Name: _____

GCSE (1 – 9)

Fractional and Negative Indices

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1 Find the value of 3^{-1} ← flip

$$\left(\frac{3}{1}\right)^{-1}$$

$$\frac{1}{3}$$

(Total for question 1 is 1 mark)

2 Find the value of $\left(\frac{4}{5}\right)^{-1}$

$$\frac{5}{4}$$

(Total for question 2 is 1 mark)

3 Find the value of 5^{-1}

$$\frac{1}{5}$$

(Total for question 3 is 1 mark)

4 Find the reciprocal of 3

$$\frac{1}{3}$$

(Total for question 4 is 1 mark)

5 Find the value of $100^{\frac{1}{2}}$ ← square root

_10_

(Total for question 5 is 1 mark)

6 Find the value of $64^{\frac{1}{2}}$

_8_

(Total for question 6 is 1 mark)

7 Find the value of $49^{\frac{1}{2}}$

_7_

(Total for question 7 is 1 mark)

8 Find the value of $81^{\frac{1}{2}}$

_9_

(Total for question 8 is 1 mark)

9 Find the value of $36^{-\frac{1}{2}}$ ← square root and flip

$\frac{1}{6}$

(Total for question 9 is 1 mark)

10 Find the value of $64^{\frac{1}{3}}$ ← cube root

4

(Total for question 10 is 1 mark)

11 Find the value of $8^{\frac{1}{3}}$

2

(Total for question 11 is 1 mark)

12 Find the value of $27^{\frac{1}{3}}$

3

(Total for question 12 is 1 mark)

13 Find the value of $125^{\frac{1}{3}}$

5

(Total for question 13 is 1 mark)

14 Find the value of $64^{-\frac{1}{3}}$ ← cube root and flip

$\dfrac{1}{4}$

(Total for question 14 is 1 mark)

15 Find the value of $64^{-\frac{2}{3}}$ ← cube root, square and flip

$(4)^{-2}$

$(16)^{-1}$

$\dfrac{1}{16}$

(Total for question 15 is 2 marks)

16 Find the value of $125^{\frac{2}{3}}$ ← cube root and square

$(5)^2$

25

(Total for question 16 is 2 marks)

17 Find the value of $8^{-\frac{2}{3}}$

$(2)^{-2}$

$(4)^{-1}$

$\dfrac{1}{4}$

(Total for question 17 is 2 marks)

18 Find the value of $27^{-\frac{2}{3}}$

$(3)^{-2}$

$(9)^{-1}$

$\dfrac{1}{9}$

(Total for question 18 is 2 marks)

19 Find the value of $(8x^6)^{\frac{2}{3}}$

$(2x^2)^2$

$4x^4$

(Total for question 19 is 2 marks)

20 Find the value of $\left(\dfrac{64}{125}\right)^{-\frac{2}{3}}$

$$\left(\frac{4}{5}\right)^{-2}$$

$$\left(\frac{16}{25}\right)^{-1}$$

$\dfrac{25}{16}$

(Total for question 20 is 2 marks)

21 Find the value of $\left(\dfrac{25}{16}\right)^{-\frac{3}{2}}$

$$\left(\frac{5}{4}\right)^{-3}$$

$$\left(\frac{125}{64}\right)^{-1}$$

$\dfrac{64}{125}$

(Total for question 21 is 2 marks)

22 Find the value of $\left(\dfrac{8}{27}\right)^{-\frac{2}{3}}$

$$\left(\frac{2}{3}\right)^{-2}$$

$$\left(\frac{4}{9}\right)^{-1}$$

$\dfrac{9}{4}$

(Total for question 22 is 2 marks)

23 Find the value of $\left(\dfrac{9}{4}\right)^{-\frac{3}{2}}$

$$\left(\frac{3}{2}\right)^{-3}$$

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

$\dfrac{8}{27}$

(Total for question 23 is 2 marks)

24 Find the value of $\sqrt[4]{2 \times 8 \times 10^{12}}$

$$\sqrt[4]{16 \times 10^{12}}$$

$$2 \times 10^{3}$$

2000

(Total for question 24 is 2 marks)

25 Find the value of $\sqrt[3]{4 \times 16 \times 10^{15}}$

$$\sqrt[3]{64 \times 10^{15}}$$

$$4 \times 10^5$$

400000

(Total for question 25 is 2 marks)

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26 Given that $3 \times \sqrt{3} = 3^n$
Find the value n.

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

$\dfrac{3}{2}$

(Total for question 26 is 2 marks)

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27 Given that $3 \times \sqrt{27} = 3^n$
Find the value n.

$$3^1 \times \sqrt{3^3}$$

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

$\dfrac{5}{2}$

(Total for question 27 is 2 marks)

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28 Given that $x = 2^p$ and $y = 2^q$
Express in terms of x and/or y,

(i) 2^{p+q}

$$2^p \times 2^q$$

$x \times y$

(ii) 2^{2p}

$$2^p \times 2^p$$

x^2

(iii) 2^{q-1}

$$2^q \div 2^1$$

$\dfrac{y}{2}$

(Total for question 28 is 3 marks)

29 Given that $3^{-n} = 0.2$
Find the value of $(3^n)^2$

$$3^{-n} = \frac{1}{5}$$
$$3^n = 5$$
$$(3^n)^2 = 25$$

25

(Total for question 29 is 2 marks)

30 Given that $5^{-n} = 0.5$
Find the value of $(5^n)^3$

$$5^{-n} = \frac{1}{2}$$
$$5^n = 2$$
$$(5^n)^3 = 8$$

8

(Total for question 30 is 2 marks)

31 Given that $4^n = 8$
Find the value of n.

$$4^n = 8$$
$$(2^2)^n = 8$$
$$2^{2n} = 2^3$$
$$2n = 3$$

$n = 1.5$

(Total for question 31 is 2 marks)

32 Given that $4^{-n} = 32$
Find the value of n.

$$4^{-n} = 32$$
$$2^{-2n} = 2^5$$
$$-2n = 5$$
$$n = -2.5$$

$n = -2.5$

(Total for question 32 is 2 marks)