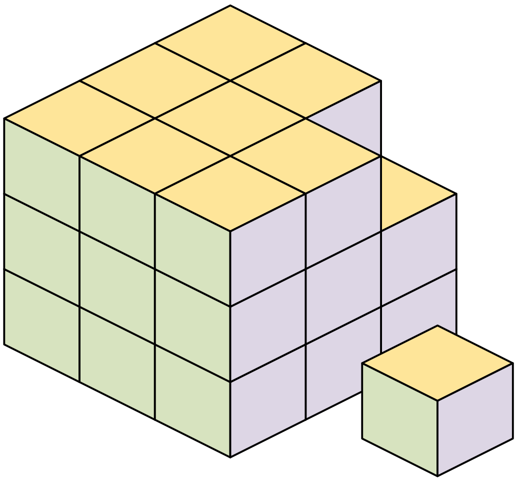


INVESTIGATING CUBES

Year Seven Investigation 2

ABSTRACT

This is two weeks' work looking at the shapes of cubes, investigating cube numbers, reinforcing algebraic expressions.

SRH

Investigating Cubes

Investigating Cubes

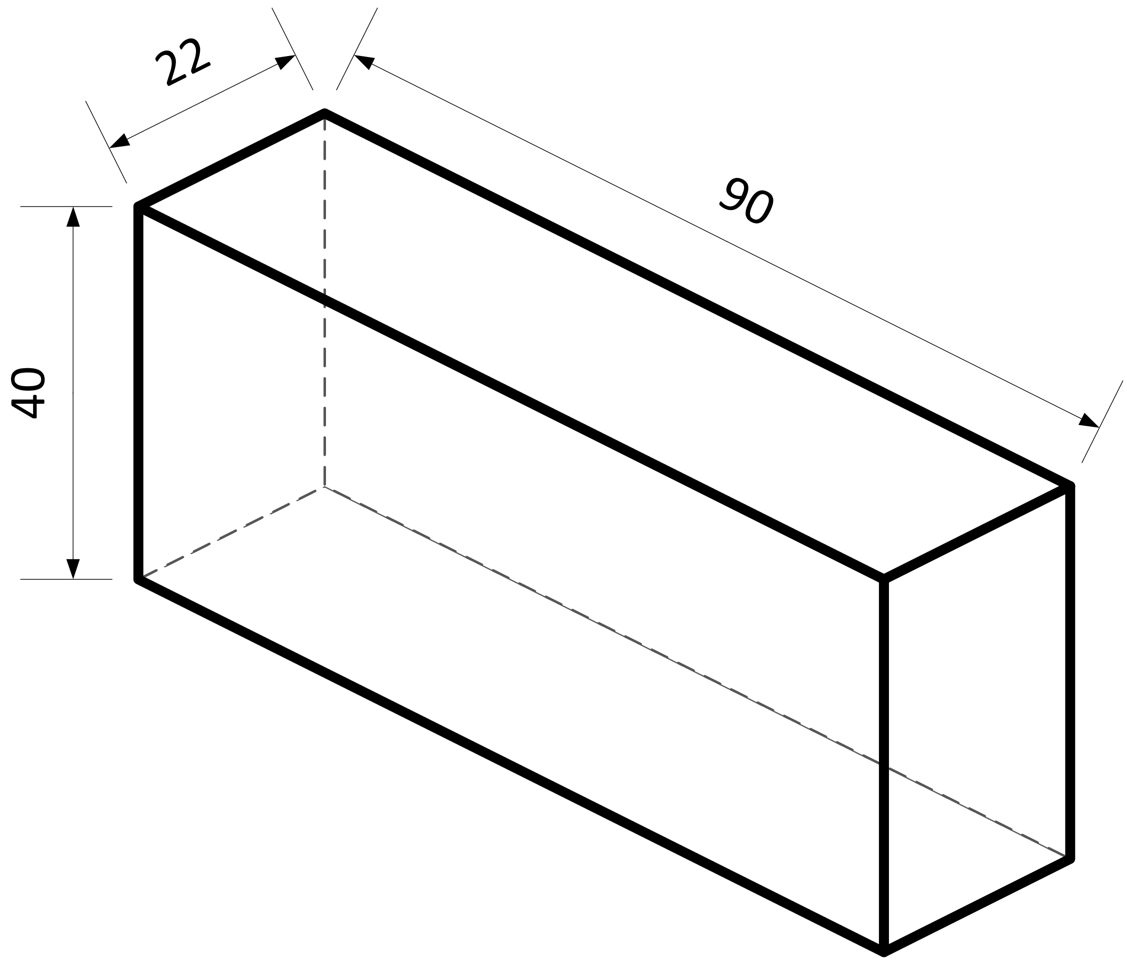
Patterns in Cubed Numbers

- Work out the values of all cubed numbers up to and including 20^3.

- Start to examine the differences between cubed numbers. What is $(n+1)^3 - n^3$?
  (eg $4^3 - 3^3$? $5^3 - 4^3$?)
- Can you find a pattern in $(n+2)^3 - n^3$?
  (eg $5^3 - 3^3$? $6^3 - 4^3$?)
- What about $n^3 + (n+1)^3$?
  (eg $1^3 + 2^3$, $2^3 + 3^3$, etc)

- Build yourself a table to make your results clear.
- See if you can make up your own investigations looking at cubed numbers.

Calculating Cuboids (1)

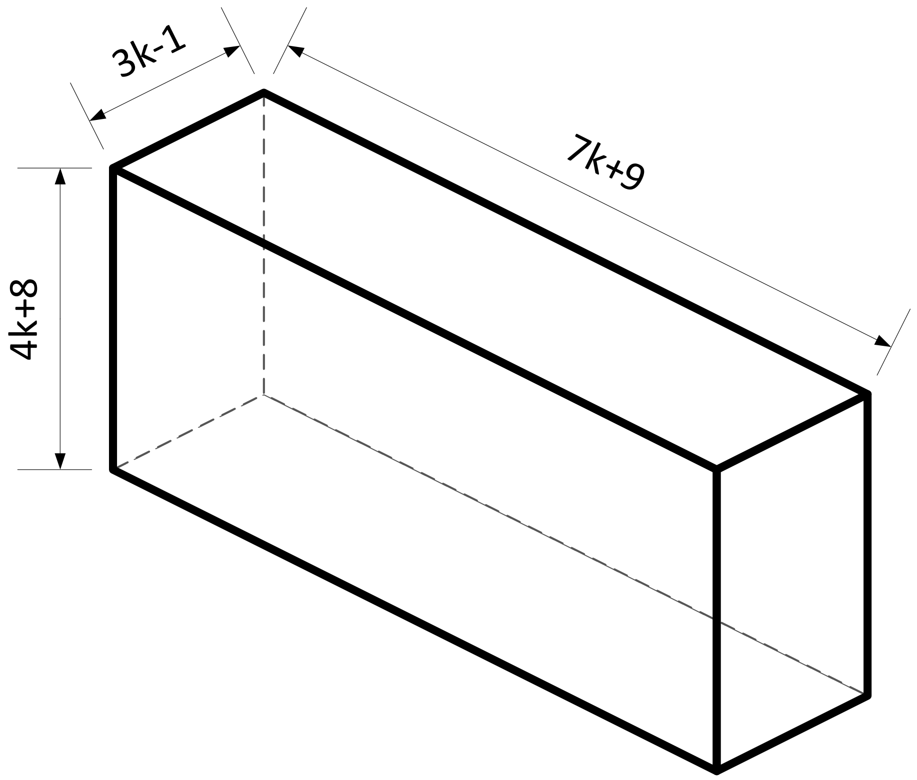


Measurements given in mm.

DO NOT SCALE

- Find the total length of the edges
- Find the surface area
- Find the volume

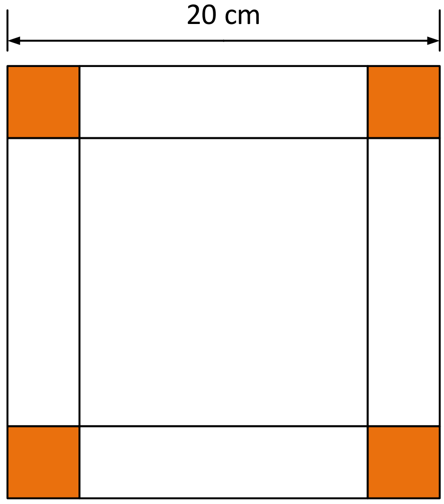
Calculating Cuboids (2)



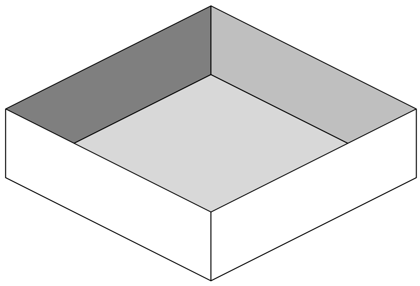
DO NOT SCALE

- Find the total length of the edges
- Find the surface area
- Find the volume
- If the length of this cuboid was 72mm, what would the other dimensions be? What is the value of k?
- Using a calculator, create a table that shows what the volume, surface area and length of the edges would be if you had values of k for 10cm, …, 100cm.

Boxes Investigation

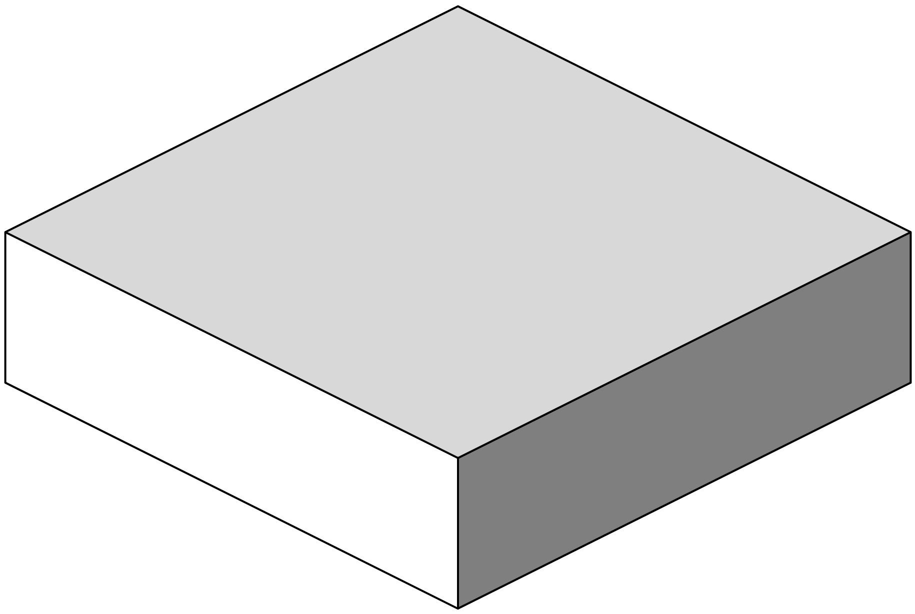


- From a square piece of paper, it is possible to make a box without a lid by cutting the squares in the corners out and folding the flaps that remain and join them using sticky tape (as in the picture below).



- We can alter the volume of the box by cutting different sized squares from each corner.
- What sized squares would you have to cut from the corners to attain the maximum volume of the box?
- Draw a graph of size of squares vs volume
- What would happen if you changed the original size of the paper?

Surface Area



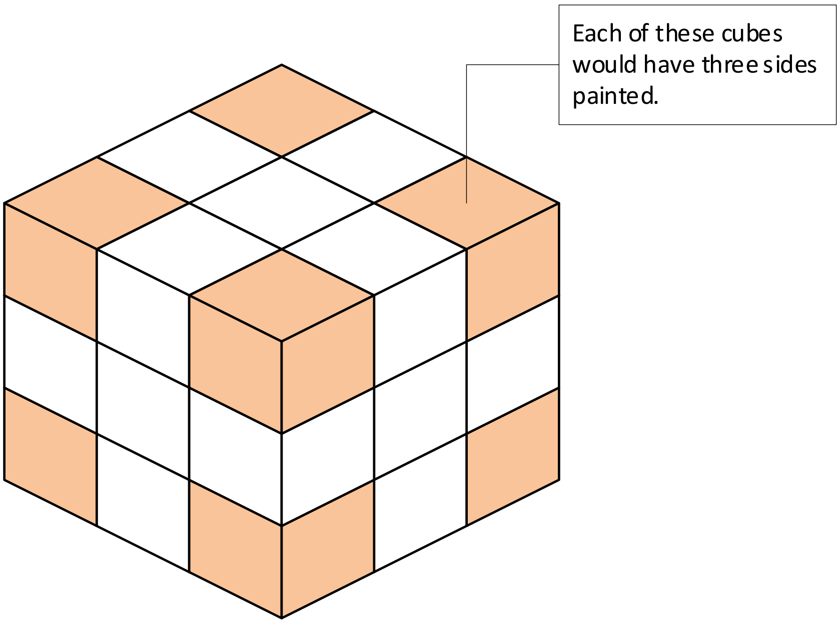
- A cuboid has a volume 900 cm^3.
- What is the smallest surface area of a cuboid with this volume?

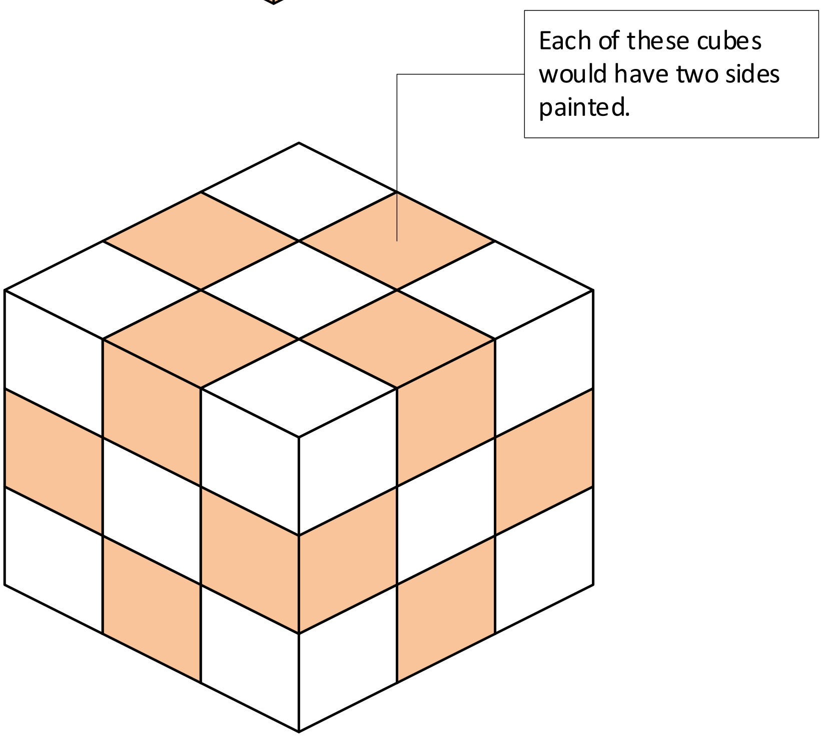
- Hint: Think of sets of three numbers that multiply together to make 900 eg 30×3×10 and then work out their surface areas.
- Hint 2: Surface area = 2(length × width) + (length × height) + (height × width)

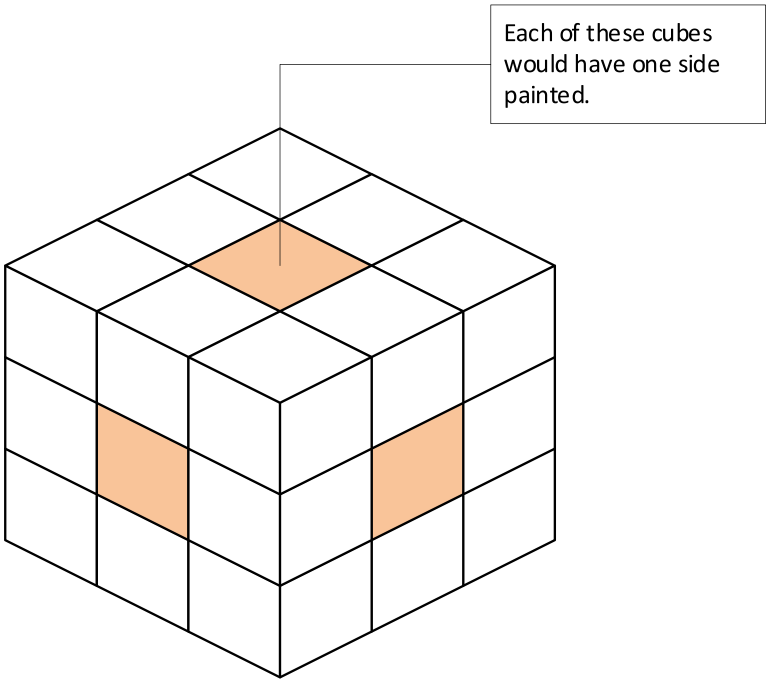
- Can you draw any conclusions or rules from your investigation?

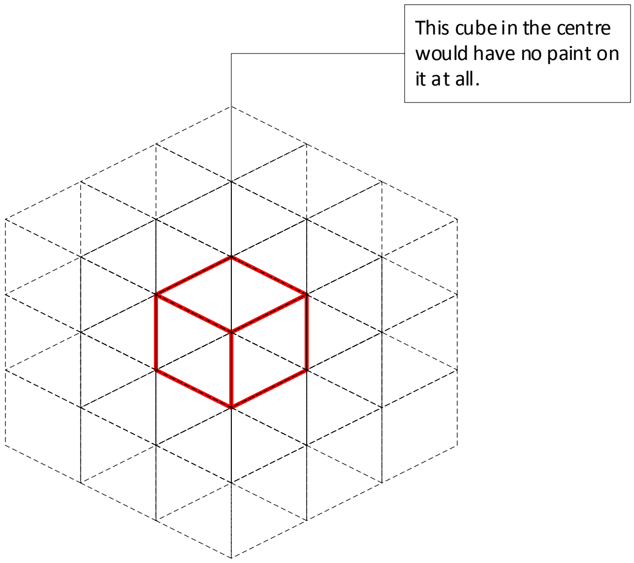
Painted Cube Investigation

If I built a 3 by 3 by 3 cube out of smaller cubes and then painted the outside of my large cube in orange, I would end up with some smaller cubes that had one face painted, some that had two faces painted and some that had three faces painted. In the centre of my large cube, there would be a small cube that had no faces painted.







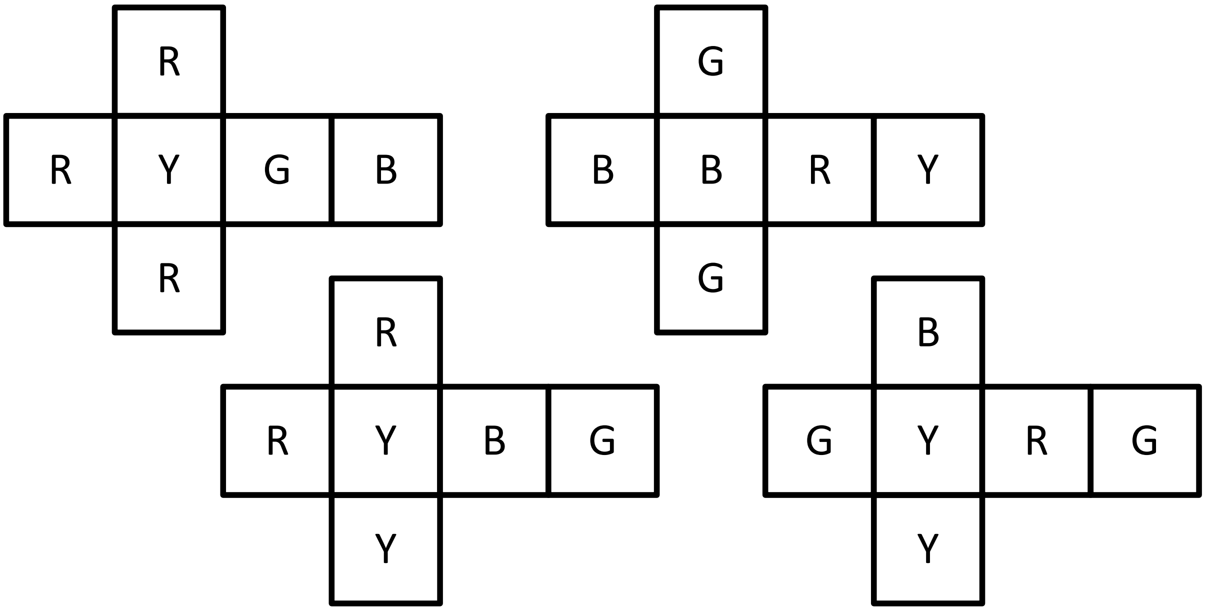


- You need to investigate how many faces of each of the smaller cubes would be painted and how many wouldn't. There are 3×3×3×6 = 162 faces of the smaller cubes altogether in a cube with side length of 3.
- Draw a table to give your results.

- Investigate the same phenomena for larger cubes such as 5×5×5 cubes.
- Can you find any patterns?
- What about the number of faces on each of the smaller cubes that was painted? Are there any patterns there?

Instant Insanity

- Below are the nets for four cubes (minus the tabs). Each letter represents a colour: R – Red, B – Blue, G – Green and Y is Yellow.
- You have to stack the cubes so that each side of the stack contains one of each of these colours.
- There are 331,776 combinations of stack.



- Good Luck