Name: _____ Section:_____ Date:____/____/____
IP 614

Basic Speed Problems

The variables that we will be working with are: speed (s), distance (d), and time (t). Please look at your MCAS formula sheet and write down the formula that you would need for this exercise:

Sample Problems for Solving Equations:

S1. Harry the mouse is running across a table. He covers a distance of 2 m in 4 seconds. What is Harry's speed?

Solution:

① What do you know: First, write the three variables and fill in the ones you know and put a question mark next to the one you do not know.

$s = ?$
$d = 2\ m$
$\Delta t = 4\ s$

② Which equation should you use? Choose the equation & write it down (do NOT plug in numbers yet!

$$s = \frac{d}{\Delta t}$$

③ Substitute: Now you may replace the symbols with the numbers from step 1

$$s = \frac{2\ m}{4\ s}$$

④ Final Answer: Write your final answer. Don't forget the units!

$$s = 0.5\ \frac{m}{s}$$

Harry's speed is 0.5 m/s

S2. Robin's car is moving at 24 m/s. What distance does Robin's car travel in 10 seconds?

① What do you know:

$s = 24$ m/s
$d = ?$
$\Delta t = 10$ s

② Which equation should you use?

$$d = s \bullet \Delta t$$

③ Substitute:

$$d = \left(24 \tfrac{m}{s}\right) \bullet \left(10 \text{ s}\right)$$

④ Final Answer: Don't forget the units!

$$d = 240 \text{ m}$$

Robin's car will travel a distance of 240 m

S3. Kelly is late to class and is running down a hallway at a speed of 2 m/s. The length of the hallway is 150 m. How long will it take her to run down the hallway?

① What do you know:

$s = 2$ m/s
$d = 150$ m
$\Delta t = ?$

② Which equation should you use?

$$\Delta t = \frac{d}{s}$$

③ Substitute:

$$\Delta t = \frac{\left(150 \text{ m}\right)}{\left(2 \tfrac{m}{s}\right)}$$

④ Final Answer: Don't forget the units!

$$\Delta t = 75 \text{ s}$$

It will take Kelly 75 seconds to run down the hallway

What do your teachers expect to see when they look at your work for a problem?

- ✓ S: Show what you know (often referred as the "givens")
- ✓ T: Trying to find
- ✓ E: Equation
- ✓ P: Plug the numbers into the equation
- ✓ S: solve the solution with your final answer (with units)

So, even though you may not write out your work so that it looks exactly like the sample problems, you need to have the same stuff.

Here is a sample of what a problem and solution might look like on your paper:

S4. In physics class, you are trying to determine the speed a toy car travels at. You use a stopwatch and meterstick. You determine the car can travel a distance of 2 meters in 3 seconds. What is the car's speed?

Key words for speed problems:

If this word (or phrase) is used in a problem…	it is referring to:
how far	
how long	
how fast	

Variables, units, and symbols:

Quantity Symbol	Quantity Term	Unit	Unit Symbol
s	speed	meters/second	m/s
V	velocity	meters/second	m
d	distance	meter	m
t	time	second	s

Problems for you to try: Be sure to show ALL your work and that your final answer has units!

1. A bike travels at a constant speed of 4 m/s for 5 seconds. How far does it go?

2. As Keith is riding his bike home from Jose's house, he finds himself zooming down Walnut Street going at a crazy 15 m/s. If it takes him 60 seconds to get down the hill, how far is that part of Walnut Street?

3. Michael Johnson, formerly the fastest man in the world, ran the 200 m sprint in 19.32 seconds. How fast was he going?

4. Your friend, "Speedy," says he can run at 15 m/s for 300 meters before he runs out of breath. If he's not lying, how long would you expect it to take him to run it?

5. You take your dog out for a walk. You end up 200 m from your house. If the walk took you 120 seconds (2 minutes), what was your average speed?

6. A dancer is doing a series of turns across the stage. It takes her 3 seconds to go 10 meters. What is her average speed?

7. Big Bird is out for a walk. His average speed is 3 m/s. How far can he walk in 3 minutes (180 seconds)?

8. The tiger is on the prowl. She slinks over a distance of 15 meters in 30 seconds. What is her average speed?

9. A lizard is moving with an average speed of 0.25 m/s. How long does it take the lizard to cover a distance of 9.5 meters?

10. Find your average speed if you can run a distance of 50 m in 10 s.

11. We decided to roll a hula hoop straight down Main Street. Main Street is approximately 173 meters long. This journey takes us 4 minutes. What is the average velocity of the hula hoop?

12. You are hiking and your GPS tells you that you are exactly 1km Northeast of where you started your hike. If your average hiking velocity is 5m/s NE, how long will it take you to return to your starting position?

13. The doctor needs to dash down to the ER for an emergency. The distance from her nap space to the ER is 125 meters. She hasn't had much sleep and her maximum speed is 2m/s. How long will it take her to get to the ER?

14. Al Unser, Jr.'s race car travels at an average speed of about 220 mi/hr when racing at the Brickyard 400 at the Indianapolis Raceway. If it takes him 50.0 s to complete one lap, how big is the track?

15. On the average, human hair grows about 1/2 inch per month. If an actress bleaches her 1.0 foot long hair for a movie, she'll have to let her hair grow a foot before it can be back to its normal color and length. How long will that take?

16. Measurements indicate that the continents of Europe and North America are separating at the rate of about 2cm/yr. If Columbus could repeat his famous voyage of 1492, about how much further would he have to go?

17. A jumbo jet flies at about 550 miles/hour through calm air.
    a. How far can it travel in 8 hours?

    b. How long would it take to travel 400 miles?

    c. How long would it take to travel around the Equator (about 24,800 miles)?

18. A Skydiver jumps out of a plane an falls 1000m in 20s before opening her parachute. Then the remaining 500m distance to the ground is traveled in 18s.
    a. Find the skydiver's average speed for each part of the fall.
       Before Opening the Parachute:

After Opening the Parachute:

b. What is the skydiver's average speed for the entire trip?

19. The Sears Tower in Chicago is 443m tall. Joe wants to set the world's stair climbing record and runs all the way up to the roof of the tower in 12 minutes. On the way back down, he is so tired that it takes him twice as long to descend. What is Joe's average speed during the entire trip?

20. Cheetahs have been observed running a distance of 550m with an average speed of 100 km/h.

    a. How long would it take a cheetah to cover this distance at this average speed?

    b. Suppose the average speed of the cheetah is just 85km/h. What distance would the cheetah cover during the same time interval as in part a?