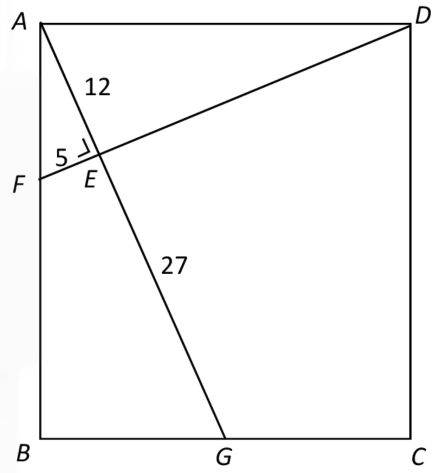
studying is easier on studyclix.ie

Question 5 **(25 marks)**

$ABCD$ is a rectangle.

$F \in [AB]$, $G \in [BC]$, $[FD] \cap [AG] = \{E\}$, and $FD \perp AG$.

$|AE| = 12$ cm, $|EG| = 27$ cm, and $|FE| = 5$ cm.



(a) Prove that ΔAFE and ΔDAE are similar (equiangular).

(b) Find $|AD|$.

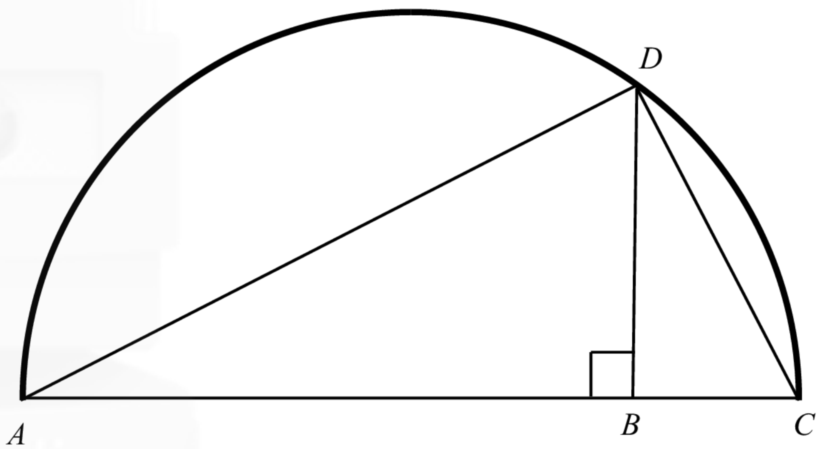
(c) ΔAFE and ΔAGB are similar. Show that $|AB| = 36$ cm.

(d) Find the area of the quadrilateral $GCDE$.

Question 2

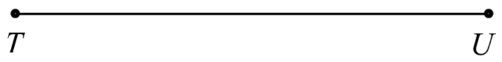
The diagram shows a semi-circle standing on a diameter $[AC]$, and $[BD] \perp [AC]$.

(a) **(i)** Prove that the triangles *ABD* and *DBC* are similar.



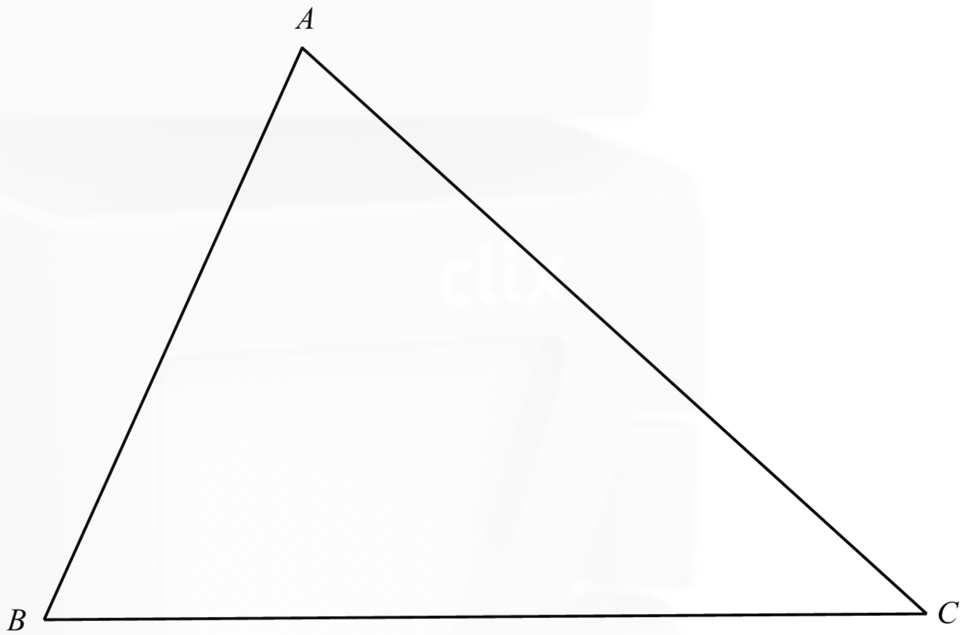
(ii) If $|AB| = x$, $|BC| = 1$, and $|BD| = y$, write y in terms of x.

(b) Use your result from part **(a)(ii)** to **construct** a line segment equal in length (in centimetres) to the square root of the length of the line segment $[TU]$ which is drawn below.



Question 6 **(25 marks)**

(a) Construct the centroid of the triangle ABC below. Show all construction lines.
(Where measurement is used, show all relevant measurements and calculations clearly.)



(b) Prove that, if three parallel lines cut off equal segments on some transversal line, then they will cut off equal segments on any other transversal line.

Diagram:

Given:

To Prove:

Construction:

Proof:

(a) Prove that, if two triangles ΔABC and $\Delta A'B'C'$ are similar, then their sides are proportional, in order:

$$\frac{|AB|}{|A'B'|} = \frac{|BC|}{|B'C'|} = \frac{|CA|}{|C'A'|}.$$

Diagram:

Given:

To Prove:

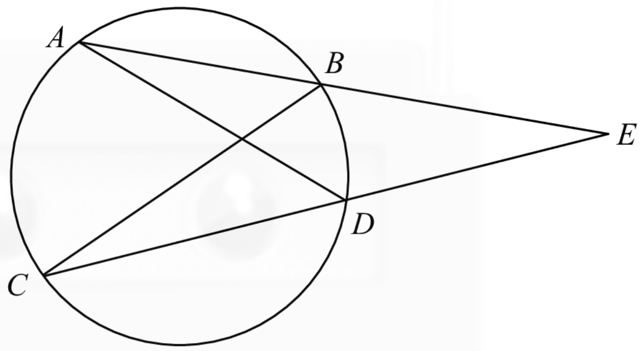
Construction:

Proof:

page	running

(b) Given the line segment $[BC]$, construct, without using a protractor or set square, a point A such that $|\angle ABC| = 60°$. Show your construction lines.

$[AB]$ and $[CD]$ are chords of a circle that intersect externally at E, as shown.



(a) Name two similar triangles in the diagram above and give reasons for your answer.

(b) Prove that $|EA|.|EB| = |EC|.|ED|$.

(c) Given that $|EB| = 6\cdot25$, $|ED| = 5\cdot94$ and $|CB| = 10$, find $|AD|$.

page	running

Question 6A

Explain, with the aid of an example, what is meant by *proof by contradiction*.

Note: you do not need to provide the full proof involved in your example. Give sufficient outline to illustrate how contradiction is used.

Explanation:

Example:

Question 7

(a) Complete each of the following statements.

(i) The circumcentre of a triangle is the point of intersection of ______________________

____

(ii) The incentre of a triangle is the point of intersection of ___________________________

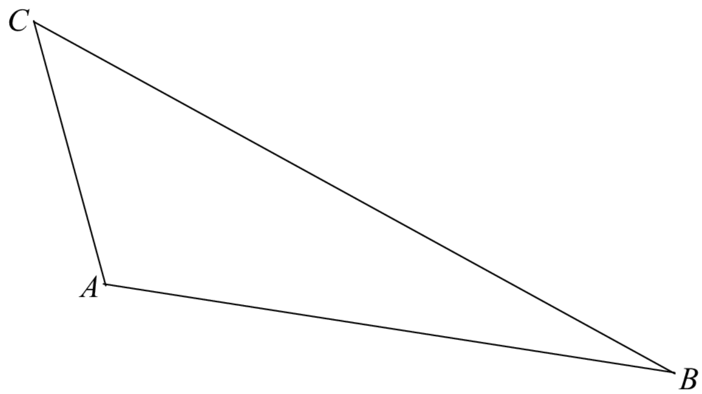
____

(iii) The centroid of a triangle is the point of intersection of ___________________________

____

(b) In an equilateral triangle, the circumcentre, the incentre and the centroid are all in the same place. Explain why this is the case.

(c) Construct the orthocentre of the triangle *ABC* below. Show all construction lines clearly.



Question 8

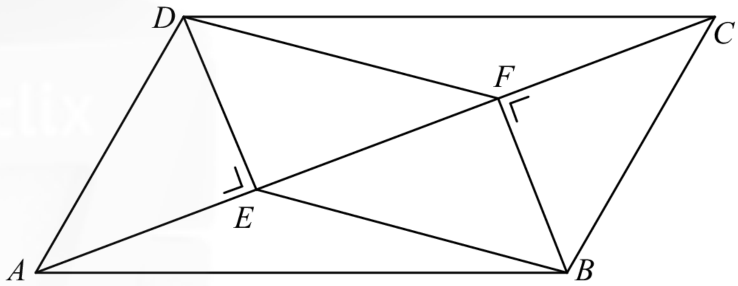
(a) A quadrilateral (four sided figure) has two sides which are parallel and equal in length. Prove that the quadrilateral is a parallelogram.

(b) In the parallelogram $ABCD$,

DE is perpendicular to AC.

BF is perpendicular to AC.

Prove that $EBFD$ is a parallelogram.



Question 6 **(25 marks)**

Answer **either** 6A **or** 6B.

Question 6A

Explain, with the aid of an example, what is meant by *proof by contradiction*.

Note: you do not need to provide the full proof involved in your example. Give sufficient outline to illustrate how contradiction is used.

Explanation:

Example:

OR

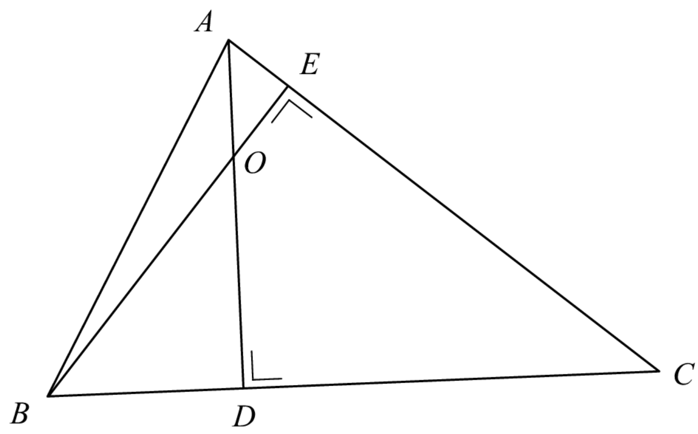
Question 6B

ABC is a triangle.

D is the point on *BC* such that $AD \perp BC$.
E is the point on *AC* such that $BE \perp AC$.

AD and *BE* intersect at *O*.

Prove that $|\angle DOC| = |\angle DEC|$.



Prove that if three parallel lines cut off equal segments on some transversal line, then they will cut off equal segments on any other transversal line.

Diagram:

Given:

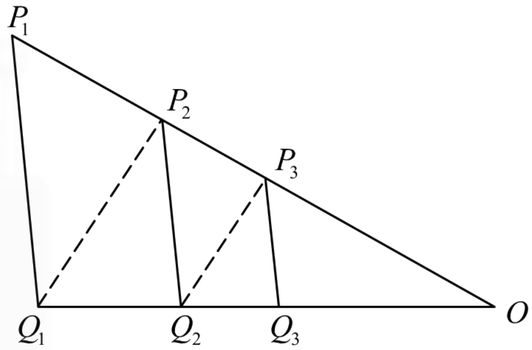
To prove:

Construction:

Proof:

Question 6B

In the diagram, P_1Q_1, P_2Q_2, and P_3Q_3 are parallel and so also are Q_1P_2 and Q_2P_3.



Prove that $|P_1Q_1| \times |P_3Q_3| = |P_2Q_2|^2$.

(a) Prove that if three parallel lines cut off equal segments on some transversal line, then they will cut off equal segments on any other transversal line.

Diagram:

Given:

To prove:

Construction:

Proof: