ORDER OF OPERATIONS
APPLYING INTEGERS
COMPOSITE SHAPES

Mathematicians follow an order to evaluate expressions. The rules are called the Mathematicians follow an order to evaluate expressions. The rules are called the "order of operations". We will look at the rules to find out which operations must be completed first.

Integers are the whole numbers and their opposites, thus negative numbers are part of the set of integers. Many "real world" problems use negative numbers to represent quantities. We will apply our knowledge of integers to solve problems.

Some problems can be difficult, but if we break them apart into smaller problems, the solution may be easier to find. We will try this problem-solving technique on some word problems by analyzing complex measurement problems.

Order of Operations

In order to find the numerical value (**evaluate**) of any combination of numbers and operations (**expression**) correctly, mathematicians have established the order of operations which tells us which operations to do first in any mathematical problem.

P (parentheses)

E (exponents – powers)

M (multiply) } **work left to right**

D (divide) }

A (add) } **work left to right**

S (subtract) }

This "saying" may be used to help remember the order of operations.

Please
Excuse
My **D**ear
Aunt **S**ally

*Note: Multiplication and division are at the same level, meaning multiplication does NOT take priority over division. Work these two operations as they occur, left to right. The same is true about addition and subtraction. Work the two operations as they occur, left to right.

Thus, if "multiplication and division" or "addition and subtraction" are the only two operations in the expression, work the problem from left to right!

Example 1: Evaluate $6\times4+2$.

$6\times4+2$	Multiply 6×4
$24+2$	Add $24+2$
26	

Example 2: Evaluate $4(6+3)-5\cdot 2$.

$4(6+3)-5\cdot 2$	Parentheses (6 + 3)
$4(9)-5\cdot 2$	Multiply 4(9)
$36-5\cdot 2$	Multiply $5\cdot 2$
$36-10$	Subtract
26	

Example 3: Evaluate $5[(3+12)-2(4)]$.

$5[(3+12)-2(4)]$	Work within brackets [ ]
$5[(3+12)-2(4)]$	Parenthesis (3+12)
$5[15-2(4)]$	Multiply 2(4)
$5[15-8]$	Subtract $15-8$
$5(7)$	Multiply 5(7)
35	

Example 4: Evaluate $4[3(3+2)^2]$.

$4[3(3+2)^2]$	Work within brackets [ ]
$4[3(3+2)^2]$	Parenthesis (3+2)
$4[3(5)^2]$	Powers $(5)^2$
$4[3(25)]$	Multiply 3(25)
$4(75)$	Multiply 4(75)
300	

Example 5: Evaluate $4[3(3+2)^2]$.

$4[3(3+2)^2]$	Work within brackets [ ]
$4[3(3+2)^2]$	Parenthesis $(3+2)$
$4[3(5)^2]$	Powers $(5)^2$
$4[3(25)]$	Multiply $3(25)$
$4(75)$	Multiply $4(75)$
300	

Example 6: Evaluate $4\cdot5-18\div6+2\cdot3$.

$4\cdot5-18\div6+2\cdot3$	Multiply and divide left to right
$20-3+6$	Add and subtract left to right
$17+6$	Add
23	

You will use the **order of operations** throughout many mathematics courses that you continue to study.

Using Integers

{…-8, –7, –6, –5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5, 6, 7, 8...}

Integers are used to show positive and negative quantities.

On Wednesday, the temperature was a high of –5° F. On Thursday, the high **rose 12°**. What was the high temperature on Thursday?

A number sentence to represent this problem is

$$-5 + 12 = N$$
$$7 = N$$

The temperature high on Thursday was **7°**.

Death Valley National Park has places that are 282 feet below level, the lowest point in the western hemisphere, in its desert area and other places that are 11,049 feet above sea level in its mountainous area. What is the difference between the highest and the lowest point in Death Valley National Park?

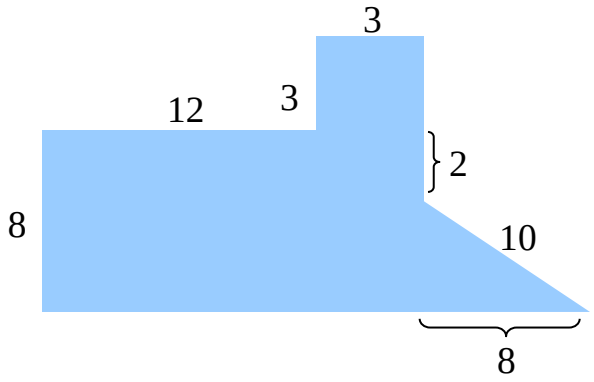
A number sentence to represent this problem is

$$11{,}049 - (-282) = N$$
$$N = 11{,}331 \text{ ft}$$

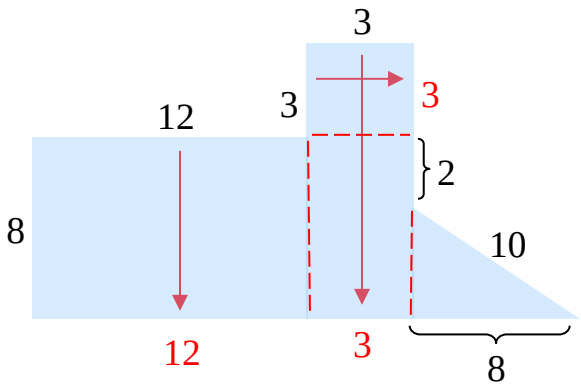
The difference between the high and low points is **11,331 feet**.

Composite Figures

Find the perimeter of the shape.



To find the total distance around the figure, we must do some figuring to find the missing lengths.



First, the figure has been divided up into rectangles and squares using the dotted lines. In rectangles the opposite sides are congruent.

Thus, the perimeter of the figure is 8 + 12 + 3 + 3 + 3 + 2 + 10 + 8 + 3 + 12 = 64 units