Calculating with Surds

SCAN ME

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 $4\sqrt{3}$

6

7 Express $5\sqrt{8}$ in its simplest form. **[1 mark]**

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

Answer $10\sqrt{2}$

8 Express $4\sqrt{18}$ in its simplest form. **[1 mark]**

$4 \times \sqrt{9} \times \sqrt{2}$
$= 4 \times 3 \times \sqrt{2}$

Answer $12\sqrt{2}$

9 Express $2\sqrt{200}$ in its simplest form. **[1 mark]**

$2 \times \sqrt{100} \times \sqrt{2}$
$= 2 \times 10 \times \sqrt{2}$

Answer $20\sqrt{2}$

10 Express $9\sqrt{20}$ in its simplest form. **[1 mark]**

$9 \times \sqrt{4} \times \sqrt{5}$
$= 9 \times 2 \times \sqrt{5}$

Answer $18\sqrt{5}$

11 Express $7\sqrt{640}$ in its simplest form. **[1 mark]**

$7 \times \sqrt{64} \times \sqrt{10}$
$= 7 \times 8 \times \sqrt{10}$

Answer $56\sqrt{10}$

12 Express $5\sqrt{80}$ in its simplest form. **[1 mark]**

$5 \times \sqrt{16} \times \sqrt{5}$
$= 5 \times 4 \times \sqrt{5}$

Answer $20\sqrt{5}$

13 Express $3\sqrt{72}$ in its simplest form. **[1 mark]**

$3 \times \sqrt{36} \times \sqrt{2}$
$= 3 \times 6 \times \sqrt{2}$

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

17

Turn over ►

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]**

$\sqrt{5} \times \sqrt{5} \times \sqrt{5} \times \sqrt{5}$

$= 5 \times 5$

Answer 25

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

$2\sqrt{3} \times 2\sqrt{3} \times 2\sqrt{3} = 8\sqrt{27}$

$= 8 \times \sqrt{9} \times \sqrt{3}$

$= 8 \times 3 \times \sqrt{3}$

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]**

$\sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3}$

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

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

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]**

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

Answer $\frac{2}{5}$

19

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]**

$\sqrt{9} \times \sqrt{2} + \sqrt{2}$

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

Answer $4\sqrt{2}$

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

$2\sqrt{3} + \sqrt{25} \times \sqrt{3}$

$= 2\sqrt{3} + 5\sqrt{3}$

Answer $7\sqrt{3}$

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

$\sqrt{16} \times \sqrt{2} + \sqrt{4} \times \sqrt{2}$

$= 4\sqrt{2} + 2\sqrt{2}$

Answer $6\sqrt{2}$

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

$3 \times \sqrt{100} \times \sqrt{5} - \sqrt{4} \times \sqrt{5}$

$= 30\sqrt{5} - 2\sqrt{5}$

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]**

$\sqrt{4} \times \sqrt{7} + \sqrt{25} \times \sqrt{7} - 3\sqrt{7}$

$= 2\sqrt{7} + 5\sqrt{7} - 3\sqrt{7}$

Answer $4\sqrt{7}$

20

39 Ross is doing a surds question.
Ross writes:

$\sqrt{300} + \sqrt{12} = \sqrt{312}$
$= \sqrt{4} \times \sqrt{78}$
$= 2 \times \sqrt{78}$
$= 2\sqrt{78}$

$\sqrt{300} + \sqrt{12}$
$= \sqrt{100} \times \sqrt{3} + \sqrt{4} \times \sqrt{3}$
$= 10\sqrt{3} + 2\sqrt{3}$
$= 12\sqrt{3}$

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 root. Ross should simplify them first.

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

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

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

$= \dfrac{30\sqrt{5}}{3\sqrt{5}}$

Answer 10

5