

Surds 3

To be able to rationalised
denominators

No Calculator

(Q1) Simplify:

$$\sqrt{7} \times \sqrt{6} =$$

Connect

(Q2) Simplify:

$$7\sqrt{3} \times 4\sqrt{3} =$$

(Q3) Simplify:

$$\frac{\sqrt{72}}{\sqrt{3}}$$

(Q4)

NEW

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

No Calculator

(Q1) Simplify:

$$\sqrt{7} \times \sqrt{6} =$$
$$\sqrt{42}$$

Connect
Answers

(Q2)

Simplify:

$$7\sqrt{3} \times 4\sqrt{3} =$$
$$84$$

(Q3) Simplify:

$$\frac{\sqrt{72}}{\sqrt{3}}$$

$$2\sqrt{6}$$

(Q4)

NEW

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

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

Activate

Key point

To **rationalise the denominator** of $\frac{a}{\sqrt{b}}$, multiply by $\frac{\sqrt{b}}{\sqrt{b}}$. Then the fraction will have an integer as the denominator.

Q1) $\frac{14}{\sqrt{3}}$

Q2) $\frac{4}{\sqrt{7}}$

Q3) $\frac{12}{\sqrt{2}}$

Q4) $\frac{5}{\sqrt{5}}$

Example

Rationalise the denominator.

I do

$$\frac{5}{\sqrt{75}}$$

We do

$$\frac{2}{\sqrt{80}}$$

You do

$$\frac{6}{\sqrt{27}}$$

Activate

Example

Rationalise the denominator.

I do

$$\frac{5}{\sqrt{75}}$$

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

We do

$$\frac{2}{\sqrt{80}} \quad \frac{\sqrt{5}}{10}$$

You do

$$\frac{6}{\sqrt{27}}$$

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

Activate
Answers

Example

Rationalise the denominator. **a** $\frac{1}{\sqrt{2}}$ **b** $\frac{5}{\sqrt{75}}$

$$\begin{aligned} \text{a} \quad \frac{1}{\sqrt{2}} &= \frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{2}}{\sqrt{4}} = \frac{\sqrt{2}}{2} \end{aligned}$$

$$\begin{aligned} \text{b} \quad \sqrt{75} &= \sqrt{25} \sqrt{3} = 5\sqrt{3} \\ \frac{5}{\sqrt{75}} &= \frac{5}{5\sqrt{3}} = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{\sqrt{9}} = \frac{\sqrt{3}}{3} \end{aligned}$$

Multiplying by $\frac{\sqrt{2}}{\sqrt{2}}$ is the same as multiplying by 1, so this does not change the value.

First simplify $\sqrt{75}$.

Simplify the fraction before rationalising.

Demonstrate 1

16 Rationalise the denominators. Simplify your answers if possible.

a $\frac{1}{\sqrt{7}}$

b $\frac{1}{\sqrt{5}}$

c $\frac{1}{\sqrt{20}}$

d $\frac{2}{\sqrt{8}}$

e $\frac{3}{\sqrt{15}}$

f $\frac{32}{\sqrt{40}}$

g $\frac{11}{\sqrt{11}}$

A: 1) $\frac{1}{\sqrt{5}}$

4) $\frac{3}{\sqrt{7}}$

7) $\frac{\sqrt{6}}{\sqrt{2}}$

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

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

8) $\frac{\sqrt{5}}{\sqrt{10}}$

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

6) $\frac{10}{\sqrt{5}}$

9) $\frac{\sqrt{3}}{\sqrt{15}}$

$\frac{\sqrt{3}}{1} = \frac{\sqrt{3}}{\sqrt{3}}$	(3)
$\frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2}$	(2)
$\frac{\sqrt{5}}{1} = \frac{\sqrt{5}}{\sqrt{5}}$	(1)

A:

$\frac{7}{\sqrt{7}}$	a
$\frac{5}{\sqrt{15}}$	e

B:

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

4) $\frac{8}{3\sqrt{14}}$

7) $\frac{7\sqrt{5}}{2\sqrt{11}}$

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

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

8) $\frac{2\sqrt{3}}{9\sqrt{2}}$

3) $\frac{3}{2\sqrt{7}}$

6) $\frac{\sqrt{3}}{10\sqrt{5}}$

9) $\frac{8\sqrt{2}}{3\sqrt{6}}$

Demonstrate 2

Work out the area of these shapes

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

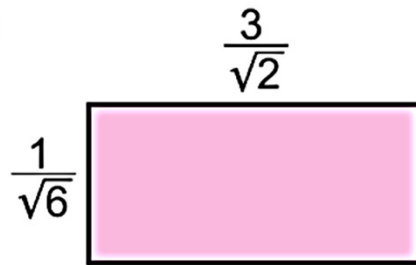
(2) $\frac{2}{\sqrt{5}} = \frac{25}{\sqrt{5}}$

(3) $\frac{3}{\sqrt{7}} = \frac{14}{\sqrt{7}}$

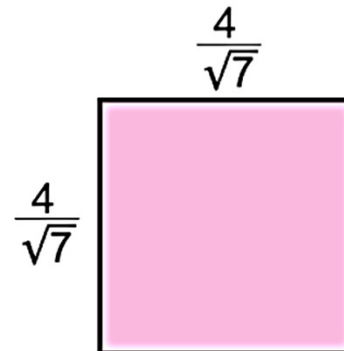


18 Work out the area of these shapes.

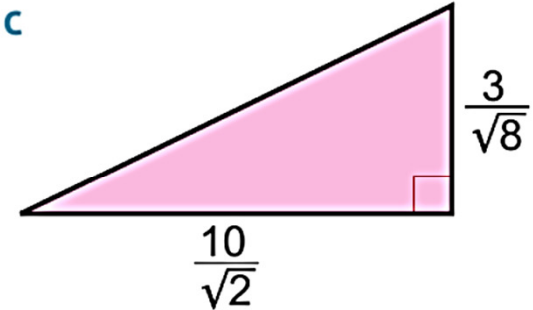
a



b



c



Give your answer as a surd in its simplest form.

16 Rationalise the denominators. Simplify your answers if possible. **Answers**

16 a $\frac{\sqrt{7}}{7}$

b $\frac{\sqrt{5}}{5}$

c $\frac{\sqrt{5}}{10}$

d $\frac{\sqrt{2}}{2}$

e $\frac{\sqrt{15}}{5}$

f $\frac{8\sqrt{10}}{5}$

g $\sqrt{11}$

A:

1) $\frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$

4) $\frac{3}{\sqrt{7}} = \frac{3\sqrt{7}}{7}$

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

2) $\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

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

8) $\frac{\sqrt{5}}{\sqrt{10}} = \frac{\sqrt{2}}{2}$

3) $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

6) $\frac{10}{\sqrt{5}} = 2\sqrt{5}$

9) $\frac{\sqrt{3}}{\sqrt{15}} = \frac{\sqrt{5}}{5}$

Answers

B:

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

$$4) \frac{8}{3\sqrt{14}} = \frac{4\sqrt{14}}{21}$$

$$7) \frac{7\sqrt{5}}{2\sqrt{11}} = \frac{7\sqrt{11}}{22}$$

$$2) \frac{2}{5\sqrt{5}} = \frac{2\sqrt{5}}{25}$$

$$5) \frac{5\sqrt{5}}{2\sqrt{6}} = \frac{5\sqrt{6}}{12}$$

$$8) \frac{2\sqrt{3}}{9\sqrt{2}} = \frac{\sqrt{5}}{5}$$

$$3) \frac{3}{2\sqrt{7}} = \frac{3\sqrt{7}}{14}$$

$$6) \frac{\sqrt{3}}{10\sqrt{5}} = \frac{11\sqrt{5}}{50}$$

$$9) \frac{8\sqrt{2}}{3\sqrt{6}} = \frac{\sqrt{5}}{5}$$

18 Work out the area of these shapes.

a

$\frac{1}{\sqrt{6}}$ **18** **a** $\frac{\sqrt{3}}{2}$ **b** $\frac{16}{7}$ **c** $\frac{15}{4}$

Give your answer as a surd in its simplest form.

Hide