Basic algebra 1.2

Evaluate expressions using the order of operations

evaluate (simplify)

PEMDAS (boo) GEMA (yay)

$3 + 5 \cdot 2 \quad \neq 16 \quad = 13$

properties:

- substitution
- additive identity
- multiplicative identity
- Mult. property of zero

$5 - 2 + 3$

$5 - 5$

0

$5 + -2 + 3$

6

What is the value of $9 \cdot 5 + 4$?

Method 1

$9 \cdot 5 + 4$

$45 + 4$

49

Method 2

$9 \cdot 5 + 4$

$9 \cdot 9$

81 11

GEMA

Find the value of each expression.

10.75

1. $38 - 5 \cdot 6$

$38 - 30$

8

$\frac{(5 \times 3)}{(4 + 7)}$

1.36

2. $\frac{4 \times 9}{26 - 8}$

$\frac{36}{18} = 2$

$\frac{15}{11}$

Reminder: the fraction bar is also a grouping symbol.

In algebra, statements that are true for any number are called **properties**. Four properties of equality are listed in the table below.

Property of Equality	Symbols	Numbers
Substitution	If $a = b$, then a may be replaced by b.	If $9 + 2 = 11$, then $9 + 2$ may be replaced by 11.
Reflexive	$a = a$	$21 = 21$
Symmetric	If $a = b$, then $b = a$.	If $10 = 4 + 6$, then $4 + 6 = 10$.
Transitive	If $a = b$ and $b = c$, then $a = c$.	If $3 + 5 = 8$ and $8 = 2(4)$, then $3 + 5 = 2(4)$.

p. 9

$9+2$
11
$5=5$
$x=3 \quad 3=x$

$x+5=12$
$-5 \quad -5$
$x = 7$

$12 = x+5$
$-5 \quad -5$
$7 = x$

They are always true...just like gravity!

T = B B = J

$3+5=8 \quad 8=2\cdot4$
$3+5=2\cdot4$

Subs.
Refl.
Symm
Trans

Examples

Name the property of equality shown by each statement.

4 If $9 + 3 = 12$, then $12 = 9 + 3$. Symm

5 If $z = 8$, then $z \div 4 = 8 \div 4$.

d. $7 - c = 7 - c$

e. If $10 - 3 = 4 + 3$ and $4 + 3 = 7$, then $10 - 3 = 7$.

Property	Words	Symbols	Numbers
Additive Identity	When 0 is added to any number a, the sum is a.	For any number a, $a + 0 = 0 + a = a$.	$45 + 0 = 45$ $0 + 6 = 6$ *0 is the identity.*
Multiplicative Identity	When a number a is multiplied by 1, the product is a.	For any number a, $a \cdot 1 = 1 \cdot a = a$.	$12 \cdot 1 = 12$ $1 \cdot 5 = 5$ *1 is the identity.*
Multiplicative Property of Zero	If 0 is a factor, the product is 0.	For any number a, $a \cdot 0 = 0 \cdot a = 0$.	$7 \cdot 0 = 0$ $0 \cdot 23 = 0$

p. 10

+ 0

× 1

n · 0 = 0

6 Find the value of $5[3 - (6 \div 2)] + 14$. Identify the properties used.

GEMA

$5[3-3]+14$ subs.

$5 \cdot 0 + 14$ Subs mult zero and id.

$0 + 14$

14

Evaluate each expression if $a = 9$ and $b = 1$.

7 $7 + \left(\frac{a}{b} - 9\right)$

$7 + \left(\frac{9}{1} - 9\right)$ subs

$7 + 0$ subs

7 add. id.

$(a + 4) - 3 \cdot b$

$(9+4) - 3 \cdot 1$ subs.

subs $13 - 3 = 10$ subs

Your Turn **Evaluate each expression if $m = 8$ and $p = 2$.**

h. $6 \cdot p - m \div p$

i. $[m + 2(3 + p)] \div 2$

$6 \cdot 2 - 8 \div 2$ subs

$12 \div 4$ subs

8 subs