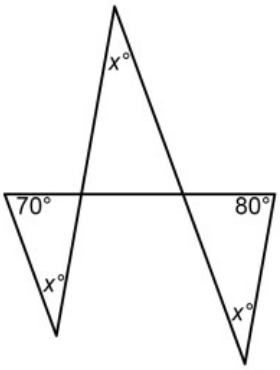
Angles, Polygons and Geometrical Proof

Stage 3 ★★
Mixed Selection 2

1. **Right angled octagon**
   A quadrilateral can have four right angles. What is the largest number of right angles an octagon (8 sides) can have?



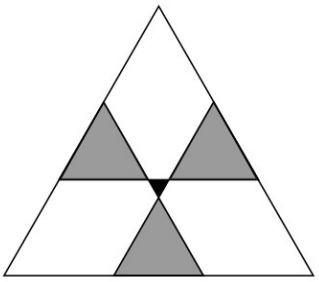
2. **Fangs**
   What is the value of x in this diagram?

3. **Integral polygons**
   Each interior angle of a particular polygon is an obtuse angle which is a whole number of degrees.

   What is the greatest number of sides the polygon could have?

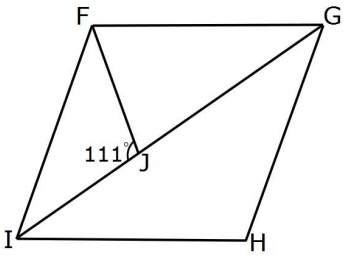
4. **Radioactive triangle**
   The diagram shows a large equilateral triangle divided by three straight lines into seven regions. The three grey regions are equilateral triangles with sides of length 5cm and the central black region is an equilateral triangle with sides of length 2cm.

   What is the side length of the original large triangle?



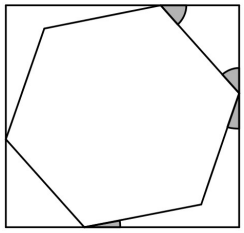
5. **Rhombus diagonal**
   The diagram on the right shows a rhombus $FGHI$ and an isosceles triangle FGJ in which $GF = GJ$, and $\angle FJI = 111°$.

   What is the size of the angle JFI?



6. **Inscribed hexagon**
   The diagram shows a regular hexagon inside a rectangle.

   What is the sum of the four marked angles?



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