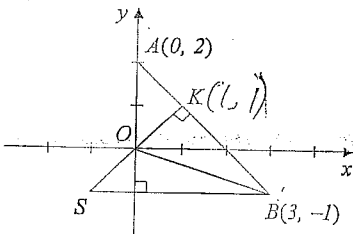


1) Yr11-2U\infunc.hsc Qn2) 2U85-4ii

The vertices of the triangle OAB are the points $O(0, 0)$, $A(0, 2)$ and $B(3, -1)$.

- Draw a sketch diagram of the triangle.
- The point K on AB is such that OK is perpendicular to AB . Find the coordinates of K , and show the point K on your diagram.
- Find the area of the triangle OAB .
- The line through the point L , perpendicular to OA , meets KO produced at S . Find the coordinates of S .
- Verify that AS is perpendicular to OB .



«1» → a)

b) $K(1, 1)$ c) 3 units^2 d) $S(-1, -1)$ e) Proof »

2) Yr11-2U\infunc.hsc Qn1) 2U84-4i

The lines L_1 , L_2 have equations

$$L_1: x - 2y - 1 = 0,$$

$$L_2: 2x + y + 18 = 0.$$

- Find the shortest distance from $P(3, 4)$ to L_1 .
- Show that the lines intersect at $Q(-7, -4)$.
- Find the distance PQ .

«2» → a) $\frac{1}{\sqrt{5}}$ or $\frac{\sqrt{5}}{5}$ units b) Proof c) 17 units »

3) Yr11-2U\infunc.hsc Qn3) 2U86-2

The coordinates of the points A , B , C are $(0, 2)$, $(4, 0)$ and $(6, -4)$ respectively.

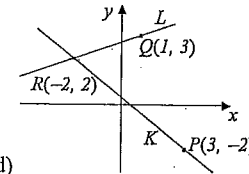
- Find the length AB , and the gradient of AB .
- Show that the equation of the line L , drawn through C parallel to AB is $x + 2y + 2 = 0$.
- Find the coordinates of D , the point where L intersects the x -axis.
- Find the perpendicular distance of the point A from the line L .
- Find the area of the quadrilateral $ABCD$.

«3» → a) $2\sqrt{5}$ units, $-\frac{1}{2}$ b) Proof c) $D(-2, 0)$ d) $\frac{6}{\sqrt{5}}$ or $\frac{6\sqrt{5}}{5}$ units e) 18 units^2 »

4) Yr11-2U\infunc.hsc Qn4) 2U87-2

The points P and Q have coordinates $(3, -2)$ and $(1, 3)$ respectively.

- The line K has equation $4x + 5y - 2 = 0$. Verify that P lies on K .
- The line L through Q has gradient $\frac{1}{3}$. Show that the equation of L is $x - 3y + 8 = 0$.
- The point of intersection of K and L is R . Find the coordinates of R .
- Draw a neat sketch on a number plane showing P , Q , R , K and L .
- Find the perpendicular distance of P from L . Leave your answer as a surd.
- Find the area of the triangle PQR .



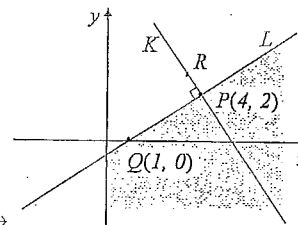
«4» → a) b) Proof c) $(-2, 2)$ d)

e) $\frac{17}{\sqrt{10}}$ or $\frac{17\sqrt{10}}{10}$ units f) 8.5 units^2 »

5) Yr11-2U\infunc.hsc Qn5) 2U88-3

Q is the point of intersection of the x -axis and the line L with equation $2x - 3y = 2$.

- On a number plane draw the line L , marking on it the point Q .
- On your diagram, indicate the point $P(4, 2)$ which lies on L . Draw the line K through P perpendicular to L .
- Find the equation of the line K .
- Without calculating its co-ordinates, indicate a point R on K which is one unit from P . Mark the right angle RPQ on your diagram.
- Find the distance PQ .
- Find the area of the triangle QPR .
- On your diagram shade the region given by $x \geq 0$, $2x - 3y \geq 2$.



«5» →

c) $3x + 2y - 16 = 0$ or $y = -\frac{3}{2}x + 8$ d) Note: Only one of the two

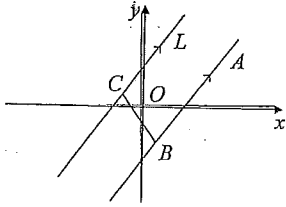
possible positions of R is shown on the diagram. e) $\sqrt{13}$ units f) $\frac{\sqrt{13}}{2} \text{ units}^2$ »

6) Yr11-2UAlnfunc.hsc Qn6) 2U89-1c

Find the co-ordinates of the midpoint of the interval AB , where $A = (2, 5)$ and $B = (-4, 4)$. □

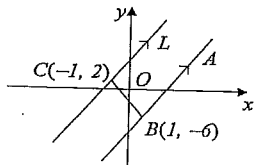
«6) → $(-1, \frac{9}{2})$ »

7) Yr11-2UAlnfunc.hsc Qn7) 2U89-2



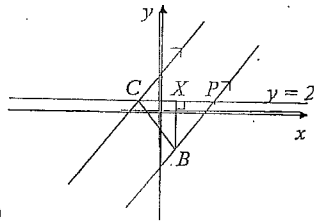
The line L passes through $C(-1, 2)$ and has equation $y = 2x + 4$. The point B has coordinates $(1, -6)$ and the line AB is parallel to L .

- Copy the diagram into your examination booklet and next to the points B and C write their co-ordinates.
- Find the length of the interval BC .
- Write down the slope of the line L and use your calculator to find the angle L makes with the x -axis. Give your answer to the nearest degree.
- Show that AB has equation $y = 2x - 8$.
- If P is a point which lies on AB and on the line $y = 2$, find the coordinates of P .
- Find the length of PC .
- On your diagram, draw the line PC and the perpendicular from B to PC .
- Find the area of the triangle PBC . □



«7) → i)

ii) $2\sqrt{17}$ units iii) $2, 63^\circ$ iv) Proof v) $P(5, 2)$ vi) 6 units

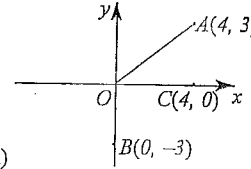


vii)

viii) 24 units² »

8) Yr11-2UAlnfunc.hsc Qn8) 2U90-2b

- Plot on a number plane the point $A(4, 3)$. Draw the interval AO where O is the origin.
- Plot the points $B(0, -3)$ and $C(4, 0)$ on your diagram.
- Show that the line BC has equation $4y = 3x - 12$.
- Show that $OACB$ is a parallelogram. Give reasons.
- Find the area of the parallelogram $OACB$.
- Calculate the length of the diagonal AB . □

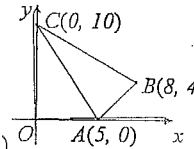


«8) → i) ii)

iii) iv) Proof, $OA \parallel BC$ and $OB \parallel AC$. v) 12 units² vi) $2\sqrt{13}$ units »

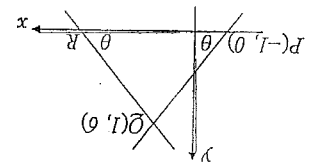
9) Yr11-2UAlnfunc.hsc Qn9) 2U912

- On a number plane, mark the origin O and $A(5, 0)$, $B(8, 4)$, and $C(0, 10)$. Join A to B , B to C , and C to A .
- Show that the line AB has equation $3y = 4x - 20$.
- Show that the gradient of the line BC is $-\frac{3}{4}$.
- Show that AB and BC are perpendicular.
- Show that the length of AB is 5 units.
- Show that triangles ACO and ACB are congruent. Give reasons.
- Find the area of the quadrilateral $ABCO$.
- If D is the point $(8, 0)$, calculate the perpendicular distance of D from the line AB . □



«9) → a)

c) d) e) f) Proof g) 50 units² h) $\frac{12}{5}$ units »



In the diagram P and Q have coordinates $(-1, 0)$ and $(1, 6)$ and $\angle QPR = \angle QRP = \theta$. Copy the diagram into your examination booklet.

a.

Find the coordinates of the midpoint of PQ .

b.

Show that PQ has equation $y = 3x + 3$.

c.

Show that $\tan \theta = 3$.

d.

Show that the gradient of QR is -3 .

e.

Show that the equation of QR is $3x + y - 9 = 0$.

f.

Find the coordinates of R .

g.

Find the perpendicular distance from P to QR .

h.

On your diagram, shade in the region satisfying both the inequalities: $y \leq 3x + 3$ and $3x + y - 9 \geq 0$.

The line $6x - ky = 4$ passes through the point $(3, 2)$. Find the value of k .

«11» $\rightarrow k = 7$ »

On a number plane, mark the origin O and the points $A(2, 1)$ and $B(3, -1)$.

i.

Find the gradients m_1 of OA and m_2 of AB .

iii.

Show that OA is perpendicular to AB .

iv.

Show that $OA = AB$.

v.

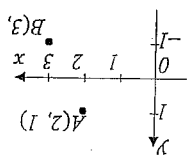
Find the midpoint D of the interval OB .

vi.

Find the coordinates of the point C such that D is the midpoint of AC .

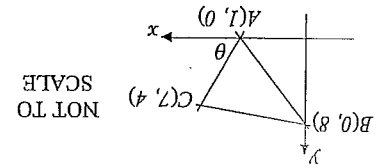
vii.

What shape best describes the geometric figure $OABC$?



«12» \rightarrow i)

ii) $m_1 = \frac{1}{2}, m_2 = -2$ iii) iv) Proof v) $D(\frac{3}{2}, -\frac{7}{2})$ vi) $C(1, -2)$ vii) Square»



The points $A, B,$ and C have coordinates $(1, 0), (0, 8),$ and $(7, 4)$, as shown in the diagram. The angle between the line AC and the x -axis is θ .

Copy this diagram into your Writing Booklet.

a.

Find the gradient of the line AC .

b.

Calculate the size of angle θ in degrees.

c.

Find the equation of the line AC .

d.

Find the coordinates of D , the midpoint of AC .

e.

Show that AC is perpendicular to BD .

f.

What does part (e) show about $\triangle ABC$?

g.

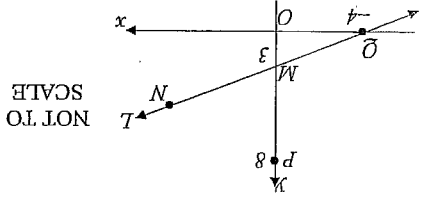
Find the area of $\triangle ABC$.

h.

Write down the coordinates of a point E such that $ABCE$ is a rhombus.

«13» \rightarrow a) $\frac{3}{2}$ b) $33^\circ 41'$ (to the nearest minute) c) $2x - 3y - 2 = 0$ d) $D(4, 2)$ e) Proof f) $\triangle ABC$ is isosceles

g) 26 units^2 h) $E(8, -4)$ »



The line L cuts the x -axis at $Q(-4, 0)$ and the y -axis at $M(0, 3)$ as shown. N is a point on the line L , and P is the point $(0, 8)$.

Copy the diagram into your Writing Booklet.

a.

Find the equation of the line L .

b.

Show that the point $(16, 15)$ lies on the line L .

c.

By considering the lengths of MQ and MP , show that $\triangle QMP$ is isosceles.

d.

Calculate the gradient of the line PQ .

e.

M is the midpoint of the interval QN . Find the coordinates of the point N .

f.

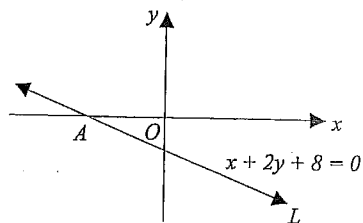
Show that $\angle NPQ$ is a right angle.

g.

Find the equation of the circle that passes through the points N, P and Q .

«14» \rightarrow a) $3x - 4y + 12 = 0$ b) c) Proof d) 2 e) $(4, 6)$ f) Proof g) $x^2 + (y - 3)^2 = 25$ »

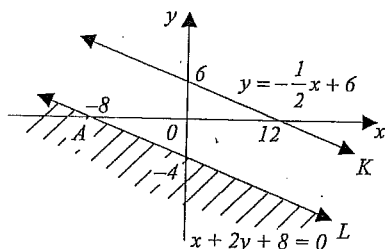
15) Yr11-2U\infunc.hsc Qn15) 2U96-2



The line L is shown in the diagram. It has equation $x + 2y + 8 = 0$ and cuts the x -axis at A . The line k has equation $y = -\frac{1}{2}x + 6$, and is not shown on the diagram.

Copy or trace the diagram into your Writing Booklet.

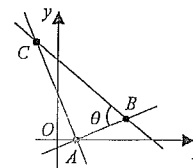
- Find the coordinates of A .
- Explain why k is parallel to L .
- Draw the graph of k on your diagram, indicating where it cuts the axes.
- Shade the region $x + 2y + 8 \leq 0$ on your diagram.
- Write down a pair of inequalities which define the region between k and L .
- Show that $P(8, 2)$ lies on k .
- Find the perpendicular distance from P to L .
- $Q(4, -6)$ lies on L . Show that Q is the point on L which is closest to P .



a) $A(-8, 0)$ b) The gradient of both lines is the same, ie. $-\frac{1}{2}$.

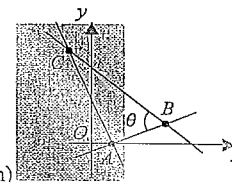
e) $x + 2y - 12 \leq 0$ and $x + 2y + 8 \geq 0$ f) Proof g) $4\sqrt{5}$ units h) Proof »

17) Yr11-2U\infunc.hsc Qn17) 098-3a



The diagram shows points $A(1, 0)$, $B(4, 1)$ and $C(-1, 6)$ in the Cartesian plane. Angle ABC is θ . Copy or trace this diagram into your Writing Booklet.

- Show that A and C lie on the line $3x + y = 3$.
- Show that the gradient of AB is $\frac{1}{3}$.
- Show that the length of AB is $\sqrt{10}$ units.
- Show that AB and AC are perpendicular.
- Find $\tan\theta$.
- Find the equation of the circle with centre A that passes through B .
- The point D is not shown on the diagram. The point D lies on the line $3x + y = 3$ between A and C , and $AD = AB$. Find the coordinates of D .
- On your diagram, shade the regions satisfying the inequality $3x + y \leq 3$.



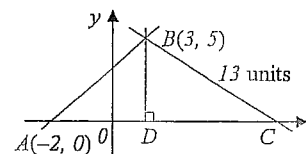
«17» → a) b) c) d) Proof e) 2 f) $(x-1)^2 + y^2 = 10$ g) $D(0, 3)$ h) »

18) Yr11-2U\infunc.hsc Qn18) 2U99-1a

The points A and B have coordinates $(3, -4)$ and $(7, 2)$ respectively. Find the coordinates of the midpoint of AB .

«18» → $(5, -1)$ »

19) Yr11-2U\infunc.hsc Qn19) 2U99-2b



NOT TO SCALE

The diagram shows the points $A(-2, 0)$, $B(3, 5)$ and the point C which lies on the x axis. The point D also lies on the x axis such that BD is perpendicular to AC .

- Show that the gradient of AB is 1 .
- Find the equation of the line AB .
- What is the size of $\angle BAC$?
- The length of BC is 13 units. Find the length of DC .
- Calculate the area of $\triangle ABC$.
- Calculate the size of $\angle ABC$, to the nearest degree.

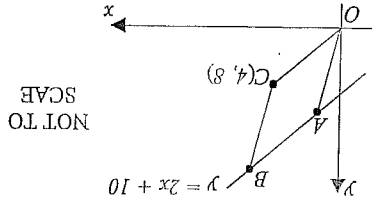
«19» → i) Proof ii) $y = x + 2$ iii) 45° iv) 12 units v) 42.5 units² vi) 112° »

6) Yr11-2U\infunc.hsc Qn16) 2U97-3b

Let A and B be the points $(0, 1)$ and $(2, 3)$ respectively.

- Find the coordinates of the midpoint of AB .
- Find the slope of the line AB .
- Find the equation of the perpendicular bisector of AB .
- The point P lies on the line $y = 2x - 9$ and is equidistant from A and B . Find the coordinates of P .

«16» → i) $(1, 2)$ ii) 1 iii) $y = -x + 3$ iv) $(4, -1)$ »

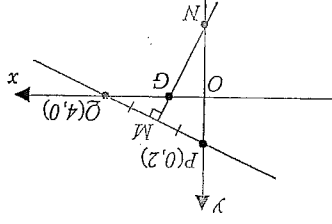
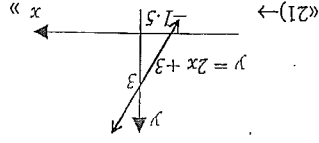


The equation of AB is $y = 2x + 10$. The point C is $(4, 8)$. Copy or trace the diagram into your Writing Booklet.

- i. Show that OC and AB are parallel.
- ii. State why $\angle ABO = \angle BOC$.
- iii. The line OB divides the quadrilateral $OABC$ into two congruent triangles. Prove that $OABC$ is a parallelogram.

«20» → i) Proof ii) Alternate angles, $AB \parallel OC$ iii) Proof »

Sketch the line $y = 2x + 3$ in the Cartesian plane.



The diagram shows the points $P(0, 2)$ and $Q(4, 0)$. The point M is the midpoint of PQ . The line MN is perpendicular to PQ and meets the x axis at G and the y axis at N .

- a. Show that the gradient of PQ is $-\frac{1}{2}$.

b. Find the coordinates of M .

c. Find the equation of the line MN .

d. Show that N has coordinates $(0, -3)$.

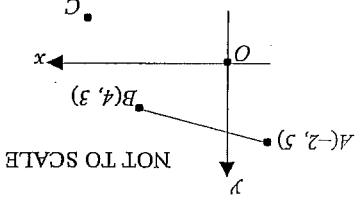
e. Find the distance NQ .

f. Find the equation of the circle with centre N and radius NQ .

g. Hence show that the circle in part (f) passes through the point P .

h. The point R lies in the first quadrant and PQR is a rhombus. Find the coordinates of R .

«22» → a) Proof b) $M(2, 1)$ c) $2x - y - 3 = 0$ d) $M(0, -3)$ e) 5 units f) $x^2 + (y + 3)^2 = 25$ g) Proof h) $R(4, 5)$



The diagram shows the points $A(-2, 5)$, $B(4, 3)$ and $O(0, 0)$. The point C is the fourth vertex of the parallelogram $OABC$.

i. Show that the equation of AB is $x + 3y - 13 = 0$.

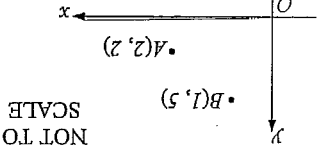
ii. Show that the length of AB is $2\sqrt{10}$.

iii. Calculate the perpendicular distance from O to the line AB .

iv. Calculate the area of parallelogram $OABC$.

v. Find the perpendicular distance from O to the line BC .

«23» → i) ii) Proof iii) $\frac{\sqrt{10}}{13}$ iv) 26 square units v) $\frac{\sqrt{29}}{26}$



The diagram shows two points $A(2, 2)$ and $B(1, 5)$ on the number plane. Copy the diagram into your writing booklet.

i. Find the coordinates of M , the midpoint of AB .

ii. Show that the equation of the perpendicular bisector of AB is $x - 3y + 9 = 0$.

iii. Find the coordinates of the point C that lies on the y -axis and is equidistant from A and B .

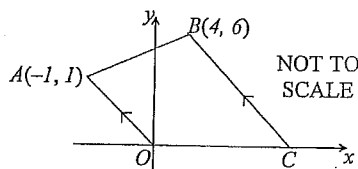
iv. The point D lies on the intersection of the line $y = 5$ and the perpendicular bisector $x - 3y + 9 = 0$.

v. Find the coordinates of D , and mark the position of D on your diagram in your writing booklet.

v. Find the area of triangle ABD .

«24» → i) $M(\frac{3}{2}, \frac{7}{2})$ ii) Proof iii) $C(0, 3)$ iv) $D(6, 5)$ v) $\frac{15}{2}$ units²

25) Yr11-2U\Infunc.hsc Qn25) 2U03-2b

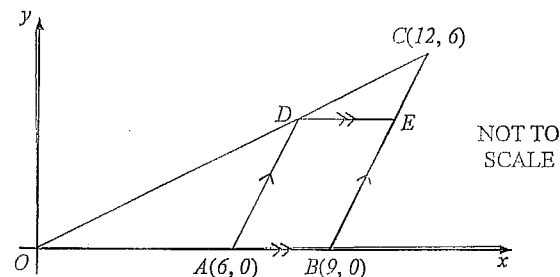


In the Diagram, $OABC$ is a trapezium with $OA \parallel CB$. The coordinates of O , A and B are $(0, 0)$, $(-1, 1)$ and $(4, 6)$ respectively.

- Calculate the length of OA .
- Write down the gradient of the line OA .
- What is the size of $\angle AOC$?
- Find the equation of the line BC , and hence find the coordinates of C .
- Show that the perpendicular distance from O to the line BC is $5\sqrt{2}$.
- Hence, or otherwise, calculate the area of the trapezium $OABC$. \square

«25)→ i) $\sqrt{2}$ units ii) -1 iii) 135° iv) $x + y - 10 = 0$, $C(10, 0)$ v) Proof vi) 35 units² »

27) Yr11-2U\Infunc.hsc Qn27) 2U05-3c



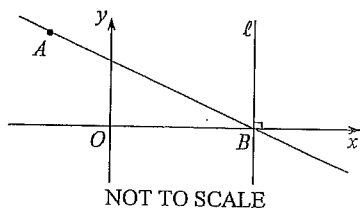
In the diagram, A , B and C are the points $(6, 0)$, $(9, 0)$ and $(12, 6)$ respectively. The equation of the line OC is $x - 2y = 0$. The point D on OC is chosen so that AD is parallel to BC . The point E on BC is chosen so that DE is parallel to the x -axis.

- Show that the equation of the line AD is $y = 2x - 12$.
- Find the coordinates of the point D .
- Find the coordinates of the point E .
- Prove that $\triangle OAD \parallel \triangle DEC$.
- Hence, or otherwise, find the ratio of the lengths AD and EC . \square

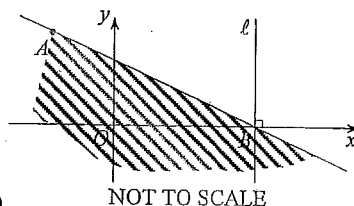
«27)→ i) Proof ii) $D(8, 4)$ iii) $E(11, 4)$ iv) Proof v) $2:1$ »

26) Yr11-2U\Infunc.hsc Qn26) 2U04-2a

The diagram shows the points $A(-1, 3)$ and $B(2, 0)$. The line ℓ is drawn perpendicular to the x -axis through the point B .

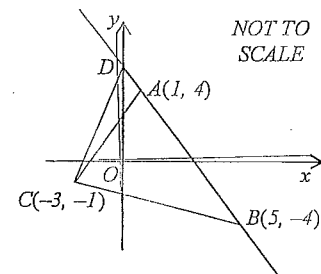


- Calculate the length of the interval AB .
- Find the gradient of the line AB .
- What is the size of the acute angle between the line AB and the line ℓ ?
- Show that the equation of the line AB is $x + y - 2 = 0$.
- Copy the diagram into your writing booklet and shade the region defined by $x + y - 2 \leq 0$.
- Write down the equation of the line ℓ .
- The point C is on the line ℓ such that AC is perpendicular to AB . Find the coordinates of C . \square



«26)→ i) $3\sqrt{2}$ units ii) -1 iii) 45° iv) Proof v) »

28) Yr11-2U\Infunc.hsc Qn28) 2U06-3a



In the diagram, A , B and C are the points $(1, 4)$, $(5, -4)$ and $(-3, -1)$ respectively. The line AB meets the y -axis at D .

- Show that the equation of the line AB is $2x + y - 6 = 0$.
- Find the coordinates of the point D .
- Find the perpendicular distance of the point C from the line AB .
- Hence, or otherwise, find the area of the triangle ADC . \square

«28)→ i) Proof ii) $D(0, 6)$ iii) $\frac{13}{\sqrt{5}}$ units iv) 6.5 units² »