



Topic/Objective: AGS 2 Module 3.1

Name: Key

Properties of Exponents

Period:

Date:

Essential Question: When simplifying, when do you add, subtract, and multiply exponents?

Questions:

Properties of Exponents:

Rule: $x^a \cdot x^b = x^{a+b}$

$$1. \underline{3^2} \cdot \underline{3^5} = 3^{2+5} = 3^7 = \textcircled{2187}$$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^7$$

Rule: $(x^a)^b = x^{a \cdot b}$

$$3. \underline{(3^2)^5} = 3^{2 \cdot 5} = 3^{10} = \textcircled{59049}$$

$$(3^2)(3^2)(3^2)(3^2)(3^2) =$$

$$(3 \cdot 3)(3 \cdot 3)(3 \cdot 3)(3 \cdot 3)(3 \cdot 3) = \textcircled{3^{10}}$$

$$4. (x^4)^{10} = x^{4 \cdot 10} = \textcircled{x^{40}}$$

$$(x^4)(x^4) \dots$$

Rule: $(xy)^a = x^a \cdot y^a$

$$5. (2 \cdot 3)^4 = \textcircled{2^4 \cdot 3^4}$$

$$6. (xy)^4 = \textcircled{x^4 y^4}$$

ex) $(2x)^3$
 $2^3 x^3$
 $\textcircled{8x^3}$

Rule: $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}, y \neq 0$

$$7. \left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{8}{27}$$

$$\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right) = \frac{2^3}{3^3}$$

$$8. \left(\frac{x}{y}\right)^3 = \left(\frac{x}{y}\right)\left(\frac{x}{y}\right)\left(\frac{x}{y}\right) = \frac{x^3}{y^3}$$

Rule: $\frac{x^a}{x^b} = x^{a-b}, x \neq 0$

$$9. \frac{3^5}{3^2} = 3^{5-2} = 3^3 = \textcircled{27}$$

$$\frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3} = 3^3$$

$$10. \frac{x^5}{x^3} = \frac{\cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot x \cdot x}{\cancel{x} \cdot \cancel{x}} = x^2$$

$$x^{5-3} = \textcircled{x^2}$$

Rule: $x^0 = 1, x \neq 0$

$$11. 8^0 = 1$$

$$12. 253^0 = 1$$

Simplify. Leave answers in exponential form.

$$1. \frac{5^3}{5^2} = 5^{3-2} = \textcircled{5}$$

$$2. 17^0 = 1$$

$$3. \frac{7^5}{7^2} \cdot \frac{7^3}{7^4} = \frac{7^{5+3}}{7^6} = \frac{7^8}{7^6} = 7^{8-6} = 7^2 = \textcircled{49}$$

$$4. 7^3 \cdot 7^5 \cdot 7^2 = 7^{3+5+2} = \textcircled{7^{10}}$$

$$5. (3^4)^5 = 3^{4 \cdot 5} = \textcircled{3^{20}}$$

$$6. (5^3)^4 \cdot 5^7 = 5^{3 \cdot 4} \cdot 5^7 = 5^{12} \cdot 5^7 = 5^{12+7} = \textcircled{5^{19}}$$

$$7. x^3 \cdot x^5 = x^{3+5} = \textcircled{x^8}$$

$$8. \frac{(y^a)^c}{y^b} = \frac{y^{ac}}{y^b}$$

$$9. \frac{(3^4)^6}{3^7} = \frac{3^{4 \cdot 6}}{3^7} = \frac{3^{24}}{3^7} = 3^{24-7} = \textcircled{3^{17}}$$

$$10. \frac{r^5 s^3}{r^2 s^2} = r^{5-2} \cdot s^{3-2} = \textcircled{r^3 \cdot s^1}$$

$$11. \frac{x^5 y^{12} z^0}{x^8 y^9} = x^{5-8} y^{12-9} z^0 = \textcircled{x^{-3} y^3}$$

$$12. 2n^4 \cdot 5n^4 = 10n^{4+4} = \textcircled{10n^8}$$

$$13. 6k^2 \cdot k^1 = 6 \cdot k^{2+1} = \textcircled{6k^3}$$

$$14. 6m^3 n^3 \cdot 8m^2 n^3 = 48m^{3+2} n^{3+3} = \textcircled{48m^5 n^6}$$

$$15. 7(k)^2 = 7k^2$$

$$16. (7k)^2 = 7^2 \cdot k^2 = \textcircled{49k^2}$$

$$17. \left(\frac{x^5}{x^3}\right)^4 = (x^{5-3})^4 = (x^2)^4 = x^{2 \cdot 4} = \textcircled{x^8}$$

$$18. \frac{4y^4}{14yz^8} = \frac{2y^{4-1}}{7z^8} = \textcircled{\frac{2y^3}{7z^8}}$$

$$19. \frac{6x^3 y^4 z^2}{9x^5 y z^2} = \frac{2x^{3-5} y^{4-1} z^{2-2}}{3} = \frac{2x^{-2} y^3 z^0}{3} = \textcircled{\frac{2}{3} x^{-2} y^3}$$