

## Indices Exam Practice



Q1. Simplify  $x^2 \times x^7 = x^9$

Answer:            $x^9$             
(1 mark)

Q2. Simplify  $t^5 \div t^8 = t^{-3}$

Answer:            $t^{-3}$             
(1 mark)



Q3. Simplify  $(a^3)^2 = a^6$

Answer:  $a^6$   
(1 mark)

Q4. Simplify the following expressions:

a)  $2t^5 \div 4t^2 = \frac{1}{2}t^3$

Answer:  $\frac{1}{2}t^3$   
(2 marks)

b)  $(3a^2)^4 = 3^4(a^2)^4$   
 $= 81a^8$

Answer:  $81a^8$   
(2 marks)

c)  $3x^3 \times 5x = 15x^4$

Answer:  $15x^4$   
(2 marks)



Q5. Find the reciprocal of 9.

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

Answer:            $\frac{1}{9}$             
(1 mark)

Q6. Work out the value of  $7^{-2}$

$$= \frac{1}{7^2}$$
$$= \frac{1}{49}$$

Answer:            $\frac{1}{49}$             
(1 mark)



Q7. Write down the value of  $\left(\frac{1}{2}\right)^0 = 1$

Answer: 1  
(1 mark)

Q8. Find the value of c, given the equation:  
 $y^5 \times y^c = y^2$

$$y^{5+c} = y^2$$

$$\Rightarrow 5+c = 2$$

$$\Rightarrow c = -3$$

Answer:  $c = -3$   
(1 mark)



Q9. Find the value of  $d$ , given the equation:

$$w^6 \div w^9 = (w^{-12})^d$$

$$w^{-3} = w^{-12d}$$

$$\Rightarrow -3 = -12d$$

$$\Rightarrow \frac{1}{4} = d$$

Answer:  $d = \frac{1}{4}$   
(2 marks)

Q10. Simplify the expression fully:  $\frac{(4a^3)^2 \times 3b^3}{24a^{-1}b^7}$

$$= \frac{16a^6 \times 3b^3}{24a^{-1}b^7}$$

$$= \frac{48a^6 \times b^3}{24a^{-1}b^7}$$

$$= 2a^7b^{-4}$$

Answer:  $2a^7b^{-4}$   
(3 marks)



Q11. Work out the following:

a)  $2^8$

Answer: 256  
(1 mark)

b)  $\left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3}$

$= \frac{27}{64}$

Answer:  $\frac{27}{64}$   
(1 mark)

c)  $(-1)^{72} = 1$

Answer: 1  
(1 mark)

Q12. Find the reciprocal of  $-\frac{3}{7}$

$= \frac{1}{-\frac{3}{7}}$

$= -\frac{7}{3}$

Answer:  $-\frac{7}{3}$   
(1 mark)



Q13. Write the following as a power of 3:

a) 27

Answer: 3<sup>3</sup>  
(1 mark)

$$\begin{aligned} \text{b) } \frac{3}{81} &= \frac{1}{27} \\ &= 3^{-3} \end{aligned}$$

Answer: 3<sup>-3</sup>  
(1 mark)

### Problem Questions:

Q14. An amoeba is a single-cell organism. On the first day, it splits into 2 cells. On the second day, each of these cells split into 2, and this process continues the next day, and so on.

a) After how many days does the total number of cells exceed 4000?

$$\begin{aligned} 2^1 &= 2 & 2^{11} &= 2048 \\ 2^2 &= 4 & 2^{12} &= 4096 \\ &\vdots & & \\ 2^{10} &= 1024 & & \end{aligned}$$

Answer: 12 days  
(1 mark)

b) Will there ever be 32,658,791 cells? Justify your answer.

This is an odd number, and all the no. of cells will be powers of 2 which are all even. So we cannot have 32,658,791 cells.

Answer: No.  
(1 mark)



Q15. A new bank offers Charlotte an interest rate of 10% compound interest.

- a) If Charlotte invests £11,000, show that the amount of money  $M$  which she will have after  $n$  years, can be written in the form,  
 $M = 1.1^{n+1} \times 10000$ .

$$\left( \begin{array}{l} \text{after Year 1 : } 11,000 \times 1.1 \\ \text{after Year 2 : } 11,000 \times 1.1^2 \\ \vdots \\ \text{after year } n : 11,000 \times 1.1^n \end{array} \right) \leftarrow \text{can omit this.}$$
$$\begin{aligned} &= 10,000 \times 1.1 \times 1.1^n \\ &= 10,000 \times 1.1^{n+1} \end{aligned}$$

Answer: \_\_\_\_\_  
(2 marks)

- (b) Use the equation in part (a) to work out the amount of money she will have after 5 years.

$$\begin{aligned} \text{let } n=5 : \text{ she will have } & 10,000 \times 1.1^6 \\ & = \pounds 17,715.61 \end{aligned}$$

Answer: £17,715.61  
(2 marks)