1 Write $\sqrt{48}$ in the form $k\sqrt{3}$, where k is an integer.

$\sqrt{48} = \sqrt{16 \times 3} = 4\sqrt{3}$

.....

(Total for question 1 is 2 marks)

---

2 Write $\sqrt{50}$ in the form $k\sqrt{2}$, where k is an integer.

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

.....

(Total for question 2 is 2 marks)

---

3 Write $5\sqrt{27}$ in the form $k\sqrt{3}$, where k is an integer.

$5\sqrt{27} = 5\sqrt{9 \times 3} = 5 \times 3\sqrt{3} = 15\sqrt{3}$

.....

(Total for question 3 is 2 marks)

---

4 Write $7\sqrt{20}$ in the form $k\sqrt{5}$, where k is an integer.

$7\sqrt{20} = 7\sqrt{4 \times 5} = 7 \times 2\sqrt{5} = 14\sqrt{5}$

.....

(Total for question 4 is 2 marks)

5 Expand and Simplify $(2+\sqrt{3})(2-\sqrt{3})$

$= 2^2 - \sqrt{3}^2$

$= 4 - 3$

$= 1$

OR $= 4 + 2\sqrt{3} - 2\sqrt{3} - 3$

$= 1$

.....

(Total for question 5 is 2 marks)

---

6 Write $(3+\sqrt{5})^2$ in the form $a + b\sqrt{5}$, where a and b are integers.

$9 + 6\sqrt{5} + 5$

$= 14 + 6\sqrt{5}$

.....

(Total for question 6 is 2 marks)

---

7 Expand and Simplify $(2+\sqrt{5})(1-\sqrt{5})$

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

$= -3 - \sqrt{5}$

.....

(Total for question 7 is 2 marks)

---

8 Write $(3-\sqrt{2})^2$ in the form $a + b\sqrt{2}$, where a and b are integers.

$= 3^2 - 6\sqrt{2} + \sqrt{2}^2$

$= 9 - 6\sqrt{2} + 2$

$= 11 - 6\sqrt{2}$

OR $(3-\sqrt{2})(3-\sqrt{2})$

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

$= 11 - 6\sqrt{2}$

.....

(Total for question 8 is 2 marks)

9 Expand and Simplify $(2+\sqrt{3})^2-(2-\sqrt{3})^2$

$(4+4\sqrt{3}+3)-(4-4\sqrt{3}+3)$

$=(7+4\sqrt{3})-(7-4\sqrt{3})$

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

$=8\sqrt{3}$

.....

(Total for question 9 is 2 marks)

---

10 Rationalise the denominator $\frac{6}{\sqrt{3}}$ $=\frac{6}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}=\frac{6\sqrt{3}}{3}=2\sqrt{3}$

.....

(Total for question 10 is 2 marks)

---

11 Rationalise the denominator $\frac{x}{\sqrt{x}}$ $=\sqrt{x}$

.....

(Total for question 11 is 2 marks)

---

12 Rationalise the denominator $\frac{1+\sqrt{5}}{\sqrt{2}}$

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

.....

(Total for question 12 is 2 marks)

13 Simplify $\frac{(3+\sqrt{6})}{\sqrt{3}}$

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

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

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

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

(Total for question 13 is 3 marks)

---

14 Simplify fully $\frac{(4+2\sqrt{3})(4-2\sqrt{3})}{\sqrt{11}}$

You must show all your working.

$$= \frac{16+8\sqrt{3}-8\sqrt{3}-12}{\sqrt{11}}$$

$$= \frac{4}{\sqrt{11}}$$

$$= \frac{4}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{4\sqrt{11}}{11}$$

(Total for question 14 is 3 marks)

15 Show that $\frac{5+2\sqrt{3}}{2+\sqrt{3}}$ can be written as $4-\sqrt{3}$

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

$$= \frac{10+4\sqrt{3}-5\sqrt{3}-6}{2^2-\sqrt{3}^2}$$

$$= \frac{4-\sqrt{3}}{4-3} = 4-\sqrt{3}$$

(Total for question 15 is 3 marks)

---

16 Show that $\frac{3\sqrt{3}+3}{3+\sqrt{3}}$ can be written as $\sqrt{3}$

$$= \frac{3\sqrt{3}+3}{3+\sqrt{3}} \times \frac{3-\sqrt{3}}{3-\sqrt{3}}$$

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

$$= \frac{6\sqrt{3}}{9-3} = \frac{6\sqrt{3}}{6} = \sqrt{3}$$

(Total for question 16 is 3 marks)

17 Show that $\dfrac{1}{\dfrac{1}{\sqrt{2}}+\sqrt{2}}$ can be written as $\dfrac{\sqrt{2}}{3}$

Multiply numerator and denominator by $\sqrt{2}$

$$= \frac{\sqrt{2}}{\sqrt{2}\left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)}$$

$$= \frac{\sqrt{2}}{1+2}$$

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

(Total for question 17 is 3 marks)

---

18 Show that $\dfrac{2}{\dfrac{1}{\sqrt{3}}+1}$ can be written as $3-\sqrt{3}$

Multiply numerator and denominator by $\sqrt{3}$

$$= \frac{2\sqrt{3}}{\sqrt{3}\left(\frac{1}{\sqrt{3}}+1\right)}$$

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

$$= \frac{2\sqrt{3}}{1+\sqrt{3}} \times \frac{1-\sqrt{3}}{1-\sqrt{3}} = \frac{2\sqrt{3}-6}{1^2-\sqrt{3}^2} = \frac{2\sqrt{3}-6}{-2} = 3-\sqrt{3}$$

(Total for question 18 is 3 marks)

19 Simplify fully $(\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b})$

$= \sqrt{a}^2 - \sqrt{b}^2$

$= a - b$

or $= a + \sqrt{ab} - \sqrt{ab} - b$

$= a - b$

(Total for question 19 is 2 marks)

---

20 Simplify fully $(2a+\sqrt{b})^2$

$= 4a^2 + 4a\sqrt{b} + b$

(first^2 + twice product + second^2)

or $(2a + \sqrt{b})(2a + \sqrt{b})$

$= 4a^2 + 2a\sqrt{b} + 2a\sqrt{b} + b$

$= 4a^2 + 4a\sqrt{b} + b$

(Total for question 20 is 2 marks)