

Name:

Section:

# Indices worksheet

1 (a) Simplify.

$$(x^2)^3$$

..... [1]

(b)  $t^{-2} = 9$

Find the value of  $t$ .

$t =$  ..... [1]

(c)  $\sqrt{5} \times 5^0 = 5^k$

Find the value of  $k$ .

$k =$  ..... [1]

2 (a) Evaluate  $(\sqrt{9} \times \sqrt[3]{64})^2$ .

..... [2]

(b) Simplify  $\left(\frac{16}{x^6}\right)^{-\frac{1}{2}}$ .

..... [2]

(c) The table shows the number of tourists and the total tourist spending for some countries in 2016.

Country	Number of tourists	Total spending in dollars
China	$5.93 \times 10^7$	$4.44 \times 10^{10}$
India	$1.46 \times 10^7$	$2.31 \times 10^{10}$
Kenya	$1.27 \times 10^6$	$1.62 \times 10^9$
Madagascar	$2.93 \times 10^5$	$9.13 \times 10^5$

(i) Calculate how many more tourists visited India than Kenya in 2016.  
Give your answer in standard form.

..... [1]

(ii) Calculate the average amount spent per tourist in China in 2016.  
Give your answer correct to the nearest dollar.

\$ ..... [2]

- (iii) From 2014 to 2016, the total amount spent by tourists in Madagascar increased by 23.5%.  
Calculate the amount spent by tourists in Madagascar in 2014.

\$ ..... [2]

- 3 (a) Solve.

$$27^k = 9$$

$k =$  ..... [2]

- (b) Simplify.

$$\left(\frac{16}{x^8}\right)^{-\frac{1}{4}}$$

..... [2]

4 (a)  $(y^k)^{-2} = y^5$

Find the value of  $k$ .

$k = \dots\dots\dots$  [1]

(b) Simplify  $\left(\frac{x^{\frac{1}{3}}}{2x}\right)^3$ .

$\dots\dots\dots$  [2]

5 (a) Write 0.000053 in standard form.

$\dots\dots\dots$  [1]

(b) Evaluate  $(1.5 \times 10^{14}) \times (8 \times 10^6)$ .  
Give your answer in standard form.

$\dots\dots\dots$  [2]

(c) Simplify  $\frac{6t^2v^3}{5} \div \frac{3t^2}{v^2}$ .

$\dots\dots\dots$  [2]

(d)  $7 \times 10^a - 3 \times 10^{a-1} = k \times 10^a$

Find  $k$ .

$k = \dots\dots\dots$  [1]

6 (a) Simplify  $(2x^2)^3$ .

$\dots\dots\dots$  [1]

(b) Simplify  $6t^3 \div \left(\frac{2}{3}t^2\right)$ .

$\dots\dots\dots$  [2]

7 (a) Simplify  $\left(\frac{2x^2}{x^5}\right)^{-3}$ .

$\dots\dots\dots$  [2]

(b) The population density of a country is the number of people per square kilometre.

In 2017, the population of Indonesia was  $2.62 \times 10^8$ , correct to 3 significant figures.  
The area of Indonesia is  $2 \times 10^6 \text{ km}^2$ , correct to 1 significant figure.

Calculate an estimate for the population density of Indonesia.

..... people/ $\text{km}^2$  [2]

8 Simplify.

(a)  $(2x^2)^0$

..... [1]

(b)  $(3x^3)^2$

..... [1]

(c)  $\left(\frac{8}{x^3}\right)^{-\frac{1}{3}}$

..... [2]

9 (a) Express  $4500 \times 1000^2$  in standard form.

..... [1]

(b) Giving your answer in standard form, evaluate  $\frac{2.4 \times 10^{-8}}{4 \times 10^{-3}}$ .

..... [2]

10 (a) Write these numbers in order of size, starting with the smallest.

$2.1 \times 10^{-3}$        $4.2 \times 10^{-4}$        $1.7 \times 10^{-5}$        $3.5 \times 10^{-4}$

....., ....., ....., ..... [1]  
*smallest*

(b)  $P = 6 \times 10^{10}$        $Q = 5 \times 10^9$

Evaluate the following.  
Give each answer in standard form.

(i)  $P - Q$

..... [1]

(ii)  $PQ$

..... [1]

11 Simplify.

$$\left(\frac{9x^7y}{x^5y^9}\right)^{\frac{1}{2}}$$

..... [2]

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$$p = 8 \times 10^{-6} \quad q = 2 \times 10^{11}$$

Evaluate the following, giving your answers in standard form.

(a)  $p \times q$

Answer ..... [1]

(b)  $p \div q$

Answer ..... [1]

(c)  $\sqrt[3]{p}$

Answer ..... [1]



13 (a) Evaluate  $9^1 + 9^0$ .

Answer ..... [1]

(b) Find  $n$ , where  $4^n = 2^{n-1}$ .

Answer  $n =$  ..... [2]

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$$N = 2 \times 10^8$$

(a) Giving your answers in standard form, find the value of

(i)  $N \times 700$ ,

Answer ..... [1]

(ii)  $\frac{1}{N}$ .

Answer ..... [2]

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$$a^x = 5$$

(a) Find  $a^{2x}$ .

Answer ..... [1]

(b) Find  $a^{-x}$ .

Answer ..... [1]

16 (a) Write the number 360 million in standard form.

Answer ..... [1]

(b)

$$p = 5 \times 10^9$$

$$q = 9 \times 10^{-16}$$

Expressing each answer in standard form, find

(i)  $p \times q$ ,

Answer ..... [1]

(ii)  $\sqrt{q}$ .

Answer ..... [1]