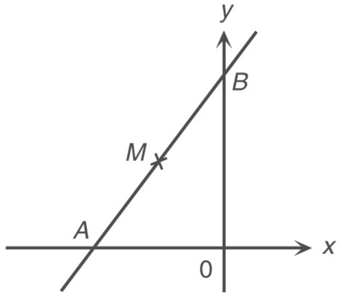
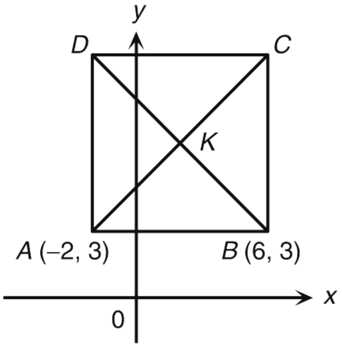
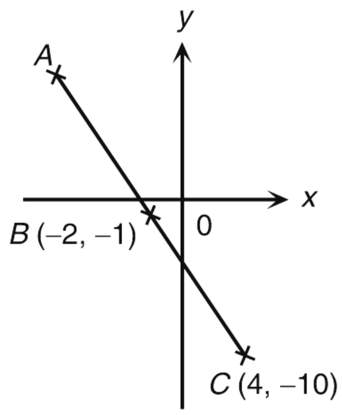
In the figure, a straight line cuts the x-axis and the y-axis at $A(-6, 0)$ and $B(0, 8)$ respectively. If M is the mid-point of AB, find the coordinates of M.



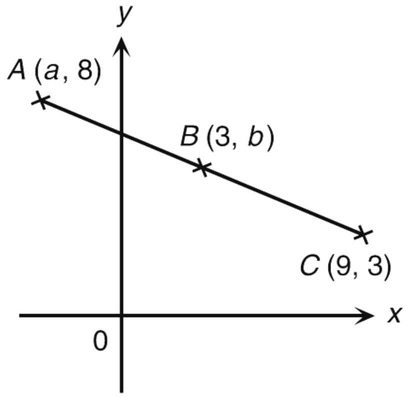
In the figure, the diagonals of the square $ABCD$ intersect at K. Find the coordinates of K.



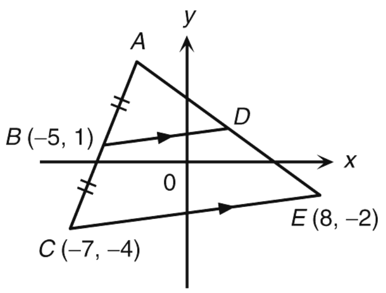
In the figure, ABC is a straight line and $AB = BC$. Find the coordinates of A.



In the figure, ABC is a straight line and $AB = BC$. Find the values of a and b.

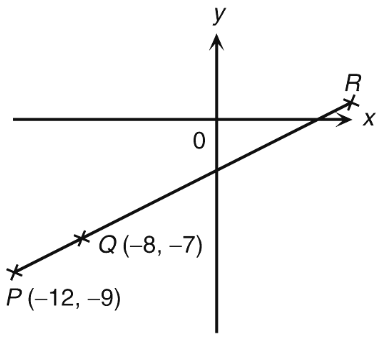


In the figure, $B(-5, 1)$ is the mid-point of the line segment joining A and $C(-7, -4)$. D is a point on AE such that BD // CE. Find the coordinates of A and D.

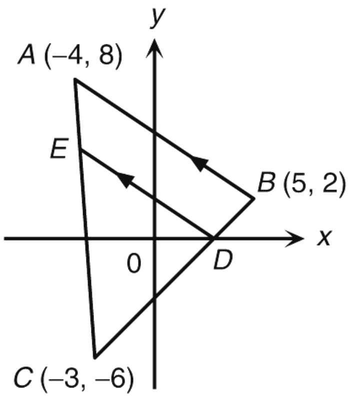


P is a point lying on the line segment joining $A(-3, -4)$ and $B(7, 8)$, where $AP : PB = 3 : 2$. Find the coordinates of P.

The figure shows two points $P(-12, -9)$ and $Q(-8, -7)$. If R is a point on PQ produced such that $PQ : QR = 1 : 4$, find the coordinates of R.



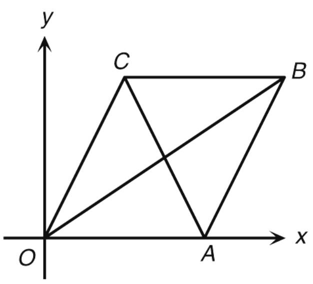
In the figure, BC cuts the x-axis at D. E is a point on AC such that $BA \mathbin{/\!/} DE$.



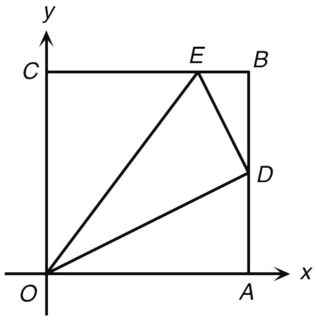
(a) Find $BD : DC$.

(b) Find the coordinates of E.

In the figure, $OABC$ is a parallelogram. Prove by the analytic approach that $OB^2 + AC^2 = 2(OA^2 + OC^2)$.



In the figure, $OABC$ is a square. D is the mid-point of AB. E is a point on CB such that $CE : EB = 3 : 1$.

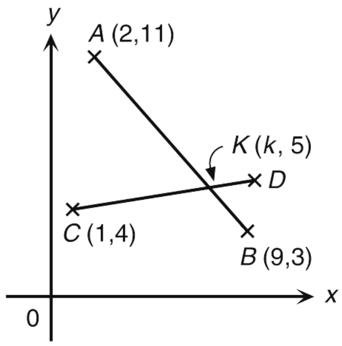


(a) Let $OA = a$. Express the coordinates of A, B, C, D and E in terms of a.

(b) **(i)** Hence, prove by the analytic approach that $OE^2 = OD^2 + DE^2$.

(ii) State what kind of $\triangle ODE$ is.

In the figure, the line joining $A(2, 11)$ and $B(9, 3)$ intersects the line joining $C(1, 4)$ and D at $K(k, 5)$.

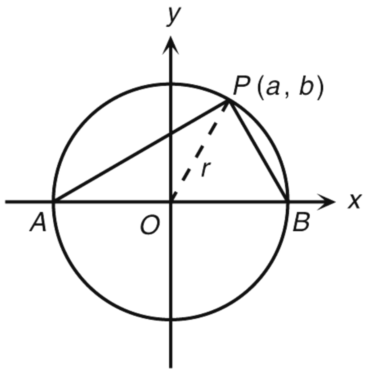


If $AK : KB = CK : KD = m : n$, find

(a) $m : n$,

(b) the coordinates of D.

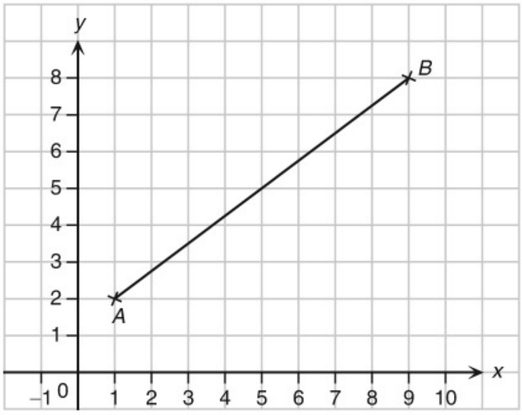
In the figure, O is the centre of the circle with radius r and $P(a, b)$ is a point on the circle.



(a) Prove that $a^2 + b^2 = r^2$.

(b) Prove by the analytic approach that $AP \perp PB$.

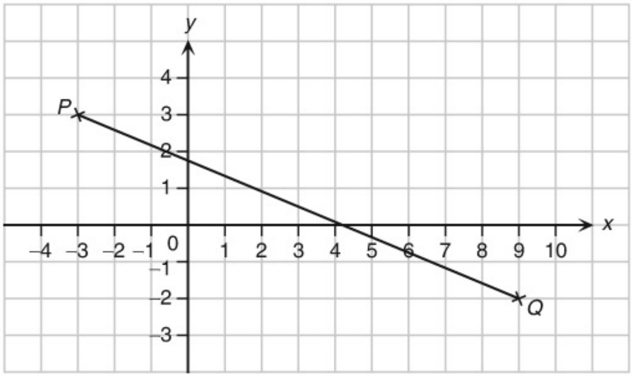
Refer to the figure.



(a) Find the length of AB.

(b) Find the slope of AB.

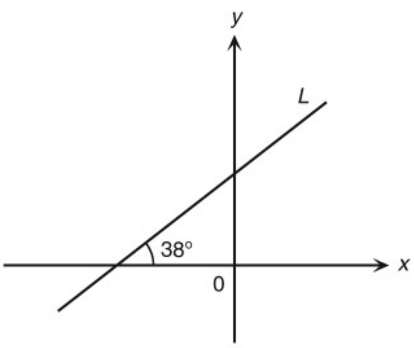
Refer to the figure.



(a) Find the length of PQ.

(b) Find the slope of PQ.

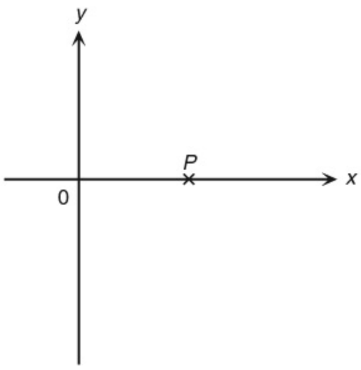
The figure shows a straight line L with inclination 38°. Find the slope of L correct to 3 significant figures.



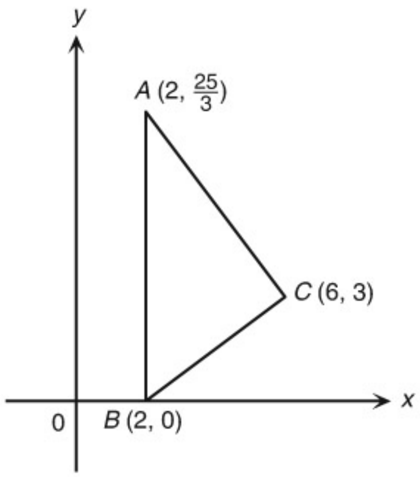
It is given that the slope of a straight line L is 1.

(a) Find the inclination of L.

(b) If L passes through a point P as shown below, draw the straight line L and mark its inclination in the figure.



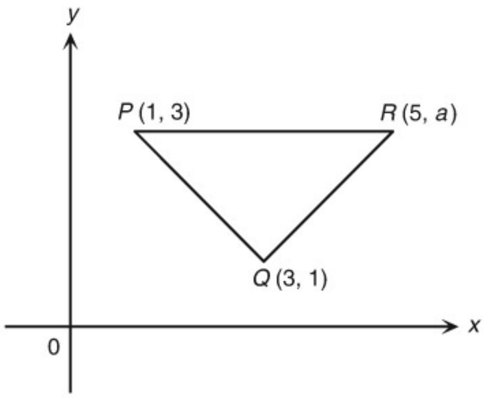
Refer to the figure.



(a) Find the perimeter of $\triangle ABC$.

(b) Show that $\triangle ABC$ is a right-angled triangle.

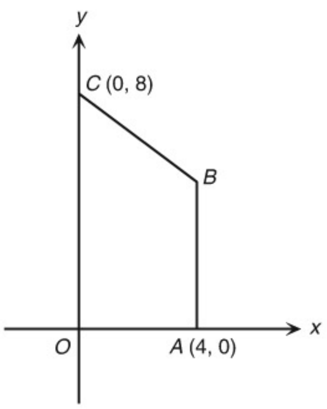
In the figure, $P(1, 3)$, $Q(3, 1)$ and $R(5, a)$ are three points above the x-axis and $PQ = QR$.



(a) Find the value of a.

(b) Find the area of $\triangle PQR$.

In the figure, $A(4, 0)$ and $C(0, 8)$ are points on the x-axis and the y-axis respectively. B is a point such that $AB \parallel OC$ and $AB = CB$.



(a) Find the coordinates of B.

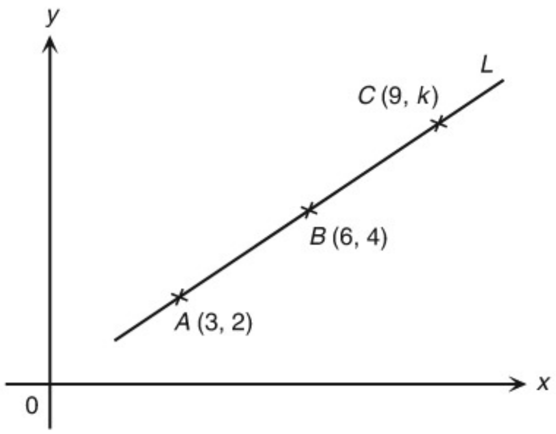
(b) Find the area of quadrilateral $OABC$.

In each of the following, determine whether the three points are collinear.

(a) $A(-4, -1)$, $B(-2, 1)$ and $C(3, 6)$

(b) $D(5, 2)$, $E(8, -4)$ and $F(10, -7)$

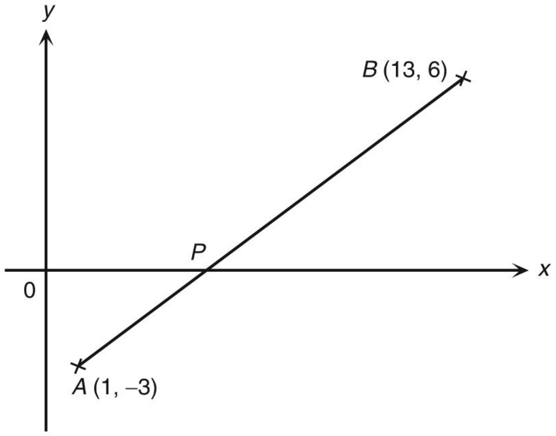
In the figure, the straight line L passes through $A(3, 2)$, $B(6, 4)$ and $C(9, k)$.



(a) Find the value of k.

(b) Does $P(12, 6)$ lie on the straight line L? Explain your answer.

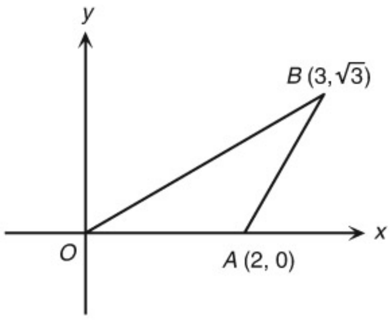
Referring to the figure, AB cuts the x-axis at P.



(a) Find the coordinates of P.

(b) Find $AP : PB$.

In the figure, $A(2, 0)$ and $B(3, \sqrt{3})$ are two points on a rectangular coordinate plane.



(a) Find the slope and the inclination of

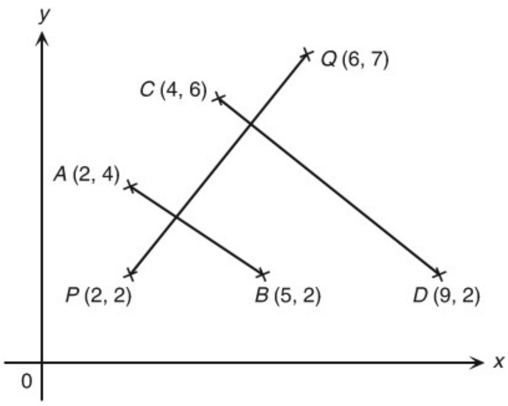
(i) OB,

(ii) AB.

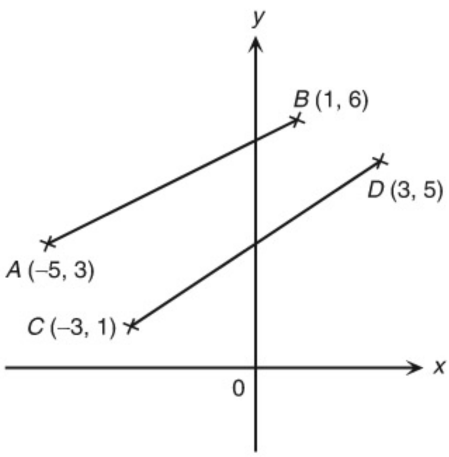
(b) **(i)** Find $\angle ABO$.

(ii) State what kind of triangle OAB is.

Referring to the figure, determine whether *AB* and *CD* are perpendicular to *PQ*.



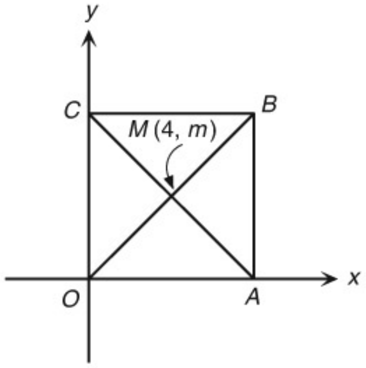
Refer to the figure.



(a) Show that *AB* and *CD* are not parallel.

(b) If *B* is translated upwards by *k* unit(s) to *B'* such that *AB'*//*CD*, find the value of *k*.

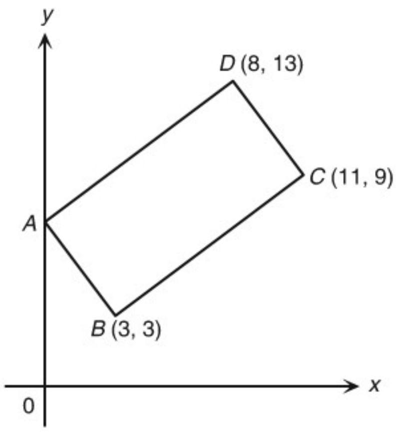
In the figure, A and C are points on the x-axis and the y-axis respectively. $OABC$ is a square. Its diagonals OB and AC intersect at $M(4, m)$.



(a) Find the value of m.

(b) Find the coordinates of A, B and C.

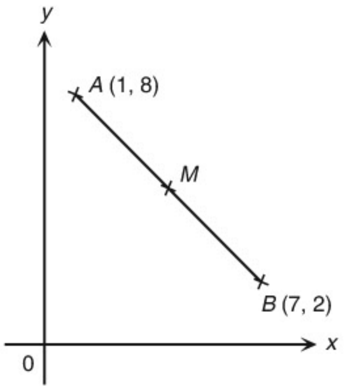
Referring to the figure, A is a point on the y-axis such that AB // DC.



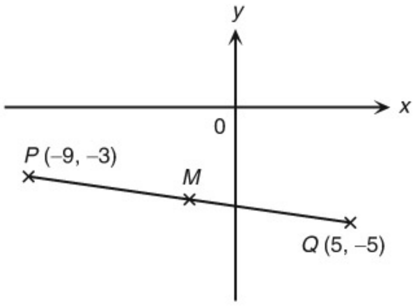
(a) Find the coordinates of A.

(b) Show that $ABCD$ is a rectangle.

In the figure, *M* is the mid-point of the line segment joining *A*(1, 8) and *B*(7, 2). Find the coordinates of *M*.



In the figure, *P*(–9, –3) and *Q*(5, –5) are the end points of the line segment *PQ*. If *M* is the mid-point of *PQ*, find the coordinates of *M*.



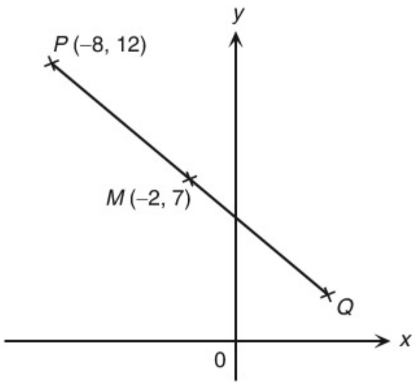
Given that a point *P* bisects the line segment joining *A*(–6, 7) and *B*(1, –3), find the coordinates of *P*.

It is given that P is the mid-point of the line segment joining $A(0, 10)$ and $B(-8, 14)$.

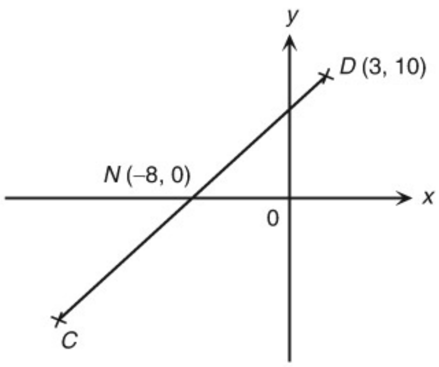
(a) Find the coordinates of P.

(b) If Q is the mid-point of PB, find the coordinates of Q.

Referring to the figure, M is the mid-point of PQ. Find the coordinates of Q.



Referring to the figure, N is the mid-point of CD. Find the coordinates of C.



Given that $M(3, 6)$ is the mid-point of the line segment joining $A(a, -4)$ and $B(7, b)$, find the values of a and b.

Given that a point $P(7, -1)$ bisects the line segment joining $C(2, c)$ and $D(d, 4)$, find the values of c and d.

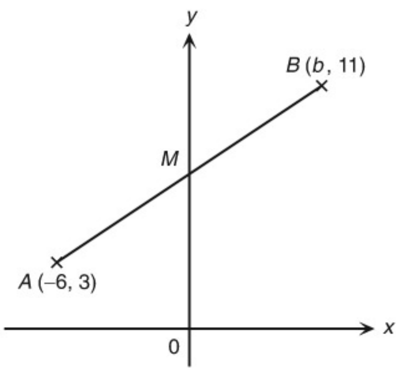
Given that the line segment joining $A(4, 5)$ and $M(7, 9)$ is produced to a point B and $AM = MB$, find the coordinates of B.

It is given that $N(-8, 3)$ divides the line segment joining C and $D(-4, -3)$ into 2 equal parts.

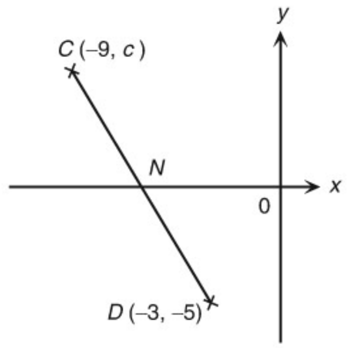
(a) Find the coordinates of C.

(b) If C is the mid-point of BN, find the coordinates of B.

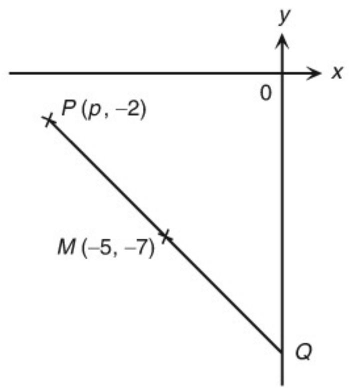
Referring to the figure, the mid-point M of AB lies on the y-axis. Find the value of b and the coordinates of M.



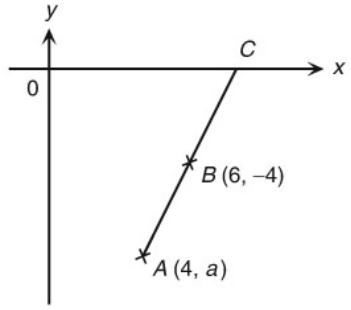
In the figure, the line segment joining $C(-9, c)$ and $D(-3, -5)$ cuts the x-axis at N, where $CN = ND$. Find the value of c and the coordinates of N.



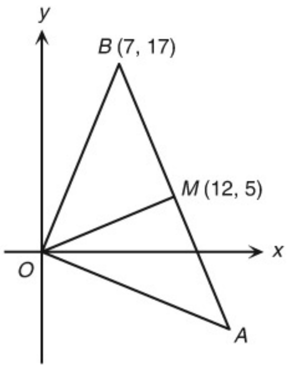
In the figure, Q is a point on the y-axis. $M(-5, -7)$ is the mid-point of the line segment joining $P(p, -2)$ and Q. Find the value of p and the coordinates of Q.



Referring to the figure, AB is produced to meet the x-axis at C and $AB = BC$. Find the value of a and the coordinates of C.



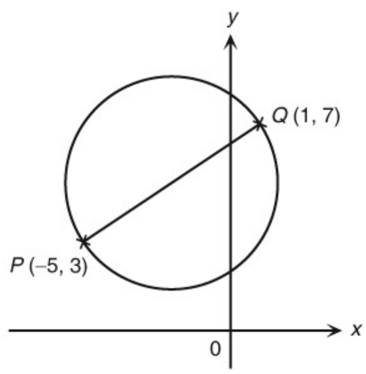
Referring to the figure, OM is the perpendicular bisector of AB in $\triangle OAB$.



(a) Find the coordinates of A.

(b) Find the area of $\triangle OAB$.

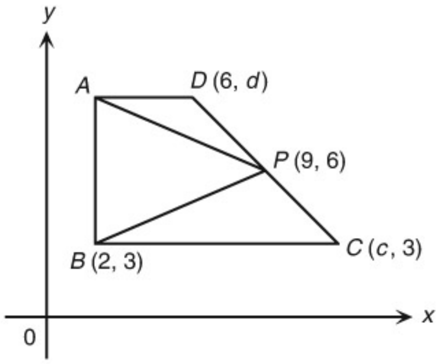
Referring to the figure, PQ is a diameter of a circle.



(a) Find the coordinates of the centre C of the circle.

(b) It is given that $R(-5, 7)$ and S are the end points of the diameter RS of the circle. Find the coordinates of S.

Referring to the figure, $ABCD$ is a right-angled trapezium, where $AD \parallel BC$ and $\angle ABC = 90°$. P is the mid-point of CD.

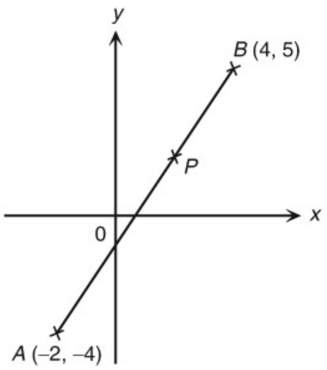


(a) Find the values of c and d.

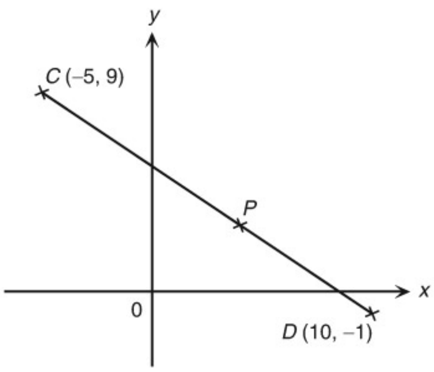
(b) Find the coordinates of A.

(c) Find the ratio of the area of $\triangle ABP$ to that of trapezium $ABCD$.

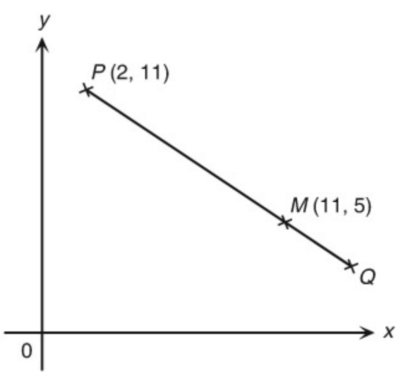
The figure shows two points $A(-2, -4)$ and $B(4, 5)$. P lies on AB such that $AP : PB = 2 : 1$. Find the coordinates of P.



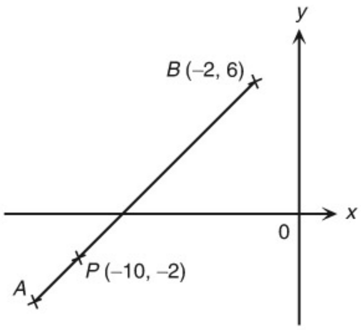
In the figure, P is a point on the line segment joining $C(-5, 9)$ and $D(10, -1)$ such that $CP : PD = 3 : 2$. Find the coordinates of P.



In the figure, the coordinates of an end point P of the line segment PQ are (2, 11). $M(11, 5)$ lies on PQ such that $PM : MQ = 3 : 1$. Find the coordinates of Q.



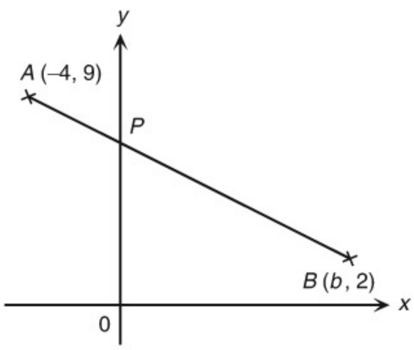
Referring to the figure, P is a point on AB such that $AP : PB = 1 : 4$. Find the coordinates of A.



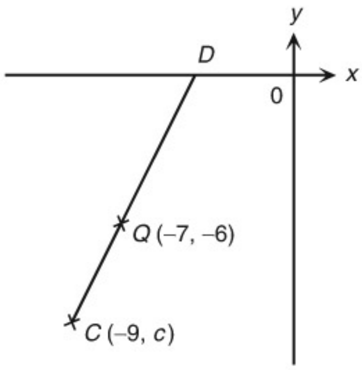
Given that $Q(0, 4)$ divides the line segment joining $P(-10, -1)$ and $R(2, 5)$ into two parts, find $PQ : QR$.

Given that $T(6, 2)$ lies on the line segment joining $P(8, -5)$ and $Q\left(\frac{36}{7}, 5\right)$, find $PT : TQ$.

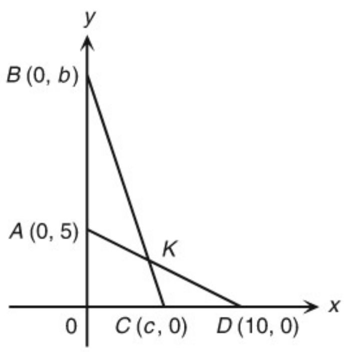
In the figure, the line segment joining $A(-4, 9)$ and $B(b, 2)$ cuts the y-axis at P and $AP : PB = 2 : 5$. Find the value of b and the coordinates of P.



Referring to the figure, CQ is produced to meet the x-axis at D and $CQ : QD = 2 : 3$. Find the value of c and the coordinates of D.



Referring to the figure, AD and BC intersect at K, where $AK : KD = 2 : 3$ and $BK : KC = 4 : 1$.

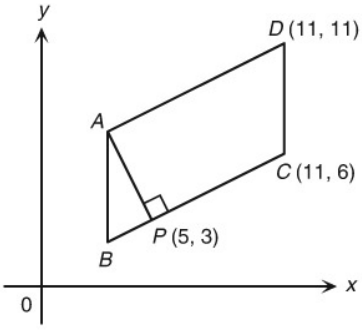


(a) Find the coordinates of K.

(b) Find the values of b and c.

(c) Consider the line segments AK, KD, BK and KC. Which one is the shortest?

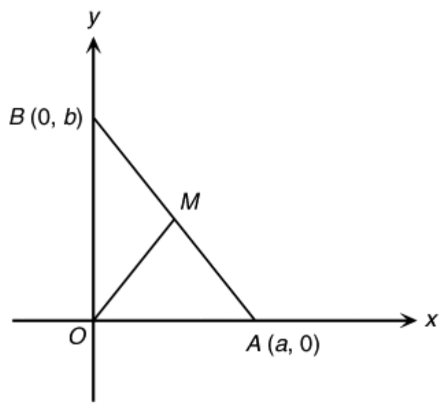
Referring to the figure, $ABCD$ is a parallelogram. P is a point on BC such that $AP \perp BC$ and $BP : PC = 1 : 3$.



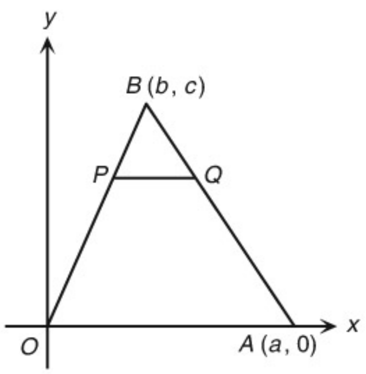
(a) Find the coordinates of A and B.

(b) Find the area of parallelogram $ABCD$.

In the figure, the coordinates of A and B are $(a, 0)$ and $(0, b)$ respectively. If M is the mid-point of AB, prove that $OM = \frac{1}{2}AB$.



In the figure, the coordinates of A and B are $(a, 0)$ and (b, c) respectively. P and Q are points on OB and AB respectively such that $OP : PB = AQ : QB = 2 : 1$.

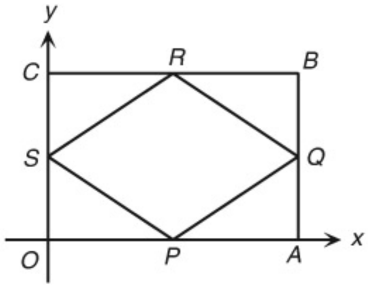


(a) Express the coordinates of P and Q in terms of a, b and c.

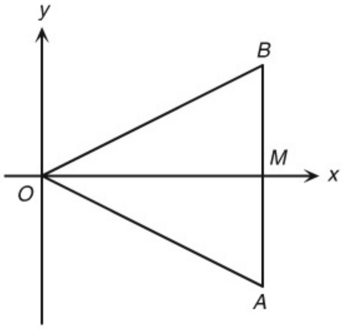
(b) **(i)** Prove that $PQ // OA$.

(ii) Prove that $PQ = \frac{1}{3}OA$.

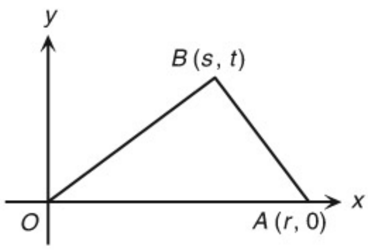
In the figure, $OABC$ is a rectangle, where $OA = a$ units and $OC = c$ units. P, Q, R and S are the mid-points of OA, AB, BC and OC respectively. Prove that $PQRS$ is a rhombus.



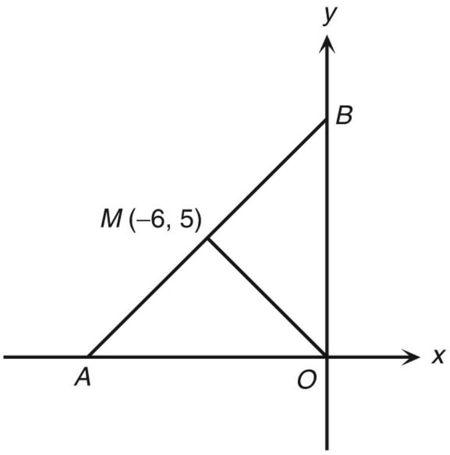
In the figure, M is a point on the x-axis. OM is the perpendicular bisector of AB in $\triangle OAB$. Prove that $\triangle OAB$ is an isosceles triangle by the analytic approach.

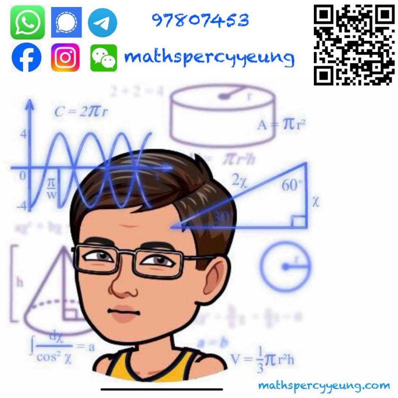


In the figure, the coordinates of A and B are $(r, 0)$ and (s, t) respectively. If $OA^2 = OB^2 + AB^2$, prove that $\angle OBA = 90°$ by the analytic approach.



In the figure, A and B are points on the x-axis and the y-axis respectively. $M(-6, 5)$ is the mid-point of AB.

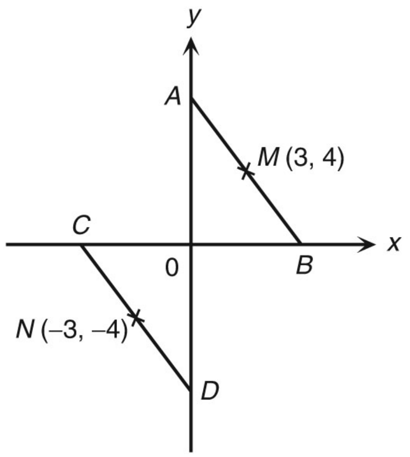




(a) Find the coordinates of A and B.

(b) Is OM perpendicular to AB? Explain your answer.

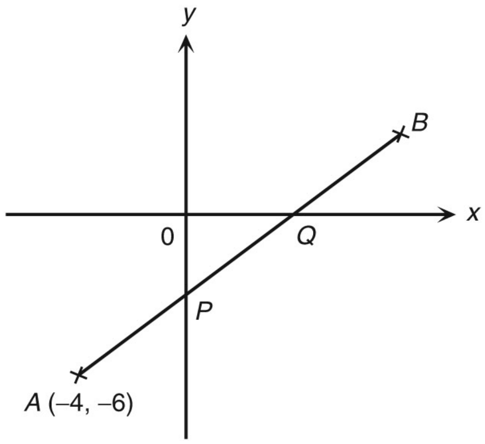
In the figure, A and D are two points on the y-axis. B and C are two points on the x-axis. $M(3, 4)$ and $N(-3, -4)$ are the mid-points of AB and CD respectively.



(a) Find the coordinates of A, B, C and D.

(b) Determine whether AB and CD are parallel.

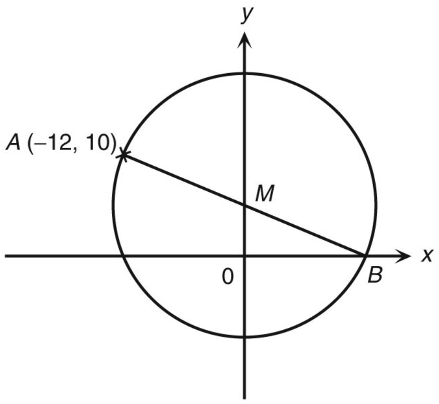
Referring to the figure, P and Q are points on the y-axis and the x-axis respectively. P and Q divide AB into 3 equal parts.



(a) Find the coordinates of P, Q and B.

(b) Find the length of AB.

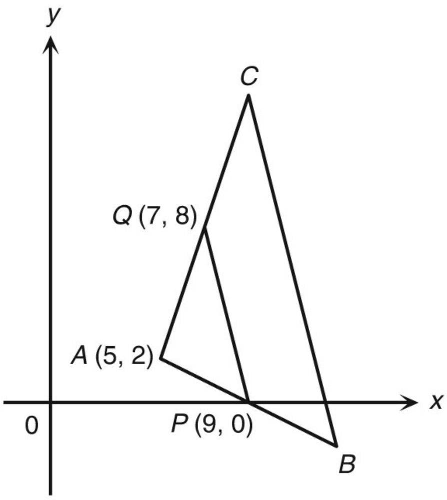
Referring to the figure, B and M are points on the x-axis and the y-axis respectively. AB is a diameter of a circle with centre M.



(a) Find the coordinates of M and B.

(b) If P is a point on the negative x-axis such that $\angle APB = 90°$, show that P lies on the circle.

Referring to the figure, *P* and *Q* are the mid-points of *AB* and *AC* respectively.

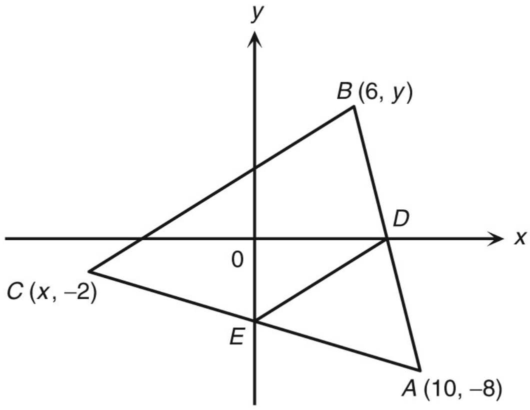


(a) Find the coordinates of *B* and *C*.

(b) **(i)** Find the slopes of *PQ* and *BC*.

(ii) Hence, determine whether *PQ* is parallel to *BC*.

In the figure, the line segment joining $A(10, -8)$ and $B(6, y)$ cuts the x-axis at D, where $AD = DB$. The line segment joining A and $C(x, -2)$ cuts the y-axis at E, where $AE = EC$.

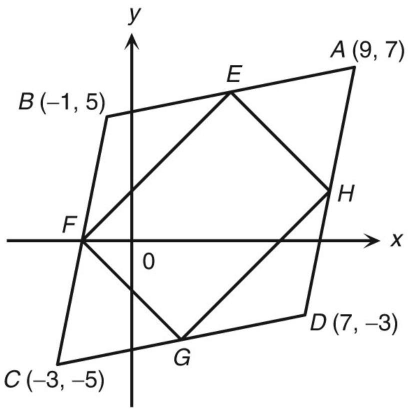


(a) **(i)** Find the value of x and the coordinates of E.

(ii) Find the value of y and the coordinates of D.

(b) Show that $DE = \frac{1}{2}BC$.

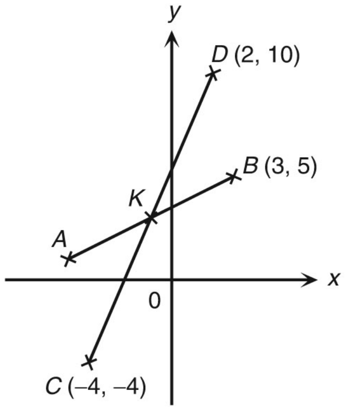
In the figure, $A(9, 7)$, $B(-1, 5)$, $C(-3, -5)$ and $D(7, -3)$ are the vertices of a quadrilateral. E, F, G and H are the mid-points of AB, BC, CD and DA respectively.



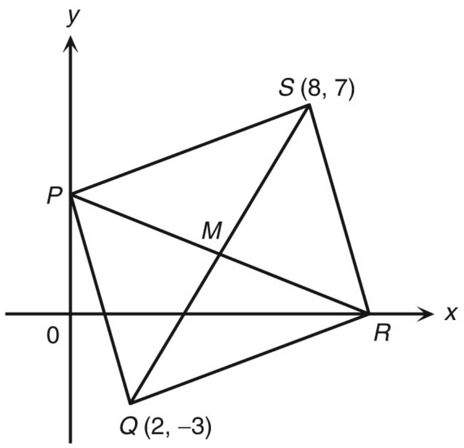
(a) Find the coordinates of E, F, G and H.

(b) Show that $EFGH$ is a rectangle.

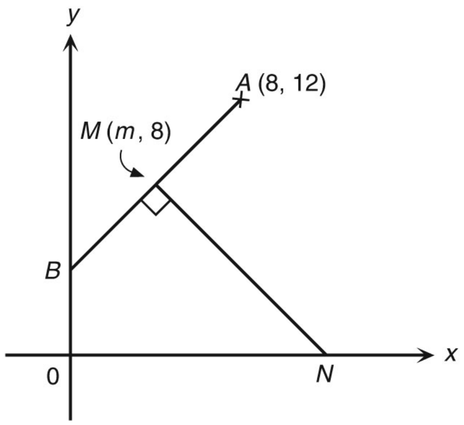
Referring to the figure, *K* bisects both the line segments *AB* and *CD*. Find the coordinates of *A* and *K*.



Referring to the figure, *PQRS* is a parallelogram and its diagonals intersect at *M*. Find the coordinates of *P*, *M* and *R*.



Referring to the figure, AM is produced to meet the y-axis at B and $AM = MB$. N is a point on the x-axis such that $NM \perp AB$.



(a) Find the value of m and the coordinates of B.

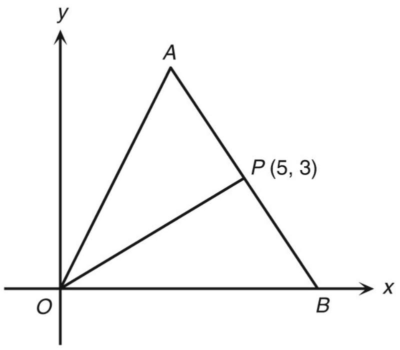
(b) Find the coordinates of N.

(c) If C and D are points on the x-axis such that $AC \,//\, MN \,//\, BD$,

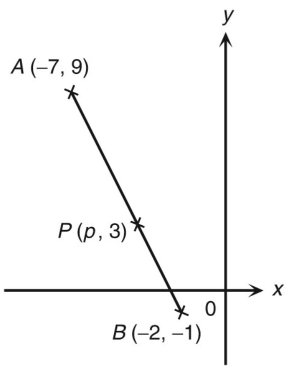
  (i) find the coordinates of C and D,

  (ii) determine whether N is the mid-point of DC.

In the figure, the coordinates of P are (5, 3) and B lies on the x-axis. OP is the median of AB in $\triangle AOB$ and its area is 21 sq. units. Find the coordinates of A and B.



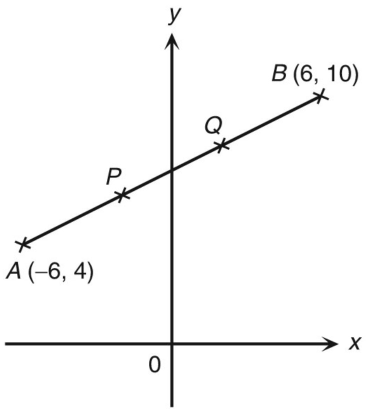
In the figure, the coordinates of A and B are (–7, 9) and (–2, –1) respectively. $P(p, 3)$ is a point on AB.



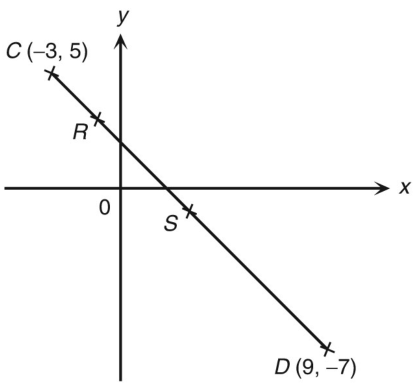
(a) Find $AP : PB$.

(b) Hence, find the value of p.

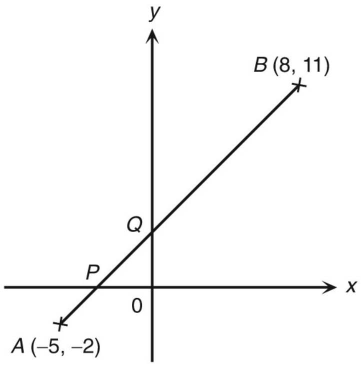
In the figure, the coordinates of A and B are $(-6, 4)$ and $(6, 10)$ respectively. P and Q divide AB into 3 equal parts. Find the coordinates of P and Q.



In the figure, the coordinates of C and D are $(-3, 5)$ and $(9, -7)$ respectively. R and S are two points on CD such that $CR : RS : SD = 1 : 2 : 3$. Find the coordinates of R and S.



In the figure, the line segment joining $A(-5, -2)$ and $B(8, 11)$ cuts the x-axis and the y-axis at P and Q respectively.



(a) **(i)** Find $AQ : QB$.

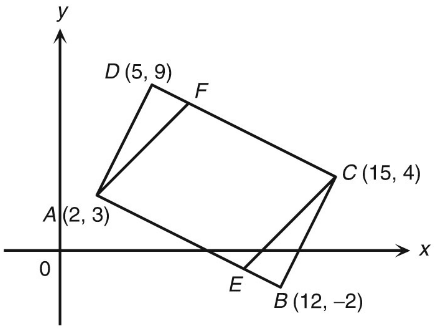
(ii) Hence, find the coordinates of Q.

(b) **(i)** Find $AP : PQ$.

(ii) Hence, find the coordinates of P.

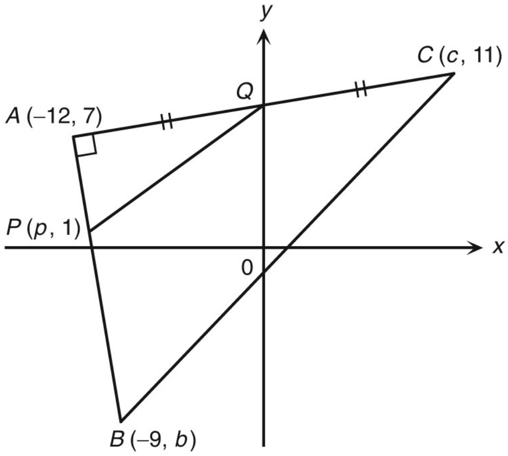
(c) Find $AP : PQ : QB$.

In the figure, $A(2, 3)$, $B(12, -2)$, $C(15, 4)$ and $D(5, 9)$ are the vertices of a quadrilateral. E and F are points on AB and CD respectively, such that $AE : EB = CF : FD = 4 : 1$.



(a) Find the coordinates of E and F.
(b) Show that $AECF$ is a parallelogram.

Referring to the figure, AC cuts the y-axis at Q and $AQ = QC$. P lies on AB and $AB \perp AC$.

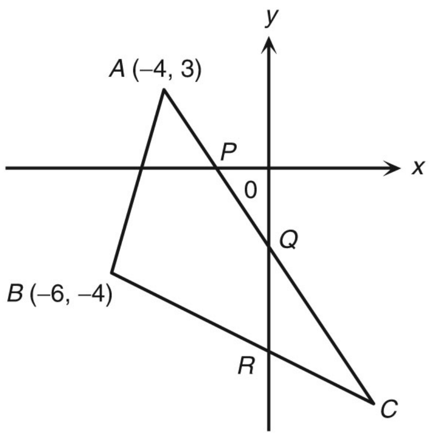


(a) Find the value of c and the coordinates of Q.
(b) Find the values of b and p.
(c) Find $AP : PB$.

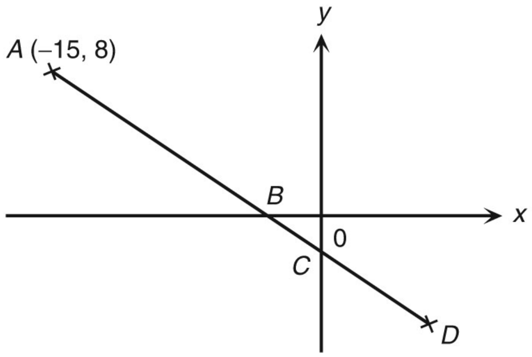
In the figure, $A(-4, 3)$, $B(-6, -4)$ and C are the vertices of a triangle. AC cuts the x-axis and the y-axis at P and Q respectively. BC cuts the y-axis at R. If $AP : PC = 1 : 3$ and $BR : RC = 3 : 2$, find the coordinates of

(a) C,

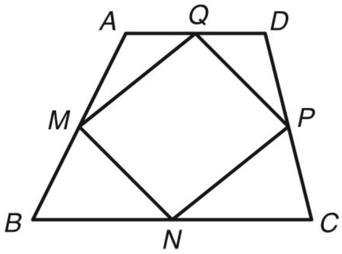
(b) P, Q and R.



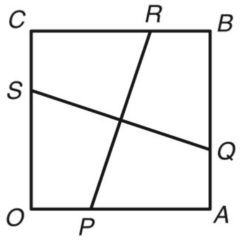
In the figure, the line segment joining $A(-15, 8)$ and D cuts the x-axis at B and the y-axis at C. If $AB : BC : CD = 4 : 1 : 2$, find the coordinates of B, C and D.



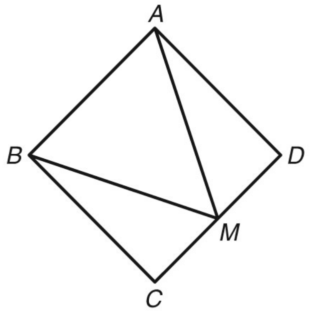
In the figure, $ABCD$ is a trapezium, where AD // BC. M, N, P and Q are the mid-points of AB, BC, CD and DA respectively. Prove that $MNPQ$ is a parallelogram by the analytic approach.



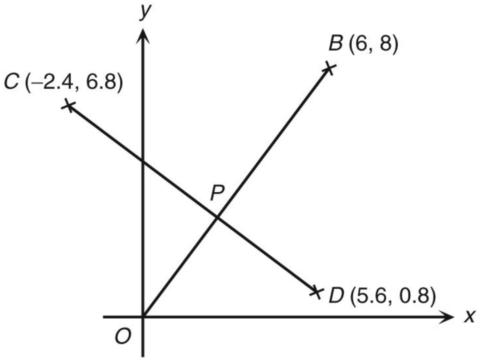
It is given that $OABC$ is a square of side a units. P, Q, R and S are points on OA, AB, BC and CO respectively, such that $OP : PA = AQ : QB = BR : RC = CS : SO = 1 : 2$. Prove that PR and QS bisect each other by the analytic approach.

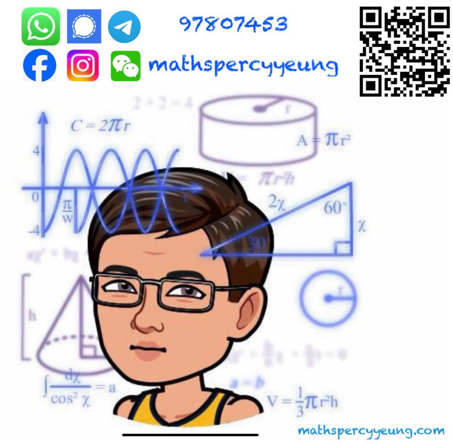


In the figure, $ABCD$ is a rhombus. M is the mid-point of CD. If $AM = BM$, prove that $ABCD$ is a square by the analytic approach.



In the figure, the coordinates of B, C and D are (6, 8), (–2.4, 6.8) and (5.6, 0.8) respectively. OB and CD intersect at P, where $OP : PB = 1 : r$ and $CP : PD = s : 1$.

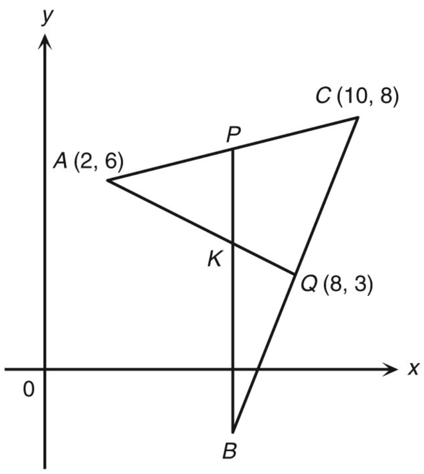




(a) Find the values of r and s.

(b) Show that $OP = PD$ and $CP = PB$.

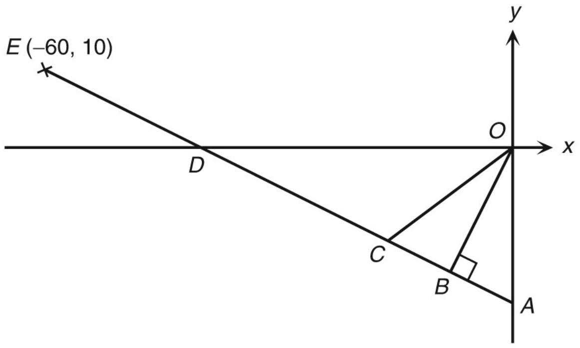
In the figure, P is the mid-point of the line segment joining $A(2, 6)$ and $C(10, 8)$. $Q(8, 3)$ bisects the line segment BC. AQ and BP intersect at K.



(a) Find the coordinates of B, K and P.

(b) Find the area of quadrilateral $CPKQ$.

In the figure, A and D are points on the y-axis and the x-axis respectively. B and C lie on AD, such that $OB \perp AD$ and OB is the angle bisector of $\angle AOC$. AD is produced to $E(-60, 10)$ and $AD : DE = 2 : 1$.

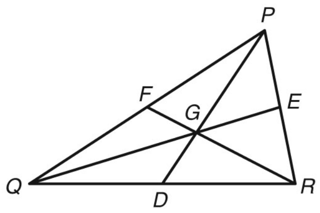


(a) Find the coordinates of A, B, C and D.

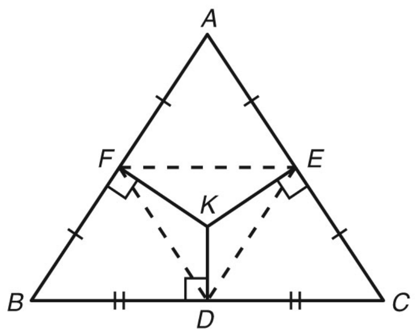
(b) Find $AB : BC : CD : DE$.

Prove that the three altitudes of an acute-angled triangle intersect at one point by the analytic approach.

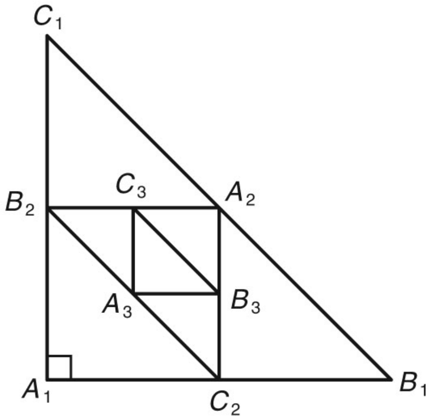
In the figure, G is the centroid of $\triangle PQR$. Prove that $PG : GD = QG : GE = RG : GF = 2 : 1$ by the analytic approach.



In the figure, $\triangle ABC$ is an isosceles triangle, where $AB = AC$. K is the circumcentre of $\triangle ABC$. Prove that K is the orthocentre of $\triangle DEF$ by the analytic approach.



In the figure, $\triangle A_1B_1C_1$ is an right-angled isosceles triangle, where $\angle A_1 = 90°$ and $A_1B_1 = A_1C_1 = k$ units. $\triangle A_2B_2C_2$ is formed by joining the mid-points of the sides of $\triangle A_1B_1C_1$. $\triangle A_3B_3C_3$ is formed by joining the mid-points of the sides of $\triangle A_2B_2C_2$.



(a) Prove that $\triangle A_2B_2C_2$ and $\triangle A_3B_3C_3$ are also right-angled isosceles triangles by the analytic approach.

(b) Find the areas of $\triangle A_1B_1C_1$, $\triangle A_2B_2C_2$ and $\triangle A_3B_3C_3$ in terms of k.

(c) It is given that a fourth right-angled isosceles triangle $A_4B_4C_4$ is formed by joining the mid-points of the sides of $\triangle A_3B_3C_3$, and this process is continued to form an infinite number of right-angled isosceles triangles. Find the areas of

$\triangle A_4B_4C_4$ and $\triangle A_5B_5C_5$ in terms of k.

(Hint: The areas of the triangles form a sequence with a pattern.)