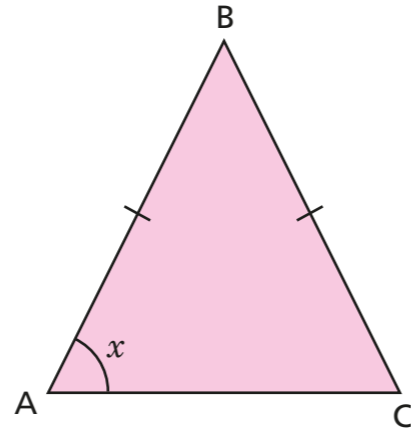


# Use known facts to obtain simple proofs H

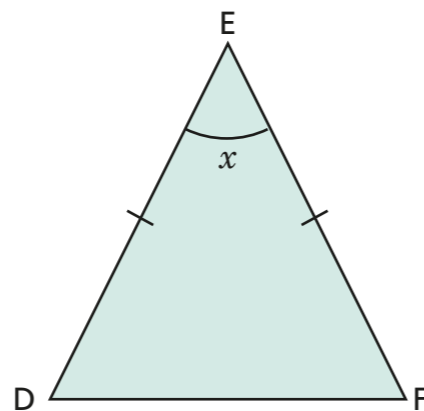
- 1 ABC is an isosceles triangle.
- a) Write an expression for the size of angle ACB.  $x$
- b) Show that angle ABC =  $180 - 2x$   
Give reasons to support your answer.



$$x + x = 2x$$

$\angle ABC = 180 - 2x$  because angles in a triangle sum to  $180^\circ$ .

- 2 DEF is an isosceles triangle.
- Show that  $\angle EDF = \frac{180 - x}{2}$   
Give reasons to support your answer.

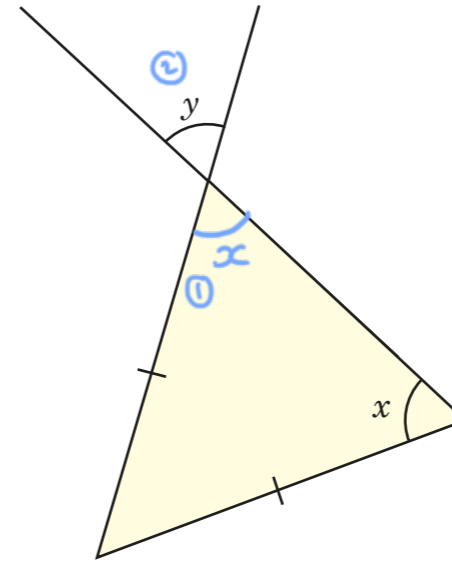


$\angle EDF + \angle EFD = 180 - x$  because angles in a triangle sum to  $180^\circ$ .

$\angle EDF = \angle EFD$  because base angles in an isosceles triangle are equal.

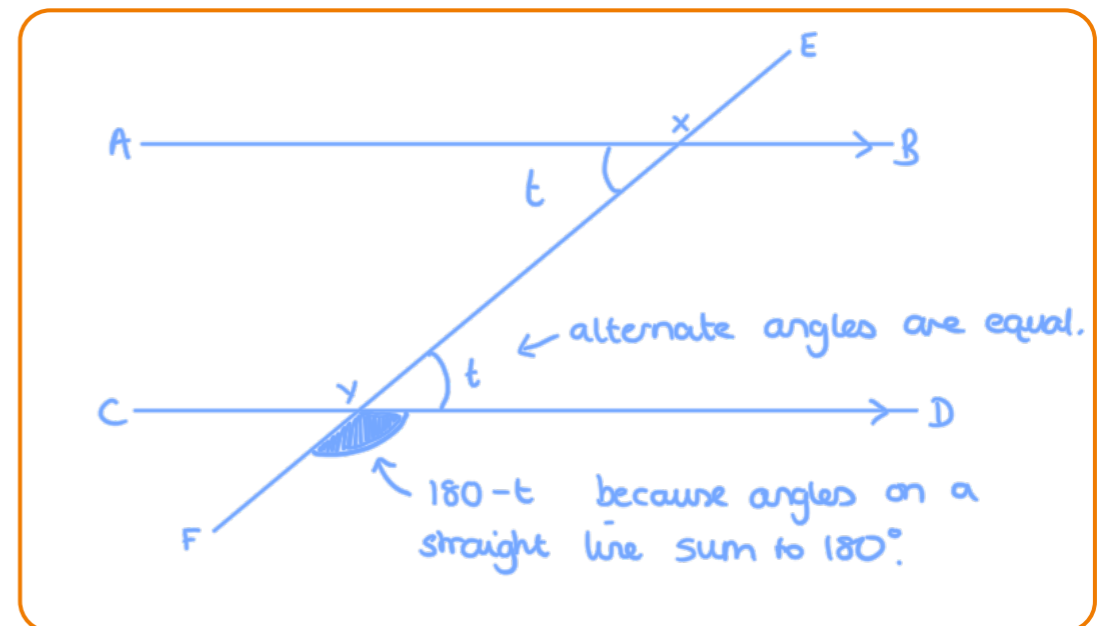
$$\angle EDF = \frac{180 - x}{2}$$

- 3 Prove that angle  $x$  is equal to angle  $y$ .  
Give reasons for each step of your workings.



- ① Base angles in an isosceles triangle are equal.
- ②  $y = x$  because vertically opposite angles are equal.

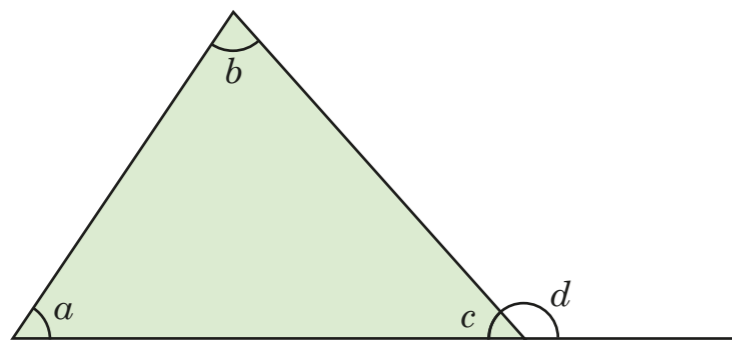
- 4 Line segments AB and CD are parallel.  
EF is a transversal that cuts through the line segments at points X and Y respectively.  
Angle AXF =  $t$
- a) Draw a diagram to show this.



- b) Show that angle FYD =  $180 - t$ .  
Give reasons to support your answer.



- 5 A triangle has interior angles  $a$ ,  $b$  and  $c$ .



Show that  $d = a + b$ .

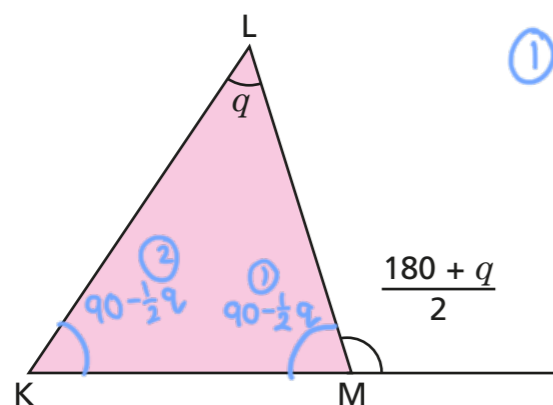
Give reasons to support your answer.

$$(a + b) + c = 180 \quad \text{because angles in a triangle sum to } 180^\circ$$

$$c + d = 180 \quad \text{because angles on a straight line sum to } 180^\circ$$

$$a + b = d$$

- 6 KLM is a triangle.



$$\begin{aligned} \textcircled{1} \angle LMK &= 180 - \left(\frac{180 + q}{2}\right) \\ &= 180 - 90 - \frac{1}{2}q \\ &= 90 - \frac{1}{2}q \end{aligned}$$

because angles on a straight line sum to  $180^\circ$

Prove that triangle KLM is an isosceles triangle.

Give reasons to support each stage of your workings.

$$\begin{aligned} \textcircled{2} \angle LKM &= 180 - (q + 90 - \frac{1}{2}q) \\ &= 180 - 90 - \frac{1}{2}q \\ &= 90 - \frac{1}{2}q \end{aligned}$$

because angles in a triangle sum to  $180^\circ$ .

$$\angle LKM = \angle LMK$$

$\therefore$  KLM is an isosceles triangle.

- 7 QPR is an isosceles triangle.

PS is perpendicular to QR.

Prove that PS bisects angle QPR.

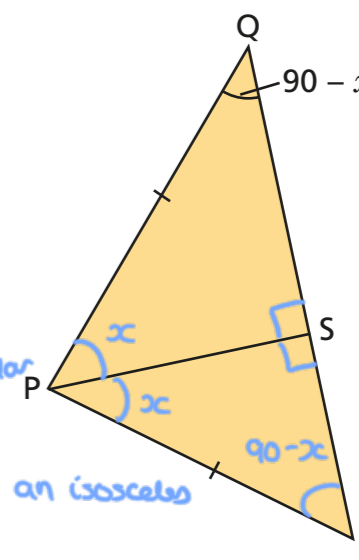
Give reasons to support each stage of your workings.

$$\angle PSQ = \angle PSR = 90^\circ \quad \text{because PS is perpendicular to QR.}$$

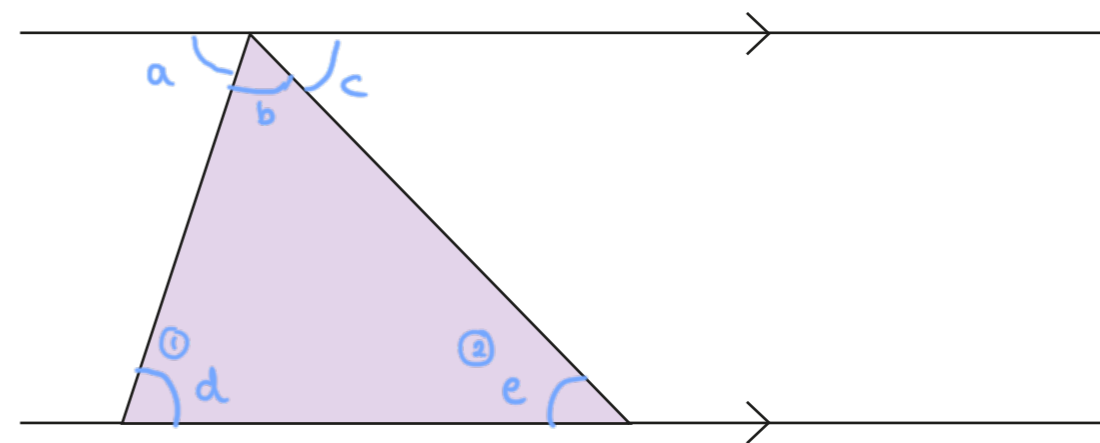
$$\angle QRP = 90 - x \quad \text{because base angles in an isosceles triangle are equal.}$$

$$\begin{aligned} \angle QPS &= 180 - (90 + 90 - x) = x \\ \angle RPS &= 180 - (90 + 90 - x) = x \end{aligned} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{angles in a triangle sum to } 180^\circ$$

$$\angle QPS = \angle RPS \quad \therefore \text{PS bisects angle QPR.}$$



- 8 Use rules of parallel lines to prove that the sum of the angles in a triangle is  $180^\circ$ .



$$a + b + c = 180 \quad \text{because angles on a straight line sum to } 180^\circ.$$

- $\textcircled{1} d = a$  because alternate angles are equal.  
 $\textcircled{2} e = c$  because alternate angles are equal.

$$b + d + e = b + a + c = a + b + c = 180^\circ$$

$$\therefore \text{Angles in a triangle sum to } 180^\circ$$

Compare your method with a partner's.