

# Edexcel GCSE

## Mathematics (Linear) – 1MA0

# FRACTIONAL AND NEGATIVE INDICES

### Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

### Items included with question papers

Nil

### Instructions

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Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

### Information

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

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

### Advice

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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

(i)  $36^{\frac{1}{2}}$

6  
.....

(ii)  $3^{-2}$

$\frac{1}{9}$   
.....

(Total 2 marks)

2. Write down the value of

(a)  $7^0$

1  
.....

(1)

(b)  $4^{-1}$

$\frac{1}{4}$   
.....

(1)

(Total 2 marks)

3. (a) Simplify  $2^0$

1  
.....

(1)

(b) Simplify  $5^{-1}$

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

(1)

(Total 2 marks)

4. (a) Write down the value of  $2^{-1}$

$\frac{1}{2}$   
.....

(1)

(b) Write down the value of  $64^{\frac{1}{2}}$

8  
.....

(1)

(Total 2 marks)

5. Write down the value of

(i)  $5^0$

.....  
1

(ii)  $4^{-2}$

.....  
 $\frac{1}{16}$

(iii)  $100^{\frac{1}{2}}$

.....  
10

(Total 3 marks)

6. (a) Write down the value of

(i)  $9^0$

.....  
1

(ii)  $169^{\frac{1}{2}}$

.....  
13

(2)

(b) Work out  $64^{\frac{2}{3}}$

.....  
16

(2)

(Total 4 marks)

7. (a) Find the value of  $36^{\frac{1}{2}}$

.....  
6

(1)

(b) Find the value of  $8^{-\frac{2}{3}}$

.....  
 $\frac{1}{4}$

(2)

(Total 3 marks)

8. Work out

(i)  $4^0$

.....  
1

(ii)  $4^{-2}$

.....  
 $\frac{1}{16}$

(iii)  $16^{\frac{3}{2}}$

.....  
64

(Total 3 marks)

9. Write down the value of

(a)  $25^{\frac{1}{2}}$

.....  
5

(1)

(b)  $9^0$

.....  
1

(1)

(Total 2 marks)

10. (a) Evaluate

(i)  $3^{-2}$

.....  
 $\frac{1}{9}$

(ii)  $36^{\frac{1}{2}}$

.....  
6

(iii)  $27^{\frac{2}{3}}$

.....  
9

(iv)  $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

$\frac{81}{16}$

.....  
 $\frac{27}{8}$

(5)

11. (a) Find the value of

(i)  $64^\circ$

(ii)  $64^{\frac{1}{2}}$

(iii)  $64^{-\frac{2}{3}}$

.....  
|

.....  
8

.....  
 $\frac{1}{16}$

(4)

(b)  $3 \times \sqrt{27} = 3^n$   
Find the value of  $n$ .

$$\begin{aligned} & 3 \times \sqrt{9 \times 3} \\ & 3 \times \sqrt{9} \times \sqrt{3} \\ & = 3 \times 3 \times \sqrt{3} \end{aligned}$$

$n = \dots 2.5 \dots$

(2)

(Total 6 marks)

12. (a) Work out  $3^6 \div 3^{-7}$

$$3^{13}$$

(1)

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

$$6$$

(1)

(c)  $3^n = \frac{1}{9}$

Find the value of  $n$ .

$$n = -2$$

(1)

(Total 3 marks)

13. (a) Simplify

(i)  $(3x^2y)^3$

$$27x^6y^3$$

(ii)  $(2t^{-3})^{-2}$

$$\frac{1}{4}t^6$$

(4)

14.  $x = 2^p, \quad y = 2^q$

(a) Express in terms of  $x$  and/or  $y$ ,

(i)  $2^{p+q} = 2^p \times 2^q$   
 $= x \times y$

.....  
 $xy$   
 .....

(ii)  $2^{2q} = (2^q)^2$   
 $= y^2$

.....  
 $y^2$   
 .....

(iii)  $2^{p-1} = 2^p \div 2^1$   
 $= x \div 2$   
 $= \frac{x}{2}$

.....  
 $\frac{x}{2}$   
 .....

(3)

$xy = 32$

and

$2xy^2 = 32$

(b) Find the value of  $p$  and the value of  $q$ .

$2 \times xy \times y = 32$

$2 \times 32 \times y = 32$

$2 \times 32 \times 2^q = 32 \Rightarrow 2 \times 2^q = 1$  so  $q = -1$   
 as  $2^0 = 1$

$2^p \times 2^q = 32$

$2^{p+q} = 32$

$2^{p-1} = 32$

$\frac{x}{2} = 32$

$p = 6$  .....

$q = -1$  .....

(2)

(Total 5 marks)

$x = 64$

$2^p = 64 \Rightarrow p = 6$

16. (a) Write down the value of  $8^{\frac{1}{3}}$

..... 2 .....

(1)

$8\sqrt{8}$  be written in the form  $8^k$

(b) Find the value of  $k$ .

$k = \dots\dots\dots 1.5 \dots\dots\dots$

(1)

$8\sqrt{8}$  can also be expressed in the form  $m\sqrt{2}$  where  $m$  is a positive integer.

(c) Express  $8\sqrt{8}$  in the form  $m\sqrt{2}$

$$\begin{aligned} 8 \times \sqrt{4 \times 2} \\ = 8 \times \sqrt{4} \times \sqrt{2} \\ = 8 \times 2 \times \sqrt{2} \end{aligned}$$

.....  $16\sqrt{2}$  .....

(2)

(d) Rationalise the denominator of  $\frac{1}{8\sqrt{8}}$

Give your answer in the form  $\frac{\sqrt{2}}{p}$  where  $p$  is a positive integer.

$$\frac{1}{8\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{8}}{64}$$

.....  $\frac{\sqrt{8}}{64}$  .....

(2)

(Total 6 marks)