Harder Surds

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1) Harder Surds: Easier

Solutions for Question 1:

Multiply out the brackets: $\frac{-(4-8\sqrt{3}+8\sqrt{3}-48)}{\sqrt{48}}$

Simplifying this will give: $\frac{-(4-48)}{\sqrt{48}}$

$$\frac{44}{\sqrt{48}}$$

$$\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$$

Rationalise the denominator: $\frac{44}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$$\frac{44\sqrt{3}}{12}$$

$$\frac{11\sqrt{3}}{3}$$

$$a = \frac{11}{3}$$

Solutions for Question 2:

$$\sqrt{8} \times \sqrt{32} = 2^n$$

$$\sqrt{8} \times \sqrt{8} \times \sqrt{4} = 2^n$$

$$\sqrt{64} \times \sqrt{4} = 2^n$$

$$8 \times 2 = 2^n$$

$$16 = 2^n$$

$$n = 4$$

1) Harder Surds: Medium

3) Show $\frac{4+\sqrt{2}}{6+\sqrt{8}}$ can be written as $\frac{5-4\sqrt{2}}{14}$

$$\frac{4+\sqrt{2}}{6+\sqrt{8}} = \frac{(4+\sqrt{2})}{6+\sqrt{8}} \times \frac{(6-\sqrt{8})}{6-\sqrt{8}} = \frac{24-4\sqrt{8}+6\sqrt{2}-\sqrt{16}}{36-8} = \frac{24-8\sqrt{2}+6\sqrt{2}-4}{28}$$

$$= \frac{20-2\sqrt{2}}{28} = \frac{10-\sqrt{2}}{14}$$

(3 Marks)

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4) Work out the value of $\frac{3}{\sqrt{3}} + \sqrt{18\frac{3}{4}}$

$$\frac{3}{\sqrt{3}} + \sqrt{\frac{75}{4}} = \frac{3}{\sqrt{3}} + \frac{\sqrt{75}}{\sqrt{4}} = \frac{3}{\sqrt{3}} + \frac{\sqrt{25 \times 3}}{2} = \frac{3}{\sqrt{3}} + \frac{5\sqrt{3}}{2}$$

$$= \frac{3\sqrt{3}}{\sqrt{3}\sqrt{3}} + \frac{5\sqrt{3}}{2} = \frac{3\sqrt{3}}{3} + \frac{5\sqrt{3}}{2} = \frac{6\sqrt{3}}{6} + \frac{15\sqrt{3}}{6}$$

$$= \frac{21\sqrt{3}}{6} = \frac{7\sqrt{3}}{2} = 3.5\sqrt{3}.$$

$$k = 3.5.$$

(3 Marks)

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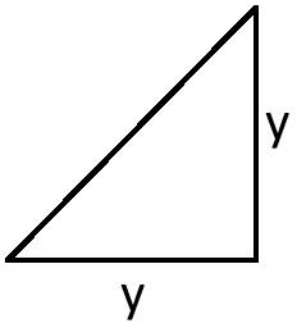
1) Harder Surds: Harder

Q5. Amir creates a square. It has a length, y, which is a whole number.

Amir cuts the square in half along the diagonal to produce a right angled triangle.



Amir is about the work out the hypotenuse of the triangle.

Amir says "The hypotenuse of the triangle could be a whole number".

Prove that Amir is wrong.

Let the hypotenuse be H.

$$H^2 = y^2 + y^2$$

$$H^2 = 2y^2$$

$$H = \sqrt{2}\, y \blacksquare$$

$\sqrt{2}$ multiplied by a whole number can not be a whole number.

An irrational number multiplied by any whole number will always be irrational.

(4 Marks)