

1 Work out the value of  $\frac{3^7 \times 3^{-2}}{3^3}$

.....  
(Total for Question 1 is 2 marks)

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2 Patrick has to work out the exact value of  $64^{\frac{1}{4}}$

Patrick says,

“ $\frac{1}{4}$  of 64 is 16 so  $64^{\frac{1}{4}} = 16$ ”

Explain what is wrong with what Patrick says.

.....

.....

.....

(Total for Question 2 is 1 mark)

3 (a) Write down the value of  $7^0$

.....  
(1)

(b) Find the value of  $3 \times 3^6 \times 3^{-6}$

.....  
(1)

(c) Find the value of  $2^{-4}$

.....  
(1)

(d) Find the value of  $27^{\frac{1}{3}}$

.....  
(1)

(Total for Question 3 is 4 marks)

**4**  $p^3 \times p^x = p^9$

(a) Find the value of  $x$ .

$$x = \dots\dots\dots$$

**(1)**

$$(7^2)^y = 7^{10}$$

(b) Find the value of  $y$ .

$$y = \dots\dots\dots$$

**(1)**

$100^a \times 1000^b$  can be written in the form  $10^w$

(c) Show that  $w = 2a + 3b$

**(2)**

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**(Total for Question 4 is 4 marks)**

**5** (a) Write down the value of  $36^{\frac{1}{2}}$

.....  
(1)

(b) Write down the value of  $23^0$

.....  
(1)

(c) Work out the value of  $27^{-\frac{2}{3}}$

.....  
(2)

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**(Total for Question 5 is 4 marks)**

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6 (a) Write down the value of  $100^{\frac{1}{2}}$

.....  
(1)

(b) Find the value of  $125^{\frac{2}{3}}$

.....  
(2)

**(Total for Question 6 is 3 marks)**

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7 (a) Find the value of  $81^{-\frac{1}{2}}$

.....  
(2)

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

.....  
(2)

**(Total for Question 7 is 4 marks)**

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8 Work out the value of  $\left(\frac{8}{27}\right)^{\frac{4}{3}}$

.....  
(Total for Question 8 is 2 marks)

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9 Work out the value of  $\frac{\left(5\frac{4}{9}\right)^{-\frac{1}{2}} \times \left(4\frac{2}{3}\right)}{2^{-3}}$

You must show all your working.

.....

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(Total for Question 9 is 4 marks)

**10** (a) Work out an estimate for the value of  $\sqrt{63.5 \times 101.7}$

.....  
(2)

$(2.3)^6 = 148$  correct to 3 significant figures.

(b) Find the value of  $(0.23)^6$  correct to 3 significant figures.

.....  
(1)

(c) Find the value of  $5^{-2}$

.....  
(1)

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**(Total for Question 10 is 4 marks)**

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11 (a) Express  $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$  as a power of 10

.....  
(3)

Liam was asked to express  $(12^{50})^2$  as a power of 12

Liam wrote  $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

.....  
.....  
.....  
(1)

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(Total for Question 11 is 4 marks)

**12** Here is a list of five numbers.

$$98^{53}$$

$$98^{64}$$

$$98^{73}$$

$$98^{88}$$

$$98^{91}$$

Find the lowest common multiple of these five numbers.

.....  
(Total for Question 12 is 1 mark)

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**13** (a) Find the value of  $\sqrt[4]{81 \times 10^8}$

.....  
(2)

(b) Find the value of  $64^{-\frac{1}{2}}$

.....  
(2)

(c) Write  $\frac{3^n}{9^{n-1}}$  as a power of 3

.....  
(2)

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(Total for Question 13 is 6 marks)

**14**  $(ax^6)^{\frac{1}{n}} = 7x^3$

Work out the value of  $a$  and the value of  $n$ .

$a =$  .....

$n =$  .....

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**(Total for Question 14 is 2 marks)**

**15**

$$16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$$

Work out the exact value of  $x$ .

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**(Total for Question 15 is 3 marks)**

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- 16** Given that  $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$   
find the exact value of  $x$ .

$x = \dots\dots\dots$

**(Total for Question 16 is 3 marks)**

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17 (a) Work out the value of  $\left(\frac{16}{81}\right)^{\frac{3}{4}}$

.....  
(2)

$$3^a = \frac{1}{9} \qquad 3^b = 9\sqrt{3} \qquad 3^c = \frac{1}{\sqrt{3}}$$

(b) Work out the value of  $a + b + c$

.....  
(2)

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(Total for Question 17 is 4 marks)

18

(a) Simplify  $8^2 \times \sqrt[3]{4^6}$

Give your answer in the form  $2^a$  where  $a$  is an integer.

Show each stage of your working clearly.

.....  
(3)

Given that  $n^{\left(-\frac{4}{5}\right)} = \left(\frac{1}{2}\right)^4$  where  $n > 0$

(b) find the value of  $n$ .

$n =$  .....  
(4)

(Total for Question 18 is 7 marks)



- 19** (a) Simplify  $8^2 \times \sqrt[3]{4^6}$   
Give your answer in the form  $2^a$  where  $a$  is an integer.  
Show each stage of your working clearly.

.....  
(3)

Given that  $n^{\left(-\frac{4}{5}\right)} = \left(\frac{1}{2}\right)^4$  where  $n > 0$

- (b) find the value of  $n$ .

$n =$  .....  
(4)

(Total for Question 19 is 7 marks)

**20**

$$2^{2y} \times 2^{3y+2} = \frac{8^{5y}}{4^n}$$

Find an expression for  $n$  in terms of  $y$ .

Show clear algebraic working and simplify your expression.

.....  
(4)

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**(Total for Question 20 is 7 marks)**

21

$$\frac{18 \times (\sqrt{27})^{4n+6}}{6 \times 9^{2n+8}} = 3^x$$

Express  $x$  in terms of  $n$

Show your working clearly and simplify your expression.

$x = \dots\dots\dots$

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(Total for Question 21 is 3 marks)