KIDSLEARN MATH · PRACTICE ASSIGNMENT

Exponents, Powers & Roots

Name: Date: Score: / 50

Work without a calculator. Give answers that are not whole numbers as fractions in lowest terms, and roots in simplest radical form when asked. Answers are at the end.

Part A — Warm-up

1. Evaluate 12^2.

2. Evaluate 2^8.

3. Evaluate 8^3.

4. What is 10 to the power 3? (Work out 10^3.)

5. Write $a \times a \times a \times a$ as a power of a. What is the exponent?

6. Which is larger: 6^3 or 3^6?

(A) 6^3 (B) 3^6 (C) They are equal

7. Which is larger: 6^4 or 4^6?

(A) 6^4 (B) 4^6 (C) They are equal

8. Which positive whole number, multiplied by itself, gives 25?

9. Evaluate $\sqrt{25} + \sqrt{49}$.

10. Evaluate $\sqrt{9} + \sqrt{25}$.

11. A square garden has an area of 25 m². How long is each side?

12. Find $\sqrt[3]{216}$.

13. Find $\sqrt[3]{-64}$.

14. Find $\sqrt[3]{64}$.

15. Find $\sqrt[3]{-729}$.

Part B — Core practice

16. Write $7^{7} \times 7^{9}$ as a single power of 7. What is the exponent?

17. Evaluate $3^{2} \times 3^{3}$.

18. Evaluate $2^{2} \times 2^{4}$.

19. Find the missing exponent: $3^{4} \times 3^{\square} = 3^{13}$.

20. Find the missing exponent: $10^{\square} \div 10^{5} = 10^{3}$.

21. Write $9^{11} \div 9^{3}$ as a single power of 9. What is the exponent?

22. Find the missing exponent: $3^{\square} \div 3^6 = 3^5$.

23. Write $5^7 \div 5^4$ as a single power of 5. What is the exponent?

24. Evaluate $(3^3)^2$.

25. Write $(4^6)^3$ as a single power of 4. What is the exponent?

26. Evaluate $(2^2)^2$.

27. Evaluate $4^3 \times 5^3$ by first writing it as $(4 \times 5)^3$.

28. Evaluate $\left(\frac{3}{2}\right)^{-1}$.

29. Evaluate 10^{-2} as a fraction or decimal.

30. Evaluate 10^{-3} as a fraction or decimal.

31. Which expression is equal to y^{-5}?

(A) $\frac{1}{y^5}$ (B) $\frac{1}{5y}$ (C) $-y^5$ (D) $-5y$

32. Evaluate $32^{1/5}$.

33. Evaluate $9^{1/2}$.

34. Which expression is equal to $a^{1/4}$?

(A) $\frac{a}{4}$ (B) $\sqrt[4]{a}$ (C) a^{-4} (D) $\frac{1}{a^4}$

35. Evaluate $2^4 \times 5^4$.

36. Evaluate $2^6 \times 5^6$.

37. Evaluate $\dfrac{10^5 \times 10^5}{10^9}$.

38. Evaluate $\dfrac{3^2 \times 3^6}{3^7}$.

Part C — Challenge

39. Simplify $\sqrt{54} + \sqrt{216}$.

40. Write $\sqrt{44}$ in simplest radical form.

41. Write $\sqrt{24}$ in simplest radical form.

42. Simplify $\sqrt{24} - \sqrt{54}$.

43. Solve $8^x = 2^1$.

44. Solve $3^{x-4} = 27$.

45. Solve $5^x = \dfrac{1}{5}$.

46. Solve $4^{2x} = 256$.

47. Evaluate $64^{4/3}$.

48. Evaluate $64^{-4/3}$.

49. Evaluate $16^{-3/2}$.

50. Evaluate $64^{-2/3}$.

Answer Key — Exponents, Powers & Roots

1. 144
   $12^2 = 12 \times 12 = 144$.

2. 256
   $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$.

3. 512
   $8^3 = 8 \times 8 \times 8 = 512$.

4. 1000
   $10^3 = 10 \times 10 \times 10 = 1000$.

5. 4
   a is multiplied by itself 4 times, so it is a^4.

6. **(B)** 3^6
   $6^3 = 216$ and $3^6 = 729$. An exponent is not multiplication — 6×3 and 3×6 would be equal, but powers usually are not.

7. **(B)** 4^6
   $6^4 = 1296$ and $4^6 = 4096$. An exponent is not multiplication — 6×4 and 4×6 would be equal, but powers usually are not.

8. 5
   $5 \times 5 = 25$, so the answer is $\sqrt{25} = 5$.

9. 12
   $\sqrt{25} = 5$ and $\sqrt{49} = 7$, so the sum is 12. (It is not $\sqrt{74}$.)

10. 8
    $\sqrt{9} = 3$ and $\sqrt{25} = 5$, so the sum is 8. (It is not $\sqrt{34}$.)

11. 5 **m**
    Side $= \sqrt{25} = 5$ m, because $5^2 = 25$.

12. 6
    $6^3 = 6 \times 6 \times 6 = 216$, so $\sqrt[3]{216} = 6$.

13. -4
    $(-4)^3 = -64$, so $\sqrt[3]{-64} = -4$. A cube root of a negative number is negative.

14. 4
    $4^3 = 4 \times 4 \times 4 = 64$, so $\sqrt[3]{64} = 4$.

15. -9
    $(-9)^3 = -729$, so $\sqrt[3]{-729} = -9$. A cube root of a negative number is negative.

16. 16
    Same base, so add the exponents: $7^{7+9} = 7^{16}$.

17. 243
    $3^2 \times 3^3 = 3^5 = 243$.

18. 64
    $2^2 \times 2^4 = 2^6 = 64$.

19. 9
    Exponents add: $4 + \square = 13$, so $\square = 9$.

20. 8
    Exponents subtract: $\square - 5 = 3$, so $\square = 8$.

21. 8
    Same base, so subtract the exponents: $9^{11-3} = 9^8$.

22. 11
    Exponents subtract: $\square - 6 = 5$, so $\square = 11$.

23. 3
    Same base, so subtract the exponents: $5^{7-4} = 5^3$.

24. 729
    $(3^3)^2 = 3^6 = 729$.

25. 18
    Multiply the exponents: $6 \times 3 = 18$, so 4^{18}.

26. 16
    $(2^2)^2 = 2^4 = 16$.

27. 8000
    $4^3 \times 5^3 = (4 \times 5)^3 = 20^3 = 8000$.

28. $\frac{2}{3}$
    Flip the fraction and make the exponent positive: $\frac{2}{3}$.

29. $\frac{1}{100}$
    $10^{-2} = \dfrac{1}{10^2} = \frac{1}{100} = 0.01$.

30. $\frac{1}{1000}$
    $10^{-3} = \dfrac{1}{10^3} = \frac{1}{1000} = 0.001$.

31. **(A)** $\dfrac{1}{y^5}$
    A negative exponent is a reciprocal, not a negative number: $y^{-5} = \dfrac{1}{y^5}$.

32. 2
    $32^{1/5} = \sqrt[5]{32} = 2$, because $2^5 = 32$.

33. 3
    $9^{1/2} = \sqrt{9} = 3$, because $3^2 = 9$.

34. **(B)** $\sqrt[4]{a}$
A power of $\frac{1}{4}$ is the fourth root: $a^{1/4} = \sqrt[4]{a}$.

35. 10000
$2^4 \times 5^4 = (2 \times 5)^4 = 10^4 = 10000$.

36. 1000000
$2^6 \times 5^6 = (2 \times 5)^6 = 10^6 = 1000000$.

37. 10
Add then subtract the exponents: $5 + 5 - 9 = 1$, so the answer is $10^1 = 10$.

38. 3
Add then subtract the exponents: $2 + 6 - 7 = 1$, so the answer is $3^1 = 3$.

39. $9\sqrt{6}$
$\sqrt{54} = 3\sqrt{6}$ and $\sqrt{216} = 6\sqrt{6}$, so the answer is $9\sqrt{6}$.

40. $2\sqrt{11}$
$44 = 4 \times 11$, so $\sqrt{44} = \sqrt{4} \times \sqrt{11} = 2\sqrt{11}$.

41. $2\sqrt{6}$
$24 = 4 \times 6$, so $\sqrt{24} = \sqrt{4} \times \sqrt{6} = 2\sqrt{6}$.

42. $-\sqrt{6}$
$\sqrt{24} = 2\sqrt{6}$ and $\sqrt{54} = 3\sqrt{6}$, so the answer is $-\sqrt{6}$.

43. $\frac{1}{3}$
Write both sides as powers of 2: $2^{3x} = 2^1$. So $3x = 1$ and $x = \frac{1}{3}$.

44. 7
$27 = 3^3$, so $x - 4 = 3$ and $x = 7$.

45. -1
$\frac{1}{5} = \frac{1}{5^1} = 5^{-1}$, so $x = -1$.

46. 2
$256 = 4^4$, so $2x = 4$ and $x = 2$.

47. 256
Take the cube root first: $\sqrt[3]{64} = 4$. Then $4^4 = 256$.

48. $\frac{1}{256}$
Take the cube root first: $\sqrt[3]{64} = 4$. Then $4^4 = 256$, and the minus sign flips it: $\frac{1}{256}$.

49. $\frac{1}{64}$
Take the square root first: $\sqrt{16} = 4$. Then $4^3 = 64$, and the minus sign flips it: $\frac{1}{64}$.

50. $\frac{1}{16}$
Take the cube root first: $\sqrt[3]{64} = 4$. Then $4^2 = 16$, and the minus sign flips it: $\frac{1}{16}$.