Math 4a. Classwork 23.

Speed, time, and distance.

1. The speed of a boat in still water on a lake is 12 km/h, and the speed of the river flow is 3 km/h. How many hours will it take the boat to travel from city A to city B if the distance between the two cities is 45 km and city A is upstream, meaning the river flows from A to B?
   How many hours will the boat need to travel from city B back to city A?

2. A boat is traveling downstream on a river at a speed of 19 km/h. When going upstream, the same boat moves at a speed of 15 km/h. What is the speed of the river's current, and what is the speed of the boat in still water on a lake?

Work problems (combine labor problems).

Mary can eat her birthday cake in 10 minutes, and Peter can eat the same cake in 15 minutes. How fast will they eat the same cake together?
These kinds of problems are related to the amount of work done per unit of time; we can call it "rate". To solve the problem, we have to find out what part of the cake Mary will eat in 1 minute. If she can eat the whole cake in 10 minutes, she only eats $\frac{1}{10}$ of the cake in one minute. Peter will eat $\frac{1}{15}$ of the cake in 1 minute. If they will start eating the cake simultaneously, each minute

$$\frac{1}{10}+\frac{1}{15}=\frac{3}{30}+\frac{2}{30}=\frac{5}{30}=\frac{1}{6}$$

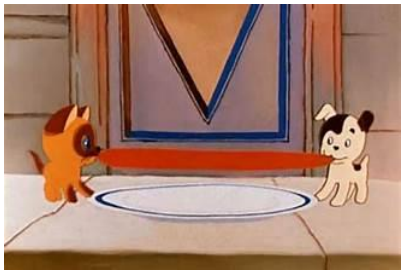
will be eaten. We don't know, how many minutes are needed, but the rate with which the cake will be disappearing is $\frac{1}{6}$ per minute:

$$x(minutes)\cdot\frac{1}{6}(part\ of\ the\ cake)=1(whole\ cake)$$

So, they will need exactly

$$x = 1(whole\ cake) : \frac{1}{6}(parts) = 1 \cdot 6 = 6\ minutes$$

3. A cat can eat the sausage in 10 minutes, a dog can eat it in 2.5 minutes. How fast will they eat the sausage together?


4. Mary, Peter, and Julia are going to do the spring clean up in their garden. Mary can do the job in 4 hours, Peter can do the full clean up in 3 hours, Julia need 6 hours to do the job. How fast they will do it together?

5. A swimming pool can be filled by pump A in 3 hours and by pump B in 6 hours, each pump working on its own. At 9 am pump A is started. At what time will the swimming pool be filled if pump B is started at 10 am?

6. The older brother can clean up the room in 2 hours, the younger brother can completely ruin it in 3 hours. In how many hours will the room be cleaned if they are locked together in the messy room? (it's a math problem, the answer "they will play games" will not be accepted!)