

GCSE Maths: Surds: simplifying and adding (Higher): answers

GCSE Maths - Standard Form, Indices and Surds - Higher - Lesson 6.7

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch06-standard-form-indices-surds/higher/surds-simplifying-and-adding/

Exercise 60 Simplifying and adding surds

Non-calculator

1 Is each of these a surd? Give a reason.

(a) $\sqrt{16}$

Answer: No

(b) $\sqrt{7}$

Answer: Yes

(c) $\sqrt{50}$

Answer: Yes

(d) $\sqrt{81}$

Answer: No

(e) $\sqrt{3}$

Answer: Yes

2 Simplify each surd.

(a) $\sqrt{12}$

Answer: $2\sqrt{3}$

(b) $\sqrt{18}$

Answer: $3\sqrt{2}$

(c) $\sqrt{20}$

Answer: $2\sqrt{5}$

(d) $\sqrt{45}$

Answer: $3\sqrt{5}$

(e) $\sqrt{75}$

Answer: $5\sqrt{3}$

(f) $\sqrt{72}$

Answer: $6\sqrt{2}$

(g) $\sqrt{98}$

Answer: $7\sqrt{2}$

(h) $\sqrt{200}$

Answer: $10\sqrt{2}$

3 Simplify each expression.

(a) $3\sqrt{8}$

Answer: $6\sqrt{2}$

(b) $2\sqrt{27}$

Answer: $6\sqrt{3}$

(c) $5\sqrt{12}$

Answer: $10\sqrt{3}$

(d) $4\sqrt{50}$

Answer: $20\sqrt{2}$

(e) $7\sqrt{18}$

Answer: $21\sqrt{2}$

4 Simplify each expression.

(a) $\sqrt{12} + \sqrt{27}$

Answer: $5\sqrt{3}$

(b) $5\sqrt{2} - \sqrt{8}$

Answer: $3\sqrt{2}$

(c) $3\sqrt{18} + \sqrt{32}$

Answer: $13\sqrt{2}$

(d) $2\sqrt{20} - \sqrt{45}$

Answer: $\sqrt{5}$

(e) $\sqrt{75} + \sqrt{12} - \sqrt{3}$

Answer: $6\sqrt{3}$

(f) $\sqrt{12} - \sqrt{5}$

Answer: $2\sqrt{3} - \sqrt{5}$

5 Write each in its simplest form.

(a) $\sqrt{\frac{2}{9}}$

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

(b) $\sqrt{\frac{8}{25}}$

Answer: $\frac{2\sqrt{2}}{5}$

(c) $\sqrt{\frac{3}{16}}$

Answer: $\frac{\sqrt{3}}{4}$

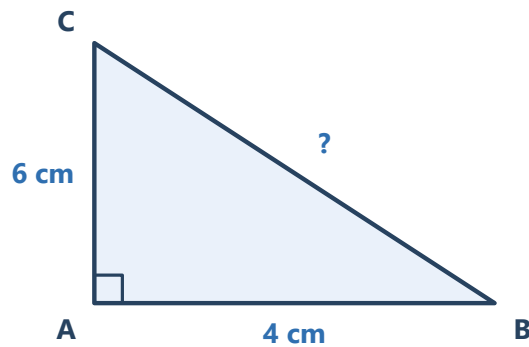
(d) $\sqrt{\frac{12}{49}}$

Answer: $\frac{2\sqrt{3}}{7}$

- 6 A rectangle has sides $\sqrt{18}$ cm and $\sqrt{8}$ cm. Work out the exact perimeter in its simplest form.

Answer: $10\sqrt{2}$ cm

- 7 Find the exact length of the third side of each right-angled triangle. Simplify your answers.



- (a) shorter sides 4 cm and 6 cm; find the hypotenuse

Answer: $2\sqrt{13}$ cm

- (b) shorter sides 3 cm and 3 cm; find the hypotenuse

Answer: $3\sqrt{2}$ cm

- (c) hypotenuse 7 cm, one side 3 cm; find the other side

Answer: $2\sqrt{10}$ cm

- 8 Show that $\sqrt{72} = 6\sqrt{2}$.

Answer: $\sqrt{72} = \sqrt{(36 \times 2)} = 6\sqrt{2}$

- 9 Is $\sqrt{2} + \sqrt{3}$ equal to $\sqrt{5}$? Use decimals to explain.

Answer: No. $\sqrt{2} + \sqrt{3} = 3.146\dots$ but $\sqrt{5} = 2.236\dots$

- 10 Explain why $\sqrt{16}$ is not a surd, but $\sqrt{18}$ is.

Answer: $\sqrt{16} = 4$, a whole number. $\sqrt{18} = 3\sqrt{2}$ is between 4 and 5 and is not a whole number or fraction.

- 11 Show that $(\sqrt{12})^2 = (2\sqrt{3})^2 = 12$.

Answer: $(\sqrt{12})^2 = 12$ and $(2\sqrt{3})^2 = 4 \times 3 = 12$

- 12 Write $\sqrt{20}$, 4.5 and $3\sqrt{2}$ in order, smallest first. Show your working.

Answer: $3\sqrt{2}$, $\sqrt{20}$, 4.5

