Did you know ?

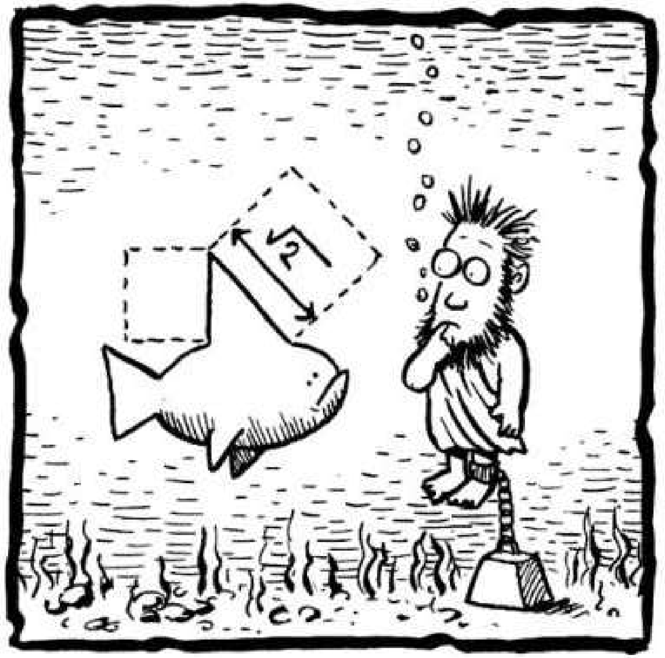
Maths can be murderous!

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!



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Surds 1

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

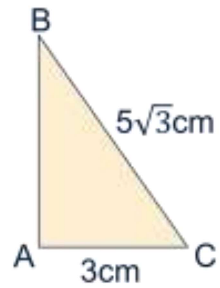
2. Simplify $\sqrt{2} \times \sqrt{6}$

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. 

Find the length AB

8. 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

Surds 1

Solutions on the next slide….

Surds 1 Solutions

1. Simplify $\sqrt{a} + 2\sqrt{a} + 5\sqrt{a}$ → 1. $= 8\sqrt{a}$

Here we are just using the same skills here as when collecting like terms with algebraic expressions e.g. $x + 2x + 5x = 8x$

2. Simplify $\sqrt{2} \times \sqrt{6}$ → 2. $= \sqrt{2 \times 6} = \sqrt{12}$

$= \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$

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

$= 4 \times 4 \times \sqrt{3} \times \sqrt{3}$

$= 16 \times 3$

$= 48$

4. Write $\sqrt{45} + \sqrt{20}$ in the form $k\sqrt{5}$ → 4. $\sqrt{45} = \sqrt{9} \times \sqrt{5} = 3\sqrt{5}$

$\sqrt{20} = \sqrt{4} \times \sqrt{5} = 2\sqrt{5}$

$3\sqrt{5} + 2\sqrt{5} = 5\sqrt{3}$

Unsure about any of these? Search Simplifying surds Then try Skills check 2 to reassess yourself.

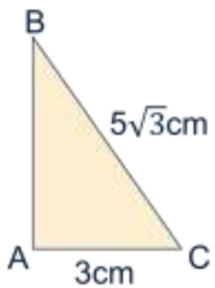
Surds 1 Solutions

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

→ 5. $\frac{\sqrt{54}}{\sqrt{6}} = \frac{\sqrt{9 \times 6}}{\sqrt{6}} = \frac{\sqrt{9}\times\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{\sqrt{6}} = 3$

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

→ 6. $\frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}} = \frac{4\sqrt{3}}{3}$

7. 

Find the length AB

→ 7. Using Pythagoras' theorem

$$AB^2 = (5\sqrt{3})^2 - 3^2$$
$$AB^2 = (25 \times 3) - 9$$
$$AB^2 = 66 \ \ so \ \ AB = \sqrt{66} \text{ cm}$$

8. 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. $$8\sqrt{15} = \text{width} \times 2\sqrt{3}$$
$$8\sqrt{15} \div 2\sqrt{3} = \text{width}$$
$$\frac{8\sqrt{15}}{2\sqrt{3}} = \frac{8 \times \sqrt{5} \times \sqrt{3}}{2\sqrt{3}} = 4\sqrt{5}\text{cm}$$

Unsure about any of these? Search Simplifying surds and rationalising the denominator
Then try Skills check 2 to reassess yourself.

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Surds 2

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

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

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

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

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

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

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

   Give you answer in simplest form.
   Rationalise the denominator.

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

Surds 2

Solutions on the next slide….

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Surds 2 Solutions

1. Simplify $\sqrt{d} + 6\sqrt{d} - 3\sqrt{d}$ → $= 4\sqrt{d}$

2. Simplify $2\sqrt{b} \times 4\sqrt{3}$ →
$= 2 \times 4 \times \sqrt{b} \times \sqrt{3}$
$= 8 \times \sqrt{b \times 3}$
$= 8\sqrt{3b}$

3. Simplify fully $(4\sqrt{5})^2$ →
$= 4\sqrt{5} \times 4\sqrt{5}$
$= 4 \times 4 \times \sqrt{5} \times \sqrt{5}$
$= 16 \times 5$
$= 80$

4. Write $\sqrt{75} + \sqrt{48} - 2\sqrt{12}$ in the form $k\sqrt{3}$ →
$\sqrt{75} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$
$\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$
$2\sqrt{12} = 2 \times \sqrt{4} \times \sqrt{3} = 2 \times 2\sqrt{3} = 4\sqrt{3}$

$5\sqrt{3} + 4\sqrt{3} - 4\sqrt{3} = 5\sqrt{3}$

Surds 2 Solutions

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

$$= \frac{\sqrt{25}\sqrt{5} - 2\sqrt{4}\sqrt{5}}{\sqrt{5}} = \frac{5\sqrt{5} - 2 \times 2\sqrt{5}}{\sqrt{5}}$$

$$= \frac{5\sqrt{5} - 4\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{\sqrt{5}} = 1$$

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

$$\frac{2\sqrt{2}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{2}\sqrt{5}}{\sqrt{5}\sqrt{5}} = \frac{2\sqrt{10}}{5}$$

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

Give you answer in simplest form.
Rationalise the denominator.

Need a common denominator to add fractions

$$= \frac{1\ (\times\sqrt{3})}{\sqrt{2}\ (\times\sqrt{3})} + \frac{\sqrt{3}}{\sqrt{6}} = \frac{\sqrt{3}}{\sqrt{6}} + \frac{\sqrt{3}}{\sqrt{6}} = \frac{2\sqrt{3}}{\sqrt{6}}$$

$$= \frac{2\sqrt{3}}{\sqrt{2}\sqrt{3}} = \frac{2\ (\times\sqrt{2})}{\sqrt{2}\ (\times\sqrt{2})} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

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

$$\text{Area} = \frac{1}{2} \times 3\sqrt{2} \times 5\sqrt{8} = \frac{1}{2} \times 3 \times 5 \times \sqrt{2}\sqrt{8}$$

$$= \frac{1}{2} \times 15 \times \sqrt{16} = \frac{1}{2} \times 15 \times 4$$

$$= 30 \text{ cm}^2$$

These are just example solutions and there is more than one way to do many of these questions – some are more efficient methods than others!