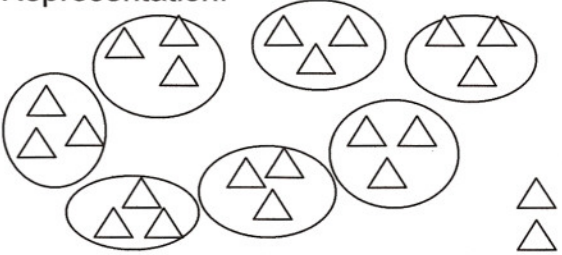


# Order Of Operations

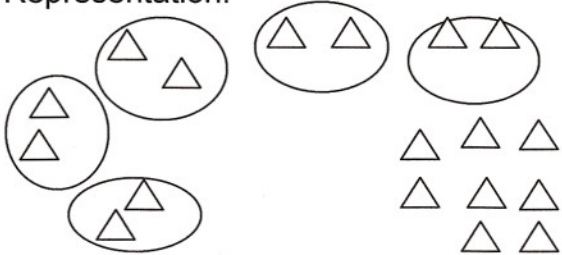
Using a four part approach to an expression, the emphasis is placed on the number of objects rather than the operations. Write the expression in words, with a representation, as an expression with addition only, and finally as the answer.

Examples:

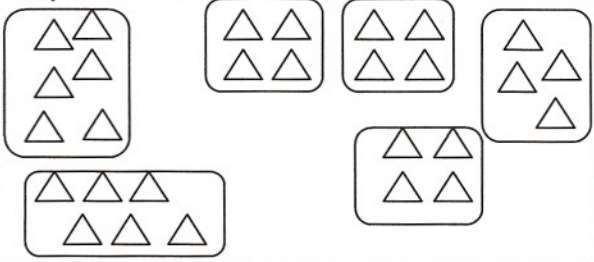
$$7 \cdot 3 + 2$$

<p>In words:</p> <p>Seven groups of three plus two</p>	<p>Representation:</p> 
<p>Expression with addition only:</p> $3+3+3+3+3+3+3+2$	<p>Answer:</p> $23$ <p><i>Can you think of a shortcut to evaluate this expression?</i></p>

$$8+5 \cdot 2$$

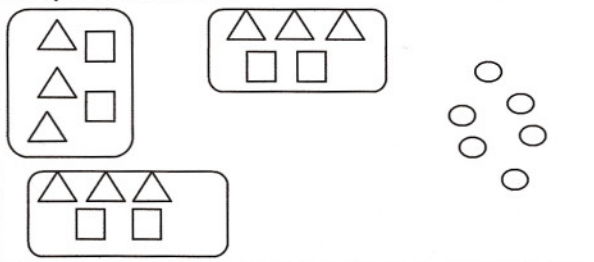
<p>In words:</p> <p>Eight plus five groups of two</p>	<p>Representation:</p> 
<p>Expression with addition only:</p> $8+2+2+2+2+2$	<p>Answer:</p> $18$ <p><i>Can you think of a shortcut to evaluate this expression?</i></p>

$$2 \cdot 6 + 4 \cdot 4$$

<p>In words:</p> <p>Two groups of six plus four groups of four</p>	<p>Representation:</p> 
<p>Expression with addition only:</p> $6 + 6 + 4 + 4 + 4 + 4$	<p>Answer:</p> <p style="text-align: center;">28</p> <p><i>Can you think of a shortcut to evaluate this expression?</i></p>

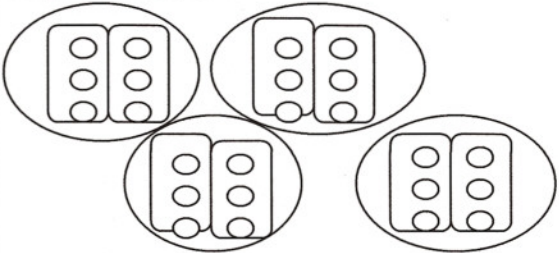
Remember the emphasis is on the number of objects

$$6 + 3(3 + 2)$$

<p>In words:</p> <p>Six plus three groups of three plus two</p>	<p>Representation:</p> 
<p>Expression with addition only:</p> $6 + 3 + 2 + 3 + 2 + 3 + 2$	<p>Answer:</p> <p style="text-align: center;">28</p> <p><i>Can you think of a shortcut to evaluate this expression?</i></p>


Remember the emphasis is on the number of objects

### 4·2·3

<p>In words:</p> <p>Four groups of two groups of three</p>	<p>Representation:</p> 
<p>Expression with addition only:</p> $3+3 + 3+3 + 3+3 + 3+3$	<p>Answer:</p> <p>24</p> <p><i>Can you think of a shortcut to evaluate this expression?</i></p>

Remember the emphasis is on the number of objects

### 4<sup>2</sup>+2·3

<p>In words:</p> <p>Four groups of four plus two groups of three</p>	<p>Representation:</p>  <p><i>Notice the short cut in representing the objects.</i></p>
<p>Expression with addition only:</p> $4+4+4+4 + 3+3$	<p>Answer:</p> <p>22</p> <p><i>Can you think of a shortcut to evaluate this expression?</i></p>

Your turn:

$$7+2\cdot3$$

In words:	Representation:
Expression with addition only:	Answer:  <i>Can you think of a shortcut to evaluate this expression?</i>

Remember the emphasis is on the number of objects

$$2\cdot4 + 2\cdot3$$

In words:	Representation:
Expression with addition only:	Answer:  <i>Can you think of a shortcut to evaluate this expression?</i>

Remember the emphasis is on the number of objects

Once you see that the groups represent multiplication, you also realize that multiplication is performed before addition. Study the following chart for the rules of order of operations.

<b><u>The Rules for the Order of Operations</u></b>	
1.	Do operations in parentheses.
2.	Do operations involving exponents, powers and square roots.
3.	Do multiplication and division operations from left to right.
4.	Do addition and subtraction operations from left to right.

We have an acronym to help remember the order of operations. PEMDAS

Parentheses	P	Please
Exponents	E	Excuse
Multiplication, Division	MD	My Dear
Addition, Subtraction	AS	Aunt Sally

**EXAMPLES:**

<b>PROBLEM</b>	<b>STEPS</b>	<b>ANSWER</b>
$4 + 6 \times 5 =$	First multiply $6 \times 5$ then add 4. $30 + 4 = 34$	34
$3 \times 2 + 8 =$	First multiply $3 \times 2$ then add 8. $6 + 8 = 14$	14
$9 \div 3 \times 7 =$	First divide 9 by 3 then multiply by 7 $3 \cdot 7 = 21$	21
$(48 - 12) \div 6 =$	First subtract 12 from 48 then divide by 6. $36 \div 6 = 6$	6

$12 - 3(14 \div (3 + 4)) =$ <i>*no sign means to multiply</i>	First add 3 and 4, divide 14 by that answer, multiply by three, and then subtract that answer from 12. $12 - 3 \cdot (14 \div 7) =$ $12 - 3 \cdot 2 =$ $12 - 6 = 6$	6
$((21 - 4) \times 3) - 5^2 \times 2$ <i>*always start with the inside parentheses first</i> <i>*5<sup>2</sup> means 5x5</i>	First subtract 4 from 21, multiply by 3, square 5, then multiply by 2. Subtract that answer from the answer in the parenthesis. $(17 \cdot 3) - 5^2 \cdot 2 =$ $51 - 25 \cdot 2 =$ $51 - 50 = 1$	1

Your turn:

1. $5 + 4 \times 2 = \underline{\quad}$	2. $6 + 3 \div 3 = \underline{\quad}$	3. $4 - 2 \times 2 = \underline{\quad}$
4. $7 \times 6 - 3 = \underline{\quad}$	5. $8 \div 4 - 2 = \underline{\quad}$	6. $10 - 5 \times 2 = \underline{\quad}$
7. $18 - 8 \div 2 = \underline{\quad}$	8. $3 + 5 \times 4 = \underline{\quad}$	9. $9 - 6 \div 3 = \underline{\quad}$
10. $12 + 4 \div 2 = \underline{\quad}$	11. $9 - 5 + 4 = \underline{\quad}$	12. $8 \div 2 \times 4 = \underline{\quad}$

More practice for you.

1. $15 \div (12 \div 2 - 1) =$ _____	2. $42 \div 14 \times 12 \div 9 =$ _____
3. $(8 + 4) \div (24 \div 8) =$ _____	4. $(16 - 8) \times 4 \div 16 =$ _____
5. $(5 + 9) \div 7 + 5 =$ _____	6. $(2 + 10) \div (6 - 4) =$ _____
7. $(7 \times 4 + 4) \div 4 =$ _____	8. $(24 \div 4 + 6) \div 3 =$ _____
9. $16 + 18 \div 6 - 11 - 7 =$ _____	10. $9 \div 3 \times 15 \div 5 \times 4 =$ _____
11. $4 \times (45 \div 5) + 6 - 17 =$ _____	12. $(8 - 5) \times 9 - 15 \div 5 =$ _____
13. $7 \times (5 + 3) \div (9 - 5) =$ _____	14. $(20 - 4 \times 3) \div 2 + 7 =$ _____
15. $(36 \div (6 - 2)) \div 3 \times 3^2 + 7 =$ _____	16. $(29 - 5) \div (18 \div (9 - 3) \times 2) =$ _____
17. $((18 - 9) \times 4) + 7) \times 0 =$ _____	18. $12 - 3(14 \div (3 + 4)) =$ _____