

Definition of Exponents

Name _____

Time _____

Score _____

$$6 \times 6 = 6^2$$

- Base: 6 Exponent: 2

$$\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = \left(\frac{1}{3}\right)^3$$

- Base: $\frac{1}{3}$ Exponent: 3

Attention!

$$4^3 = 4 \times 3 = 12 \quad \text{✗}$$

$$4^3 = 4 \times 4 \times 4 = 64 \quad \text{✓}$$

Exponent is the repeated multiplication



Multiplication → Exponent

★ $6 \times 6 \times 6 = 6^3$

★ $3 \times 3 \times 3 \times 3 \times 3 \times 3 =$

★ $47 \times 47 \times 47 =$

★ $99 \times 99 \times 99 \times 99 \times 99 =$

★ $\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} =$

★ $\frac{215}{216} \times \frac{215}{216} \times \frac{215}{216} =$

Exponent → Multiplication

★ $8^3 = 8 \times 8 \times 8 = 512$

★ $\left(\frac{1}{5}\right)^4 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

★ $12^2 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

★ $20^5 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$



Challenge



$2^{16} \underline{\hspace{1cm}} 16^2$

Comparison
'>' or '<'?



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Operations of Exponents

Name _____

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- Product Rule (Same Base): $a^m \times a^n = a^{m+n}$ $2^2 \times 2^3 = 2^{2+3} = 2^5$
- Quotient Rule (Same Base): $a^m \div a^n = a^{m-n}$ $2^3 \div 2^2 = 2^{3-2} = 2^1 = 2$
- Power Rule: $(a^m)^n = a^{mn}$ $(2^2)^3 = 2^{2 \times 3} = 2^6$



Product and Quotient Rule



★ $4^2 \times 4^2 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

★ $25^{123} \div 25^{50} = \underline{\hspace{2cm}}$

★ $(\frac{1}{6})^2 \times (\frac{1}{6})^1 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

★ $(\frac{1}{5})^{51} \div (\frac{1}{5})^{28} = \underline{\hspace{2cm}}$

★ $(0.1)^3 \times (0.1)^2 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

★ $(\frac{11}{24})^{33} \div (\frac{11}{24})^{17} = \underline{\hspace{2cm}}$



Power Rule

★ $(3^{31})^7 = \underline{\hspace{2cm}}$

★ $((\frac{1}{3})^3)^2 = \underline{\hspace{2cm}}$

★ $(91^{25})^{11} = \underline{\hspace{2cm}}$

★ $(217^9)^6 = \underline{\hspace{2cm}}$



Challenge



$1^{2025} + 2025^0 + 2025^1 =$



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Definition of Algebraic Expressions

Name _____

Time _____

Score _____

Expressions are mathematical phrases that contain numbers, variables, and operations.

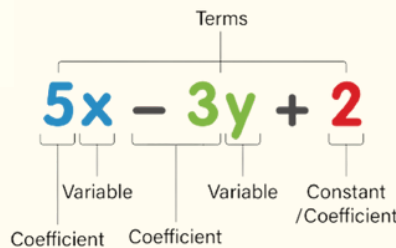
In a zoo, the ticket for adults is \$30, the ticket for students is \$25.

4 adults and 7 students will totally cost

$$4 \times 30 + 7 \times 25 = 295 \text{ dollars}$$

m adult tickets and n students will totally cost

$$m \times 30 + n \times 25 = 30m + 25n \text{ dollars}$$



• Coefficient of the last term: 2

• Number of terms: 3 (5x, -3y and 2)

• Number of different variables: 2 (x and y)



Write Algebraic Expressions

★ 4 less than m _____

★ 6 greater than y _____

★ The sum of z and 5 _____

★ 15 divided by y _____

★ 10 minus 2y _____

★ 7 multiplied by y, and add 4 _____

★ The sum of 5 times x and 9 times z _____

★ The difference between 10 times y and 3 times z _____

	$3 + xy - z$	$a + b + 5cd$
coefficient of the last term		
number of terms		
number of different variables		

Application of Algebraic Expressions

★ At a museum, adult tickets cost \$28 and child tickets cost \$18. If 3 adults and 5 children visit the museum, the total cost is _____ dollars. If m adults and n children visit the museum, the total cost is _____ dollars.

★ At a concert, VIP tickets are \$50, regular tickets are \$35, and student tickets are \$20. If 2 VIP, 4 regular guests, and 6 students attend, the total revenue is _____ dollars. If x VIP, y regular guests, and z students attend, the total revenue is _____ dollars.



Challenge

★ A clothing store sells T-shirts (\$12 each), jeans (\$25 each), jackets (\$40 each), and hats (\$8 each). Wholesaler A buys x jeans, y jackets, and z hats. The total price is _____ dollars. Wholesaler B buys a total of 20 items, including T-shirts and jeans. If B buys k T-shirts, the total price is _____ dollars. Wholesaler C buys p jeans, q T-shirts, r jackets, and s hats. There is a 15% discount for hats. The total price is _____ dollars.



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Operations of Algebraic Expressions

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Like terms are terms that **have the same variables and exponents**.An algebraic expression is in its **simplest form** if all like terms are combined and there are no parentheses.

Pair Like Terms

2a	0.75
-b	3ba
0.75ab	0.5a
3456	2b

1. Commutative Property of Addition & Multiplication **Example**

$a + b = b + a$

$x + 3 = 3 + x$

$a \times b = b \times a$

$c \cdot ab = ab \cdot c = abc$

2. Associative Property of Addition

$a + (b + c) = (a + b) + c$ $1 + (3 + x) = (1 + 3) + x = 4 + x$

3. Distributive Property of Multiplication

$a \times (b + c) = ab + ac$

$2(a + b) = 2a + 2b$



Simplify Basic Algebraic Expressions

★ $125x + 87x =$ _____

★ $3\frac{1}{4}y - 1\frac{3}{4}y =$ _____

★ $503m + 217 - 128m =$ _____

★ $\frac{7}{10}n + \frac{3}{5} - \frac{1}{2}n =$ _____

★ $156a - 234b + 78a =$ _____

★ $-\frac{3}{4}p + \frac{1}{2}q - \frac{1}{4}p =$ _____



Simplify Complex Algebraic Expressions

★ $24(3x + 15) - 95x =$ _____

★ $2\frac{1}{2}(8y + 7) - 1\frac{2}{3}y =$ _____

★ $45(12x + 23y) - 37(15x - 8y) =$ _____

★ $-\frac{1}{2}(6m - 4n) + \frac{3}{4}(8m + 12n) =$ _____

★ $428 - 156k - (237 + 89k) + 75k =$ _____

★ $\frac{3}{8}(16p + 24) - \frac{5}{6}(3p - \frac{12}{7}) =$ _____



Challenge

★ **Simplify:** $(x + 25)^2 - (x + 25)(x + 24)$

★ **Simplify:** $(x - 1)^2 + (1 - x)(x + 1)$



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