Basic algebra 1.2

Evaluate expressions using the order of operations

evaluate (simplify)

GEMA

properties:

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

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 $3 + 5 = 2(4)$. |

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

Whiteboards

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**Find the value of each expression.** *(Examples 1–3)*

**8.** $7 \cdot 4 + 3$

$28 + 3$

$31$

**9.** $4(1 + 5) \div 8$

$4 \cdot 6 \div 8$

$3$

**10.** $18 \div [3(11 - 8)]$

$18 \div (3 \cdot 3)$

$18 \div 9$

$2$

**Find the value of each expression.** *(Examples 1–3)*

**8.** $7 \cdot 4 + 3$

**9.** $4(1 + 5) \div 8$

**10.** $18 \div [3(11 - 8)]$

**Name the property of equality shown by each statement.**
*(Examples 4 & 5)*

**11.** If $5 + 2n = 5 + 3$ and $5 + 3 = 2 \cdot 4$, then $5 + 2n = 2 \cdot 4$.

**12.** If $\frac{y}{2} = 19$, then $19 = \frac{y}{2}$.

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**Find the value of each expression. Identify the property used in each step.** *(Example 6)*

13. $8(4 - 8 \cdot 2)$

$8(4-4)$ Subs.

$8(0)$ Subs

$0$ mult zero

14. $5(2) \cdot (15 \div 15)$

$5(2) \cdot 1$ Subs

$10 \cdot 1$ Subs

$10$ mult ident

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**Evaluate each algebraic expression if $q = 4$ and $r = 1$.** *(Examples 7 & 8)*

15. $4(q - 2r)$

16. $\frac{7q}{r + 3}$

17. $r + \frac{q}{2} \cdot 6$

$4(4-2\cdot1)$ Subs

$4(4-2)$ mult ident

$4(2)$ Subs

$8$ Subs

$\frac{(7\cdot4)}{(1+3)} = \frac{28}{4}$

$= 7$

18. **Car Rental** The cost to rent a car is given by the expression $25d + 0.10m$, where $d$ is the number of days and $m$ is the number of miles. If Teresa rents the car for five days and drives 300 miles, what is the cost? *(Examples 7 & 8)*

$25 \cdot 5 + 0.10 \cdot 300$

$125 + 30$

$\$155$