

Our equations:  $d = st$ ,  $s = \frac{d}{t}$ ,  $t = \frac{d}{s}$ .

1.

2. The problem is asking for time, so we will use the equation  $t = \frac{d}{s}$ . We need to calculate two things,  $d$  and  $s$ . Instead of calculating regular distance and speed, we will calculate DIFFERENCE in speed and DIFFERENCE in distance.

$d$ : let's consider the part that says Nicholas left 10 seconds earlier. In 10 seconds, Nicholas travels how many meters?  $d = st$ , so  $d = 12 \times 10 = 120$  meters. Let's think about the problem in a way that is less confusing. Let's pretend that Hunter is at the starting line, and Nicholas is 120 meters ahead of him. Then they both run straight forward, starting at the same time, until Hunter catches up to Nicholas. So the difference in distances that they run is **120 meters**.

$s$ : we are given their speeds are 12 and 14 meters per second. The difference in their speeds is  $14 - 12 = 2$  meters per second.

Now we can calculate  $t$ .  $t = \frac{d}{s} = \frac{120}{2} = \input{type="text" value="60 s"}$

3.

4. This problem is the same as problem 2. We will use  $t = \frac{d}{s}$ , calculating  $d$  and  $s$  to be the difference in distance and speed.

$d$ : is given: the difference in distance is 80 meters.

$s$ : we know Rabbit travels at 5 m/s, and Chipmunk at 3 m/s, so the difference in speed is  $5 - 3 = 2$ .

Now we calculate  $t$ .  $t = \frac{d}{s} = \frac{80}{2} = \input{type="text" value="40 s"}$

5. This problem is the same as 2 and 4. We will use  $t = \frac{d}{s}$ , calculating  $d$  and  $s$  to be the difference in distance and speed.

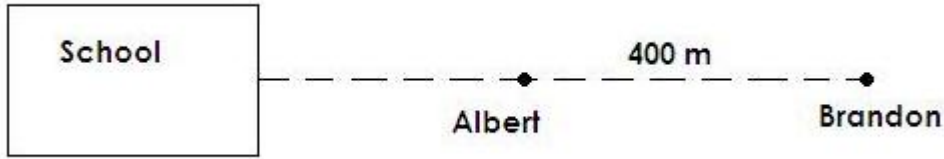
$d$ : Michelle travels for 5 minutes at 120 meters per minute. How far does she travel in that time?  $d = st$ , so  $d = 120 \times 5 = 600$  meters. This is the difference in distance.

$s$ : we are given Michelle travels as 120 m/min, and Ryder travels at 150 m/min, so their difference in speed is  $150 - 120 = 30$ .

Now we calculate  $t$ .  $t = \frac{d}{s} = \frac{600}{30} = \input{type="text" value="20 min"}$

6.

7. Here is the picture of the problem:



This problem requires us to use a couple steps.

a) *Find the distance from Albert to the school.* Since  $d = st$ , and we know Albert's speed is 75 m/min and his time is 16, we can find the distance from Albert to the school:  $d = st = 75 \times 16 = 1200$  meters.

b) *Find the total distance from Brandon to the school.* We know the distance from Brandon to Albert is 400, and the distance from Albert to school is 1200, so the total distance from Brandon to school is  $400 + 1200 = 1600$  meters.

c) *Find Brandon's speed.* The equation we will use is  $s = \frac{d}{t}$ , so we need to know distance and time. The total distance Brandon must travel is 1600 meters, and the time he needs to travel it in is 16 minutes, so his speed is  $s = \frac{d}{t} = \frac{1600}{16} = \boxed{100 \text{ m/min}}$

8. How long does it take Alex C. to travel to Mystery City?  $t = \frac{d}{s} = \frac{3600}{80} = 45$  minutes.

How long does it take Matthew?  $t = \frac{d}{s} = \frac{3600}{60} = 60$  minutes. It takes Matthew  $60 - 45 = \boxed{15 \text{ min}}$  more minutes to travel to Mystery City.

9.  $\boxed{125 \text{ m/min}}$

10. This problem is best done with a timeline in order to keep all the information straight.

First, let's find out how long it takes Tortoise to complete the race. Our equation is  $t = \frac{d}{s}$ , the distance is 2000 and his speed is 25, so it takes Tortoise  $t = \frac{d}{s} = \frac{2000}{25} = 80$  minutes to complete the race.

Now let's think about the order of events:

Start: both are at the beginning line.

Middle: Tortoise is somewhere on the track, while Hare is 400 meters away from the finish line. Hare takes a nap.

End: Tortoise finishes, Hare is still 400 meters away from the finish line napping.

So if Hare stopped running 400 meters away from the finish line, then he completed  $2000 - 400 = 1600$  meters of the race. How long did it take him to get there? We need the equation  $t = \frac{d}{s}$ . Hare's speed is 320 m/min, and his distance is 1600 meters, so his time is  $t = \frac{d}{s} = \frac{1600}{320} = 5$  minutes.

So Hare has run for 5 minutes, then lays down to take a nap. He keeps napping until Tortoise finishes. Since it takes Tortoise 80 minutes to finish the race, then Hare has been napping for  $80 - 5 = \boxed{75 \text{ min}}$