Proof with Angles

Starter

1. **(Review of last lesson)**
The exterior angle of a regular polygon is 18°. How many sides does the polygon have?

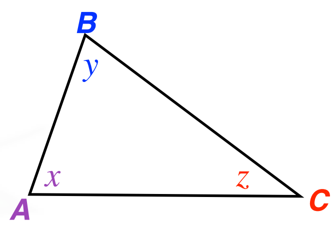
2. **(Review of last lesson)**
A regular polygon has interior angles of 150°. How many sides does the polygon have?

3. **(Review of last lesson)** Tasneem claims she has found a regular polygon whose interior angle is 80º more than the exterior angle. If the regular polygon exists, how many sides does it have?

Notes

Angle notation

There are three main ways to indicate an angle using the vertices of the shape.



In the diagram to the right:

$x \equiv \angle BAC$ or $B\hat{A}C$ or $\hat{A}$

When three letters are used, the middle letter is the angle.
Also, the letters can be written in the opposite order: $\angle BAC \equiv \angle CAB$

E.g. 1 Give the different angle notations for angles: (a) y (b) z.

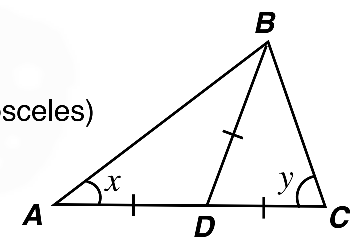
Working: (a) $y \equiv \angle ABC$ or $\angle CBA$ or $A\hat{B}C$ or $C\hat{B}A$ or $\hat{B}$

Proof involving angles

Each mathematical statement must be supported by a written explanation.

E.g. $A\hat{B}C = 84^\circ$ since $\triangle ABC$ is isosceles.

E.g. 2 Prove that $x + y = 90^\circ$.



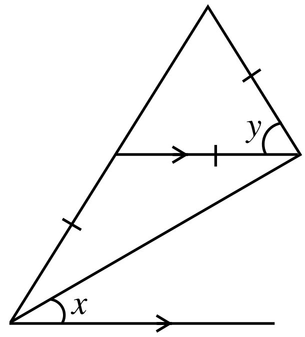
Working: $\angle BAD = x \Rightarrow \angle ABD = x$ ($\triangle ABD$ is isosceles)
$\angle ADB = 180 - 2x$ since angles in a triangle add up to 180°

$\angle BCD = y \Rightarrow \angle CBD = y$ ($\triangle BCD$ is isosceles)
$\angle BDC = 180 - 2y$ since angles in a triangle add up to 180°
$\angle ADB + \angle BDC = 180^\circ$ since angles on a straight line add up to 180°
So $180^\circ - 2x + 180^\circ - 2y = 180^\circ$ $\quad 180^\circ = 2x + 2y$
Divide both sides by 2: $\quad x + y = 90^\circ$

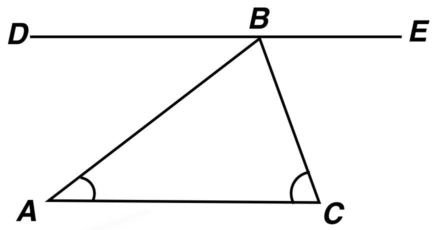
Sometimes the diagram of the question does not include letters at the vertices of the shape. In such cases, write them in yourself, making sure to go round clockwise (or anti-clockwise from your starting vertex.

E.g. 3 Prove that $4x + y = 180°$.

Hint: Label the important points of the shape with a capital letter.



E.g. 4 Use the fact that the sum of the angles in a triangle add up to $180°$, to prove that the degrees on a straight line are also $180°$.



Video: Proof with angles

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p71 M3.5 Qu 1-10
A*-G class textbook:	p64 M3.5 Qu 1-17 odd
9-1 homework book:	p23 M3.5 Qu 1-8
A*-G homework book:	p17 M3.5 Qu 1-10

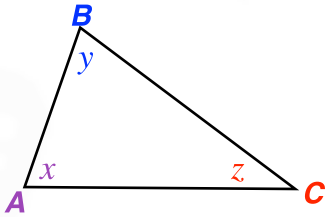
Summary

There are three main ways to indicate an angle using the vertices of the shape.
In the diagram to the right:

$x \equiv \angle BAC$ or $B\hat{A}C$ or $\hat{A}$

When three letters are used, the middle letter is the angle.

Also, the letters can be written in the opposite order: $\angle BAC \equiv \angle CAB$



Proof involving angles — each mathematical statement must be supported by a written explanation.

E.g. $A\hat{B}C = 84°$ since $\triangle ABC$ is isosceles.