

# Math, you can do it!

## Integers - multiply & divide

by Bill Hanlon

Remembering that mathematics is used to describe events, we will again use the number line as we did with addition and subtraction to model multiplication and division of signed numbers.

Here are the agreements we will use to describe events.

### AGREEMENTS

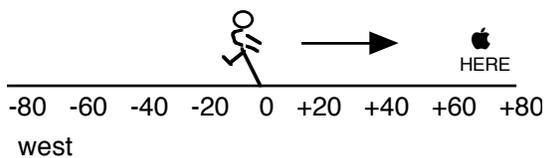
1. Traveling to the LEFT (west) means moving in a negative direction, traveling to the RIGHT (east) means moving in a positive direction.
2. FUTURE is designated by a positive sign. PAST time will be designated as negative.
3. You are located at position zero.

### ILLUSTRATION 1.

You are at position zero and move east at a rate of 40 mph, where will you be in two hours?

Moving east means you are at +40 mph, we are looking for future time, therefore the time is +2.

Now standing at zero, heading in a positive direction for two hours you will end up 80 miles east of zero or at +80.



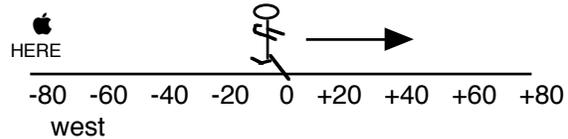
Mathematically, we would write the distance formula  $d = r t$  and substitute the given information.

$$\begin{aligned} d &= r t \\ d &= (+40) \times (+2) \\ d &= 80 \text{ miles east or } +80 \end{aligned}$$

### ILLUSTRATION 2

If you are at zero and move east at a rate of 40 mph where would you have been two hours ago?

Moving east is described as (+40). Since we are looking at past time, the time is described as a (-2).



Now standing at zero, heading in a positive direction, you would have been 80 miles west of zero two hours ago.

Mathematically, we have  $d = r t$

$$\begin{aligned} d &= (+40) \times (-2) \\ d &= 80 \text{ miles west or } -80 \end{aligned}$$

### ILLUSTRATION 3.

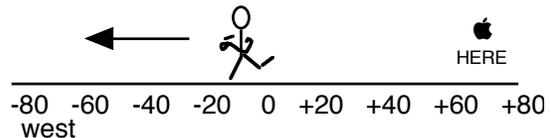
You are at zero and move west at a rate of 40 mph, where will you be in two hours?

Now, standing at zero heading in a negative direction, we are using future time. Therefore we have  $d = r t$  where  $r = -40$  and  $t = +2$ .

$$\begin{aligned} d &= (-40) \times (+2) \\ d &= 80 \text{ west or } -80 \end{aligned}$$

### ILLUSTRATION 4.

You are at position zero heading west at a rate of 40 mph, where were you two hours ago?



Moving west means you are traveling at -40 mph, two hours ago represents past time or -2.

Substituting those numbers into our formula, we have  $d = r t$

$$\begin{aligned} d &= (-40) \times (-2) \\ d &= 80 \text{ miles east or } +80 \end{aligned}$$

Looking at these illustrations might suggest these two rules.

### Multiplication / Division

5. Same signs are positive
6. Different signs are negative

These rules work for only two numbers at a time.