)$ .
- (c) Find the point of intersection of  $l_1$  and  $l_2$ .
- (d) Hence find the shortest distance between PQ and  $l_2$ .