

Boost Free Lessons - Year 10 Maths

Lesson 9: Rationalising the Denominator

Name: _____ Grade: _____ Date: _____

Worked Example 1

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

1. A surd should never be left in the denominator of a final answer.
2. Multiply the top and the bottom by $\sqrt{5}$. This is the same as multiplying by 1, so the value does not change.
3. The bottom becomes $\sqrt{5} \times \sqrt{5} = 5$.
4. The top becomes $3 \times \sqrt{5} = 3\sqrt{5}$.

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

Worked Example 2

Rationalise $\frac{10}{2\sqrt{3}}$

1. Only the surd part needs to be dealt with, so multiply top and bottom by $\sqrt{3}$.
2. The bottom becomes $2 \times 3 = 6$, and the top becomes $10\sqrt{3}$.
3. That gives $\frac{10\sqrt{3}}{6}$.
4. Now simplify the fraction, since 10 and 6 share a factor of 2.

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

Remember: Multiply the top and the bottom by the surd in the denominator, then simplify the fraction that results. $\sqrt{a} \times \sqrt{a} = a$.



Question 1: Rationalise the denominator of each fraction.

1. $\frac{1}{\sqrt{2}}$

2. $\frac{1}{\sqrt{3}}$

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

4. $\frac{4}{\sqrt{7}}$

5. $\frac{5}{\sqrt{2}}$

6. $\frac{3}{\sqrt{6}}$

7. $\frac{6}{\sqrt{3}}$

8. $\frac{1}{\sqrt{10}}$



Question 2: Rationalise and simplify each fraction.

1. $\frac{4}{2\sqrt{2}}$

2. $\frac{6}{3\sqrt{5}}$

3. $\frac{8}{\sqrt{8}}$

4. $\frac{9}{2\sqrt{3}}$

5. $\frac{12}{4\sqrt{6}}$

6. $\frac{15}{5\sqrt{3}}$



Question 3: Answer the following questions.

1. Rationalise $\frac{7}{\sqrt{7}}$.

2. Rationalise $\frac{5}{2\sqrt{5}}$.

3. A rectangle has an area of 12 cm^2 and a width of $\sqrt{3} \text{ cm}$. Find its exact length.

4. Rationalise $\frac{1}{3\sqrt{2}}$.

5. Explain why we rationalise denominators.





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Answers: Rationalising the Denominator**Question 1**

1. $\frac{\sqrt{2}}{2}$

2. $\frac{\sqrt{3}}{3}$

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

4. $\frac{4\sqrt{7}}{7}$

5. $\frac{5\sqrt{2}}{2}$

6. $\frac{\sqrt{6}}{2}$

7. $2\sqrt{3}$

8. $\frac{\sqrt{10}}{10}$

Question 2

1. $\sqrt{2}$

2. $\frac{2\sqrt{5}}{5}$

3. $2\sqrt{2}$

4. $\frac{3\sqrt{3}}{2}$

5. $\frac{\sqrt{6}}{2}$

6. $\sqrt{3}$

Question 3

1. $\sqrt{7}$

2. $\frac{\sqrt{5}}{2}$

3. $4\sqrt{3}$ cm

4. $\frac{\sqrt{2}}{6}$

5. It makes surds easier to compare and to add, because dividing by a whole number is far simpler than dividing by an irrational one.

