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## Section 4.1: Mental Math

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- Mental Math uses the properties of whole numbers and compatible numbers. By compatible numbers, we mean those numbers that go together well with a particular operation.

- Commutative Properties:

$$a + b = b + a \quad \text{and} \quad a \cdot b = b \cdot a$$

- Associative Properties:

$$a + (b + c) = (a + b) + c \quad \text{and} \quad a(bc) = (ab)c$$

- Distributive Properties:

$$a(b + c) = ab + ac \quad \text{and} \quad a(b - c) = ab - ac$$

**Example 1:** Perform the following operations by using the compatible numbers and the properties of whole numbers.

(a)  $15 + (26 + 35) =$

(b)  $4 \times 9 \times 25 =$

(c)  $(8 \times 13) \times 25 =$

(d)  $23 \cdot 17 - 15 \cdot 23 =$

(e)  $97 + 58 =$

(f)  $168 \div 3 =$

- **Compensation:** Compensation is the process of reformulating a problem into one that is more easily obtained mentally.

- **Additive compensation:** increase one number by  $n$ , and decrease the second number by  $n$

**Example 2:**  $98 + 57 =$

- **Equal additions method:** In a subtraction problem, we add the same number to both numbers.

**Example 3:**  $93 - 48 =$

- **Left to Right Methods:** Researchers have found that those individuals that are excellent mental calculators utilize a left to right method.

**Example 4:**  $372 + 429 =$

- **Multiplying by special factors:** Since multiplying by 10 is easy, we consider the following:

$$5 = 10 \div 2 \qquad 25 = 100 \div 4 \qquad 99 = 100 - 1$$

**Example 5:**

(a)  $42 \times 5 =$

(b)  $36 \times 26 =$

(c)  $24 \times 99 =$