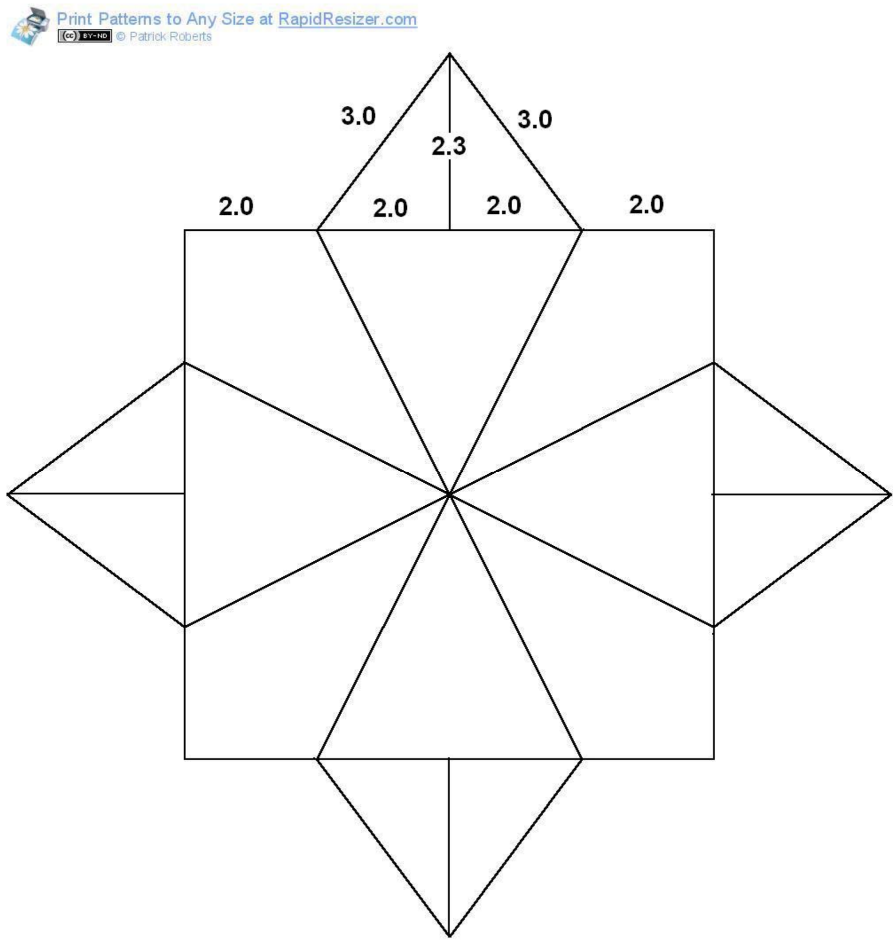
The Surface Area of a Snowflake



The diagram above shows the basic plan for one common type of snowflake. The detailed pattern within each polygonal area has been removed to show the regular areas. The numbers at the top are the measured line segments in millimeters.

Problem 1 - Using the geometric clues in the diagram, what is the total area of this pattern in square millimeters, rounded to the nearest integer?

Problem 2 - If all measurements were doubled in length, what would be the total area of the pattern to the nearest integer in square-millimeters?

Problem 1 - Using the geometric clues in the diagram, what is the total area of this pattern in square millimeters, rounded to the nearest integer?

Answer:

The pattern consists of a main square with a side length of 2.0mm+2.0mm+2.0mm+2.0mm = 8.0 mm and an area of $(8.0\text{mm})^2$ = 64 mm^2.

The four triangular points each have an area of 1/2(4.0mm)(2.3mm) = 4.6 mm^2, so the total area of the pattern is 64.0 mm^2+ 4(4.6mm^2) = 82.4 mm^2, which is rounded to **82 mm^2**.

Problem 2 - If all measurements were doubled in length, what would be the total area of the pattern to the nearest integer in square-millimeters?

Answer: Doubling the dimensions means that the area is increased by a factor of 2x2 = 4 so it now becomes 82.4mm^2 x 4 = 329.6 mm^2, which rounds to **330 mm^2**.

The side length of the square becomes 2 x 8.0mm = 16.0 mm and the area is then $(16\text{mm})^2$ = 256 mm^2. The four triangles each have an area of 1/2 (8.0mm) (4.6mm) = 18.4 mm^2, so the total area is 256 mm^2+ 4(18.4mm^2) = 329.6 mm^2 or rounded to **330 mm^2**.