

1. Write each of these in the form  $p\sqrt{3}$ , where  $p$  is an integer.

(a)  $\sqrt{6} \times \sqrt{50} = \sqrt{300} = \sqrt{3} \sqrt{100} = 10\sqrt{3}$

Answer .....  $10\sqrt{3}$

(2)

(b)  $\sqrt{48} + \sqrt{75} = \sqrt{16} \sqrt{3} + \sqrt{25} \sqrt{3}$   
 $= 4\sqrt{3} + 5\sqrt{3}$

Answer .....  $9\sqrt{3}$

(2)

(c)  $\frac{18}{\sqrt{3}} = \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{18\sqrt{3}}{3} = 6\sqrt{3}$

Answer .....  $6\sqrt{3}$

(2)

(Total 6 marks)

2. (a) Simplify fully  $\sqrt{75} + \sqrt{27}$

You **must** show your working.

$\sqrt{75} + \sqrt{27} = \sqrt{25} \sqrt{3} + \sqrt{9} \sqrt{3}$   
 $= 5\sqrt{3} + 3\sqrt{3}$   
 $= 8\sqrt{3}$

Answer .....  $8\sqrt{3}$

(2)

- (b) Rationalise the denominator and simplify  $\frac{21}{\sqrt{7}}$

$\frac{21}{\sqrt{7}} = \frac{21 \times \sqrt{7}}{\sqrt{7} \sqrt{7}} = \frac{21\sqrt{7}}{7} = 3\sqrt{7}$

Answer .....  $3\sqrt{7}$

(2)

(Total 4 marks)

3. (a) Simplify

$$\sqrt{18} + \sqrt{32}$$

$$\begin{aligned} \sqrt{18} + \sqrt{32} &= \sqrt{9} \sqrt{2} + \sqrt{16} \sqrt{2} \\ &= 3\sqrt{2} + 4\sqrt{2} \\ &= 7\sqrt{2} \end{aligned}$$

Answer

$$\underline{7\sqrt{2}}$$

(2)

(b) Rationalise

$$\frac{1}{\sqrt{6}}$$

$$\frac{1}{\sqrt{6}} = \frac{1}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{6}}{6}$$

Answer

$$\underline{\frac{\sqrt{6}}{6}}$$

(1)

(Total 3 marks)

4. Show that

$$\sqrt{12}(\sqrt{75} - \sqrt{48}) = 6$$

$$\begin{aligned} \sqrt{12}(\sqrt{75} - \sqrt{48}) &= 2\sqrt{3}(5\sqrt{3} - 4\sqrt{3}) \\ &= 2\sqrt{3} \times \sqrt{3} \\ &= 6 \end{aligned}$$

(Total 3 marks)

5. (a) Rationalise and simplify

$$\frac{1}{\sqrt{8}}$$

$$\frac{1}{\sqrt{8}} = \frac{1}{\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{8}}{8}$$

Answer

$$\underline{\frac{\sqrt{8}}{8}}$$

(2)

(b) By simplifying

$$\sqrt{12} + \sqrt{108},$$

write

$$\frac{\sqrt{12} + \sqrt{108}}{\sqrt{8}}$$

in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers.

$$\frac{\sqrt{12} + \sqrt{108}}{\sqrt{8}} = \frac{2\sqrt{3} + 6\sqrt{3}}{\sqrt{8}}$$

$$= \frac{8\sqrt{3}}{\sqrt{8}} = \frac{8\sqrt{3}\sqrt{8}}{8} = \sqrt{3}\sqrt{8} = \sqrt{24} = 2\sqrt{6}$$

Answer

$$\underline{2\sqrt{6}}$$

(3)

(Total 5 marks)

6. Simplify fully  $\frac{\sqrt{150} - \sqrt{6}}{\sqrt{12}}$

$$\frac{\sqrt{150} - \sqrt{6}}{\sqrt{12}} = \frac{5\sqrt{6} - \sqrt{6}}{2\sqrt{3}} = \frac{4\sqrt{6}}{2\sqrt{3}} = 2\sqrt{\frac{6}{3}} = \frac{2\sqrt{18}}{3} = \frac{6\sqrt{2}}{3}$$

$$= 2\sqrt{2}$$

Answer

$$2\sqrt{2}$$

(Total 4 marks)

7. Work out  $2\sqrt{3}(\sqrt{3} + \sqrt{8})$

Give your answer in the form  $a + b\sqrt{6}$  where  $a$  and  $b$  are integers.

$$2\sqrt{3}(\sqrt{3} + \sqrt{8}) = 6 + 2\sqrt{3}\sqrt{8}$$

$$= 6 + 2\sqrt{24}$$

$$= 6 + 4\sqrt{6}$$

Answer

$$6 + 4\sqrt{6}$$

(Total 3 marks)

8. (a) By rationalising the denominator, simplify  $\frac{15}{\sqrt{5}}$

$$\frac{15}{\sqrt{5}} = \frac{15 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{15\sqrt{5}}{5} = 3\sqrt{5}$$

Answer

$$3\sqrt{5}$$

(2)

- (b) Show that  $(\sqrt{3} + \sqrt{12})^2 = 27$

$$(\sqrt{3} + \sqrt{12})^2 = (\sqrt{3} + 2\sqrt{3})^2$$

$$= (3\sqrt{3})^2$$

$$= 9 \times 3$$

$$= 27$$

(2)  
(Total 4 marks)

9. (a) Rationalise the denominator and simplify fully  $\frac{1}{\sqrt{12}}$ .

$$\frac{1}{\sqrt{12}} = \frac{1}{\sqrt{12}} \times \frac{\sqrt{12}}{\sqrt{12}} = \frac{\sqrt{12}}{12}$$

Answer  $\frac{\sqrt{12}}{12}$

(2)

- (b) By simplifying  $\sqrt{32} - \sqrt{18}$ ,  
write  $\sqrt{3}(\sqrt{32} - \sqrt{18})$

in its simplest form.

$$\begin{aligned} \sqrt{3}(\sqrt{32} - \sqrt{18}) &= \sqrt{3}(4\sqrt{2} - 3\sqrt{2}) \\ &= \sqrt{3} \times \sqrt{2} \\ &= \sqrt{6} \end{aligned}$$

Answer  $\sqrt{6}$

(3)

(Total 8 marks)

10. (a) You are given that  $\sqrt{12} + \sqrt{27} = a\sqrt{3}$  where  $a$  is an integer.

Find the value of  $a$ .

$$\sqrt{12} + \sqrt{27} = 2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3}$$

Answer  $5\sqrt{3}$

(2)

- (b) Simplify  $\sqrt{8} + \sqrt{50}$

$$\sqrt{8} + \sqrt{50} = 2\sqrt{2} + 5\sqrt{2} = 7\sqrt{2}$$

Answer  $7\sqrt{2}$

(2)

(Total 4 marks)