Notes - Distance and Work Problems

Distance problems are word problems that involve the distance an object will travel at a certain average rate for a given period of time. The formula for distance problems is: distance = rate × time or d = r × t.

Example:
A bus traveling at an average rate of 50 kilometers per hour made the trip to town in 6 hours. If it had traveled at 45 kilometers per hour, how many more minutes would it have taken to make the trip?

Solution:
Step 1: Set up a *rate time distance* table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| Case 1 |   |   |   |
| Case 2 |   |   |   |

Step 2: Fill in the table with information given in the question.

A bus traveling at an average rate of 50 kilometers per hour made the trip to town in 6 hours. If it had traveled at 45 kilometers per hour, how many more minutes would it have taken to make the trip?

Let *t* = time to make the trip in Case 2.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| Case 1 | 50  | 6  |   |
| Case 2 | 45  | *t*  |   |

Step 3: Fill in the values for *d* using the formula *d = rt*

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| Case 1 | 50  | 6  | 50 × 6 = 300 |
| Case 2 | 45  | *t*  | 45*t* |

Step 4: Since the distances traveled in both cases are the same, we get the equation:

45*t* = 300

[Isolate](http://www.onlinemathlearning.com/isolate-the-variable.html) variable *t*



Step 5: Beware - the question asked for “how many more minutes would it have taken to make the trip”, so we need to deduct the original 6 hours taken.



Answer: The time taken would have been 40 minutes longer.

Example:
A bus and a car leave the same place and traveled in opposite directions. If the bus is traveling at 50 mph and the car is traveling at 55 mph, in how many hours will they be 210 miles apart?

Solution:
Step 1: Set up a *r-t-d* table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| bus |    |    |    |
| car |    |    |    |

Step 2: Fill in the table with information given in the question.

If the bus is traveling at 50 mph and the car is traveling at 55 mph, in how many hours will they be 210 miles apart?

Let *t* = time when they are 210 miles apart.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| bus | 50  | *t*  |   |
| car | 55  | *t*  |   |

Step 3: Fill in the values for *d* using the formula *d = rt*

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***r***  | ***t***  | ***d***  |
| bus | 50  | *t*  | 50*t*  |
| car | 55  | *t*  | 55*t*  |

Step 4: Since the total distance is 210, we get the equation:

50*t* + 55*t* = 210

105*t* = 210

[Isolate](http://www.onlinemathlearning.com/isolate-the-variable.html) variable *t*



Answer: They will be 210 miles apart in 2 hours.

Work Problems are word problems that involve different people doing work together but at different rates.

Example 1:

Peter can mow the lawn in 40 minutes and John can mow the lawn in 60 minutes. How long will it take for them to mow the lawn together?

Solution:

Step 1: Assign [variables](http://www.onlinemathlearning.com/algebra-terms.html#variable):

Let x = time to mow lawn together

Step 2: Use the table:

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***w***  | ***t***  | ***Amount worked w\*t***  |
| Peter | $\frac{1}{40}$  | *x*  | $\frac{x}{40}$ |
| John | $\frac{1}{60}$  | *x*  | $\frac{x}{60}$ |

Step 3: Solve the equation :
$$\frac{x}{40}+\frac{x}{60}=1 job completed$$

$$\left(\frac{x}{40}+\frac{x}{60}=1 \right)120$$

$$3x+2x=120$$

$$5x=120$$

$$\frac{5x}{5}=\frac{120}{5}$$

$$x=24$$

Answer: The time taken for both of them to mow the lawn together is 24 minutes.