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8th Grade Exponents Worksheets

Questions

Q1. Simplify the following:

a. -3^3

b. $\left(\frac{3x}{2y}\right)^3$

Q2. Simplify the following:

a. $\left(3^0-5^0\right)\div\left(4^0+2^0\right)$

b. $x^0\times y^0$

Q3. Simplify the following and express the answer in terms of positive exponent.

a. $((-3)^2)^3$

b. $\left(\left(-\frac{2}{5}\right)^3\right)^{-2}$

Q4. The revenue function of a retail store is modelled by the equation $R=0.3x^3+5$ (in hundreds of dollars), where x is the number of years after it is opened. Find the revenue earned in 5 years.

Q5. Simplify the following and express the answer as an exponent.

a. $\left(\frac{1}{3}\right)^5 \cdot \left(\frac{1}{7}\right)^5$

b. $\left(\frac{1}{2}\right)^5 \cdot \left(\frac{1}{2}\right)^7$

Q6. Use the properties of exponents to simplify the following. Write the answers in terms of positive exponents.

a. $(-3)^5 \div (-3)^8$

b. $\left(2^{-7} \div 2^{-10}\right) \times 2^{-5}$

Q7. Simplify the following using multiple properties of exponents and express the answer as a number.

$$\frac{(-5)^7}{(-5)^2} \cdot \frac{(-5)^3}{(-5)^8}$$

Q8. Simplify the following using properties of exponent and express your answer as an exponent.

$$\frac{z^5 \cdot z^2}{z^6} \cdot \frac{z^5}{z^2} \cdot \frac{z^{-1}}{z^{-2}}$$

Q9. Find the value of x that satisfies the equation

$$\frac{7^{4x}}{7^{3x+1}} = 7^{-9}$$

.

Q10. If the mass of each sand grain is about 10^{-4} grams., then how many sand grains a bag of 1 kg of sand can have?

Q11. Which of the following is equivalent to $\left(a^{-2}+b^{-2}\right)^{-1}$?

a. $\frac{1}{a^2+b^2}$

b. $\frac{1}{a^2}+\frac{1}{b^2}$

c. a^2+b^2

d. $\frac{a^2b^2}{a^2+b^2}$

Q12. Write the following in scientific notation.

a. 0.0000044

b. $25{,}000{,}000$

Q13. Simplify the following and express the answer in scientific notation.

$$\left(3.2\times10^{7}\right)\times\left(7.5\times10^{-3}\right)$$

Q14. The dimensions of a rectangular field are $8.1\times10^{3}\ \text{cm}$ and $2.8\times10^{5}\ \text{cm}$. Find its area and express the answer in scientific notation.

Q15. Solve the following equation for x.

$$\left(\frac{1}{4}\right)^{5}\cdot\left(\frac{1}{4}\right)^{-x}=\frac{1}{1024}$$

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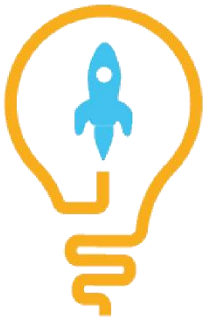
ANSWERS

1(a) -27 1(b) $\frac{27x^3}{8y^3}$	2(a) 0 2(b) 1	3(a)3^6 3(b)$(5/2)^6$
4)42.5 hundreds of dollars	5(a)$(1/21)^5$ 5(b)$(1/2)^{12}$	6(a)(-1/27) 6(b)(1/4)
7) 1	8) z^5	9) x = -8
10)10^7	11)Option d)	12(a)4.4×10^{-6} 12(b)2.5×10^7
13)2.4×10^5	14)2.268×10^9	15)0



SOLUTIONS

Complete solution/explanation

1. Simplify the following:

a) -3^3

b) $\left(\frac{3x}{2y}\right)^3$

Solution a): $-3^3 = -3 \times 3 \times 3 = -27$

Solution b): $\left(\frac{3x}{2y}\right)^3 = \frac{3x}{2y} \times \frac{3x}{2y} \times \frac{3x}{2y} = \frac{27x^3}{8y^3}$

2. Simplify the following:

a. $\left(3^0 - 5^0\right) \div \left(4^0 + 2^0\right)$

b. $x^0 \times y^0$

Solution a: We know that $a^0 = 1$, for every a.

$$\left(3^0 - 5^0\right) \div \left(4^0 + 2^0\right) = (1-1) \div (1+1)$$
$$= \frac{0}{2}$$
$$= 0$$

Solution b: $x^0 \times y^0 = 1 \times 1 = 1$

3. Simplify the following and express the answer in terms of positive exponent.

a. $((-3)^2)^3$

b. $\left(\left(-\frac{2}{5}\right)^3\right)^{-2}$

Solution a): Here, we use the property $(a^m)^n = a^{mn}$.

$$\left((-3)^2\right)^3 = (-3)^6 = (-1)^6(3)^6 = (1)3^6 = 3^6$$

Solution b): We use different properties of exponents here.

$$\left(\left(-\frac{2}{5}\right)^3\right)^{-2} = \left(-\frac{2}{5}\right)^{-6} \left[\because (a^m)^n = a^{mn}\right]$$

$$= (-1)^{-6} \cdot \left(\frac{2}{5}\right)^{-6}$$

$$= \frac{1}{(-1)^6} \cdot \left(\frac{5}{2}\right)^6 \left[\because a^{-m} = \frac{1}{a^m}\right]$$

$$= \left(\frac{5}{2}\right)^6$$

4. The revenue function of a retail store is modelled by the equation $R = 0.3x^3 + 5$ (in hundreds of dollars), where x is the number of years after it is opened. Find the revenue earned in 5 years.

Solution : Here, $x = 5$.

The revenue earned in 5 years is obtained by substituting $x = 5$ in the given equation.

$R = 0.3(5)^3 + 5 = 0.3(125) + 5 = 37.5 + 5 = 42.5$ hundreds of dollars.

5. Simplify the following and express the answer as an exponent.

a. $\left(\frac{1}{3}\right)^5 \cdot \left(\frac{1}{7}\right)^5$

b. $\left(\frac{1}{2}\right)^5 \cdot \left(\frac{1}{2}\right)^7$

Solution a): We use the properties of exponents to solve this.

$$\left(\frac{1}{3}\right)^5 \cdot \left(\frac{1}{7}\right)^5 = \left(\frac{1}{3} \cdot \frac{1}{7}\right)^5 \left[\because a^m \cdot b^m = (ab)^m\right]$$

$$= \left(\frac{1}{21}\right)^5$$

$$= \frac{1}{21^5} \left[\because \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right]$$

Solution b): We use the product property of exponents to solve this.

$$\left(\frac{1}{2}\right)^5 \cdot \left(\frac{1}{2}\right)^7 = \left(\frac{1}{2}\right)^{5+7} = \left(\frac{1}{2}\right)^{12}$$

6. Use the properties of exponents to simplify the following. Write the answers in terms of positive exponents.

a. $(-3)^5 \div (-3)^8$

b) $\left(2^{-7} \div 2^{-10}\right) \times 2^{-5}$

Solution a): By using the properties of exponents,

$$(-3)^5 \div (-3)^8 = (-3)^{5-8} \left[\because \frac{a^m}{a^n} = a^{m-n}\right]$$

$$= (-3)^{-3}$$

$$= \frac{1}{(-3)^3} \left[\because a^{-m} = \frac{1}{a^m}\right]$$

$$= \frac{1}{-27}$$

$$= -\frac{1}{27}$$

Solution b): By using the properties of exponents,

$$\left(2^{-7} \div 2^{-10}\right) \times 2^{-5} = (2^{-7-(-10)}) \times 2^{-5} \left[\because \frac{a^m}{a^n} = a^{m-n}\right]$$

$$= 2^3 \times 2^{-5}$$

$$= 2^{3-5} \left[\because a^m \cdot a^n = a^{m+n}\right]$$

$$= 2^{-2}$$

$$= \frac{1}{2^2} \left[\because a^{-m} = \frac{1}{a^m}\right]$$

7. Simplify the following using multiple properties of exponents and express the answer as a number.

$$\frac{(-5)^7}{(-5)^2} \cdot \frac{(-5)^3}{(-5)^8}$$

Solution :

$$\frac{(-5)^7}{(-5)^2}\cdot\frac{(-5)^3}{(-5)^8} = (-5)^{7-2}\cdot(-5)^{3-8}\left[\because \frac{a^m}{a^n}=a^{m-n}\right]$$

$$= (-5)^5\cdot(-5)^{-5}$$

$$= (-5)^{5-5}[\because a^m\cdot a^n = a^{m+n}]$$

$$= (-5)^0$$

$$= 1[\because a^0 = 1]$$

8. Simplify the following using properties of exponent and express your answer as an exponent.

$$\frac{z^5\cdot z^2}{z^6}\cdot\frac{z^5}{z^2}\cdot\frac{z^{-1}}{z^{-2}}$$

Solution :

$$\frac{z^5\cdot z^2}{z^6}\cdot\frac{z^5}{z^2}\cdot\frac{z^{-1}}{z^{-2}} = \frac{z^{5+2+5-1}}{z^{6+2-2}}[\because a^m\cdot a^n = a^{m+n}]$$

$$= \frac{z^{11}}{z^6}$$

$$= z^{11-6}\left[\because \frac{a^m}{a^n}=a^{m-n}\right]$$

$$= z^5$$

9. Find the value of x that satisfies the equation $\frac{7^{4x}}{7^{3x+1}} = 7^{-9}$.

Solution :

$$\frac{7^{4x}}{7^{3x+1}} = 7^{-9}$$

$$7^{4x-(3x+1)} = 7^{-9}\left[\because \frac{a^m}{a^n}=a^{m-n}\right]$$

$$7^{x-1} = 7^{-9}$$

$$x-1 = -9[\because \text{The bases are same on both sides}]$$

$$x = -8[\because 1 \text{ is added on both sides}]$$

10. If the mass of each sand grain is about 10^{-4} grams., then how many sand grains a bag of 1 kg of sand can have?

Solution :

The mass of each sand grain = 10^{-4} grams.

Let there are x number of sand grains in 1 kg (=10^3 grams) of sand. Then,

$$10^{-4}x = 10^3$$

$$x = \frac{10^3}{10^{-4}}$$

$$x = 10^{3-(-4)} \left[\because \frac{a^m}{a^n} = a^{m-n}\right]$$

$$x = 10^7$$

11. Which of the following is equivalent to $\left(a^{-2}+b^{-2}\right)^{-1}$?

a) $\frac{1}{a^2+b^2}$

a. $\frac{1}{a^2}+\frac{1}{b^2}$

b. a^2+b^2

c. $\frac{a^2b^2}{a^2+b^2}$

Solution :

$$\left(a^{-2}+b^{-2}\right)^{-1} = \left(\frac{1}{a^2}+\frac{1}{b^2}\right)^{-1} \left[\because a^{-m}=\frac{1}{a^m}\right]$$

$$= \left(\frac{a^2+b^2}{a^2b^2}\right)^{-1} \text{[The fractions are added]}$$

$$= \frac{a^2b^2}{a^2+b^2} \left[\because a^{-m}=\frac{1}{a^m}\right]$$

Thus, the answer is d).

12. Write the following in scientific notation.

a. 0.0000044

b. $25{,}000{,}000$

Solution a): $0.0000044 = 4.4\times10^{-6}$ (as we have moved the decimal 6 times to right)

Solution b): $25{,}000{,}000 = 25000000.0 = 2.5\times10^{7}$ (as we have moved the decimal 7 times to left)

13. Simplify the following and express the answer in scientific notation.

$$\left(3.2\times10^{7}\right)\times\left(7.5\times10^{-3}\right)$$

Solution :

$$\left(3.2\times10^{7}\right)\times\left(7.5\times10^{-3}\right) = (3.2\times7.5)\times(10^{7}\times10^{-3})$$

$$= 24\times10^{4} \left[\because a^m\times a^n = a^{m+n}\right]$$

$$= 2.4\times10^{5}$$

14. The dimensions of a rectangular field are 8.1×10^3 cm and 2.8×10^5 cm. Find its area and express the answer in scientific notation.

Solution :

The area of a rectangle is the product of its dimensions.

$$\begin{aligned}\text{Area} &= (8.1\times10^3)\times(2.8\times10^5)\\ &= (8.1\times2.8)\times(10^3\times10^5)\\ &= 22.68\times10^8\\ &= 2.268\times10^9\end{aligned}$$

15. Solve the following equation for x.

$$\left(\frac{1}{4}\right)^5\cdot\left(\frac{1}{4}\right)^{-x}=\frac{1}{1024}$$

Solution :

$$\left(\frac{1}{4}\right)^5\cdot\left(\frac{1}{4}\right)^{-x}=\frac{1}{1024}$$

$$\left(\frac{1}{4}\right)^{5-x}=\frac{1}{4^5}\left[\because 4^5=1024\right]$$

$$\left(\frac{1}{4}\right)^{5-x}=\left(\frac{1}{4}\right)^5$$

$$5-x=5[\because \text{Bases are same on both sides}]$$

$$5-5=x$$

$$x=0$$

FUN FACT

1. If you raise zero to any number, it will still be zero.
2. The first time exponents was used was way back in the 15th century.
3. Robert Recorde took it further in the next century and developed the exponents system