

1 Without using a calculator, write each expression in the form $k\sqrt{5}$.

a i $\sqrt{125}$

ii $\sqrt{20}$

b i $7\sqrt{5} - 2\sqrt{5}$

ii $\sqrt{5} + 9\sqrt{5} - 3\sqrt{5}$

c i $3\sqrt{80} - 5\sqrt{20}$

ii $\sqrt{125} + 7\sqrt{45}$

2 Without using a calculator, write each expression in the form \sqrt{a} .

a i $4\sqrt{2}$

ii $10\sqrt{3}$

b i $\sqrt{7} + 2\sqrt{7}$

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

c i $\sqrt{3} + \sqrt{75}$

ii $\sqrt{32} + \sqrt{8}$

3 Without using a calculator, write each expression in the form $a + b\sqrt{3}$.

a i $2(3 - \sqrt{3}) - 3(1 - \sqrt{3})$

ii $(1 + \sqrt{3}) - (1 - \sqrt{3})$

b i $(1 + 2\sqrt{3})(2 - \sqrt{3})$

ii $(1 + \sqrt{3})(2 + \sqrt{3})$

c i $(1 + \sqrt{3})^2$

ii $(2 - \sqrt{3})^2$

4 Without using a calculator, rationalise the denominator of each expression.

a i $\frac{7}{\sqrt{7}}$

ii $\frac{2}{\sqrt{5}}$

b i $\frac{3 - \sqrt{6}}{\sqrt{6}}$

ii $\frac{\sqrt{2} + \sqrt{6}}{\sqrt{3}}$

c i $\frac{1}{\sqrt{2} - 1}$

ii $\frac{1 + \sqrt{5}}{1 + \sqrt{7}}$

5 Simplify $\frac{1}{1 + \sqrt{n}} + \frac{1}{1 - \sqrt{n}}$.

6 Show that $\frac{4}{\sqrt{20} - \sqrt{12}}$ can be written in the form $\sqrt{a} + \sqrt{b}$, where a and b are whole numbers.

7 Show that $\frac{5 + \sqrt{2}}{3 - 2\sqrt{2}}$ can be written in the form $a + b\sqrt{2}$, where a and b are constants to be found.

8 Without using decimal approximations, explain why $3\sqrt{2}$ is larger than $2\sqrt{3}$.

9 Solve $x\sqrt{27} = 5x\sqrt{3} + 2\sqrt{48}$.

10 Rationalise the denominator of $\frac{1}{2\sqrt{n} - 3}$.

11 Given that n is a positive whole number, write $(n\sqrt{15} - \sqrt{5})^2$ in the form $a + b\sqrt{3}$.

12 A rectangle has length $a + b\sqrt{2}$ and width $b - a\sqrt{2}$.

a Find the area of the rectangle and write it in the form $m + n\sqrt{2}$.

b Find and simplify an expression for the length of the diagonal of the rectangle.

13 Given that $\frac{5\sqrt{7} - \sqrt{x}}{\sqrt{7} - \sqrt{x}} = 8 + \sqrt{y}$, where x and y are positive integers and \sqrt{y} is a surd in its simplest form, find the values of x and y .

14 a Write $\sqrt{27} + \sqrt{3}$ in the form \sqrt{a} .

b Without using decimal approximations, explain whether $\sqrt{27} - \sqrt{20}$ is greater or less than $\sqrt{5} - \sqrt{3}$.

15 a Show that $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.

b Hence rationalise the denominator of $\frac{1}{\sqrt[3]{3} - \sqrt[3]{2}}$.

16 Is it always true that $\sqrt{x^2}$ equals x ?

EXERCISE 2B

1 a i $5\sqrt{5}$

ii $2\sqrt{5}$

b i $5\sqrt{5}$

ii $7\sqrt{5}$

c i $2\sqrt{5}$

ii $26\sqrt{5}$

2 a i $\sqrt{32}$

ii $\sqrt{300}$

b i $\sqrt{63}$

ii $\sqrt{80}$

c i $\sqrt{108}$

ii $\sqrt{72}$

3 a i $3 + 5\sqrt{3}$

ii $2\sqrt{3}$

b i $-4 + 3\sqrt{3}$

ii $5 + 3\sqrt{3}$

c i $4 + 2\sqrt{3}$

ii $7 - 4\sqrt{3}$

4 a i $\sqrt{7}$

ii $\frac{2\sqrt{5}}{5}$

b i $\frac{\sqrt{6} - 2}{2}$

ii $\frac{\sqrt{6} + 3\sqrt{2}}{3}$

c i $1 + \sqrt{2}$

ii $\frac{\sqrt{7} - \sqrt{5} + \sqrt{35} - 1}{6}$

5 $\frac{2}{1-n}$

6 $a = 5, b = 3$

7 $a = 19, b = 13$

8 $(3\sqrt{2})^2 = 18$ and $(2\sqrt{3})^2 = 12$

9 $x = -4$

10 $\frac{2\sqrt{n} + 3}{4n - 9}$

11 $15n^2 + 5 - 10n\sqrt{3}$

12 a $-ab + (b^2 - a^2)\sqrt{2}$

b $\sqrt{3(a^2 + b^2)}$

13 $x = 3, y = 21$

14 a $\sqrt{48}$

b $\sqrt{27} - \sqrt{20} > \sqrt{5} -$

15 a Proof.

b $\sqrt[3]{9} + \sqrt[3]{6} + \sqrt[3]{4}$

16 No; not if $x < 0$.