# Index Notation

37 marks

**1.** (a) Find the value of

(i) $64^0$

.........................

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

........................

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

........................

**(4)**

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

$n =$ ...............

**(2)**

**(Total 6 marks)**

**2.** (a) Evaluate

(i) $3^{-2}$

.............................

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

.............................

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

.............................

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

.............................

**(5)**

(b)  (i)  Rationalise the denominator of $\dfrac{21}{\sqrt{7}}$ and simplify your answer.

…………………………

(ii)  Expand $\left(\sqrt{5}+2\sqrt{3}\right)\left(\sqrt{5}-2\sqrt{3}\right)$
Express your answer as simply as possible.

…………………………
**(4)**
**(Total 9 marks)**

**3.**  (a)  Simplify

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

...................................

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

.....................................
**(4)**

**4.**  (a)  Simplify $2^0$

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

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

............................
**(1)**
**(Total 2 marks)**

**5.** Simplify $\dfrac{15a^3 b^7}{3a^2 b^3}$

…………..……
**(Total 2 marks)**

**6.** (a) Work out the value of

$$\frac{2^5 \times 2^8}{2^7}$$

...............................
**(2)**

(b) Write down the value of $6^0$

...............................
**(1)**
**(Total 3 marks)**

**7.** Find the value of $\dfrac{5^5 \times 5^7}{5^{10}}$

………………..
**(Total 2 marks)**

**8.** Simplify fully $5x^3y^4 \times 7xy^2$

………………………………
**(Total 2 marks)**

**9.** Find the value of

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

..................................

(ii) $3^{-2}$

..................................
**(Total 2 marks)**

**10.** The number 40 can be written as $2^m \times n$, where $m$ and $n$ are prime numbers.

Find the value of $m$ and the value of $n$.

$m = $ ....................

$n = $ ....................
**(Total 2 marks)**

**11.** $2^x \times 2^y = 2^{10}$

and

$2^x \div 2^y = 2^4$

Work out the value of $x$ and the value of $y$.

$x = $ ....................

$y = $ ....................
**(Total 3 marks)**

# Index Notation       Mark Scheme

**1.**   (a)  (i)   1                                                            1

                      *B1 cao*

        (ii)   8                                                              1

                      *B1 cao*

        (iii)   $\dfrac{1}{16}$                                                         2

$$64^{-\frac{2}{3}} = \frac{1}{64^{\frac{2}{3}}} \quad \text{or} \quad 64^{-\frac{2}{3}} = (4^2)^{-1}$$

*M1 for knowing negative power is a reciprocal or power of $\dfrac{1}{3}$*

*root is a cube root*

*A1 cao for $\dfrac{1}{16}$*

    (b)   $\dfrac{5}{2}$ oe                                                             2

$$\sqrt{27} = \sqrt{9 \times 3} \ \text{ or } \ \sqrt{27} = 3\sqrt{3} \ \text{ or } \ \sqrt{27} = 3^{3/2}$$

*M1 for $\sqrt{27} = \sqrt{9 \times 3}$ or $\sqrt{27} = 3^{3/2}$*

*A1 for $\dfrac{5}{2}$ oe (cao)*

***Alternative method***

*M1 for $9 \times 27 = 3^{2n}$*

*A1 for $\dfrac{5}{2}$ oe (cao)*

                                                                     **[6]**

**2.**   (a)  (i)   $\dfrac{1}{9}$                                                             5

                      *B1 cao*

        (ii)   6

                      *B1 cao*

        (iii)   9

                      *B1 cao*

        (iv)   $\dfrac{27}{8}$ oe

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

*B2 for $\dfrac{27}{8}$ oe*

*(B1 for $\left(\dfrac{81}{16}\right)^{\frac{3}{4}}$ or $\left(\dfrac{2^3}{3^3}\right)^{-1}$ or $\left(\dfrac{2}{3}\right)^{-3}$ or $\left(\dfrac{3}{2}\right)^{3}$ or better) or*

$$\dfrac{\frac{1}{8}}{27} \;\; or \;\; \dfrac{8}{27}$$

(b) (i) $3\sqrt{7}$      4

$$\dfrac{21\sqrt{7}}{\sqrt{7} \times \sqrt{7}}$$

*M1 for* $\dfrac{21\sqrt{7}}{\sqrt{7} \times \sqrt{7}}$

*A1 cao*

(ii) $-7$

$5 + 2\sqrt{3}\sqrt{5} - 2\sqrt{3}\sqrt{5} - 12$

*M1 for correct expansion with at least one non zero integer term*
*or 3 of our 4 terms correct and slip in $4^{th}$ ; or for $5 + k - k - 12$*
*where k is a surd*
*A1 for $-7$ with no error seen*

**[9]**

**3.** (a) (i) $27x^6y^3$      4
*B2 cao*

*(B1 for $x^6y^3$ or $27x^6$ or $27y^3$ in a product)*

(ii) $\dfrac{t^6}{4}$

*B2 cao*

*B1 for* $\dfrac{1}{4}$ *in a product or $t^6$ in a product*

*(B1 for* $\dfrac{1}{(2t^{-3})^2}, \left(\dfrac{2}{t^3}\right)^{-2}$ *)*

**[4]**

**4.** (a) 1      2
*B1 cao*

(b) $\dfrac{1}{5}$

*B1 cao*

**[2]**

**5.** $5ab^4$      2
*B2 cao*
*(B1 for 2 of 5, a, $b^4$ correct)*

**[2]**

**6.** (a) 64    2

$2^{13}/2^7$

*M1 for $2^{(5+8)}$ or $2^6$*
*A1 cao*

(b) 1    1

*B1 cao*

**[3]**

**7.** 25    2

$5^{5+7-10}$

*M1 for $5^{5+7-10}$*
*A1 cao*

**[2]**

**8.** $35x^4y^6$    2

*B2*
*(B1 for any 2 of 35, $x^4$, $y^6$)*

**[2]**

**9.** (i) 6    2

*B1 cao*

(ii) 1/9

*B1 cao*

**[2]**

**10.** $m = 3$
$n = 5$    2

*B1 for 3*
*B1 for 5*
*(B2 for $2^3 \times 5$ or $2 \times 2 \times 2 \times 5$)*
*SC: award B1 only if m = 3, n = 3 , for 8 × 5 seen*

**[2]**

**11.** $x = 7$
$y = 3$    3

$x + y = 10$ and $x - y = 4$

*M1 for either x + y = 10 or x – y = 4*
*A2 for both values correct [(A1 for one value correct)*
*If M0, award B3 for both values correct or B2 for one value*
*correct, otherwise B0]*
*SC B2 for x = 3 or y = 7*    *[3]*