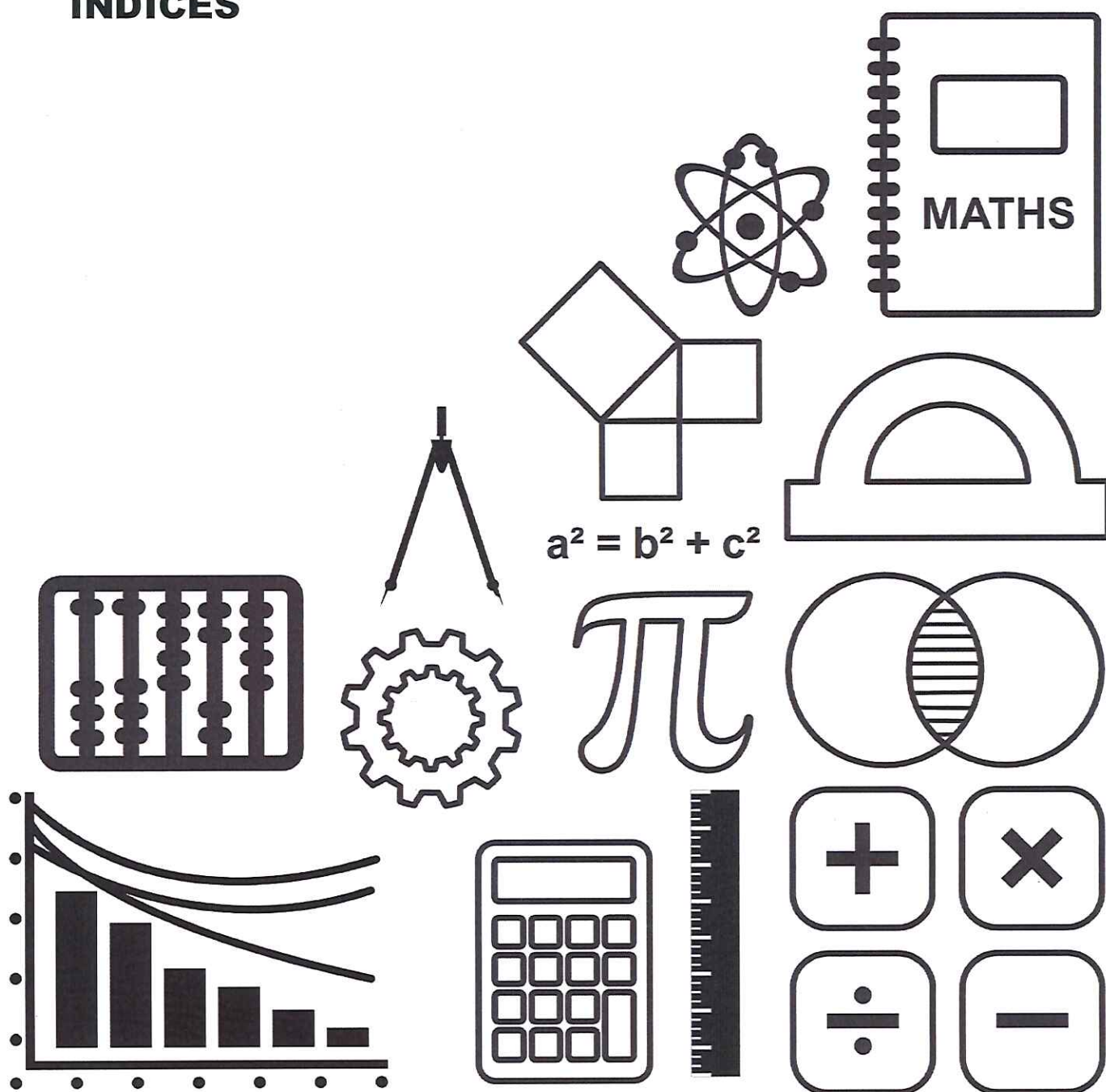


SOLUTIONS

GCSE TOPIC BOOKLET INDICES



1.

Raul has been asked to look at some data. He is asked to write the data in the form 2^n , where n is a whole number or a decimal. Write the following numbers in the form 2^n .

(a) $\frac{1}{2^3}$

2^{-3}

[1]

(b) $(2^{0.3})^{0.4}$

$2^{0.3 \times 0.4} = \underline{2^{0.12}}$

[1]

(c) $(\sqrt[3]{8})^{12} = (8^{\frac{1}{3}})^{12} = 8^{\frac{1}{3} \times 12} = 8^3$

$= (2^3)^3$

$= 2^{3 \times 3} = \underline{2^9}$

[2]

2.

Circle the correct answer for each of the following statements.

(a) $9^{-\frac{1}{2}}$ is equal to

-3

$-\frac{1}{3}$

$4\frac{1}{2}$

$-4\frac{1}{2}$

$\frac{1}{3}$

[1]

$= \frac{1}{9^{\frac{1}{2}}} = \frac{1}{\sqrt{9}} = \frac{1}{3}$

(b) $8^{\frac{2}{3}}$ is equal to

$5\frac{1}{3}$

4

6

$8\frac{2}{3}$

$\frac{16}{24}$

[1]

$= (8^{\frac{1}{3}})^2 = (\sqrt[3]{8})^2 = 2^2 = 4$

3.

(a) Evaluate $8^{-\frac{2}{3}}$. [2]

$$= \frac{1}{(8^{2/3})} = \frac{1}{(\sqrt[3]{8})^2}$$

$$= \frac{1}{2^2} = \underline{\underline{\frac{1}{4}}}$$

(b) Calculate the value of $2^3 + 5^2$. [2]

$$= 8 + 25$$

$$= \underline{\underline{33}}$$

(because $2^3 = 2 \times 2 \times 2 = 8$
and $5^2 = 5 \times 5 = 25$)

(c) $3^3 - 2^4$ [2]

$$= 27 - 16 = \underline{\underline{11}}$$

(because $3^3 = 3 \times 3 \times 3 = 27$
and $2^4 = 2 \times 2 \times 2 \times 2 = 16$)

4.

(a) Evaluate $5^7 \div 5^4$.

$$= 5^{7-4} = 5^3$$

[2]

$$= 5 \times 5 \times 5 = \underline{\underline{125}}$$

(b) Evaluate

[2]

$$10000^{-\frac{1}{4}} = \frac{1}{10000^{\frac{1}{4}}}$$

$$= \frac{1}{\sqrt[4]{10000}}$$

$$= \underline{\underline{\frac{1}{10}}}$$

(c) Evaluate $\left(\frac{27}{8}\right)^{-\frac{1}{3}}$

[2]

$$= \frac{1}{\left(\frac{27}{8}\right)^{\frac{1}{3}}} = \frac{1}{\left(\frac{\sqrt[3]{27}}{\sqrt[3]{8}}\right)}$$

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

$$= 1 \div \frac{3}{2} = 1 \times \frac{2}{3}$$

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

5.

(a) Express $8^{-\frac{2}{3}}$ as a decimal. $= \frac{1}{(8^{\frac{2}{3}})} = \frac{1}{(\sqrt[3]{8})^2} = \frac{1}{2^2}$

$= \frac{1}{4} = 0.25$

[2]

(b) Evaluate

(i) $7 \cdot 3^0$

$= 1$

[1]

(ii) $27^{-\frac{2}{3}}$

$= \frac{1}{(\sqrt[3]{27})^2} = \frac{1}{3^2} = \frac{1}{9}$

[2]

(c) Simplify $\sqrt{(2^3 \times \sqrt{64})}$. $= \sqrt{2^3 \times 8} = \sqrt{2^3 \times 2^3} = 2^3$

$= 8$

[3]

(d) Express $1000^{-\frac{2}{3}}$ as a decimal.

$= \frac{1}{(\sqrt[3]{1000})^2} = \frac{1}{10^2} = \frac{1}{100}$

$= 0.01$

[3]

6.

- (a) Write down the value of $\sqrt{0.49}$. [1]

$$= \sqrt{0.7 \times 0.7}$$

$$= 0.7$$

- (b) Write down the exact value of 5.8^2 . [1]

$$\begin{array}{r} 5.8 \\ \times 5.8 \\ \hline \end{array}$$

$$46.4$$

$$290.0$$

$$330.64$$

$$= 33.64$$

- (c) Find the value of $\sqrt{25 \cdot 3} + 2 \cdot 3^2$. Write down your answer to 1 significant figure. [2]

calculator

$$= 10.31991054 = 10 \text{ (1sf)}$$

- (d) Find the value of $\sqrt{\frac{3}{4 \cdot 2^2 - 3}}$, giving your answer correct to two decimal places. [2]

calculator

$$= 0.4526787302$$

$$= 0.45 \text{ (2dp)}$$

7.

Dafydd works in a scientific research unit.
He has been asked to evaluate a number of results from experiments.

Complete the following table for Dafydd to give the values correct to 2 significant figures. [3]

	Result	Value correct to 2 significant figures
	$10^2 + 2^3$	110
①	$\left(8^{\frac{1}{3}} + 4^{-\frac{1}{2}}\right)$	2.5
②	$2.3 \times 10^{-1} + 9^0$	1.2
③	$(\sqrt[3]{125})^2 + 12 \times 160000^{-\frac{1}{4}}$	26

① $8^{\frac{1}{3}} = \sqrt[3]{8} = 2$, $4^{-\frac{1}{2}} = \frac{1}{\sqrt{4}} = \frac{1}{2}$, $2 + \frac{1}{2} = 2.5$

② $2.3 \times 10^{-1} = 2.3 \times \frac{1}{10} = 2.3 \times 0.1 = 0.23$
 $9^0 = 1$, $0.23 + 1 = 1.23 = 1.2$ (2sf)

③ $(\sqrt[3]{125})^2 = 5^2 = 25$
 $(160000)^{-\frac{1}{4}} = \frac{1}{\sqrt[4]{160000}} = \frac{1}{20} = 0.05$
 $12 \times 160000^{-\frac{1}{4}} = 12 \times 0.05 = \frac{3}{5} = 0.6$
 $25 + 0.6 = 25.6 = 26$ (2sf)

8.

(a) Express 8^{-1} as a fraction. $= \frac{1}{8^1} = \frac{1}{8}$ [1]

(b) Express $100^{-\frac{1}{2}}$ as a fraction. $= \frac{1}{100^{\frac{1}{2}}} = \frac{1}{\sqrt{100}} = \frac{1}{10}$

(c) Evaluate $(\sqrt{3})^6$. $= (3^{\frac{1}{2}})^6 = 3^{\frac{1}{2} \times 6} = 3^3 = 27$ [1]

9.

(a) Evaluate 26^0 .

$$= 1$$

[1]

(b) Express $8^{-\frac{2}{3}}$ as a fraction.

$$= \frac{1}{(\sqrt[3]{8})^2} = \frac{1}{2^2} = \frac{1}{4}$$

[2]

(c)

$$\text{Simplify } \frac{(x+2)^{16}(y-1)^{20}}{(x+2)^5(y-1)^3}$$

$$= (x+2)^{16-5} (y-1)^{20-3}$$

[2]

$$= (x+2)^{11} (y-1)^{17}$$

10.

Find the exact value of each of the following.

(a) 5.6^2

$$= 31.36$$

$$\begin{array}{r} 5.6 \\ \times 5.6 \\ \hline 336 \\ 2800 \\ \hline 313.6 \end{array}$$

[1]

(b) 4 to the power of 5

$$4^5 = 1024$$

[1]

(c) the square root of 28.09

$$\sqrt{28.09} = 5.3$$

[1]

calculator

11.

(a) Evaluate $1000^{-\frac{1}{3}}$. $= \frac{1}{(1000)^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{1000}}$ [2]

$= \underline{\underline{\frac{1}{10}}}$

(b) Simplify $\frac{y^{16} \times y^2}{y^4}$. $= \frac{y^{16+2}}{y^4} = \frac{y^{18}}{y^4} = y^{18-4}$ [2]

$= \underline{\underline{y^{14}}}$

(c) Evaluate $16^{-\frac{1}{2}}$. $= \frac{1}{16^{\frac{1}{2}}} = \frac{1}{\sqrt{16}} = \underline{\underline{\frac{1}{4}}}$ [1]

(d) Find the value of $2^3 \times 5^2$. $= 8 \times 25 = \underline{\underline{200}}$ [2]

(e) Work out the value of $7^2 - 2^3$. $= 49 - 8 = \underline{\underline{41}}$ [2]

(f) Evaluate 19^0 . $= \underline{\underline{1}}$

(g) Calculate the cube root of 125. $\sqrt[3]{125} = \underline{\underline{5}}$ [1]

(h) Calculate the value of 1.4 cubed. $1.4^3 = \underline{\underline{2.744}}$ [1]

calculator ✓