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

..... [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	5.93×10^7	4.44×10^{10}
India	1.46×10^7	2.31×10^{10}
Kenya	1.27×10^6	1.62×10^9
Madagascar	2.93×10^5	9.13×10^5

(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)** $\left(y^k\right)^{-2} = y^5$

Find the value of k.

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

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

..... [2]

5 **(a)** Write $0.000\,053$ in standard form.

..... [1]

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

..... [2]

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

..... [2]

(d) $7\times10^{a}-3\times10^{a-1}=k\times10^{a}$

Find k.

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

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

..... [1]

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

..... [2]

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

..... [2]

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

In 2017, the population of Indonesia was 2.62×10^8, 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/km^2 [2]

8 Simplify.

(a) $\left(2x^2\right)^0$

..... [1]

(b) $\left(3x^3\right)^2$

..... [1]

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

..... [2]

9 **(a)** Express 4500×1000^2 in standard form.

..... [1]

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

..... [2]

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

2.1×10^{-3} 4.2×10^{-4} 1.7×10^{-5} 3.5×10^{-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]

12 $p = 8 \times 10^{-6}$ $q = 2 \times 10^{11}$

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]

14 $N = 2 \times 10^8$

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

(i) $N \times 700$,

Answer ..... [1]

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

Answer ..... [2]

15 $a^x = 5$

(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]