

Cuboid Investigation

Volume:	Total space inside the cuboid
Formula:	$V = length \times width \times height$
Units:	Usually cm^3 ("cubic centimetres", "centimetres cubed", "cc", "ml")
Surface area:	The total area (flat space) of all 6 faces of the cuboid
Formula:	$SA = 2 \times (length \times width + length \times height + width \times height)$
Units:	Usually cm^2 ("square centimetres", "centimetres squared")

Investigate the different surface areas of cuboids with a volume of $900cm^3$. What is the largest surface area you can find? What is the smallest?

- *How do I begin?*

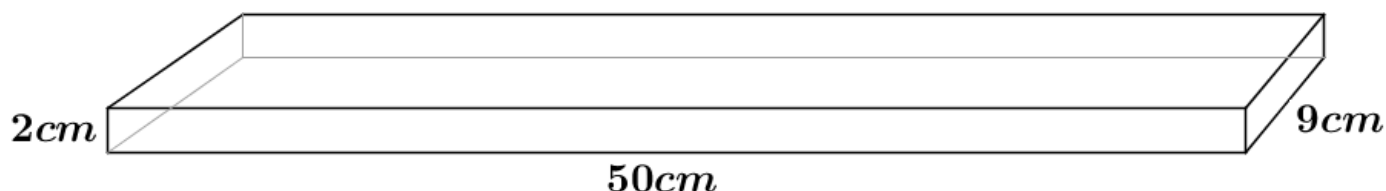
Think of any three numbers that multiply together to make 900. These can be the dimensions of your cuboid. Draw a diagram and work out the total surface area.

- *What next?*

Once you have three numbers that work, you can create a new set of three by scaling one number up and another down. Eg, if you have $50cm$, $9cm$ and $2cm$, then $25cm$, $18cm$ and $2cm$ will also work (halving one number and doubling another in this case).

Eg:

Dimensions: $Length = 2cm$ $Width = 50cm$ $Height = 9cm$



Surface area: $2 \times (2 \times 50 + 2 \times 9 + 50 \times 9) = 1136cm^2$

Conclusions:

The cuboid with the **largest** surface area was: _____

It has a total surface area of: _____

The cuboid with the **smallest** surface area was: _____

It has a total surface area of: _____

What do you notice?

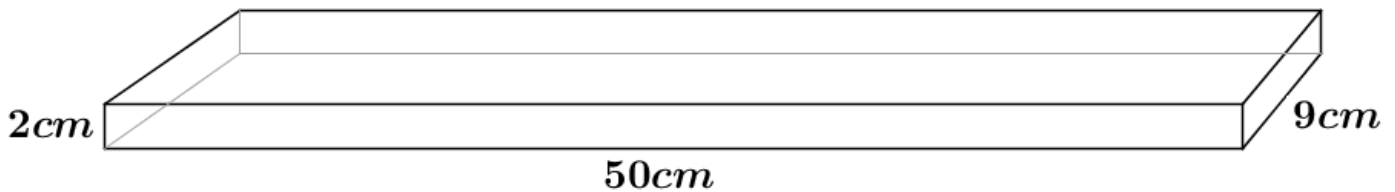
Cuboid Investigation SOLUTIONS

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Conclusions:

The cuboid with the **largest** surface area was: $1cm \times 1cm \times 900cm$

It has a total surface area of: $3602cm^2$

(note: no limit on surface area if not restricted to whole numbers)

The cuboid with the **smallest** surface area was: $9cm \times 10cm \times 10cm$

It has a total surface area of: $560cm^2$

(note: the cube $9.65 \dots cm \times 9.65 \dots cm \times 9.65 \dots cm$ gives the overall min: $559.3 \dots cm^2$)

What do you notice?

The more similar the lengths, the smaller the surface area.

The closer the cuboid gets to a cube, the smaller the surface area.

Cuboid Investigation SOLUTIONS Continued

Full list of possible surface areas for each integer factor triple:

Length	Width	Height	SA
9	10	10	560
6	10	15	600
5	12	15	630
5	10	18	640
5	9	20	650
6	6	25	672
4	15	15	690
5	6	30	720
4	9	25	722
5	5	36	770
3	15	20	810
3	12	25	822
3	10	30	840
4	5	45	850
3	6	50	936
3	5	60	990
2	18	25	1072
3	4	75	1074
2	15	30	1080
2	10	45	1120
2	9	50	1136
3	3	100	1218
2	6	75	1224
2	5	90	1280
2	3	150	1512
2	2	225	1808
1	30	30	1920
1	25	36	1922
1	20	45	1930
1	18	50	1936
1	15	60	1950
1	12	75	1974
1	10	90	2000
1	9	100	2018
1	6	150	2112
1	5	180	2170
1	4	225	2258
1	3	300	2406
1	2	450	2704
1	1	900	3602