Exponents & Roots Practice Questions

NO CALCULATOR IS PERMITTED ON ANY OF THESE QUESTIONS.

1. Which of the following is equal to $x^{\frac{4}{3}}$, for all values of x?

(A) $\sqrt[3]{x^{\frac{1}{4}}}$

(B) $\sqrt[3]{x^4}$

(C) $\sqrt[4]{x^3}$

(D) $\sqrt[4]{x^{\frac{1}{3}}}$

$$\sqrt{16x^2}$$

2. If $x > 0$, which of the following is equivalent to the given expression?

(A) $4x$

(B) $4x^2$

(C) $8x$

(D) $32x$

3. FREE RESPONSE: If $q^{\frac{g}{3}} = 81$ for positive integers q and g, what is one possible value of g?

4. Which of the following is equivalent to $4^{\frac{3}{4}}$?

(A) 3

(B) $2\sqrt{2}$

(C) $2\sqrt[4]{4}$

(D) $4\sqrt[3]{4}$

5. If $n^{-\frac{2}{3}} = p$, where $n > 0$, what is n in terms of p?

(A) $-\frac{2}{3}p$

(B) $-\sqrt[3]{p^2}$

(C) $\frac{1}{\sqrt{p^3}}$

(D) $-\frac{1}{\sqrt[3]{p^2}}$

6. FREE RESPONSE: If $x^{\frac{n-3}{2.5}} = 1$ and $x \neq 0$, what is the value of n?

7. The expression $\dfrac{x^{-\frac{3}{2}}y^{\frac{2}{3}}}{x^{\frac{3}{2}}y^{-\frac{1}{6}}}$, where $x>1$ and $y>1$, is equivalent to which of the following?

(A) $\sqrt{y}$

(B) $\dfrac{\sqrt[6]{y^5}}{x^3}$

(C) $\dfrac{\sqrt[9]{y}}{\sqrt[4]{x^9}}$

(D) $\dfrac{\sqrt[4]{xy}}{xy}$

8. If $2x+y=4$, what is the value of $\dfrac{9^x}{3^{-y}}$?

(A) 3^4

(B) 3^8

(C) 9^6

(D) The value cannot be determined from the information given.

9. If $\dfrac{n^{b^4}}{n^{a^4}}=n^{24}$ and $a+b=4$, what is the value of $a-b$?

(A) -6

(B) -4

(C) 4

(D) 6

10. The expression $\dfrac{(x^{\frac{2}{3}}y^{-\frac{3}{2}})^{-\frac{5}{6}}}{\sqrt[3]{x^{-\frac{3}{2}}y^{\frac{5}{6}}}}$, where $x\neq 0$ and $y\neq 0$, is equivalent to which of the following?

(A) $\sqrt[9]{\dfrac{1}{x^6y^{22}}}$

(B) $\dfrac{1}{x^{\frac{13}{24}}y^{\frac{5}{4}}}$

(C) $(xy)^{\frac{55}{12}}$

(D) $\sqrt[36]{\dfrac{y^{35}}{x^2}}$

Exponential Growth & Decay Practice Questions

YOU MAY USE A CALCULATOR FOR ALL OF THE FOLLOWING PRACTICE PROBLEMS.

1. When a certain concert hall was opened, its first performance had an audience of 10 people. For each of the next 7 performances, the audience at each performance doubled over the previous performance. If $a(p)$ is a function for the audience size at each concert p performances after opening the concert hall, which of the following statements best describes the function a?

   (A) The function a is a decreasing linear function.

   (B) The function a is an increasing linear function.

   (C) The function a is a decreasing exponential function

   (D) The function a is an increasing exponential function.

2. James is choosing a bank account into which he will make an initial deposit of $350. Of the following four types of bank account, which choice would yield exponential growth of the money in the account?

   (A) At the end of each year, $35 is added to the value of the account.

   (B) At the end of each year, 3.5% of the original deposit is added to the value of the account.

   (C) At the end of each year, 3.5% of the current value is added to the value of the account.

   (D) At the end of each year, 3.5% of the original deposit and $35 is added to the value of the account.

Time (Years)	Value (Dollars)
0	8100
2	2700
4	900
6	300
8	100

3. The value of an investment over time is shown in the table above. Which of the following best describes the relationship between time and the value of the investment?

   (A) Exponential Decay

   (B) Exponential Growth

   (C) Increasing Linear

   (D) Decreasing Linear

4. Dan modeled the growth of a colony of bacterial organisms he was studying in Biology class. He estimated the colony began with 440 bacterial organisms and had a 3% daily increase in the number of bacterial organisms every day thereafter. Which of the following functions models $B(d)$, the number of bacterial organisms in the colony t days after the first day that Dan began tracking the growth of the colony?

(A) $B(d) = 440^{1.03t}$

(B) $B(d) = 440t^{1.03}$

(C) $B(d) = 440(1.3)^t$

(D) $B(d) = 440(1.03)^t$

5. FREE RESPONSE: Christian purchased a guitar that had a value of $2000 at the time of purchase. Each year, the value of the guitar is estimated to increase 20% over its value the previous year. The estimated value of the guitar, in dollars, 2 years after purchase can be represented by the expression $2000b$, where b is a constant. What is the value of b?

$$U = 325(1.03)^n$$

6. The equation above models the number of users, U, of a recording studio n years after the studio opens. Which of the following equations models the number of users of the recording studio q quarter years after the studio opens?

(A) $U = 325(1.0075)^{4q}$

(B) $U = 325(1.03)^{\frac{q}{4}}$

(C) $U = 325(1.03)^{4q}$

(D) $U = 325(1.12)^q$

7. A radioactive substance decays at an annual rate of 35%. If the initial amount of the substance is 1.3 kilograms, which of the following functions f models the remaining amount of the substance, in kilograms, t years later?

(A) $f(t) = 1.3(.65)^t$

(B) $f(t) = 1.3(.35)^t$

(C) $f(t) = .35(1.3)^t$

(D) $f(t) = .65(1.3)^t$

$$2{,}000(1+\frac{n}{1{,}200})^{12}$$

8. The expression above gives the amount of money, in dollars, generated in a year by a \$2,000 deposit in a savings account that pays an annual interest rate of $n\%$, compounded monthly. Which of the following expressions shows how much additional money is generated in one year at an interest rate of 6% than an interest rate of 2%?

(A) $2{,}000(1+\frac{6-2}{1{,}200})^{12}$

(B) $2{,}000(1+\frac{\frac{6}{2}}{1{,}200})^{12}$

(C) $2{,}000(1+\frac{6}{1{,}200})^{12}-2{,}000(1+\frac{2}{1{,}200})^{12}$

(D) $\frac{2{,}000(1+\frac{6}{1{,}200})^{12}}{2{,}000(1+\frac{2}{1{,}200})^{12}}$

9. A student starts a business that resells limited-edition shoes online. The student begins with one pair of shoes in stock at the start of Month 1. At the end of each month, the student takes the profits and reinvests them to buy twice as many shoes to sell in the following month. For the next 12 months, the student sells out their entire stock of shoes before the end of the month. Which of the following expressions represents S, the number of individual shoes the student has in stock at the start of month t?

(A) $S=1(2)^{t-1}$

(B) $S=2(2)^{t-1}$

(C) $S=1(2)^{t}$

(D) $S=2(2)^{t}$

10. An urban planner estimates that, starting from the present day, the population of a certain city will decrease by 5% every 15 years. If the present population of the city is 80,000, which of the following expressions represents the urban planner's estimate of the population t years from now?

(A) $80{,}000(.05)^{15t}$

(B) $80{,}000(.95)^{15t}$

(C) $80{,}000(.95)^{\frac{t}{15}}$

(D) $80{,}000(.05)^{\frac{t}{15}}$

11. FREE RESPONSE: Ian made an investment of d dollars on January 1st, 2015. The value of his investment increased by 50% each year until Ian's investment was worth $5,568.75 on January 1st, 2019. What is the value of d?

12. FREE RESPONSE: The population of water bugs in a certain lake is 15,000 on January 1st, 2010. A scientist believes the population will decrease by 14% per month for the next 6 months. The scientist uses the equation $P = 15{,}000(x)^t$ to model the population, P, of water bugs in the lake t months after January 1st, 2010. What value should the scientist use for x?

13. (REFER TO QUESTION #12) To the nearest whole number, what is the predicted population of water bugs in the lake at the end of the six-month period?

Time (Minutes)	Concentration (mg/liter)
0	600
5	438
10	320
15	233
20	170

14. FREE RESPONSE: The concentration in milligrams per liter of a certain substance dissolved in water can be modeled by $C(t) = 600(n)^{\frac{t}{5}}$ as the solution evaporates, where *t* is the number of minutes since the substance was mixed into the water. The table above shows a set of times and concentrations for this solution. If C approximates the values in the table above, what is the value of n, rounded to the nearest tenth?

Polynomial Long Division Practice Questions

DO NOT USE A CALCULATOR ON ANY OF THE FOLLOWING QUESTIONS UNLESS INDICATED.

1. The expression $\frac{x^2-7x+4}{x-3}$ is equivalent to which of the following?

(A) $x+7-\frac{4}{x-3}$

(B) $x-7-\frac{3}{x-3}$

(C) $x+4-\frac{7}{x-3}$

(D) $x-4-\frac{8}{x-3}$

2. Which of the following expressions is equivalent to $\frac{2x^2-6}{x+2}$?

(A) $2x-4+\frac{2}{x+2}$

(B) $2x+4-\frac{6}{x+2}$

(C) $2x-6+\frac{12}{x+2}$

(D) $2x+6+\frac{4}{x+2}$

3. If $x \neq -2$, which of the following expressions is equivalent to $\frac{x^2+4x+4}{x+2}$?

(A) $x+2$

(B) $x+4$

(C) $x+2+\frac{4}{x+2}$

(D) $x+2x+\frac{4}{x+2}$

4. (CALCULATOR) The expression $\frac{7x^2-9x-12}{x-7}$ is equivalent to which of the following?

(A) $7x-7+\frac{37}{x-7}$

(B) $7x-9+\frac{51}{x-7}$

(C) $7x+40+\frac{268}{x-7}$

(D) $7x+58+\frac{406}{x-7}$

5. Which of the following expressions is equivalent to $\frac{12x^2-8x+8}{x+2}$?

(A) $12x+32-\frac{72}{x+2}$

(B) $12x-32+\frac{72}{x+2}$

(C) $12x+32+\frac{56}{x+2}$

(D) $12x-32-\frac{56}{x+2}$

6. The expression $\frac{x^3-x^2-x-1}{x+1}$ is equivalent to which of the following?

(A) $x^2+1-\frac{2}{x+1}$

(B) $x^2-1-\frac{4}{x+1}$

(C) $x^2-2x+1-\frac{2}{x+1}$

(D) $x^2-2x+3-\frac{4}{x+1}$

7. (CALCULATOR) Which of the following expressions is equivalent to $\frac{9x^3-18x^2+6x-12}{x+3}$?

(A) $9x^2+9x-21-\frac{75}{x+3}$

(B) $9x^2+9x+33-\frac{111}{x+3}$

(C) $9x^2+45x-141-\frac{423}{x+3}$

(D) $9x^2-45x+141-\frac{435}{x+3}$

8. (CALCULATOR) The expression $\frac{3x^4-2x^3+9x^2-4x+8}{x-3}$ is equivalent to which of the following?

(A) $3x^3-2x^2+9x-4+\frac{8}{x-3}$

(B) $3x^3+7x^2+30x+86+\frac{266}{x-3}$

(C) $3x^3-7x^2+12x-16+\frac{56}{x-3}$

(D) $3x^3-2x^2+11x-15+\frac{53}{x-3}$