



SCAN ME

Calculating with Surds

REVISE THIS TOPIC



For the entire booklet

1 Express $\sqrt{12}$ in its simplest form. [1 mark]

$$\sqrt{12} = \sqrt{4} \times \sqrt{3}$$

Answer $2\sqrt{3}$

2 Express $\sqrt{50}$ in its simplest form. [1 mark]

$$\sqrt{50} = \sqrt{25} \times \sqrt{2}$$

Answer $5\sqrt{2}$

3 Express $\sqrt{500}$ in its simplest form. [1 mark]

$$\sqrt{500} = \sqrt{100} \times \sqrt{5}$$

Answer $10\sqrt{5}$

4 Express $\sqrt{27}$ in its simplest form. [1 mark]

$$\sqrt{27} = \sqrt{9} \times \sqrt{3}$$

Answer $3\sqrt{3}$

5 Express $\sqrt{98}$ in its simplest form. [1 mark]

$$\sqrt{98} = \sqrt{49} \times \sqrt{2}$$

Answer $7\sqrt{2}$

6 Express $\sqrt{48}$ in its simplest form. [1 mark]

$$\sqrt{48} = \sqrt{16} \times \sqrt{3}$$

Answer $4\sqrt{3}$





- 7 Express $5\sqrt{8}$ in its simplest form. $5 \times \sqrt{4} \times \sqrt{2}$
 $= 5 \times 2 \times \sqrt{2}$ [1 mark]
Answer $10\sqrt{2}$
- 8 Express $4\sqrt{18}$ in its simplest form. $4 \times \sqrt{9} \times \sqrt{2}$
 $= 4 \times 3 \times \sqrt{2}$ [1 mark]
Answer $12\sqrt{2}$
- 9 Express $2\sqrt{200}$ in its simplest form. $2 \times \sqrt{100} \times \sqrt{2}$
 $= 2 \times 10 \times \sqrt{2}$ [1 mark]
Answer $20\sqrt{2}$
- 10 Express $9\sqrt{20}$ in its simplest form. $9 \times \sqrt{4} \times \sqrt{5}$
 $= 9 \times 2 \times \sqrt{5}$ [1 mark]
Answer $18\sqrt{5}$
- 11 Express $7\sqrt{640}$ in its simplest form. $7 \times \sqrt{64} \times \sqrt{10}$
 $= 7 \times 8 \times \sqrt{10}$ [1 mark]
Answer $56\sqrt{10}$
- 12 Express $5\sqrt{80}$ in its simplest form. $5 \times \sqrt{16} \times \sqrt{5}$
 $= 5 \times 4 \times \sqrt{5}$ [1 mark]
Answer $20\sqrt{5}$
- 13 Express $3\sqrt{72}$ in its simplest form. $3 \times \sqrt{36} \times \sqrt{2}$
 $= 3 \times 6 \times \sqrt{2}$ [1 mark]
Answer $18\sqrt{2}$





14 Work out $\sqrt{6} \times \sqrt{3}$ giving your answer in its simplest form. [2 marks]

$$\sqrt{18} = \sqrt{9} \times \sqrt{2}$$

$$= 3 \times \sqrt{2}$$

Answer $3\sqrt{2}$

15 Work out $\sqrt{10} \times \sqrt{6}$ giving your answer in its simplest form. [2 marks]

$$\sqrt{60} = \sqrt{4} \times \sqrt{15}$$

$$= 2 \times \sqrt{15}$$

Answer $2\sqrt{15}$

16 Work out $2\sqrt{5} \times 5\sqrt{8}$ giving your answer in its simplest form. [2 marks]

$$10\sqrt{40} = 10 \times \sqrt{4} \times \sqrt{10}$$

$$= 10 \times 2 \times \sqrt{10}$$

Answer $20\sqrt{10}$

17 Work out $4\sqrt{2} \times 2\sqrt{12}$ giving your answer in its simplest form. [2 marks]

$$8\sqrt{24} = 8 \times \sqrt{4} \times \sqrt{6}$$

$$= 8 \times 2 \times \sqrt{6}$$

Answer $16\sqrt{6}$

18 Work out $2\sqrt{20} \times 3\sqrt{5}$ giving your answer as an integer. [2 marks]

$$6\sqrt{100} = 6 \times 10$$

Answer 60





19 Work out $(\sqrt{6})^2$ giving your answer as an integer. [2 marks]

$$\sqrt{6} \times \sqrt{6} = \sqrt{36}$$

Answer 6

20 Work out $(\sqrt{5})^4$ giving your answer as an integer. [2 marks]

$$\begin{aligned} &\sqrt{5} \times \sqrt{5} \times \sqrt{5} \times \sqrt{5} \\ &= 5 \times 5 \end{aligned}$$

Answer 25

21 Work out $(2\sqrt{3})^3$ giving your answer in its simplest form. [2 marks]

$$\begin{aligned} &2\sqrt{3} \times 2\sqrt{3} \times 2\sqrt{3} = 8\sqrt{27} \\ &= 8 \times \sqrt{9} \times \sqrt{3} \\ &= 8 \times 3 \times \sqrt{3} \end{aligned}$$

Answer $24\sqrt{3}$

22 Work out $(\sqrt{2} \times \sqrt{3} \times \sqrt{5})^2$ giving your answer as an integer. [2 marks]

$$(\sqrt{30})^2 = \sqrt{30} \times \sqrt{30}$$

Answer 30

23 Express $(\sqrt{3})^7$ in the form $a\sqrt{3}$, where a is an integer. [2 marks]

$$\begin{aligned} &\sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \\ &= 3 \times 3 \times 3 \times \sqrt{3} \end{aligned}$$

Answer $27\sqrt{3}$





24 Work out $\sqrt{60} \div \sqrt{3}$ giving your answer in its simplest form. [2 marks]

$$\sqrt{20} = \sqrt{4} \times \sqrt{5}$$
$$= 2 \times \sqrt{5}$$

Answer $2\sqrt{5}$

25 Work out $8\sqrt{30} \div 4\sqrt{6}$ giving your answer in its simplest form. [1 mark]

Answer $2\sqrt{5}$

26 Simplify fully $\frac{18\sqrt{150}}{9\sqrt{3}}$ [2 marks]

$$2\sqrt{50} = 2 \times \sqrt{25} \times \sqrt{2}$$
$$= 2 \times 5 \times \sqrt{2}$$

Answer $10\sqrt{2}$

27 Simplify fully $\frac{40\sqrt{40}}{5\sqrt{10}}$ [2 marks]

$$8\sqrt{4} = 8 \times 2$$

Answer 16

28 Simplify fully $\left(\frac{\sqrt{2}}{\sqrt{5}}\right)^2$ [2 marks]

$$\left(\frac{\sqrt{2}}{\sqrt{5}}\right)^2 = \sqrt{\frac{2}{5}} \times \sqrt{\frac{2}{5}}$$

Answer $\frac{2}{5}$





29 Simplify $\sqrt{11} + \sqrt{11} + \sqrt{11}$ [1 mark]

Answer $3\sqrt{11}$

30 Simplify $3\sqrt{5} + 6\sqrt{5}$ [1 mark]

Answer $9\sqrt{5}$

31 Simplify $9\sqrt{7} + 3\sqrt{7} - \sqrt{7}$ [1 mark]

Answer $11\sqrt{7}$

32 Work out $(\sqrt{2} + 6\sqrt{2} - 2\sqrt{2})^2$ giving your answer as an integer. [2 marks]

$$(5\sqrt{2})^2 = 5\sqrt{2} \times 5\sqrt{2}$$
$$= 25\sqrt{4}$$

Answer 50

33 Simplify $4\sqrt{3} + 6\sqrt{2} - \sqrt{3} + 8\sqrt{2}$ [2 marks]

$$3\sqrt{3} + 14\sqrt{2}$$

Answer $3\sqrt{3} + 14\sqrt{2}$





34 Express $\sqrt{18} + \sqrt{2}$ in the form $a\sqrt{2}$, where a is an integer. [2 marks]

$$\begin{aligned} & \sqrt{9} \times \sqrt{2} + \sqrt{2} \\ & = 3\sqrt{2} + \sqrt{2} \end{aligned}$$

Answer $4\sqrt{2}$

35 Express $2\sqrt{3} + \sqrt{75}$ in the form $a\sqrt{3}$, where a is an integer. [2 marks]

$$\begin{aligned} & 2\sqrt{3} + \sqrt{25} \times \sqrt{3} \\ & = 2\sqrt{3} + 5\sqrt{3} \end{aligned}$$

Answer $7\sqrt{3}$

36 Express $\sqrt{32} + \sqrt{8}$ in the form $a\sqrt{2}$, where a is an integer. [3 marks]

$$\begin{aligned} & \sqrt{16} \times \sqrt{2} + \sqrt{4} \times \sqrt{2} \\ & = 4\sqrt{2} + 2\sqrt{2} \end{aligned}$$

Answer $6\sqrt{2}$

37 Express $3\sqrt{500} - \sqrt{20}$ in the form $a\sqrt{5}$, where a is an integer. [3 marks]

$$\begin{aligned} & 3 \times \sqrt{100} \times \sqrt{5} - \sqrt{4} \times \sqrt{5} \\ & = 30\sqrt{5} - 2\sqrt{5} \end{aligned}$$

Answer $28\sqrt{5}$

38 Express $\sqrt{28} + \sqrt{175} - 3\sqrt{7}$ in the form $a\sqrt{7}$, where a is an integer. [3 marks]

$$\begin{aligned} & \sqrt{4} \times \sqrt{7} + \sqrt{25} \times \sqrt{7} - 3\sqrt{7} \\ & = 2\sqrt{7} + 5\sqrt{7} - 3\sqrt{7} \end{aligned}$$

Answer $4\sqrt{7}$



- 39 Ross is doing a surds question.
Ross writes:

$$\begin{aligned}\sqrt{300} + \sqrt{12} &= \sqrt{312} \\ &= \sqrt{4} \times \sqrt{78} \\ &= 2 \times \sqrt{78} \\ &= 2\sqrt{78}\end{aligned}$$

$$\begin{aligned}\sqrt{300} + \sqrt{12} \\ &= \sqrt{100} \times \sqrt{3} + \sqrt{4} \times \sqrt{3} \\ &= 10\sqrt{3} + 2\sqrt{3} \\ &= 12\sqrt{3}\end{aligned}$$

Explain the mistake that Ross has made

[1 mark]

You cannot add $\sqrt{300}$ and $\sqrt{12}$ as they do not have the same number inside the roots.
Ross should simplify them first.

- 40 Work out $\frac{\sqrt{30} \times 5\sqrt{6}}{\sqrt{125} - \sqrt{20}}$ giving your answer as an integer. [4 marks]

$$\frac{5\sqrt{180}}{\sqrt{25} \times \sqrt{5} - \sqrt{4} \times \sqrt{5}} = \frac{5 \times \sqrt{36} \times \sqrt{5}}{5\sqrt{5} - 2\sqrt{5}}$$

$$= \frac{5 \times 6 \times \sqrt{5}}{3\sqrt{5}}$$

$$= \frac{30\cancel{\sqrt{5}}}{3\cancel{\sqrt{5}}}$$

Answer 10

