

PART A



- 1) What does 7^4 mean?
- 2) Which is greater, 3^4 or 4^3 ? Explain.
- 3) How many times greater is 8^7 than 8^6 ? Explain.
- 4) Evaluate.

a) $4^2 + 5^2$ b) $2(3)^3 - 3^2$ c) $5(3^4 - 2^6)$ d) $(5^2)^2$ e) $4(2^3) - 4(3^2)$

f) $(-2)^2$ g) $(-2)^3$ h) -2^4 i) $(-2)^4$ j) $(2^4 - 3^2)^2$ k) $(3^2 - 2^4)^2$

- 5) Continue the pattern to fill in each box. Use fractions to express values that are less than 1.

a) $10^4 = 10000$	b) $2^4 = 16$	c) $3^4 = 81$	d) $4^4 = 256$
$10^3 = 1000$	$2^3 = 8$	$3^3 = 27$	$4^3 = 64$
$10^2 = 100$	$2^2 = 4$	$3^2 = 9$	$4^2 = 16$
$10^1 = \square$	$2^1 = \square$	$3^1 = \square$	$4^1 = \square$
$10^0 = \square$	$2^0 = \square$	$3^0 = \square$	$4^0 = \square$
$10^{-1} = \square$	$2^{-1} = \square$	$3^{-1} = \square$	$4^{-1} = \square$
$10^{-2} = \square$	$2^{-2} = \square$	$3^{-2} = \square$	$4^{-2} = \square$

- 6) Evaluate.

a) 7^1 b) 7^0 c) 16^1 d) 25^0 e) 257^0 f) 0^5 g) 0^1

- 7) Evaluate. Use fractions to express values that are less than 1.

a) 5^{-1} b) 5^{-2} c) 7^{-1} d) 7^{-2} e) 10^{-3} f) 2^{-3} g) 3^{-3} h) 3^{-4}

- 8) Which is greater, 6^{-3} or 6^{-4} ? Explain.

- 9) Explain the meaning of 5×10^4 and evaluate this expression.

- 10) Explain the meaning of 4×10^{-3} and evaluate this expression.

- 11) Identify which of the following values are correctly expressed in scientific notation.

a) 5.23×10^7 b) 9×10^{12} c) 52.31×10^8 d) 1.6×12^{-7} e) 8.0×10^{-11} f) 14×10^{11}

PART B

12) Express each of the following as a power of 5.

a) 5 b) 25 c) 125 d) $\frac{1}{5}$ e) $\frac{1}{25}$ f) $\frac{1}{125}$ g) $\frac{1}{5 \times 5 \times 5 \times 5}$ h) $\frac{1}{5^7}$

13) Evaluate. Use fractions to express values that are less than 1.

a) 6^2 b) 4^3 c) 10^1 d) 10^0 e) 10^{-1} f) 16^0
g) 4^{-1} h) 6^{-2} i) 5^{-3} j) 2^{-4} k) 10^6 l) 10^{-6}

14) Arrange the following powers from least to greatest.

6^3 7^{-5} 14^{-3} 128^0 7^3 5^{-7} 3^6 12^{-4}

15) Marcia claims that the number 16 000 000 000 is written as 16×10^9 in scientific notation. Is Marcia's claim correct? Explain.

16) When Saturn is closest to Earth, the two planets are approximately 1.2×10^9 km apart. Express this distance in standard notation.



17) Alpha particles are emitted when radioactive Plutonium-239 decays. The mass of an alpha particle is 6.645×10^{-28} kilograms. Express this mass in standard notation.

18) The Andromeda Galaxy, which is the closest galaxy to our Milky Way galaxy, contains at least 200 000 000 000 stars. Express this number using scientific notation.



19) Violet light has the shortest wavelength of all visible light, measuring 0.0000004 metres. Express this wavelength in scientific notation.

20) Express each of the following values in standard notation.

a) 8×10^5 b) 2.9×10^8 c) 6.54×10^{-3} d) 9×10^{-11} e) 7.562×10^{-9}

21) Express each of the following values in scientific notation.

a) 5 000 000 000 b) 0.000000007 c) 65 200 000 d) 0.00000000000008745

22) Arrange the following values from least to greatest.

2.35×10^{15} 0.0002 8.25×10^{12} 3.5×10^{-4} 82 541 236 454 125 8×10^{12}

PART C

23) About 71% of Earth's surface is water. The total surface area of Earth is approximately 510 million square kilometres. Express Earth's water surface area in scientific notation.

24) Explain why 0^{-3} cannot be evaluated.

ANSWERS

- 1) 7^4 means $7 \times 7 \times 7 \times 7$.
- 2) 3^4 is greater than 4^3 since $3^4 = 3 \times 3 \times 3 \times 3 = 81$ and $4^3 = 4 \times 4 \times 4 = 64$.
- 3) 8^7 is 8 times greater than 8^6 since $8^7 = 8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8 = 8 \times (8 \times 8 \times 8 \times 8 \times 8 \times 8) = 8 \times 8^6$
- 4) a) 41 b) 45 c) 85 d) 625 e) -4 f) 4 g) -8 h) -16 i) 16 j) 49 k) 49
- 5) a) $10^1 = \boxed{10}$ b) $2^1 = \boxed{2}$ c) $3^1 = \boxed{3}$ d) $4^1 = \boxed{4}$
 $10^0 = \boxed{1}$ $2^0 = \boxed{1}$ $3^0 = \boxed{1}$ $4^0 = \boxed{1}$
 $10^{-1} = \boxed{\frac{1}{10}}$ $2^{-1} = \boxed{\frac{1}{2}}$ $3^{-1} = \boxed{\frac{1}{3}}$ $4^{-1} = \boxed{\frac{1}{4}}$
 $10^{-2} = \boxed{\frac{1}{100}}$ $2^{-2} = \boxed{\frac{1}{4}}$ $3^{-2} = \boxed{\frac{1}{9}}$ $4^{-2} = \boxed{\frac{1}{16}}$
- 6) a) 7 b) 1 c) 16 d) 1 e) 1 f) 0 g) 0
- 7) a) $\frac{1}{5}$ b) $\frac{1}{25}$ c) $\frac{1}{7}$ d) $\frac{1}{49}$ e) $\frac{1}{1000}$ f) $\frac{1}{8}$ g) $\frac{1}{27}$ h) $\frac{1}{81}$
- 8) 6^{-3} is greater than 6^{-4} since $6^{-3} = \frac{1}{216}$ and $6^{-4} = \frac{1}{1296}$.
- 9) 5×10^4 means that 5 is multiplied by 10 four times, thereby moving the decimal point four places to the right. That is, 5 is multiplied by 10 000. The expression is equal to 50 000.
- 10) 4×10^{-3} means that 4 is divided by 10 (or multiplied by $\frac{1}{10}$) three times, thereby moving the decimal point three places to the left. That is, 4 is divided by 1000 (or multiplied by $\frac{1}{1000}$).
The expression is equal to 0.004.
- 11) a, b and e
- 12) a) 5^1 b) 5^2 c) 5^3 d) 5^{-1} e) 5^{-2} f) 5^{-3} g) 5^{-4} h) 5^{-7}
- 13) a) 36 b) 64 c) 10 d) 1 e) $\frac{1}{10}$ f) 1 g) $\frac{1}{4}$ h) $\frac{1}{36}$ i) $\frac{1}{125}$ j) $\frac{1}{16}$
 k) 1 000 000 l) $\frac{1}{1000000}$
- 14) 5^{-7} , 12^{-4} , 7^{-5} , 14^{-3} , 128^0 , 6^3 , 7^3 , 3^6
- 15) Marcia's claim is incorrect. To be properly expressed in scientific notation, the first part of the product should have only one non-zero digit in front of the decimal point. The correct notation would be 1.6×10^{10} .
- 16) 1 200 000 000 km
- 17) 0.00000000000000000000000000006645 kg
- 18) 2×10^{11}
- 19) 4×10^{-7} m
- 20) a) 800 000 b) 290 000 000 c) 0.00654 d) 0.00000000009 e) 0.000000007562
- 21) a) 5×10^9 b) 7×10^{-9} c) 6.52×10^7 d) 8.745×10^{-13}
- 22) 0.0002, 3.5×10^{-4} , 8×10^{12} , 8.25×10^{12} , 82 541 236 454 125, 2.35×10^{15}
- 23) 3.621×10^8 km²
- 24) $0^{-3} = \frac{1}{0 \times 0 \times 0} = \frac{1}{0}$, which is undefined since we cannot divide by 0.