

Spot the errors ~ surds

Activity 1

Some students are attempting to answer this question.

Show that $\sqrt{75} - \sqrt{27}$ can be written in the form $a\sqrt{b}$, where a and b are integers to be found.

Here are their solutions.

Mila

$$\begin{aligned}\sqrt{75} - \sqrt{27} &= \sqrt{48} \\ \sqrt{48} &= \sqrt{16 \times 3} \\ &= \sqrt{16} \times \sqrt{3} \\ &= 4\sqrt{3}\end{aligned}$$

Asher

$$\begin{aligned}\sqrt{75} - \sqrt{27} &= \sqrt{25 \times 3} - \sqrt{9 \times 3} \\ &= 5\sqrt{3} - 3\sqrt{3} \\ &= \pm 2\sqrt{3}\end{aligned}$$

So $a = \pm 2$ and $b = 3$

Lily

$$\begin{aligned}\sqrt{75} - \sqrt{27} &= 2\sqrt{3} \\ \text{So } a &= 2 \text{ and } b = 3\end{aligned}$$

Kai

$$\begin{aligned}\sqrt{75} - \sqrt{27} &= 25\sqrt{3} - 9\sqrt{3} \\ &= 16\sqrt{3}\end{aligned}$$

- (a) Comment on each students' solution.
- (b) Haydn has written down a perfect solution to the question. What could Haydn have written?

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Activity 2

Some students are attempting to answer this question.

Show that $\frac{4+\sqrt{2}}{2-\sqrt{2}}$ can be written in the form $a+b\sqrt{2}$,
where a and b are integers to be found.

Here is the start of each of their answers.

Mila

$$\frac{4+\sqrt{2}}{2-\sqrt{2}} = 5+3\sqrt{2}$$

Asher

$$\frac{4+\sqrt{2}}{2-\sqrt{2}} = \frac{(4+\sqrt{2})(4-\sqrt{2})}{(2-\sqrt{2})(4-\sqrt{2})}$$

Lily

$$\begin{aligned}\frac{4+\sqrt{2}}{2-\sqrt{2}} &= \frac{4+\sqrt{2}}{2-\sqrt{2}} \times (2+\sqrt{2}) \\ &= \frac{(4+\sqrt{2})(2+\sqrt{2})}{4-2}\end{aligned}$$

Kai

$$\begin{aligned}\frac{4+\sqrt{2}}{2-\sqrt{2}} &= \frac{(4+\sqrt{2})(2+\sqrt{2})}{(2-\sqrt{2})(2+\sqrt{2})} \\ &= \frac{(4+\sqrt{2})(2+\sqrt{2})}{4+2}\end{aligned}$$

- (a) Comment on each students' answer.
- (b) Write down a full solution to the question.
Make sure you show all your reasoning.

Activity 3

Some students are planning how to answer this question.

$$\text{Show that } \frac{1}{\sqrt{5}+\sqrt{6}} + \frac{1}{\sqrt{6}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{8}} = a\sqrt{a} - \sqrt{b}$$

where a and b are integers to be found.

Here are their plans.

Mila

I'm going to write the left hand side as a single fraction with a denominator of $(\sqrt{5} + \sqrt{6})(\sqrt{6} + \sqrt{7})(\sqrt{7} + \sqrt{8})$.

Asher

I'm going to start by rationalising the denominator of each fraction.

Lily

You can't rationalise the denominator as there are two surds in each. I'll just write down the answer from my calculator which is $\sqrt{8} - \sqrt{5}$ - I'm bound to get 1 mark!

Kai

I'm going to clear the fractions by multiplying both sides by $(\sqrt{5} + \sqrt{6})(\sqrt{6} + \sqrt{7})(\sqrt{7} + \sqrt{8})$ and then I'll compare coefficients to find a and b .

- (a) Comment on each students' plan.
- (b) Write down a full solution to the question. Make sure you show all your reasoning.