## A USEFUL TRICK: *SWITCHING FACTORS*

Factors → 2 x 3 = 6 is the same as this → 3 x 2 = 6 ← Factors *Switched*

As shown above, in multiplication, the ***order*** in which factors are multiplied doesn't matter. This fact allows you to switch factors in a problem to make it easier to work. Study these:

| **Factors Switched** | **Equation Reversed Factors switched** |
|---|---|
| $\frac{C}{d} = 3 \rightarrow \frac{C}{3} = d$ | $3 = \frac{C}{d} \rightarrow d = \frac{C}{3}$ |
| $\frac{6}{2} = 3 \rightarrow \frac{6}{3} = 2$ | $3 = \frac{6}{2} \rightarrow 2 = \frac{6}{3}$ |

The *space **inside*** a circle, is called its **area.** Of course, there is a *formula* for finding that too, which is:

Area = $\pi r^2$ (r = radius of the circle)

What is *radius*? It's ½ the diameter. Easy enough. If the greatest distance across a circle, its *diameter*, is 10, its *radius* is 5.

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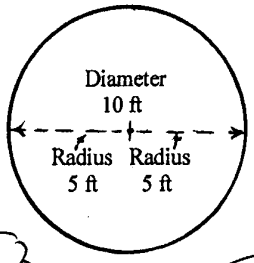
What is the area of a circle having a 5 ft radius? Let's use the formula to find out. [NOTE: The dot for multiplication is not used in writing formulas. As *pi* and $r^2$ are written, the multiplication is ***understood.***]

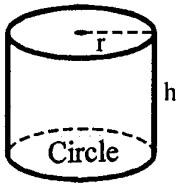



Product ← $A = \pi r^2$ → 2 Factors

$A = 3.14 \quad [5 \cdot 5]$

$A = 78.5 \text{ ft}^2$, ans.

## A *CYLINDER* IS JUST A *CIRCLE* WITH AN *ALTITUDE*



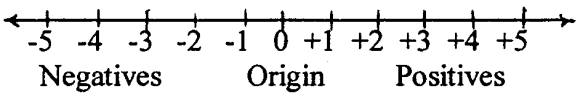

3 Factors and a Product

$$V = \pi \cdot r^2 \cdot h \implies V = \pi r^2 h$$

The *geometric shape* called a ***cylinder*** is quite common. Tanks, tubes, cans of paint, and cans containing food have cylindrical shapes. Can you think of others? How about rolls of paper towels, containers of oatmeal cereal and some glass jars?

In the formula above, $V$ represents the *volume* of the cylinder, which is the *amount of space* the cylinder occupies. You know the value of $\pi$ is 3.14, and that $r$ represents the *radius*, which is squared, and $h$ represents the cylinder's *height* ["*altitude*"].

## ABSOLUTE VALUE




The ***distance*** a number is *from zero* on the number line is called its ***absolute value***. Look at the number line above. What are the absolute values of +4 and -4? Since both numbers are the same distance from the 0, the ***absolute value*** of each number is the same: 4. The absolute value symbol is | |.

Since 0 is 0 distance from itself, its absolute value is 0. The absolute value of a number is shown as:

$|-10| = \mathbf{10}$ $|10| = \mathbf{10}$ $|1.5| = \mathbf{1.5}$ $|-1.5| = \mathbf{1.5}$

## OPPOSITES

A number plus its opposite = 0: ➡ (+5) + (-5) = 0. Numbers, like +5 and -5, are called ***ADDITIVE INVERSES*** because *their sum is zero*. It may help to think of *positive numbers* as *positive charges* on an atom [protons] and *negative numbers* as *negative charges* on an atom [electrons] that cancel each other.

### KEEP IN MIND!

* ***Integers*** include *all positive* and *all negative* numbers, and 0.
* A number to the ***left*** of a number on the number line is less than [<] the number to its right.

$-10 < 9$ $-5 < 0$ $15 < 25$

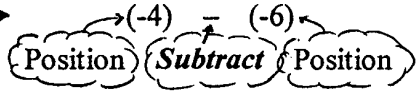
* A number to the ***right*** of a number on the number line is greater than [>] the number to its left.

$9 > -10$ $0 > -5$ $-15 > -20$

## WHERE *CONFUSION* OFTEN REIGNS: AN IMPORTANT NOTICE!

Plus [+] and minus [-] signs each have ***TWO MEANINGS***:

1. They tell you the position of a number on the number line indicating a ***quantity*** - such as 5 protons [+5] or 5 degrees below 0 [-5].
2. They are also ***operation symbols*** saying "***add*** or ***subtract***" ➡




## ACTIVITY

### ADDING AND SUBTRACTING SIGNED NUMBERS ON A SLIDE RULE

Before learning the crucial rules for *adding* and *subtracting* **positive** and **negative** integers, you may find it interesting to do it with the Slide Rule in the back of the book. If only ***positive*** integers were involved, it could be done with 2 ordinary 12-inch rulers or 2 yardsticks, which you might like to try after using the Slide Rule in the back of the book. The steps are the same.

**AFTER YOU FINISH, COME BACK FOR A SUMMARY OF THE RULES AND PRACTICE.**

### MEMORIZE THESE RULES

1. The sums of positive integers are positive. [#1 below]
2. The sums of negative integers are negative. [#3 below]
3. In adding opposites, subtract the lesser absolute value from the greater and use the sign of the greater in your answer. [#5 below]
4. **REMEMBER!** In ***subtracting*** integers, ***add the opposite***. [#2, #4, #6 below]

### NOW TRY THESE USING THE RULES AND CHECKING YOUR WORK WITH THE SLIDE RULE.

1] (+3) + (+4) =? 3] (–3) + (– 4) =? 5] (+3) + (– 4) =?

2] (+7) – (+4) =? 4] (–7) – (– 4) = ? 6] (–1) – (– 4) = ?