Solar Power in Space: Shape and Area

Part 1: How useful are solar panels in space?

Solar panels are (usually) flat surfaces that absorb light and produce electrical power.

On the surface of the planet Mars each cm^2 of ground gets about 0.05 Watts of sunlight. This is called the **Solar Irradiance** on Mars.

How many Watts of sunlight do each of the following objects receive if they are lying flat on the surface of Mars:

- a 100 cm^2 bathroom tile?
- a 10,000 cm^2 umbrella?
- a 200,000 cm^2 bus roof?
- a 625 cm^2 sheet of A4 paper?

Solar panels are not 100% efficient, which means they can't turn **all** of the sunlight's power into electrical power.

The best solar panels at the moment are about 50% efficient, which means they can convert half of the sunlight's power into electrical power.

Complete the following table for solar panels on Mars, if the solar panels are 50% efficient.

Area (cm^2)	Solar power received (Watts)	Electrical power (Watts)
100		
10,000		
200,000		
625		

Design Challenge:

Suppose a small system-on-a-chip computer requires 1.5 Watts of power to run. What area of solar panel would be necessary to run this computer on Mars?

Part 2: Designing solar panels.

Solar panels come in different shapes and sizes.

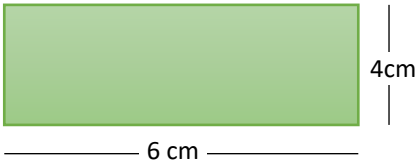
We saw in Part 1 that the **area** of a solar panel determines how much electrical power it produces.

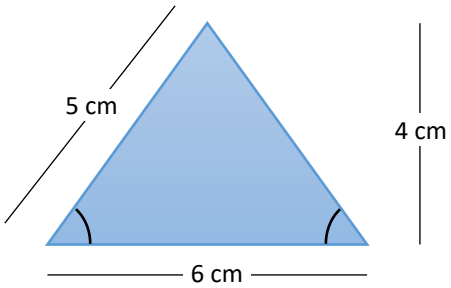
Also, if we know the **perimeter** of a solar panel we can build a frame to support it.

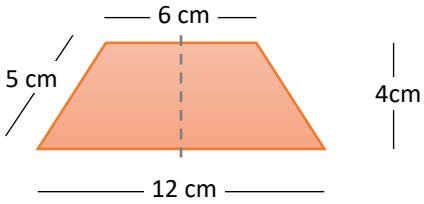
For each of the following solar panel designs:

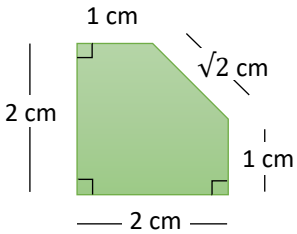
- name the shape
- find all pairs of parallel lines
- find all lines of symmetry (some are given for you)
- calculate the area of the solar panel
- calculate the perimeter of the solar panel

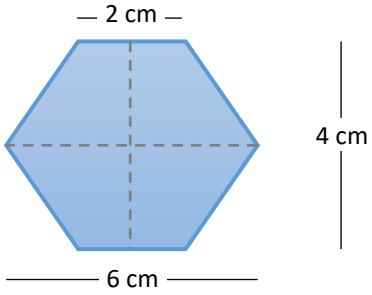
Rectangle











Design Challenge:

In Part 1 you worked out the area of solar panel needed to run a system-on-a-chip computer on Mars. Draw a solar panel meeting this requirement. Don't forget to label the dimensions.