



CREST Mathematics Olympiad (CMO) Worksheet *for* Class 7



Topic

Exponents and Powers



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Worksheet on Exponents and Powers

1. Evaluate the following expression using laws of expression:

$$\frac{5^2 \times 7^3 \times 11^3 \times 7^2}{2^2 \times 11 \times 7^5 \times 5^{-4}}$$

- a. $2^{-2} \times 5^6 \times 7^2 \times 11^4$
b. $2^{-2} \times 7^2 \times 11^4$
c. $2^{-2} \times 5^6 \times 11^4$
d. $2^{-5} \times 5^6 \times 7^2 \times 11^4$
2. Which is the following numerical expression in scientific notation “A single drop of water has 602300000000000000000 molecules.”?

- a. 6.023×10^{19} molecules
b. 6.023×10^{21} molecules
c. 6.023×10^{22} molecules
d. 6.023×10^{23} molecules

3. What is the value of “a” in the given equation?

$$(2023^{11})^a \div (2023^7)^a = (2023)^{108}$$

- a. 21
b. 23
c. 27
d. 29

4. What is the value of n in the following equation?

$$\left(\frac{-0.3}{0.5}\right)^n = -\frac{27}{125}$$

- a. -3
b. 3
c. -5
d. 5

5. Simplify the following expression using laws of exponents:

$$(-1)^{199} \times [(243)^3 \div (27)^4]$$

- a. -27
- b. 2
- c. -81
- d. 81

Answer Key

1. c - $2^{-2} \times 5^6 \times 11^4$

Explanation: Using laws of exponents,



$$\begin{aligned} & \frac{5^2 \times 7^3 \times 7^2 \times 11^5}{2^2 \times 11 \times 7^5 \times 5^{-4}} \\ &= \frac{5^2 \times 7^3 \times 7^2 \times 11^5}{2^2 \times 11 \times 7^5 \times 5^{-4}} \\ &= \frac{5^2 \times 7^{3+2} \times 11^5}{2^2 \times 11 \times 7^5 \times 5^{-4}} \\ &= \frac{5^2 \times 7^5 \times 11^5}{2^2 \times 11 \times 7^5 \times 5^{-4}} \\ &= 2^{-2} \times 5^{2 - (-4)} \times 7^{5-5} \times 11^{5-1} \\ &= 2^{-2} \times 5^{2+4} \times 7^0 \times 11^4 \\ &= 2^{-2} \times 5^6 \times 1 \times 11^4 \\ &= 2^{-2} \times 5^6 \times 11^4 \end{aligned}$$

2. c - 6.023×10^{22} molecules

Explanation:



A single drop of water contains molecules = 6023000000000000000000

$$\begin{aligned} &= 6023 \times 10^{19} \\ &= \frac{6023 \times 1000}{1000} \times 10^{19} \\ &= 6.023 \times 10^3 \times 10^{19} \\ &= 6.023 \times 10^{22} \text{ molecules} \end{aligned}$$

3. c - 27

Explanation: Using laws of exponents,

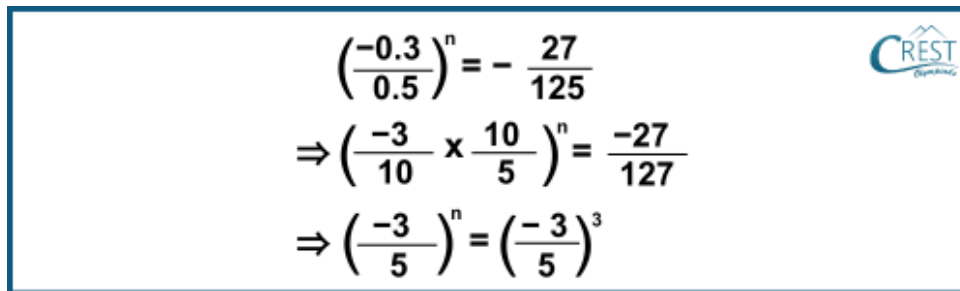
$$\begin{aligned}(2023^{11})^a \div (2023^7)^a &= (2023)^{108} \\ \Rightarrow (2023)^{11 \times a} \div (2023)^{7 \times a} &= (2023)^{108} \\ \Rightarrow (2023)^{11a} \div (2023)^{7a} &= (2023)^{108} \\ \Rightarrow (2023)^{11a - 7a} &= (2023)^{108} \\ \Rightarrow (2023)^{4a} &= (2023)^{108}\end{aligned}$$

Comparing both sides

$$\begin{aligned}\Rightarrow 4a &= 108 \\ \Rightarrow a &= 108/4 \\ \Rightarrow a &= 27\end{aligned}$$

4. b - 3

Explanation: Using laws of exponents,


$$\begin{aligned}\left(\frac{-0.3}{0.5}\right)^n &= -\frac{27}{125} \\ \Rightarrow \left(\frac{-3}{10} \times \frac{10}{5}\right)^n &= \frac{-27}{125} \\ \Rightarrow \left(\frac{-3}{5}\right)^n &= \left(\frac{-3}{5}\right)^3\end{aligned}$$

Comparing both sides

$$\Rightarrow n = 3$$

5. a - -27

Explanation: Using laws of exponents,

$$\begin{aligned}(-1)^{199} \times [(243)^3 \div (27)^4] \\ = (-1) \times [(3^5)^3 \div (3^3)^4] & \quad [(-1)^{\text{odd}} = -1] \\ = (-1) \times [3^{15} \div 3^{12}] \\ = (-1) \times [3^{15-12}] \\ = (-1) \times [3^3] \\ = (-1) \times 27 \\ = -27\end{aligned}$$

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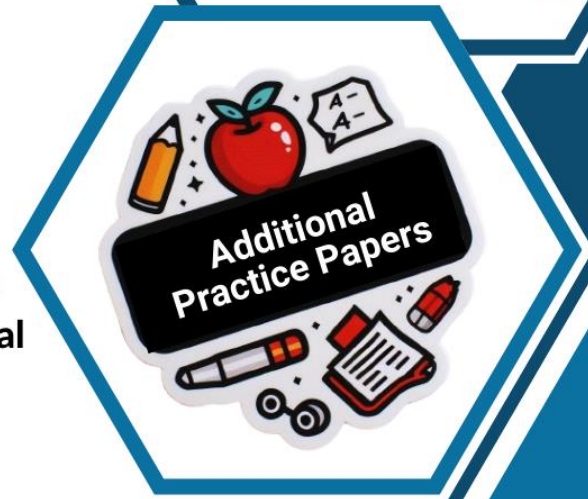
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