Rationalising the Denominator

SCAN ME

REVISE THIS TOPIC

For the entire booklet

1 Show that $\frac{10}{\sqrt{5}}$ can be written in the form $a\sqrt{b}$ where a and b are integers.

$$\frac{10}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{10\sqrt{5}}{5}$$

$$= 2\sqrt{5}$$

(Total for Question 1 is 2 marks)

2 Show that $\frac{18}{\sqrt{6}}$ can be written in the form $a\sqrt{b}$ where a and b are integers.

$$\frac{18}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{18\sqrt{6}}{6}$$

$$= 3\sqrt{6}$$

(Total for Question 2 is 2 marks)

3 Show that $\frac{70}{\sqrt{2}}$ can be written in the form $a\sqrt{b}$ where a and b are integers.

$$\frac{70}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{70\sqrt{2}}{2}$$

$$= 35\sqrt{2}$$

(Total for Question 3 is 2 marks)

4 Show that $\frac{20}{\sqrt{10}}$ can be written in the form $a\sqrt{b}$ where a and b are integers.

$$\frac{20}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{20\sqrt{10}}{10}$$

$$= 2\sqrt{10}$$

(Total for Question 4 is 2 marks)

5 Show that $\frac{24}{\sqrt{15}}$ can be written in the form $\frac{a\sqrt{15}}{b}$ where a and b are integers.

$\frac{24}{\sqrt{15}} \times \frac{\sqrt{15}}{\sqrt{15}} = \frac{24\sqrt{15}}{15}$

$= \frac{8\sqrt{15}}{5}$

(Total for Question 5 is 2 marks)

6 Show that $\frac{35}{4\sqrt{5}}$ can be written in the form $\frac{a\sqrt{5}}{b}$ where a and b are integers.

$\frac{35}{4\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{35\sqrt{5}}{20}$

$= \frac{7\sqrt{5}}{4}$

(Total for Question 6 is 2 marks)

7 Show that $\frac{1}{9\sqrt{2}}$ can be written in the form $\frac{\sqrt{2}}{a}$ where a is an integer.

$\frac{1}{9\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{18}$

(Total for Question 7 is 2 marks)

8 Show that $\frac{60}{\sqrt{24}}$ can be written in the form $a\sqrt{b}$ where a and b are integers

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

$= 2\sqrt{6}$

$\frac{60}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{60\sqrt{6}}{12}$

$= 5\sqrt{6}$

(Total for Question 8 is 2 marks)

9 Show that $\frac{24}{\sqrt{45}}$ can be written in the form $\frac{a\sqrt{5}}{b}$ where a and b are integers.

$\sqrt{45} = \sqrt{9} \times \sqrt{5}$

$= 3\sqrt{5}$

$\frac{24}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{24\sqrt{5}}{15}$

$= \frac{8\sqrt{5}}{5}$

(Total for Question 9 is 2 marks)

10 Show that $\frac{10-\sqrt{32}}{\sqrt{2}}$ can be written in the form $a\sqrt{2}-b$ where a and b are integers.

$\frac{10-\sqrt{32}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(10-\sqrt{32})}{2}$

$= \frac{10\sqrt{2}-\sqrt{64}}{2}$

$= \frac{10\sqrt{2}-8}{2}$ $= 5\sqrt{2}-4$

(Total for Question 10 is 3 marks)

11 Show that $\frac{\sqrt{12}+9}{\sqrt{3}}$ can be written in the form $a+b\sqrt{3}$ where a and b are integers.

$\frac{\sqrt{12}+9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}(\sqrt{12}+9)}{3}$

$= \frac{\sqrt{36}+9\sqrt{3}}{3}$

$= \frac{6+9\sqrt{3}}{3}$ $= 2+3\sqrt{3}$

(Total for Question 11 is 3 marks)

12 Show that $\frac{\sqrt{180}+40}{\sqrt{20}}$ can be written in the form $a+b\sqrt{5}$ where a and b are integers.

$\sqrt{180} = \sqrt{36} \times \sqrt{5}$
$= 6\sqrt{5}$

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

$\frac{6\sqrt{5}+40}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}(6\sqrt{5}+40)}{10}$

$= \frac{30+40\sqrt{5}}{10}$

$= 3+4\sqrt{5}$

(Total for Question 12 is 3 marks)

13 Show that $\left(\frac{1}{\sqrt{2}}\right)^5$ can be written in the form $\frac{\sqrt{2}}{a}$ where a is an integer.

$\frac{1^5}{(\sqrt{2})^5} = \frac{1}{4\sqrt{2}}$ $\quad\quad$ $\frac{1}{4\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{8}$

(Total for Question 13 is 3 marks)

14 Show that $\frac{24}{\sqrt{6}} + \sqrt{54}$ can be written in the form $k\sqrt{6}$ where k is an integer.

$\frac{24}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{24\sqrt{6}}{6}$

$= 4\sqrt{6}$

$\sqrt{54} = \sqrt{9} \times \sqrt{6}$

$= 3\sqrt{6}$

$4\sqrt{6} + 3\sqrt{6} = 7\sqrt{6}$

(Total for Question 14 is 3 marks)

15 Show that $\frac{42}{\sqrt{18}} + \sqrt{200}$ can be written in the form $k\sqrt{2}$ where k is an integer.

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

$= 3\sqrt{2}$

$\frac{42}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{42\sqrt{2}}{6}$

$= 7\sqrt{2}$

$\sqrt{200} = \sqrt{100} \times \sqrt{2}$

$= 10\sqrt{2}$

$7\sqrt{2} + 10\sqrt{2} = 17\sqrt{2}$

(Total for Question 15 is 4 marks)

16 Show that $\frac{21}{\sqrt{3}} + \frac{12}{\sqrt{48}}$ can be written in the form $k\sqrt{3}$ where k is an integer.

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

$= 7\sqrt{3}$

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

$= 4\sqrt{3}$

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

$= \sqrt{3}$

$7\sqrt{3} + \sqrt{3} = 8\sqrt{3}$

(Total for Question 16 is 3 marks)

17 Show that $20 \times \sqrt{3\frac{1}{5}}$ can be written in the form $k\sqrt{5}$ where k is an integer.

$20 \times \sqrt{\frac{16}{5}} = 20 \times \frac{\sqrt{16}}{\sqrt{5}}$

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

$= \frac{80}{\sqrt{5}}$

$= \frac{80}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{80\sqrt{5}}{5}$

$= 16\sqrt{5}$

(Total for Question 17 is 4 marks)

18 Show that $\frac{\sqrt{3}+\sqrt{5}}{\sqrt{2}} - \frac{5}{\sqrt{10}}$ can be written in the form $\frac{\sqrt{6}}{a}$ where a is an integer.

$\frac{\sqrt{3}+\sqrt{5}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}+\sqrt{10}}{2}$

$\frac{5}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{5\sqrt{10}}{10}$

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

$\frac{\sqrt{6}+\sqrt{10}}{2} - \frac{\sqrt{10}}{2}$

$= \frac{\sqrt{6}+\sqrt{10}-\sqrt{10}}{2}$

$= \frac{\sqrt{6}}{2}$

(Total for Question 18 is 4 marks)

19 Show that $\frac{1}{3-\sqrt{2}}$ can be written in the form $\frac{a+\sqrt{2}}{b}$ where a and b are integers.

$$\frac{1}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{3+\sqrt{2}}{(3-\sqrt{2})(3+\sqrt{2})}$$

$$= \frac{3+\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-2}$$

$$= \frac{3+\sqrt{2}}{7}$$

(Total for Question 19 is 3 marks)

20 Show that $\frac{7}{2+\sqrt{3}}$ can be written in the form $a-b\sqrt{3}$ where a and b are integers.

$$\frac{7}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = \frac{7(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$$

$$= \frac{14-7\sqrt{3}}{4-2\sqrt{3}+2\sqrt{3}-3}$$

$$= \frac{14-7\sqrt{3}}{1}$$

$$= 14-7\sqrt{3}$$

(Total for Question 20 is 3 marks)

21 Show that $\frac{\sqrt{2}}{\sqrt{6}-2}$ can be written in the form $a\sqrt{3}+b\sqrt{2}$ where a and b are integers.

$$\frac{\sqrt{2}}{\sqrt{6}-2} \times \frac{\sqrt{6}+2}{\sqrt{6}+2} = \frac{\sqrt{2}(\sqrt{6}+2)}{(\sqrt{6}-2)(\sqrt{6}+2)}$$

$$= \frac{\sqrt{12}+2\sqrt{2}}{6+2\sqrt{6}-2\sqrt{6}-4}$$

$$= \frac{\sqrt{12}+2\sqrt{2}}{2}$$

$$= \frac{\sqrt{4}\times\sqrt{3}+2\sqrt{2}}{2}$$

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

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

(Total for Question 21 is 3 marks)

22 Show that $\frac{\sqrt{5}}{3-2\sqrt{2}}$ can be written in the form $a\sqrt{5}+b\sqrt{10}$ where a and b are integers.

$$\frac{\sqrt{5}}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}} = \frac{\sqrt{5}(3+2\sqrt{2})}{(3-2\sqrt{2})(3+2\sqrt{2})}$$

$$= \frac{3\sqrt{5}+2\sqrt{10}}{9+6\sqrt{2}-6\sqrt{2}-8}$$

$$= \frac{3\sqrt{5}+2\sqrt{10}}{1}$$

$$= 3\sqrt{5}+2\sqrt{10}$$

(Total for Question 22 is 4 marks)

23 Show that $\frac{\sqrt{45}+\sqrt{5}}{3+\sqrt{10}}$ can be written in the form $a\sqrt{2}-b\sqrt{5}$ where a and b are integers.

$\sqrt{45} = \sqrt{9} \times \sqrt{5}$

$= 3\sqrt{5}$

$\sqrt{45}+\sqrt{5}$

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

$= 4\sqrt{5}$

$$\frac{4\sqrt{5}}{3+\sqrt{10}} \times \frac{3-\sqrt{10}}{3-\sqrt{10}} = \frac{4\sqrt{5}(3-\sqrt{10})}{(3+\sqrt{10})(3-\sqrt{10})}$$

$$= \frac{12\sqrt{5}-4\sqrt{50}}{9-3\sqrt{10}+3\sqrt{10}-10}$$

$$= \frac{12\sqrt{5}-4\times\sqrt{25}\times\sqrt{2}}{-1}$$

$$= 20\sqrt{2}-12\sqrt{5}$$

(Total for Question 23 is 4 marks)

24 Show that $\frac{8-\sqrt{12}}{5-\sqrt{3}}$ can be written in the form $\frac{a-\sqrt{3}}{b}$ where a and b are integers.

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

$= 2\sqrt{3}$

$$\frac{8-2\sqrt{3}}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}} = \frac{(8-2\sqrt{3})(5+\sqrt{3})}{(5-\sqrt{3})(5+\sqrt{3})}$$

$$= \frac{40+8\sqrt{3}-10\sqrt{3}-6}{25+5\sqrt{3}-5\sqrt{3}-3}$$

$$= \frac{34-2\sqrt{3}}{22}$$

$$= \frac{17-\sqrt{3}}{11}$$

(Total for Question 24 is 4 marks)