

**Lesson #4: Understanding and Using the Properties of Real Numbers to Simplify Expressions**  
(Reference: Lesson #12, #15 & #18 in book)**Problem**

1. For each of the following determine the properties of real numbers that are being used.

1.  $(-8 + 13) + 2 = -8 + (13 + 2)$

2.  $8(x - y) = 8x - 8y$

3.  $-5 \cdot 1 = -5$

4.  $8 + 4 = 4 + 8$

5.  $8 \cdot \frac{1}{8} = 1$

6.  $4(3x + 5y) = 12x + 20y$

7.  $\left(\frac{5}{8}\right) \cdot \left(\frac{8}{5}\right) = 1$

8.  $-8.456 + 0 = -8.456$

9.  $\left(\frac{7}{8}\right) \cdot \left(\frac{4}{7}\right) = \left(\frac{4}{7}\right) \cdot \left(\frac{7}{8}\right)$

10.  $(-8 + 4) + (-12) = (-12) + (-8 + 4)$

11.  $7 \cdot (5 \cdot 9) = (7 \cdot 5) \cdot 9$

12.  $1 \cdot \left(-\frac{2}{3}\right) = -\frac{2}{3}$

13.  $a \cdot (b \cdot c) = cab$

14.  $ab(cx - dy) = abcx - abdy$

15.  $xy \cdot (ab \cdot cd) = (xy \cdot ab) \cdot cd$

16. Simplify each of the following equations using the properties of real numbers.

$$16. 4x(y+7)$$

$$17. 8(3x+4) - 20x - 17$$

$$18. 2a(3y-4c+8) - 3ay - 12a + 6ac$$

$$19. -2(3x+2y+4) - 3(x+y+1)$$

$$20. 4(3x-xyz-5) + 3x(5yz-5)$$

$$21. 4ax(3by-2cz+5) - 8abxy - 20ax$$

$$22. 3[2x(y-2y+4) + 4xy - 6x + 2]$$