

Prove simple geometric facts

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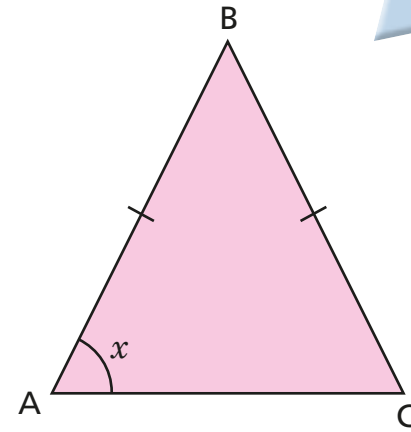
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Maths

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.



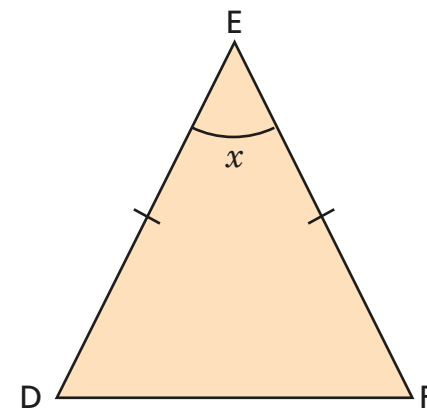
$\angle ACB = x$ because
in an isosceles triangle two angles are equal.

$\angle ABC = 180 - (x + x) = 180 - 2x$ because
angles in a triangle sum to 180° .

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° .

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

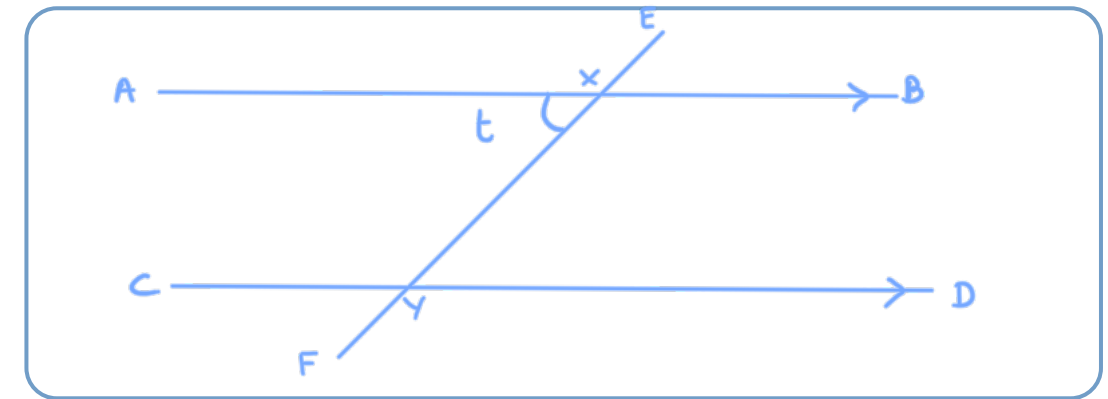
$$\angle EDF = \frac{180 - x}{2}$$

3 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.



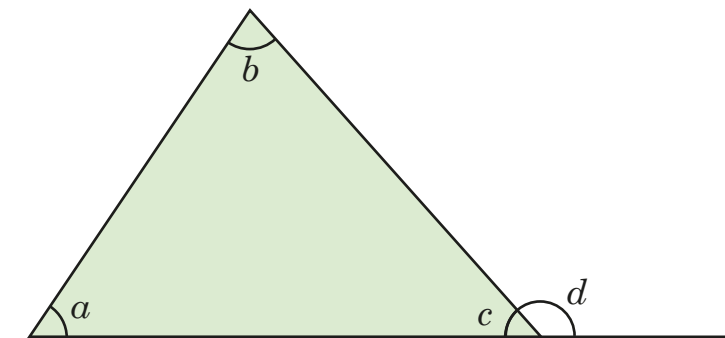
b) Show that angle FYD = $180 - t$.

Give reasons to support your answer.

$\angle EYD = t^\circ$ because alternate angles are equal.

$\angle FYD = 180 - t$ because angles on a straight
line sum to 180° .

4 A triangle has interior angles a , b and c .



$a + b + c = 180$ because
angles in a triangle sum
to 180° .

$c + d = 180$ because
angles on a straight
line sum to 180° .

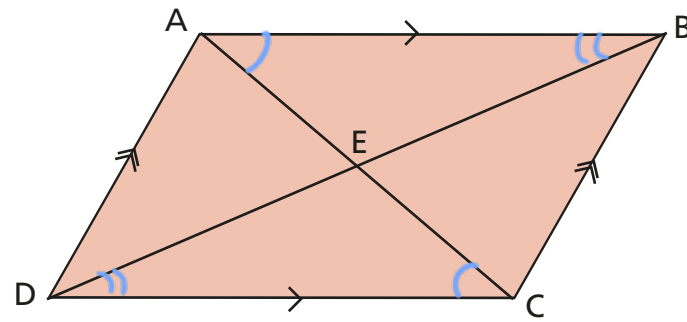
$$a + b + c = c + d$$

$$\therefore a + b = d$$

Show that $d = a + b$.

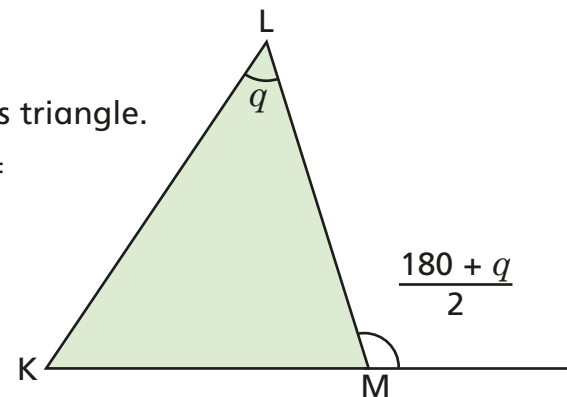
Give reasons to support your answer.

- 5 ABCD is a parallelogram.
Prove that triangles AEB and CED are identical.
Give reasons to support your answer.



$\angle BAE = \angle CED$
& $\angle ABD = \angle BDC$ because alternate angles are equal.
Line segments AB and DC are equal in length because ABCD is a parallelogram.
 \therefore triangles AEB and CED are identical.

- 6 KLM is a triangle.
Prove that triangle KLM is an isosceles triangle.
Give reasons to support each stage of your workings.



$$\begin{aligned}\angle LMK &= 180 - \frac{180 + q}{2} \\ &= \frac{360 - 180 - q}{2} \\ &= \frac{180 - q}{2}\end{aligned}$$

angles on a straight line sum to 180° .

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

angles in a triangle sum to 180° .

\therefore KLM is isosceles.

- 7 QPR is an isosceles triangle.

PS is perpendicular to QR.

Prove that PS bisects angle QPR.

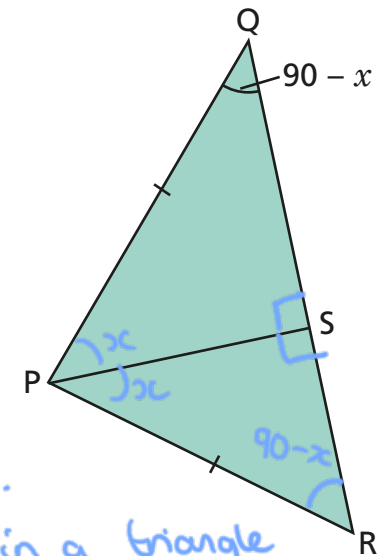
Give reasons to support each stage of your workings.

$\angle PSQ$ & $\angle PSR = 90^\circ$ because PS is perpendicular to QR.

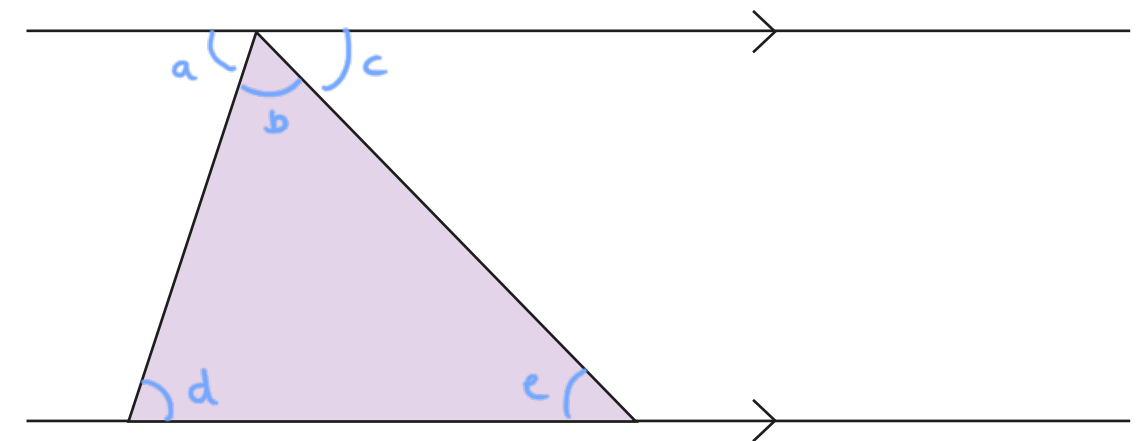
$\angle PRS = 90 - x$ because QPR is isosceles.

$\angle QPS = \angle RPS = x$ because angles in a triangle sum to 180 .

\therefore PS bisects $\angle QPR$



- 8 Use rules of parallel lines to prove that the sum of the angles in a triangle is 180° .



$a + b + c = 180$ because angles on a straight line sum to 180 .

$a = d$ and $c = e$ because alternate angles are equal.

$$b + d + e = b + a + c = 180$$

Compare your method with a partner's.