

Unit Two Practice Test: Powers and Exponent Laws**Multiple Choice***Identify the choice that best completes the statement or answers the question.*

- _____ 1. Write the base of $-(-6)^5$.
a. 6 b. -6 c. -6×5 d. 5
- _____ 2. Evaluate: 4^6
a. 1296 b. 4096 c. 10 d. 24
- _____ 3. Write one billion as a power of 10.
a. 10^9 b. 10^8 c. 10^{10} d. 10^8
- _____ 4. Evaluate: $(-15)^0$
a. -1 b. 1 c. 0 d. -15
- _____ 5. Evaluate: $-(10^0)^7$
a. -7 b. 1 c. 7 d. -1
- _____ 6. State which operation you would do first to evaluate $8 + 9 \times 6^2 - 5$.
a. Square 6 c. Subtract 5 from 6
b. Add 8 and 9 d. Multiply 9 and 6
- _____ 7. Evaluate: $5^3 - (-6)^3$
a. 33 b. -91 c. 341 d. -3
- _____ 8. Evaluate: $(2 + 3)^2 - (3 - 5)^3$
a. 17 b. -85 c. 16 d. 33
- _____ 9. Write the product of $5^2 \times 5^4$ as a single power.
a. 10^6 b. 5^6 c. 25^6 d. 5^8

_____ 10. Write the quotient of $\frac{6^8}{6^4}$ as a single power.

- a. 6^4 b. 2 c. 6^2 d. 6^{12}

_____ 11. Express $\frac{(-5)^6 \times (-5)^6}{(-5)^4}$ as a single power.

- a. $(-5)^9$ b. $(-5)^8$ c. $(-5)^{32}$ d. $(-5)^3$

_____ 12. Write $[(-4) \times (-5)]^5$ as a product of powers.

- a. $(-4)^5 + (-5)^5$ c. $(-4)^5 \times (-5)^5$
b. $4^5 \times 5^5$ d. $5(-4) + 5(-5)$

_____ 13. Write $\left(\frac{5}{3}\right)^3$ as a quotient of powers.

- a. $5^3 - 3^3$ b. 2^3 c. $\frac{5^3}{3^1}$ d. $\frac{5^3}{3^3}$

_____ 14. Evaluate: $\left[(-4)^0\right]^5$

- a. 5 b. -5 c. 1 d. -1

_____ 15. Which answer is negative?

- i) $(-7)^{10}$
ii) $-(7)^{10}$
iii) $-(-7)^{10}$
a. i only b. i and iii c. i and ii d. ii and iii

_____ 16. Evaluate: 10^7

- a. 100 000 000 b. 10 000 000 c. 1 000 000 d. 70

Name: _____

ID: A

- _____ 17. Which is the correct value of $2^2 + 3 \times 5 - 3$?
i) 14
ii) 10
iii) 16
iv) 32
a. ii b. iii c. i d. iv
- _____ 18. Evaluate: $(-2)^4 \times (-2)^2 \div (-2)^0$
a. -32 b. 64 c. 256 d. -64
- _____ 19. Evaluate: $10^4 \times 10^3 + 10^5$
a. 1 000 000 000 000
b. 10 100 000
c. 120
d. 1 000 000 100 000
- _____ 20. Write $[(-7) \times 2]^5$ as a product of powers.
a. $(-7)^5 \times 2^5$ b. $(-7)^5 + 2^5$ c. $(-5)^5$ d. $5(-7) \times 2$
- _____ 21. Which expressions have positive values?
i) $[(-7)^6]^7$
ii) $[-(-7)^6]^7$
iii) $-(7^6)^7$
iv) $-[-(-7)^6]^7$
a. ii and iv b. i and iv c. i and ii d. ii and iii

Short Answer

22. Write the base and the exponent of this power: $(-8)^4$

Name: _____

ID: A

23. Write 704 065 using powers of 10.

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24. Evaluate: $4^2 - [6 \div (-2)]^3$

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25. Simplify, then evaluate.

$$(-2)^5 \times (-2)^7 \div (-2)^6$$

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26. Simplify, then evaluate.

$$\left(\frac{2^2}{8^0} \right)^3$$

.

27. State which operation you would do first to evaluate $(6)^0 + [8 \div (-2)]^2 - 5$.

.

Name: _____

ID: A

28. Insert brackets to make each statement true.

a) $3^2 + 4 \times 5 - 2^2 = 13$

b) $3^2 + 4 \times 5 - 2^2 = 61$

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29. Simplify, then evaluate.

$$\frac{(-2)^4 \times (-2)^2}{(-2)^4 \times (-2)^0}$$

.

30. Write $[11 \times (-12) \times 13]^3$ as a product of powers.

.

31. Simplify, then evaluate.

$$\frac{(2^4)^3 \times (2^2)^4}{(2^2 \times 2^6)^2}$$

.

Name: _____

ID: A

32. Simplify, then evaluate.

$$\left(4^9 \div 4^6\right)^2 - \left(2^8 \div 2^6\right)^2$$

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Problem

33. Evaluate: $5(3)^3 - 3(-5)^3$

Show your steps.

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34. One estimate shows that the number of people without access to safe drinking water is about one billion. How much water is required if each person who does not have access to safe drinking water is given 10 L of safe drinking water?
Give your answer in standard form and using powers of 10.

.

Name: _____

ID: A

35. Evaluate: $\frac{(10)^2 - (4)^2}{(6)^2 - 2(2)^2}$

Show your calculations.

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36. Identify, then correct, any errors in the work shown.

$$3^3 \times 3^4 \div 3^6$$

$$= 3^{3 \times 4 + 6}$$

$$= 3^2$$

$$= 6$$

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37. Identify, then correct, any errors in the work shown.

$$\begin{aligned}\left(3^2 \times 3^3\right)^2 &= \left(3^{2 \times 3}\right)^2 \\ &= \left(3^6\right)^2 \\ &= 3^{6+2} \\ &= 3^8 \\ &= 6561\end{aligned}$$

38. Where possible, replace $\square$ with a “+” or “-” sign to make each product positive.

- a) $-(\square 8)^{11}$
- b) $\square(-8)^{12}$
- c) $-(\square 8)^{12}$
- d) $\square(-8)^{11}$

Can all products be made positive? Explain.

Name: _____

ID: A

39. These are two samples of student work. Are they correct? Explain.

Student A: $\left(3^3 \times 3^4\right)^2 = \left(3^{12}\right)^2 = 3^{14}$

Student B: $\left(3^3 \times 3^4\right)^2 = \left(3^7\right)^2 = 3^{14}$

40. Simplify, then evaluate. Show your work.

$$\frac{\left(10^2\right)^4 \times \left(5^3\right)^4}{\left(5^4\right)^2 \times \left(10^2\right)^5} \times \frac{\left(10^5\right)^3 \times \left(2^4\right)^3}{\left(2^2\right)^4 \times \left(10^2\right)^2}$$

Unit Two Practice Test: Powers and Exponent Laws

Answer Section

MULTIPLE CHOICE

1. ANS: B PTS: 1 DIF: Easy REF: 2.1 What Is a Power?
LOC: 9.N1 TOP: Number KEY: Conceptual Understanding
2. ANS: B PTS: 1 DIF: Moderate REF: 2.1 What Is a Power?
LOC: 9.N1 TOP: Number KEY: Procedural Knowledge
3. ANS: A PTS: 1 DIF: Easy
REF: 2.2 Powers of Ten and the Zero Exponent LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
4. ANS: B PTS: 1 DIF: Easy
REF: 2.2 Powers of Ten and the Zero Exponent LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
5. ANS: D PTS: 1 DIF: Moderate
REF: 2.2 Powers of Ten and the Zero Exponent LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
6. ANS: A PTS: 1 DIF: Easy
REF: 2.3 Order of Operations with Powers LOC: 9.N1
TOP: Number KEY: Conceptual Understanding
7. ANS: C PTS: 1 DIF: Moderate
REF: 2.3 Order of Operations with Powers LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
8. ANS: D PTS: 1 DIF: Moderate
REF: 2.3 Order of Operations with Powers LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
9. ANS: B PTS: 1 DIF: Easy REF: 2.4 Exponent Laws I
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
10. ANS: A PTS: 1 DIF: Easy REF: 2.4 Exponent Laws I
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
11. ANS: B PTS: 1 DIF: Moderate REF: 2.4 Exponent Laws I
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
12. ANS: C PTS: 1 DIF: Easy REF: 2.5 Exponent Laws II
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
13. ANS: D PTS: 1 DIF: Easy REF: 2.5 Exponent Laws II
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
14. ANS: C PTS: 1 DIF: Moderate REF: 2.5 Exponent Laws II
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
15. ANS: D PTS: 1 DIF: Moderate REF: 2.1 What Is a Power?
LOC: 9.N1 TOP: Number KEY: Conceptual Understanding
16. ANS: B PTS: 1 DIF: Easy
REF: 2.2 Powers of Ten and the Zero Exponent LOC: 9.N1
TOP: Number KEY: Procedural Knowledge
17. ANS: B PTS: 1 DIF: Moderate
REF: 2.3 Order of Operations with Powers LOC: 9.N1
TOP: Number KEY: Procedural Knowledge

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|------------|-------------|-------------------------------|---------------------------|
| 18. ANS: B | PTS: 1 | DIF: Moderate | REF: 2.4 Exponent Laws I |
| LOC: 9.N2 | TOP: Number | KEY: Procedural Knowledge | |
| 19. ANS: B | PTS: 1 | DIF: Moderate | REF: 2.4 Exponent Laws I |
| LOC: 9.N2 | TOP: Number | KEY: Procedural Knowledge | |
| 20. ANS: A | PTS: 1 | DIF: Easy | REF: 2.5 Exponent Laws II |
| LOC: 9.N2 | TOP: Number | KEY: Procedural Knowledge | |
| 21. ANS: B | PTS: 1 | DIF: Moderate | REF: 2.5 Exponent Laws II |
| LOC: 9.N2 | TOP: Number | KEY: Conceptual Understanding | |

SHORT ANSWER

22. ANS:
Base: -8
Exponent: 4
- PTS: 1 DIF: Easy REF: 2.1 What Is a Power?
LOC: 9.N1 TOP: Number KEY: Conceptual Understanding
23. ANS:
 $704\,065 = (7 \times 10^5) + (4 \times 10^3) + (6 \times 10^1) + (5 \times 10^0)$
- PTS: 1 DIF: Moderate REF: 2.2 Powers of Ten and the Zero Exponent
LOC: 9.N1 TOP: Number KEY: Procedural Knowledge
24. ANS:
43
- PTS: 1 DIF: Moderate REF: 2.3 Order of Operations with Powers
LOC: 9.N1 TOP: Number KEY: Procedural Knowledge
25. ANS:
 $(-2)^6 = 64$
- PTS: 1 DIF: Moderate REF: 2.4 Exponent Laws I
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
26. ANS:
 $\left(\frac{2^2}{8^0}\right)^3 = \left(\frac{2^2}{1}\right)^3 = 2^6 = 64$
- PTS: 1 DIF: Moderate REF: 2.5 Exponent Laws II
LOC: 9.N2 TOP: Number KEY: Procedural Knowledge
27. ANS:
Divide 8 by -2
- PTS: 1 DIF: Easy REF: 2.3 Order of Operations with Powers
LOC: 9.N1 TOP: Number KEY: Conceptual Understanding

28. ANS:

a) $3^2 + 4 \times (5 - 2^2) = 13$

b) $(3^2 + 4) \times 5 - 2^2 = 61$

PTS: 1

DIF: Moderate

REF: 2.3 Order of Operations with Powers

LOC: 9.N1

TOP: Number

KEY: Problem-Solving Skills

29. ANS:

$(-2)^2 = 4$

PTS: 1

DIF: Moderate

REF: 2.4 Exponent Laws I

LOC: 9.N2

TOP: Number

KEY: Procedural Knowledge

30. ANS:

$11^3 \times (-12)^3 \times 13^3$

PTS: 1

DIF: Easy

REF: 2.5 Exponent Laws II

LOC: 9.N2

TOP: Number

KEY: Procedural Knowledge

31. ANS:

$$\frac{(2^4)^3 \times (2^2)^4}{(2^2 \times 2^6)^2} = \frac{2^{20}}{2^{16}} = 2^4 = 16$$

PTS: 1

DIF: Moderate

REF: 2.5 Exponent Laws II

LOC: 9.N2

TOP: Number

KEY: Procedural Knowledge

32. ANS:

$$(4^9 \div 4^6)^2 - (2^8 \div 2^6)^2 = (4^3)^2 - (2^2)^2 = 4^6 - 2^4 = 4080$$

PTS: 1

DIF: Moderate

REF: 2.5 Exponent Laws II

LOC: 9.N2

TOP: Number

KEY: Procedural Knowledge

PROBLEM

33. ANS:

$$\begin{aligned} 5(3)^3 - 3(-5)^3 &= 5 \times 27 - 3 \times (-125) \\ &= 135 + 375 \\ &= 510 \end{aligned}$$

PTS: 1

DIF: Difficult

REF: 2.1 What Is a Power?

LOC: 9.N1

TOP: Number

KEY: Problem-Solving Skills

34. ANS:

Each person is to be given 10 L of safe drinking water.

$$1 \text{ billion} \times 10 \text{ L} = 1\,000\,000\,000 \times 10$$

$$= 10\,000\,000\,000$$

$$= 1 \times 10^{10} \text{ L}$$

$$1 \times 10^{10} \text{ L} = 10\,000\,000\,000 \text{ L}$$

The amount of water required is about 1×10^{10} L, or 10 000 000 000 L.

PTS: 1

DIF: Moderate

REF: 2.2 Powers of Ten and the Zero Exponent

LOC: 9.N1

TOP: Number

KEY: Problem-Solving Skills | Communication

35. ANS:

$$\frac{(10)^2 - (4)^2}{(6)^2 - 2(2)^2}$$

$$= \frac{100 - 16}{36 - 8}$$

$$= \frac{84}{28}$$

$$= 3$$

PTS: 1

DIF: Moderate

REF: 2.3 Order of Operations with Powers

LOC: 9.N1

TOP: Number

KEY: Problem-Solving Skills | Communication

36. ANS:

Errors:

The exponents should be added and subtracted, not multiplied and divided.

The result of 3^2 is 3×3 , not 3×2 .

Correction:

$$3^3 \times 3^4 \div 3^6$$

$$= 3^{3+4-6}$$

$$= 3^1$$

$$= 3$$

PTS: 1

DIF: Difficult

REF: 2.4 Exponent Laws I

LOC: 9.N2

TOP: Number

KEY: Problem-Solving Skills | Communication

37. ANS:

Errors:

In line 1, the exponents of 3 should be added instead of multiplied.

In line 3, the exponents of 3 should be multiplied instead of added.

Correction:

$$\begin{aligned} (3^2 \times 3^3)^2 &= (3^{2+3})^2 \\ &= (3^5)^2 \\ &= 3^{5 \times 2} \\ &= 3^{10} \\ &= 59\,049 \end{aligned}$$

PTS: 1

DIF: Moderate

REF: 2.5 Exponent Laws II

LOC: 9.N2

TOP: Number

KEY: Problem-Solving Skills | Communication

38. ANS:

a) Replace $\square$ with a “-” sign.

b) Replace $\square$ with a “+” sign.

c) $-(\square 8)^{12}$ is always negative.

d) Replace $\square$ with a “-” sign.

Not all products can be made positive.

In part c, there is an even number of factors in the power $(\square 8)^{12}$.

$(\square 8)^{12}$ is always positive, which means $-(\square 8)^{12}$ is always negative.

PTS: 1

DIF: Difficult

REF: 2.1 What Is a Power?

LOC: 9.N1

TOP: Number

KEY: Problem-Solving Skills | Communication

39. ANS:

Both final answers are correct but the method Student A used is wrong.

When two powers of 3, 3^3 and 3^4 , are multiplied, the exponents 3 and 4 should be added.

When a power of 3, 3^{12} , is raised to the exponent 2, the exponents 12 and 2 should be multiplied.

PTS: 1

DIF: Moderate

REF: 2.5 Exponent Laws II

LOC: 9.N2

TOP: Number

KEY: Communication

40. ANS:

$$\begin{aligned}
 & \frac{(10^2)^4 \times (5^3)^4}{(5^4)^2 \times (10^2)^5} \times \frac{(10^5)^3 \times (2^4)^3}{(2^2)^4 \times (10^2)^6} = \frac{10^8 \times 5^{12}}{5^8 \times 10^{10}} \times \frac{10^{15} \times 2^{12}}{2^8 \times 10^{12}} \\
 & = \frac{10^{(8+15)} \times 5^{12} \times 2^{12}}{10^{(10+12)} \times 5^8 \times 2^8} \\
 & = \frac{10^{23} \times 5^{12} \times 2^{12}}{10^{22} \times 5^8 \times 2^8} \\
 & = 10^1 \times 5^4 \times 2^4 \\
 & = 10 \times 625 \times 16 \\
 & = 100\,000
 \end{aligned}$$

PTS: 1
 LOC: 9.N2

DIF: Difficult
 TOP: Number

REF: 2.5 Exponent Laws II
 KEY: Problem-Solving Skills