

Lesson 1-2

Exponents and Order of Operations

Lesson Objectives

- ▽ Simplify and evaluate expressions and formulas
- ▽ Simplify and evaluate expressions containing grouping symbols

NAEP 2005 Strand: Algebra

Topic: Variables, Expressions, and Operations

Local Standards: _____

Vocabulary and Key Concepts

Order of Operations

- P** 1. Perform any operation(s) in grouping symbols () { }
- E** 2. Simplify Exponents []
- M** 3. multiply or divide in order from left to right.
- A** 4. Add or Subtract in order from left to right.

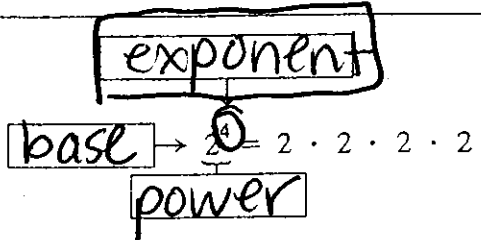
To

Simplify ~~means~~ a numerical expression, you replace it w/ its simplest name (ex) $2 \cdot 8 + 2 \cdot 3 \rightarrow 16 + 6 \rightarrow 22$

An exponent ~~is~~ tells how many times you multiply that # by itself

A base is used as a factor

A power ~~is~~ has 2 parts, a base + an exponent



you Evaluate ~~means~~ an algebraic expression by substituting #'s in for the variables, then simplify by order of ops.

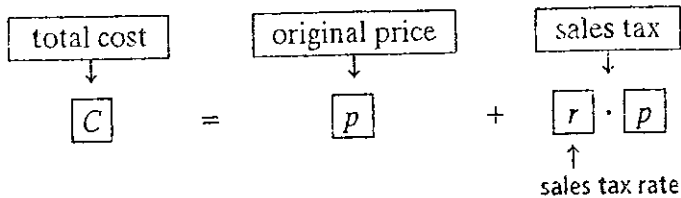
Examples

- 1 Simplifying a Numerical Expression Simplify $32 + 6^2 - 14 \cdot 3$.
- $32 + 6^2 - 14 \cdot 3 = 32 + 36 - 14 \cdot 3$ Simplify the power: $6^2 = 6 \cdot 6 = 36$.
- $= 32 + 36 - 42$ Multiply 14 and 3.
- $= 68 - 42$ Add and subtract in order from left to right.
- $= 26$ Subtract.

10% of 32 is \$3.20

2. **Evaluating an Algebraic Expression** Find the total cost of a pair of jeans that costs \$32 and has an 8% sales tax.

8% → .08



$$C = p + r \cdot p$$

$$= 32 + 0.08 \cdot 32$$

$$= 32 + 2.56$$

$$= 34.56$$

The total cost of the jeans is \$ 34.56

Substitute 32 for p. Change 8% to 0.08 and substitute 0.08 for r.

Multiply first.

Then add.

3. **Evaluating Expressions with Exponents** Evaluate each expression for $x = 11$ and $z = 16$.

a. $(xz)^2$

$$(xz)^2 = (11 \cdot 16)^2$$

$$= (176)^2$$

$$= 30,976$$

Substitute 11 for x and 16 for z.

Simplify within parentheses.

Simplify the power.

b. xz^2

$$xz^2 = 11 \cdot 16^2$$

$$= 11 \cdot 256$$

$$= 2816$$

Substitute 11 for x and 16 for z.

Simplify the power.

Multiply.

$4^2 = 4 \cdot 4 = 16$
NOT $4 \cdot 2 = 8$

Quick Check

1. Simplify each expression.

a. $6 - 10 \div 5$

$$6 - 2 = 4$$

b. $3 \cdot 6 - 4^2 \div 2$

$$3 \cdot 6 - 16 \div 2 = 18 - 8 = 10$$

c. $4 \cdot 7 + 4 \div 2^2$

$$4 \cdot 7 + 4 \div 4 = 28 + 1 = 29$$

d. $5^3 + 90 \div 10$

$$125 + 9 = 134$$

2. Evaluate each expression for $c = 2$ and $d = 5$.

a. $4c - 2d \div c$

$$4 \cdot 2 - 2 \cdot 5 \div 2 = 8 - 5 = 3$$

b. $d + 6c \div 4$

$$5 + 6 \cdot 2 \div 4 = 5 + 3 = 8$$

c. $c^4 - d \cdot 2$

$$2^4 - 5 \cdot 2 = 16 - 10 = 6$$

d. $40 - d^2 + cd \cdot 3$

$$40 - 5^2 + 2 \cdot 5 \cdot 3 = 40 - 25 + 30 = 45$$