

ANSWER KEY

3.1 Using Exponents to Describe Numbers, pages 92-98

6. Write each expression as a power.

a) $2 \times 2 \times 2$

2^3

b) $(-3) \times (-3) \times (-3) \times (-3)$

$(-3)^4$

7. Write each power in repeated multiplication form.

a) 4^6

$4 \times 4 \times 4 \times 4 \times 4 \times 4$

b) 6^4

$6 \times 6 \times 6 \times 6$

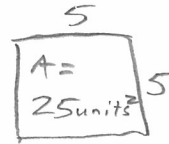
c) $(-5)^7$

$-5 \times -5 \times -5 \times -5 \times -5 \times -5 \times -5$

d) -5^7

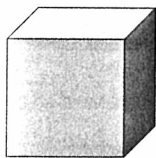
$-5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

8. The area of a square on grid paper is 5^2 . Evaluate the area. Draw the square and label its area and side length.



$$\begin{aligned} A &= lw \\ &= 5^2 \\ &= 5^2 \\ &= 5 \times 5 \\ &= 25 \text{ units}^2 \end{aligned}$$

9. A cube has an edge length of 4 cm. Express its volume in repeated multiplication form and in exponential form. Then, evaluate.



4 cm

$$\begin{aligned} V &= lwh \\ &= (4)(4)(4) \\ &= 4^3 \\ &= 64 \text{ cm}^3 \end{aligned}$$

10. Arrange the following numbers in ascending order:

4^3 7^2 -3^4 9 2^5 32
 64 49 -81 9 32

$-3^4, 9, 2^5, 7^2, 4^3$

3.2 Exponent Laws, pages 99-107

11. Rewrite each power in the following products in repeated multiplication form.

a) $3^2 \times 5^4$

$3 \times 3 \times 5 \times 5 \times 5 \times 5$

b) $(-3)^3 \times 2^6$

$(-3)(-3)(-3)(2)(2)(2)(2)(2)(2)$

12. Write each expression in parentheses as a power. Then, write the entire expression as a single power.

a) $(2 \times 2 \times 2) \times (2 \times 2)$

$2^3 \times 2^2 = 2^5$

b) $\frac{(4 \times 4)(4 \times 4 \times 4 \times 4)}{(4 \times 4 \times 4)}$

$\frac{4^2 \times 4^4}{4^3} = \frac{4^6}{4^3} = 4^3$

13. Write each expression in repeated multiplication form, and then as a single power.

a) $(-5)^2 \times (-5)^5$

$(-5)(-5)(-5)(-5)(-5)(-5)(-5) = (-5)^7$

b) $(3^2)^4$

$(3)(3)(3)(3)(3)(3)(3)(3) = 3^8$

14. Write each expression as the multiplication of two powers.

a) $(6 \times 4)^3 = 6^3 \times 4^3$

b) $[(7 \times (-2))]^5 = 7^5 \times (-2)^5$

15. Write each expression as the division of two powers.

a) $\left(\frac{4}{5}\right)^2 = \frac{4^2}{5^2}$

b) $\left(\frac{2}{7}\right)^4 = \frac{2^4}{7^4}$

16. Evaluate.

a) $-4^2 = -4 \times 4 = -16$

b) $(-10)^0 = 1$

c) $3^2 \times 3^3 = 3^5 = 243$

3.3 Order of Operations, pages 108-113

17. Write the calculator key sequence you would use to evaluate each expression.

a) $(-2)^2 + (-2)^3 = 4 + -8 = -4$

b) $(2^3)^2 - 4 \times 6^0 = 2^6 - 4 \times 1 = 64 - 4 = 60$

c) $(-3)^4 - (-3)^3 + (2 \times 4)^2 = 81 - -27 + 8^2 = 81 + 27 + 64 = 172$

18. Evaluate.

a) $7^2 + (-2)^3 \div (-2)^2 = 49 + -8 \div 4 = 49 + -2 = 47$

b) $(2 - 5)^3 + 6^2 = (-3)^3 + 36 = -27 + 36 = 9$

c) $\frac{(2)^6(2)^2 - 13 \times 2^0}{(-1 + 2^2)^5} = \frac{2^8 - 13 \times 1}{(-1+4)^5} = \frac{256 - 13}{3^5} = \frac{243}{243} = 1$

d) $(-1)^{10} + (-22)^0 - \left(\frac{3}{5}\right)^2 = 1 + 1 - \frac{9}{25} = 2 - \frac{9}{25} = 1\frac{16}{25}$

19. Explain the mistake in Ang's solution.

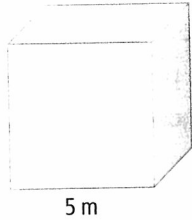
Determine the correct answer.

$(-3)^4 + 7 \times 2^3$
 $= 81 + (7 \times 8)$
 $= 88 \times 8$
 $= 704$

MULTIPLY BEFORE ADDING $(-3)^4 + 7 \times 2^3$
 $= 81 + 7 \times 8$
 $= 81 + 56$
 $= 137$

3.4 Using Exponents to Solve Problems,
pages 114–119

20. What is the surface area of a cube with an edge length of 5 m?



$$\begin{aligned} \text{one surface} &= 5\text{ m} \times 5\text{ m} = 25\text{ m}^2 \\ \text{Six sides} &\quad \times 6 \\ \hline &150\text{ m}^2 \end{aligned}$$

21. A population of ten bacteria doubles every hour. This growth can be represented by $N = 10(2)^t$, where N is the number of bacteria, and t is the amount of time, in hours. How many bacteria will there be after each number of hours?

- a) 3
 b) 6

$$\begin{aligned} \text{a) } N &= 10(2)^3 \\ &= 10(8) \\ &= 80 \end{aligned}$$

$$\begin{aligned} \text{b) } N &= 10(2)^6 \\ &= 10(64) \\ &= 640 \end{aligned}$$

22. A formula that approximates the distance an object falls through air in relation to time is $d = 4.9t^2$. The distance, d , is measured in metres, and the time, t , in seconds. A pebble breaks loose from a cliff. What distance would it fall in each number of seconds?

- a) 1
 b) 2
 c) 6

$$\begin{aligned} \text{a) } d &= 4.9(1^2) \\ &= 4.9(1) \\ &= 4.9\text{ m} \end{aligned}$$

$$\begin{aligned} \text{b) } d &= 4.9(2^2) \\ &= 4.9(4) \\ &= 19.6\text{ m} \end{aligned}$$

$$\begin{aligned} \text{c) } d &= 4.9(6^2) \\ &= 4.9(36) \\ &= 176.4\text{ m} \end{aligned}$$

