# Calculating with Surds

SCAN ME

REVISE THIS TOPIC

For the entire booklet

**1** Express $\sqrt{12}$ in its simplest form.

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

$2\sqrt{3}$

**(Total for Question 1 is 1 mark)**

**2** Express $\sqrt{50}$ in its simplest form.

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

$5\sqrt{2}$

**(Total for Question 2 is 1 mark)**

**3** Express $\sqrt{500}$ in its simplest form.

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

$10\sqrt{5}$

**(Total for Question 3 is 1 mark)**

**4** Express $\sqrt{27}$ in its simplest form.

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

$3\sqrt{3}$

**(Total for Question 4 is 1 mark)**

**5** Express $\sqrt{98}$ in its simplest form.

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

$7\sqrt{2}$

**(Total for Question 5 is 1 mark)**

**6** Express $\sqrt{48}$ in its simplest form.

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

$4\sqrt{3}$

**(Total for Question 6 is 1 mark)**

**7** Express $5\sqrt{8}$ in its simplest form.

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

$10\sqrt{2}$

**(Total for Question 7 is 1 mark)**

**8** Express $4\sqrt{18}$ in its simplest form.

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

$12\sqrt{2}$

**(Total for Question 8 is 1 mark)**

**9** Express $2\sqrt{200}$ in its simplest form.

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

$20\sqrt{2}$

**(Total for Question 9 is 1 mark)**

**10** Express $9\sqrt{20}$ in its simplest form.

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

$18\sqrt{5}$

**(Total for Question 10 is 1 mark)**

**11** Express $7\sqrt{640}$ in its simplest form.

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

$56\sqrt{10}$

**(Total for Question 11 is 1 mark)**

**12** Express $5\sqrt{80}$ in its simplest form.

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

$20\sqrt{5}$

**(Total for Question 12 is 1 mark)**

**13** Express $3\sqrt{72}$ in its simplest form.

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

$18\sqrt{2}$

**(Total for Question 13 is 1 mark)**

**14** Work out $\sqrt{6} \times \sqrt{3}$ giving your answer in its simplest form.

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

$= 3 \times \sqrt{2}$

$3\sqrt{2}$

**(Total for Question 14 is 2 marks)**

**15** Work out $\sqrt{10} \times \sqrt{6}$ giving your answer in its simplest form.

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

$= 2 \times \sqrt{15}$

$2\sqrt{15}$

**(Total for Question 15 is 2 marks)**

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

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

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

$20\sqrt{10}$

**(Total for Question 16 is 2 marks)**

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

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

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

$16\sqrt{6}$

**(Total for Question 17 is 2 marks)**

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

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

$60$

**(Total for Question 18 is 2 marks)**

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

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

6

**(Total for Question 19 is 2 marks)**

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

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

$= 5 \times 5$

25

**(Total for Question 20 is 2 marks)**

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

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

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

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

$24\sqrt{3}$

**(Total for Question 21 is 2 marks)**

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

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

30

**(Total for Question 22 is 2 marks)**

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

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

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

$27\sqrt{3}$

**(Total for Question 23 is 2 marks)**

**24** Work out $\sqrt{60} \div \sqrt{3}$ giving your answer in its simplest form.

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

$= 2 \times \sqrt{5}$

$2\sqrt{5}$

**(Total for Question 24 is 2 marks)**

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

$2\sqrt{5}$

**(Total for Question 25 is 1 mark)**

**26** Simplify fully $\dfrac{18\sqrt{150}}{9\sqrt{3}}$

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

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

$10\sqrt{2}$

**(Total for Question 26 is 2 marks)**

**27** Simplify fully $\dfrac{40\sqrt{40}}{5\sqrt{10}}$

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

$16$

**(Total for Question 27 is 2 marks)**

**28** Simplify fully $\left(\dfrac{\sqrt{2}}{\sqrt{5}}\right)^2$

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

$\frac{2}{5}$

**(Total for Question 28 is 2 marks)**

**29** Simplify $\sqrt{11} + \sqrt{11} + \sqrt{11}$

$3\sqrt{11}$

**(Total for Question 29 is 1 mark)**

**30** Simplify $3\sqrt{5} + 6\sqrt{5}$

$9\sqrt{5}$

**(Total for Question 30 is 1 mark)**

**31** Simplify $9\sqrt{7} + 3\sqrt{7} - \sqrt{7}$

$11\sqrt{7}$

**(Total for Question 31 is 1 mark)**

**32** Work out $\left(\sqrt{2} + 6\sqrt{2} - 2\sqrt{2}\right)^2$ giving your answer as an integer.

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

$= 25\sqrt{4}$

$50$

**(Total for Question 32 is 2 marks)**

**33** Simplify $4\sqrt{3} + 6\sqrt{2} - \sqrt{3} + 8\sqrt{2}$

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

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

**(Total for Question 33 is 2 marks)**

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

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

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

$4\sqrt{2}$

**(Total for Question 34 is 2 marks)**

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

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

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

$7\sqrt{3}$

**(Total for Question 35 is 2 marks)**

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

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

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

$6\sqrt{2}$

**(Total for Question 36 is 3 marks)**

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

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

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

$28\sqrt{5}$

**(Total for Question 37 is 3 marks)**

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

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

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

$4\sqrt{7}$

**(Total for Question 38 is 3 marks)**

**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

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

**(Total for Question 39 is 1 mark)**

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

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

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

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

10

**(Total for Question 40 is 4 marks)**