Rationalising Surds (2)

Mr Lund
Maths

Rationalising Surds (2)

1. Expand and simplify

a) $(\sqrt{2} + 1)(\sqrt{2} - 1)$

b) $(\sqrt{3} + 1)(\sqrt{3} - 1)$

c) $(2 + \sqrt{5})(2 - \sqrt{5})$

d) $(2 - \sqrt{6})(2 + \sqrt{6})$

What do you notice about all your answers?

2. Max says,

> "to rationalise the expression $\frac{5}{\sqrt{3}-1}$ I should multiply the numerator and denominator by $\sqrt{3}+1$"

Show that Max is right.

3. Rationalise

a) $\frac{2}{3+\sqrt{2}}$ b) $\frac{2}{3-\sqrt{2}}$ c) $\frac{\sqrt{2}}{3+\sqrt{2}}$

d) $\frac{\sqrt{2}}{1+\sqrt{2}}$ e) Which is largest?

$\frac{2}{3+\sqrt{2}}$ or $\frac{2}{3-\sqrt{2}}$

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4. Rationalise

a) $\frac{\sqrt{7}}{\sqrt{7}-3}$

b) $\frac{\sqrt{5}}{\sqrt{5}-3}$

Which of the numbers is largest?

5. Compare the answers in question 4 to the answers in question 3.

What do you notice?

Why does this happen?

6. Amir has tried to rationalise $\frac{3\sqrt{6}}{\sqrt{6}-3}$

$\frac{3\sqrt{6}}{\sqrt{6}-3} \times \frac{\sqrt{6}-3}{\sqrt{6}-3}$

$\frac{18-9\sqrt{6}}{6-3\sqrt{6}-3\sqrt{6}+9}$

What mistake has he made?

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7. Match the number cards to their rationalised form.

$\frac{15 + 7\sqrt{3}}{13}$

$\frac{\sqrt{2}}{18}$

$\frac{\sqrt{15} + 5\sqrt{5}}{11}$

$\frac{1}{3\sqrt{18}}$

$\frac{2\sqrt{5}}{5 - \sqrt{3}}$

$\frac{3 + \sqrt{3}}{4 - \sqrt{3}}$

Answers

Rationalising Surds (2)

1. Expand and simplify

a) $(\sqrt{2}+1)(\sqrt{2}-1) = 1$

b) $(\sqrt{3}+1)(\sqrt{3}-1) = 2$

c) $(2+\sqrt{5})(2-\sqrt{5}) = -1$

d) $(2-\sqrt{6})(2+\sqrt{6}) = -2$

What do you notice about all your answers?
They are integer answers.
There are no surds in the answer.

2. Max says,

> "to rationalise the expression $\frac{5}{\sqrt{3}-1}$ I should multiply the numerator and denominator by $\sqrt{3}+1$"

Show that Max is right. $\frac{5}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{5+5\sqrt{3}}{2}$

3. Rationalise

a) $\frac{2}{3+\sqrt{2}} = \frac{6-2\sqrt{2}}{7}$

b) $\frac{2}{3-\sqrt{2}} = \frac{6+2\sqrt{2}}{7}$

c) $\frac{\sqrt{2}}{3+\sqrt{2}} = \frac{-2+3\sqrt{2}}{7}$

d) $\frac{\sqrt{2}}{1+\sqrt{2}} = 2-\sqrt{2}$

e) Which is largest?

$\frac{2}{3+\sqrt{2}}$ or $\frac{2}{3-\sqrt{2}}$

Rationalising Surds (2)

4. Rationalise

a) $\frac{\sqrt{7}}{\sqrt{7}-3} = -\frac{7+3\sqrt{7}}{2}$ b) $\frac{\sqrt{5}}{\sqrt{5}-3} = -\frac{5+3\sqrt{5}}{4}$

Which of the numbers is largest?

$\frac{\sqrt{5}}{\sqrt{5}-3}$

5. Compare the answers in question 4 to the answers in question 3.

What do you notice? Answers in Question 3 are all positive but negative in question 4

Why does this happen? (eg $\sqrt{5} - 3 < 0$)

6. Amir has tried to rationalise $\frac{3\sqrt{6}}{\sqrt{6}-3}$

$\frac{3\sqrt{6}}{\sqrt{6}-3} \times \frac{\sqrt{6}-3}{\sqrt{6}-3}$

$\frac{18-9\sqrt{6}}{6-3\sqrt{6}-3\sqrt{6}+9}$

He should Multiply by $\frac{\sqrt{6}+3}{\sqrt{6}+3}$

What mistake has he made?

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7. Match the number cards to their rationalised form.