



SURDS AND INDICES

You must write down all the stages in your working.

Q1

- (a) Rationalise the denominator of $\frac{a + \sqrt{4b}}{a - \sqrt{4b}}$ where a is an integer and b is a prime number.

Simplify your answer.

- (b) Given that $\left(\sqrt{\frac{y}{x}}\right)^{-5} = \frac{x^m}{y^m}$ where $x \neq y$

find the value of m .

.....
(3)

$m =$

(1)

Q2

(a) Show that $(6 + 2\sqrt{12})^2 = 12(7 + 4\sqrt{3})$

Show each stage of your working.

(3)

(b) Simplify fully $\left(\frac{27a^{12}}{t^{15}}\right)^{-\frac{2}{3}}$

(3)

Q3

Simplify completely $\left(\frac{16w^8}{y^{20}}\right)^{-\frac{3}{4}}$

(3)

(3)

Q4

$$3^{\frac{1}{2}} \times 3^{\frac{2}{5}} = 3^m$$

(a) Work out the value of m

$$m = \dots\dots\dots$$

(1)

$$5^{-10} \div 5^{-4} = 5^n$$

(b) Work out the value of n

$$n = \dots\dots\dots$$

(1)

Q5

$$x^5 \times x^7 = x^m$$

(a) Find the value of m

$$m = \dots\dots\dots$$

(1)

$$y^8 \div y^3 = y^n$$

(b) Find the value of n

$$n = \dots\dots\dots$$

(1)

(c) Simplify fully $(5a^4r^2)^3$

$$\dots\dots\dots$$

(2)

Q6

$$(\sqrt{3})^5 = k\sqrt{3} \quad \text{where } k \text{ is an integer.}$$

(a) Find the value of k

$$k = \dots\dots\dots$$

(1)

(b) Show that $\frac{21}{3 - \sqrt{2}}$ can be written in the form $c + \sqrt{d}$

where c and d are integers.

Show each stage of your working clearly.

(3)

Q7

$$\frac{8^{-2} \times 8^9}{8^{10}} = 8^n$$

Work out the value of n

$n = \dots\dots\dots$ **(3)**

Q8

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

Show your working clearly.

(3)**Q9**

(a) Express $\sqrt{675}$ in the form $n\sqrt{27}$ where n is a positive integer.

(1)

- (b) Show that $\frac{5 - \sqrt{2}}{\sqrt{2} - 1}$ can be written in the form $a + b\sqrt{2}$ where a and b are integers.

(3)

Q10

- (a) Simplify $(2p)^0$ where $p > 0$

.....
(1)

$$y^9 \times y^{-3} = y^n$$

- (b) Find the value of n

$n =$
(1)

(c) Simplify fully $(5a^4c^2)^3$

(2)

Q11

Show that $\frac{1 + \sqrt{5}}{3 - \sqrt{5}}$ can be written in the form $a + \sqrt{b}$ where a and b are integers.

Show each stage of your working clearly.

(3)

Q12

Simplify fully $\left(\frac{9t^4w^9}{18t^6w^{10}}\right)^{-2}$

Q13

Show that $\frac{\sqrt{12}}{\sqrt{3} + 2}$

can be written in the form $a + \sqrt{b}$ where a and b are integers.

Q14

(a) Write down the value of $(m + 2)^0$ where m is a positive integer.

.....
(1)

(b) Simplify $(3a^2b^4)^3$

.....
(2)

(c) Factorise fully $14x^2y^4 + 21x^3y^2$

.....
(2)

Q15

Given that $8\sqrt{m} + \sqrt{49m} - \sqrt{9m} = k\sqrt{m}$

where k is an integer and m is a prime number,

(a) work out the value of k

$k =$
(1)

(b) Show that $\frac{5 - \sqrt{18}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$

where a and b are integers.

Show each stage of your working clearly.

(3)

Q16

Given that $3 \times \sqrt{27} = 3^n$

Find the value n .

..... (3)

Q17

Find the values of n such that

$$\frac{10^{4n} \times 2^{3(n^2-5n)} \times 5^{2(1-2n)}}{20^2} = 1$$

Show clear algebraic working.

(5)

Q18

$$\frac{8}{2^7} = 2^n$$

(a) Find the value of n .

$$n = \dots\dots\dots$$

(2)

$$(13^{-6})^4 \times 13^5 = 13^k$$

(b) Find the value of k .

$$k = \dots\dots\dots$$

(2)

Q19

(a) Show that $\sqrt{45} + \sqrt{20} = 5\sqrt{5}$
Show your working clearly.

(2)

- (b) Express $\frac{2}{\sqrt{3}-1}$ in the form $p + \sqrt{q}$
where p and q are integers.
Show your working clearly.

(2)

- (c) Express $x^2 + 6\sqrt{2}x - 1$ in the form $(x + a)^2 + b$
Show your working clearly.

(2)

Q20

Simplify fully $\left(\frac{2a^3}{10a^7c^2}\right)^{-3}$

(3)

Q21

$$2^7 \times 4^5 = 4^x$$

(a) Calculate the value of x

$$x = \text{.....}$$

(2)

(b) Simplify fully $(125p^6y^{24})^{\frac{2}{3}}$

.....

(2)

Q22

) Express $\frac{\sqrt{125} + \sqrt{80}}{\sqrt{3}}$ in the form $\sqrt{n}$ where n is an integer.

Show your working clearly.

(3)

Q23

Simplify $\frac{30 \times 25^{2x+7}}{\sqrt{180} \times (\sqrt{5})^{4x+9}}$

Give your answer in the form 5^w where w is an expression in terms of x
 Show each stage of your working clearly.

.....(4)

Q24

(a) Simplify fully $\left(\frac{125x^6}{y^{15}}\right)^{\frac{2}{3}}$

.....
 (2)

Given that $4^n = \frac{4^m}{64^p}$

(b) Express n in terms of m and p

$$n = \dots\dots\dots$$

(2)
