

Math 4b.

Speed, time, and distance.

Car was moving for 3 hours with the speed of 70 km/h. How far did it travel? In this kind of problems in math we always assume that the car (or any other moving object) is moving with the constant speed along the straight line. Of course, this is seldom case in the actual reality, and in physics you will be studying the laws of motion in a more profound way.

Let's denote the speed of the car v , the time during which the car was moving t , and the distance it travelled, S . These letters are usually used for speed, time and distance, but you can use any other letters as well.



$$S = v \times t = vt$$

If $v = 70\text{km}/h$ and $t = 3h$, then $S = 70 \frac{\text{km}}{h} \times 3h = 70\text{km}$. ($70 \frac{\text{km}}{h}$ means $\frac{70 \text{ km}}{1 \text{ hour}}$, kilometers per hour, also can be written as kmph).

This is simple. If we know two out of three parameters, we always can find the third one.

$$S = vt;$$

$$v = \frac{S}{t};$$

$$t = \frac{S}{v};$$

Examples:

- Train is moving at the speed of 50 miles/h. How far will it travel in 120 minutes?

Solution:

$$120 \text{ minutes} = 2 \text{ hours}$$

$$50 \text{ miles/h} \cdot 2 \text{ h} = 100 \text{ m.}$$

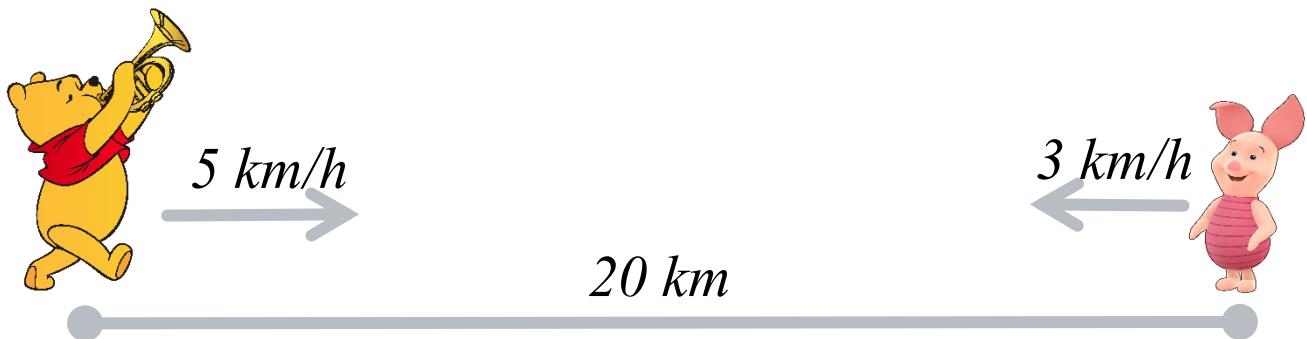
- b. Cyclist is traveling from Stony Brook to Port Jefferson. Distance between these two towns is 8 kilometers. The speed of the cyclist is 16 km/h. How much time does he need to go from S.B. to P.J.?

Solution:

$$8 \text{ km} : 16 \frac{\text{km}}{\text{h}} = 0.5 \text{ hour (or 30 minutes)}$$

Now let's take a look at the following problem:

Winnie-the-Pooh and Piglet start walking toward each other at the same time from their houses along the straight street. The Winnie's speed is 5 km/h, and Piglet is walking at the speed of 3 km/h. Distance between their houses is 20km. When and where they will meet?



How fast the distance between them will be shrinking? In one hour Winnie will walk 5 km and Piglet will walk 3 km, so distance between them will be

$$20 \text{ km} - 5 \text{ km} - 3 \text{ km} = 20 - (5 + 3) = 20 - 8 = 12 \text{ km}$$

Speed of this shrinking is 8 km/h, and they will meet exactly when the distance will shrink to zero.

$$20 \text{ km} : 8 \frac{\text{km}}{\text{h}} = 2.5 \text{ hour.}$$

They will meet in 2.5 hours. By this time Winnie will walk

$$2.5h \cdot 5 \frac{km}{h} = 12.5km, \text{ and Piglet will walk } 20 - 12.5 = 7.5km$$



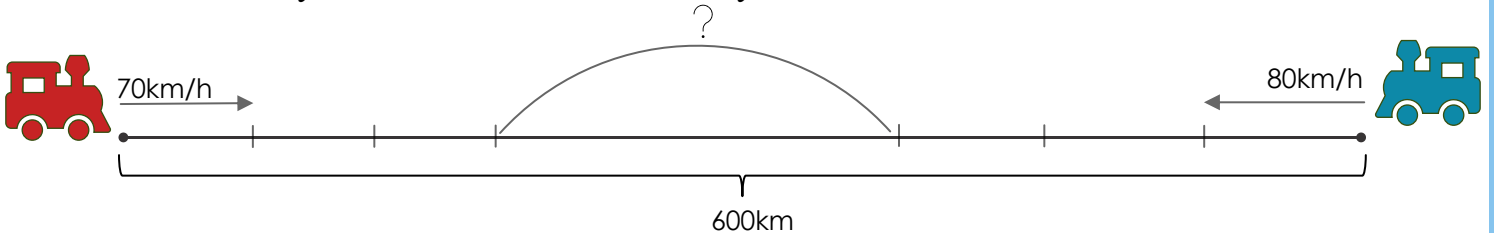
12.5 km

7.5 km



Homework.

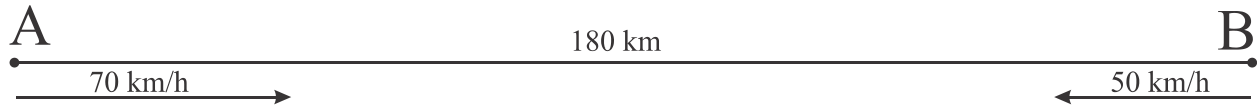
1. Peter was walking for 15 minutes with the speed of 5km/h. How far did he go?
(Hint: convert minutes to hours)
2. It takes Julia 45 minutes to drive from home to work, and she drives at a speed of 55 miles per hour. How far is her office from her home? (Hint: convert minutes to hours.)
3. Two trains leave simultaneously towards each other from two cities, the distance between which is 600 km. The speed of the first train is 70km/h, and the speed of the second is 80 km/h. What will be the distance between the trains after 3 hours?
In how many hours after the start will they meet?



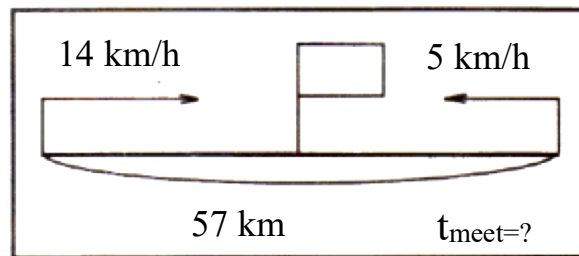
4. Two cars start moving towards each other at the same time from the two villages, Stony Brook Village and Montauk. The distance between the villages is 180 km. The speed of the car that departed from Stony Brook is 50 km/h, the speed of the car that left from the Montauk is 70 km/h.

Montauk

Stony Brook



- In how many hours will they meet?
 - How far from Stony Brook they will meet?
5. Solve the following equations:
- $3x - 1 = 2x + 8$
 - $7a = 5(3a - 4)$
 - $6z - 15 = z$
6. For the picture below, come up with the problem and solve it.



7. The caterpillar is crawling along the trunk of a poplar. In the first hour, it rose by 10 cm. In the second hour, it dropped by 4 cm. In the third hour, it rose again by 10 cm. And in the fourth hour, it dropped by 4 cm. The caterpillar continued to rise and fall for several hours. How many centimeters will the caterpillar have risen in 11 hours?

