Speed, Time, and Distance

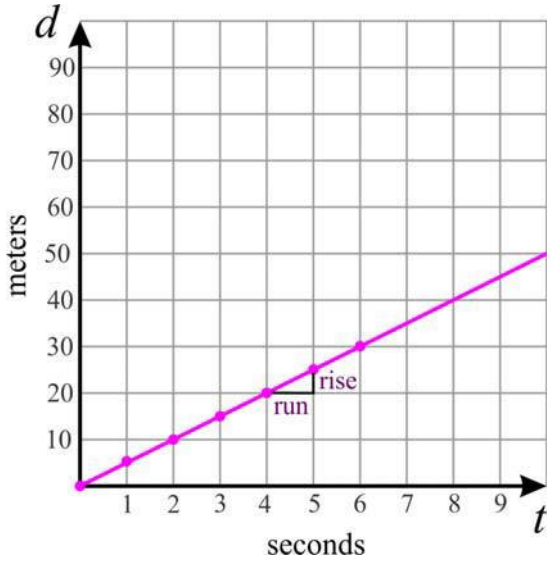
We studied the formula $d = vt$ in chapter 3. It tells us how the quantities *distance* (d), *velocity* (v), and *time* (t) are interrelated when an object travels at a constant speed. Their relationship can also be written as $v = d / t$, which you can derive from the common unit for speed, "kilometers per hour."

In this lesson, we explore the relationships between speed, time, and distance in the context of graphing.

Example 1. Harry runs along a 100-meter track at a constant speed. The table below shows his position or distance (d) from the starting line in relation to time (t).

t	0	1	2	3	4	5	6
d	0	5	10	15	20	25	30

We graph the points and then draw a line through them.



Notice that for each second of time that passes, Harry advances 5 meters. This gives us the "rise/run" relationship that determines the slope of the line.

So, the slope is (5 m)/(1 s), or 5 meters per second. This slope, or change in position over time, is simply Harry's speed.

We can use the slope to relate the quantities t and d in a simple equation: $d = 5t$. Notice that this is simply the formula $d = vt$ with a velocity v of 5 m/s.

In reality, we have to express the velocity in some unit of measure (meters per second in this case), but when we write a formula or an equation, we usually omit the units as a convenience and simply write $d = 5t$ instead of $d = 5 \text{ m/s} \cdot t$. However, you still need to include the units in your calculations and final answers.

1. Graph the points. Draw a line through them. Write an equation that relates t and d.

a.

t	0	1	2	3	4	5	6
d	0	4	8	12	16	20	24

equation: _____

b.

t	0	1	2	3	4	5	6
d	0	7	14	21	28	35	42

equation: _____

c. If the lines represent two runners running with a constant speed, how far from the starting line is each runner when $t = 12$ s?