Rational Exponents WORKSHEET

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is equivalent to $(10^3)(10^5)(10^2)$?

a. 1000^{10}
c. 1000^{30}
b. 10^{10}
d. 10^{30}

____ 2. Which of the following is equivalent to $\frac{(t^4)^6}{t^8}$?

a. t^{16}
c. t^3
b. t^2
d. t^{10}

____ 3. Simplify $(b(b^8))^3$.

a. b^{12}
c. b^{24}
b. b^{11}
d. b^{27}

____ 4. What is the expression for 8^6 written as a base 2 power?

a. 2^{24}
c. 2^{18}
b. 2^{10}
d. 2^9

____ 5. Simplify $\left(\left(\frac{3}{2}\right)^2\right)^3$.

a. $\frac{243}{32}$
c. $\frac{6561}{264}$
b. $\frac{27}{8}$
d. $\frac{729}{64}$

____ 6. If 7^n is a perfect square, which of the following could NOT be the value of *n*?

a. 2
c. 6
b. 7
d. 10

____ 7. Which of the following is equivalent to $\frac{1}{9^{-4}}$?

a. $-\frac{1}{36}$
c. -9^4
b. 9^4
d. -36

____ 8. Evaluate $\left(\frac{2}{3}\right)^{-3}$.

a. $\frac{27}{8}$
c. $-\frac{27}{8}$
b. $\frac{8}{27}$
d. $-\frac{8}{27}$

____ 9. Which of the following expressions can be used to show that a number with a zero exponent is equal to 1?

a. 0^1
c. $\frac{8^5}{8^5}$
b. $8 - 8^{-1}$
d. $\left(8 \times \frac{1}{8}\right)^1$

____ 10. Which of the following is equivalent to $\left(\frac{7^{-3}}{(7^4)^5}\right)^2$?

a. $-\frac{1}{7^{34}}$
c. $-\frac{1}{7^{46}}$
b. $\frac{1}{7^{34}}$
d. $\frac{1}{7^{46}}$

____ 11. Simplify so that the expression is a single power with a positive exponent: $\left(\frac{k^4}{k^{-7}}\right)^{-3}$.

a. $\frac{1}{k^{33}}$
c. k^{33}
b. $\frac{1}{k^9}$
d. k^9

____ 12. Determine the value of *h* that makes the following a true statement: $4^h = \frac{1}{256}$.

a. –5
c. $\frac{1}{4}$
b. $\frac{1}{5}$
d. –4

____ 13. Evaluate $6^{-2} + (3^2)^{-1}$.

a. –45
c. $\frac{5}{36}$
b. $\frac{1}{45}$
d. $\frac{1}{12}$

____ 14. Write $27^{\frac{1}{3}}$ in radical form.

a. $\sqrt[3]{3}$
c. $\sqrt[3]{27}$
b. $\sqrt[\frac{1}{3}]{3}$
d. $\sqrt[\frac{1}{3}]{27}$

____ 15. Write $\left(\sqrt{36}\right)^5$ in exponential form.

a. $36^{\frac{5}{2}}$
c. $6^{\frac{2}{5}}$
b. $36^{\frac{2}{5}}$
d. $6^{\frac{5}{2}}$

____ 16. Determine the value of *r* that makes the statement true, to the nearest hundredth: $1.18 = \sqrt[4]{r}$

a. 1.04
c. 0.30
b. 1.94
d. 4.72

____ 17. Simplify and express with positive exponents: $\frac{(c^{\frac{3}{4}})^{-\frac{1}{3}}c}{c^{\frac{1}{2}}}$.

a. $c^{\frac{7}{4}}$
c. $c^{\frac{3}{4}}$
b. $c^{\frac{5}{4}}$
d. $c^{\frac{1}{4}}$

____ 18. Determine the value of *q* for which $q^{-0.25} = \frac{1}{5}$. Round your answer to the nearest thousandth.

a. 0.002
c. 625
b. 3125
d. 1.041

____ 19. Evaluate and express as a fraction or an integer: $(-125)^{-\frac{2}{3}}$.

a. $-\frac{1}{5}$
c. 25
b. –5
d. $\frac{1}{25}$

____ 20. Simplify $\frac{6^{-2}-6^{-1}}{6^{-2}+6^{-1}}$.

a. –1
c. 0
b. $-\frac{5}{7}$
d. $-\frac{4}{3}$

Short Answer

21. Write $\left(\frac{1}{27}\right)^2$ as a base $\left(\frac{1}{3}\right)$ power.

22. Simplify $(5x^3)^2$.

23. For what value(s) of *a* is $\left(\frac{a^5}{a^3}\right)^2$ equal to 256?

24. What can you conclude about the numbers *m* and *n* if $7^m \times 7^n = 7^r$ and *r* is an even number and *m* and *n* are integers?

25. Simplify. Write as a single power: $\frac{(3^4)^3}{3^7(3^2)}$.

26. Simplify: $b^8(b^7)^3$.

27. For what value(s) of *y* is $\frac{(y^2)^3}{y^4}$ equal to 64?

28. Simplify, then evaluate without using a calculator. Write your answer as a fraction or whole number: $\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)^4$.

29. Simplify, and write as a single power with a positive exponent: $\left(\frac{9}{9^{-3}}\right)^3\left(\frac{9^4}{9^{-2}}\right)$.

30. Determine the value of *n* for which $10^n = 0.000\,000\,1$.

31. Simplify and write as a single power with a positive exponent: $\frac{c^{-3}(c^7c^3)^{-1}}{c^{-2}c^8}$.

32. What power of 9 is equivalent to $\left(\frac{1}{3}\right)^6$?

33. Simplify and write as a single power with a positive exponent: $\frac{(12^{-2})^3}{12^{-8}(12^2)}$.

34. Evaluate and leave your answer as a fraction or integer: $2(6^0 - 4^{-3})$.

35. A plant grows by splitting each vine into three vines every 3 months. If the plant starts out with one vine in February, during what month will it split into 27 vines?

36. Determine the value of *y* that makes the following statement true: $3^{2y} = \frac{1}{81}$.

37. Simplify and express with positive exponents: $\dfrac{(n^{\frac{1}{3}})(n^{-3})^{\frac{1}{2}}n}{n^{\frac{3}{4}}}$.

38. Let x and a be positive numbers, with x greater than one. If x^a is less than x, what type of number is a?

39. Express $121^{0.2}$ in two other forms, without simplifying.

40. Find the value of T for which $3.044 = (\sqrt[3]{T})^2$. Round your answer to the nearest thousandth.

41. Simplify, and express using positive exponents: $\left((w^{-12})^{-\frac{1}{3}}\right)^{\frac{3}{4}}$.

42. Evaluate, and express your answer as a fraction or integer: $\left(\dfrac{64^{-\frac{1}{3}}}{8^{\frac{1}{3}}}\right)^{-2}$.

43. Write $\sqrt[4]{256^3}$ in exponential form.

44. Write $(216)^{\frac{2}{3}}$ in radical form.

45. Write $\sqrt{10000} \times \sqrt[3]{100} \times \sqrt[5]{1000}$ in exponential form. Express the simplified result as a power of 10 with a rational exponent