Surds

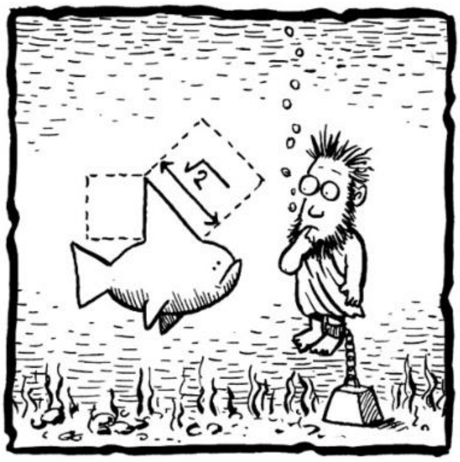
Did you know?

Maths can be murderous!

You will have heard of Pythagoras and his theorem but have you heard of Hippasus who was one of his followers?

Pythagoreans preached that all numbers could be expressed as the ratio of integers – i.e. fractions.

Hippasus is sometimes credited with the discovery of the existence of irrational numbers – proving it for $\sqrt{2}$. Following which, he was drowned at sea!



https://www.flickr.com/photos/28698046@N08/21275364908/

Surds 1

1. Simplify $\sqrt{a} + 2\sqrt{a} + 5\sqrt{a}$

2. Simplify $\sqrt{2}$ x $\sqrt{6}$

3. Simplify fully $(4\sqrt{3})^2$

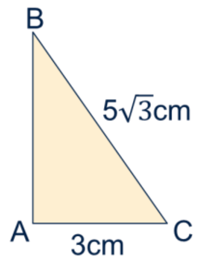
4. Write $\sqrt{45} + \sqrt{20}$ in the form k $\sqrt{5}$

5. Calculate $\frac{\sqrt{54}}{\sqrt{6}}$

6. Rationalise the denominator of $\frac{4}{\sqrt{3}}$

7. A rectangle has an area of $8\sqrt{15}$ cm^2 and a length of 2 $\sqrt{3}$ cm.
   Find the width of the rectangle

8. Find the length AB



Surds 2

1. Simplify $\sqrt{d} + 6\sqrt{d} - 3\sqrt{d}$

2. Simplify $2\sqrt{b}$ x $4\sqrt{3}$

3. Simplify fully $(4\sqrt{5})^2$

4. Write $\sqrt{75} + \sqrt{48} - 2\sqrt{12}$ in the form $k\sqrt{3}$

5. Simplify $\frac{\sqrt{125} - 2\sqrt{20}}{\sqrt{5}}$

6. Rationalise the denominator of $\frac{2\sqrt{2}}{\sqrt{5}}$

7. Evaluate $\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{\sqrt{6}}$

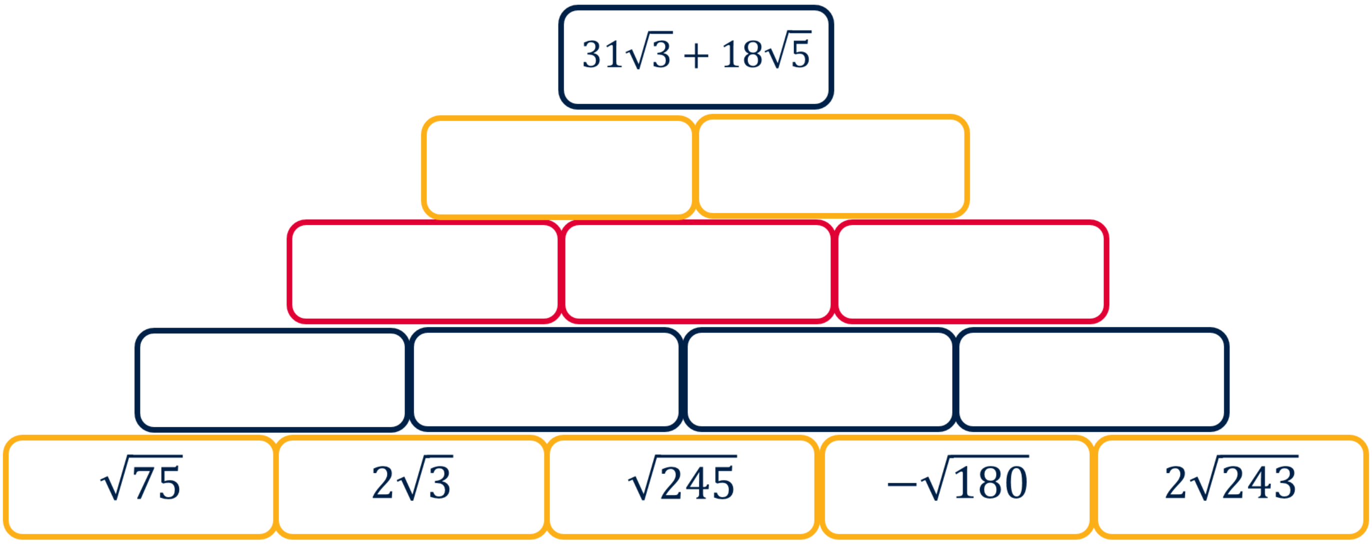
8. A triangle has base of $3\sqrt{2}$ and a perpendicular height of $5\sqrt{8}$

   Calculate the area of the triangle

Another Brick in the Wall

Complete the empty boxes in the pyramid.

Each box is the sum of the two boxes directly below it.



Hint: You may need to simplify some of the surds in the bottom row to get started.

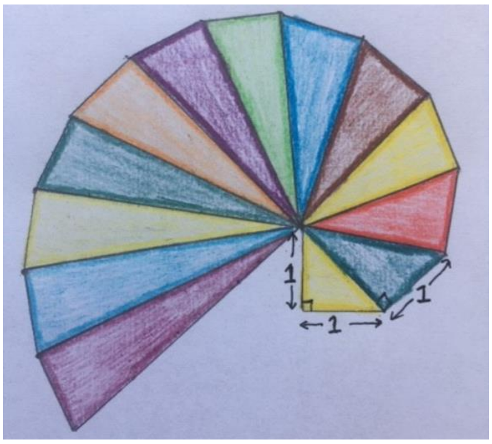
True or False

Decide if each of the following expressions is *True* or *False*

1. $\sqrt{9} + \sqrt{4} = \sqrt{13}$
2. $\sqrt{a} \times \sqrt{b} = \sqrt{c}$
3. $\sqrt{(8)^2} = 8$
4. $10\sqrt{2} = \sqrt{8}$
5. $\frac{\sqrt{12} \times \sqrt{3}}{\sqrt{9}} = 2$
6. $\sqrt{2}^3 = 2\sqrt{2}$
7. $\sqrt{ab}^2 = ab$
8. $2\sqrt{100} = \sqrt{200}$

Are there some statements that are 'Sometimes true' but not 'Always true'? Explain why.

The Wheel of Theodorus



The diagram shows a spiral made up of right angled triangles.

The shortest side of each triangle measures 1 unit long.

Can you see how it is constructed?

Find the length of the hypotenuse of the first few triangles.

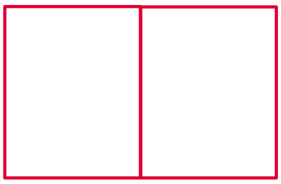
What do you notice ?

Which triangle would have a side length of 3?

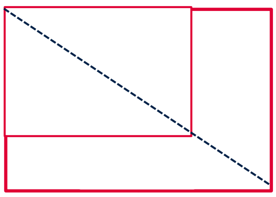
What other questions might you want to ask about the diagram?

Take a sheet of A4 paper

Take a sheet of A4 paper – actually take 2 and place them side by side to make A3 paper. Like this



Then place another A4 piece of paper on top of it like this



What do you notice about the ratio of the sides of an A3 sheet to an A4 sheet?

Thinking about the ratio of the long side to the short side we get

$$\frac{x}{1} = \frac{2}{x} \rightarrow x^2 = 2 \rightarrow x = \sqrt{2}$$

Therefore, for A4, A3, A2, etc… the length of the long side divided by the length of the short side is always $\sqrt{2}$