



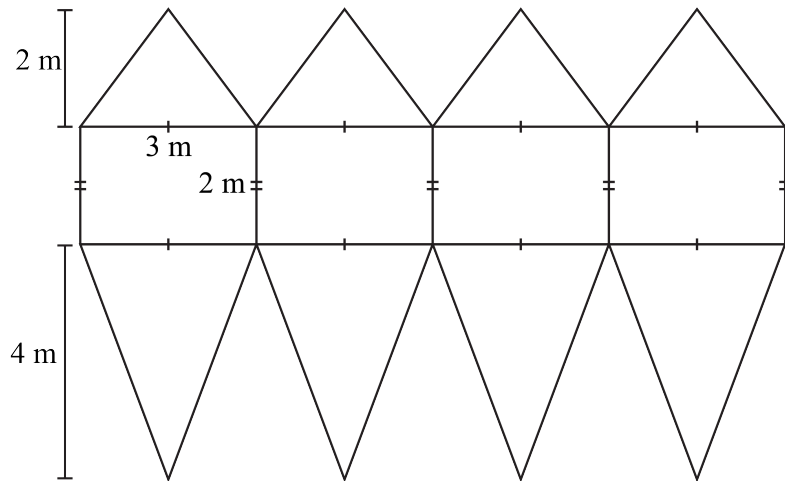
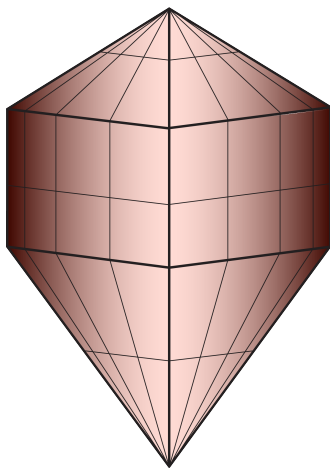
Problem of the Week

Problem B and Solution

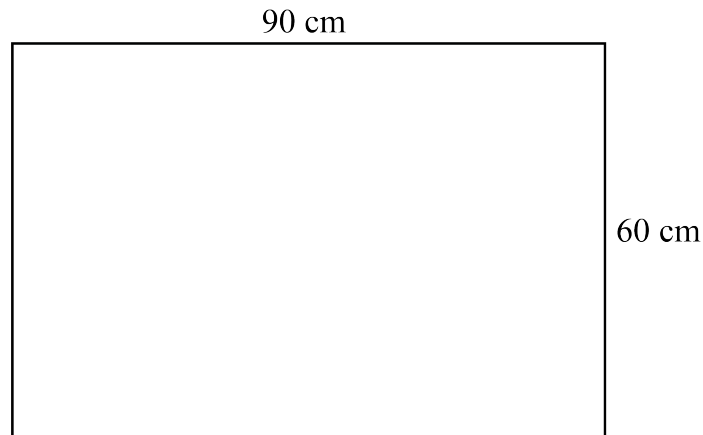
How to Net a Balloon

Problem

In 1783, the Montgolfier brothers launched the first hot air balloon flight in history, using a balloon that they created out of fabric and paper. The flight was short but successful. For an art exhibit, Vijay used cardboard to create a model of a balloon inspired by the Montgolfier brothers' balloon. Vijay's model, as well as its net, are shown below. Note that these diagrams are not drawn to scale.



- Calculate the total area of cardboard Vijay used in his model. This is also called the *surface area* of Vijay's model.
- Suppose you have a sheet of paper measuring 90 cm by 60 cm. Draw a net for a balloon that you could make using this sheet of paper. Write the dimensions for each shape on your net.





Solution

- (a) To calculate the total area we notice that the net has four triangles on top, four rectangles, and four triangles on the bottom. We will calculate the area of each of these shapes separately and then add them together.

$$\begin{aligned}\text{Area of one top triangle} &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 3 \times 2 \\ &= \frac{1}{2} \times 6 \\ &= 3 \text{ m}^2\end{aligned}$$

Since there are four top triangles, the total area is $4 \times 3 = 12 \text{ m}^2$.

$$\begin{aligned}\text{Area of one rectangle} &= \text{length} \times \text{width} \\ &= 3 \times 2 \\ &= 6 \text{ m}^2\end{aligned}$$

Since there are four rectangles, the total area is $4 \times 6 = 24 \text{ m}^2$.

$$\begin{aligned}\text{Area of one bottom triangle} &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 3 \times 4 \\ &= \frac{1}{2} \times 12 \\ &= 6 \text{ m}^2\end{aligned}$$

Since there are four bottom triangles, the total area is $4 \times 6 = 24 \text{ m}^2$.

Therefore, the total area of cardboard used is $12 + 24 + 24 = 60 \text{ m}^2$.

- (b) There are many possible nets. Here is one.

