



Angles, Polygons and Geometrical Proof

Stage 3 ★

Mixed Selection 2

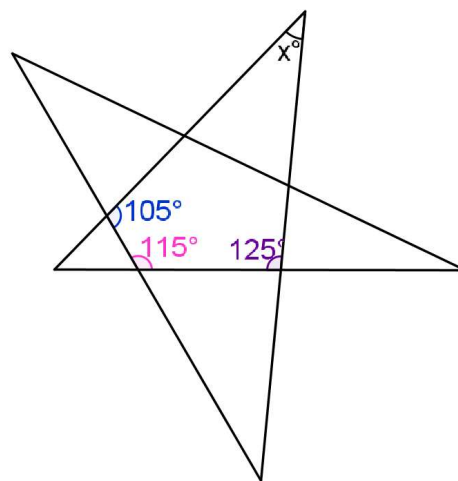
1. Robo-turn

A robot, which is initially facing North, is programmed to travel 5m then turn through 10° clockwise, travel 5m then turn through 20° clockwise, travel 5m then turn through 30° clockwise, and so on. Each move consists of moving 5m in a straight line and then turning clockwise through an angle which increases by 10° at each move.

How far has it travelled by the time it is first facing due East at the end of a move?

2. Stellar angles

What is the value of x in the diagram?



3. Two exterior triangles

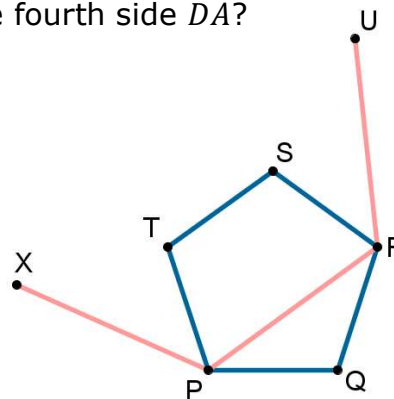
A square is labelled clockwise $ABCD$. P and Q are points outside the square such that triangles ABP and BCQ are both equilateral. How big is angle PQB ?

4. As long as possible

The length of each side of a quadrilateral $ABCD$ is a whole number of centimetres. Given that $AB = 4$ cm, $BC = 5$ cm, and $CD = 6$ cm, what is the maximum possible length of the fourth side DA ?

5. Polygon cradle

The figure shows a regular pentagon $PQRST$ together with three sides XP, PR, RU of a regular hexagon with vertices $PRUVWX$. What is the size of the angle SRU ?



These problems are adapted from UKMT Mathematical Challenge problems (ukmt.org.uk)