Topic: Uniform motion problems

Question: On Monday, Jenny walked at 3 mph from the school to the library. On Tuesday, Kelly walked at 6 mph from the school to the library and it took her 1 hour to get there. How long did it take Jenny to get from the school to the library?

Answer choices:

A 1 hour

B 2 hours

C 3 hours

D 4 hours

Solution: B

Since Jenny and Kelly each walked at a constant speed, we recognize this as a uniform motion problem. We can use subscripts to create a unique equation for Jenny and Kelly.

Jenny: $D_J = R_J T_J$

Kelly: $D_K = R_K T_K$

The problem tells us that Jenny walked at a rate of 3 mph, that Kelly walked at a rate of 6 mph, and that it took Kelly 1 hour to get to the library. Plugging the information we've been given into the equations for Jenny and Kelly, we get

$$D_J = R_J T_J$$

$$D_J = 3T_J$$

and

$$D_K = R_K T_K$$

$$D_K = 6(1)$$

$$D_K = 6$$

Jenny and Kelly walked the same distance ($D_J = D_K$), so we can equate the value we just found for D_K to the expression we found for D_J (and then solve for T_J).

$$D_K = D_J$$

$$6 = 3T_J$$

$$2 = T_J$$

It took Jenny 2 hours to get to the library.

Topic: Uniform motion problems

Question: Janet and Ken made the same trip on different days. When Janet made the trip, she traveled at 25 mph. When Ken made the trip, he traveled at 35 mph, and the trip took him 4 hours less than it took Janet. How far did each person travel?

Answer choices:

A 350 miles

B 300 miles

C 250 miles

D 200 miles

Solution: A

Since Janet and Ken each traveled at a constant speed, we recognize this as a uniform motion problem. We can use subscripts to create a unique equation for Janet and Ken.

Janet: $D_J = R_J T_J$

Ken: $D_K = R_K T_K$

The problem tells us that Janet traveled at a rate of 25 mph, that Ken traveled at a rate of 35 mph, and that it took Ken 4 hours less than Janet to travel the same distance. Plugging the information we've been given into the equations for Janet and Ken, we get

$$D_J = R_J T_J$$

$$D_J = 25T_J$$

and

$$D_K = R_K T_K$$

$$D_K = 35(T_J - 4)$$

Janet and Ken traveled the same distance ($D_J = D_K$), so we can equate the expression we found for D_J to the expression we found for D_K (and then solve for T_J).

$$D_J = D_K$$

$$25T_J = 35(T_J - 4)$$

$$25T_J = 35T_J - 140$$

$$-10T_J = -140$$

$$10T_J = 140$$

$$T_J = 14$$

We now know that it took Janet 14 hours to make the trip. Since $T_K = T_J - 4$, we can substitute 14 for T_J in this equation (and then compute the value of T_K).

$$T_K = T_J - 4$$

$$T_K = 14 - 4$$

$$T_K = 10$$

Now that we have a rate and a time for both Janet and Ken, we can find the distance that each of them traveled (and verify that it was the same for both of them).

Janet:

$$D_J = R_J T_J$$

$$D_J = (25)(14)$$

$$D_J = 350$$

Ken:

$$D_K = R_K T_K$$

$$D_K = (35)(10)$$

$$D_K = 350$$

Topic: Uniform motion problems

Question: A ball flies (horizontally) over toward a gym wall at 30 m/s. After bouncing off the wall, it travels back (horizontally) to its starting place at 20 m/s. The total time of flight is 2 s. How far is the wall from the starting place?

Answer choices:

A 45 m

B 36 m

C 24 m

D 12 m

Solution: C

The distance over to the wall, D_o, is the same as the distance back to the starting place, D_b.

$$D_o = D_b$$

Since $D = RT$, we can write

$$R_o T_o = R_b T_b$$

$$30T_o = 20T_b$$

Because $T_o + T_b = 2$, we can write

$$T_b = 2 - T_o$$

and we can substitute $2 - T_o$ for T_b in the equation $30T_o = 20T_b$ (and then solve for T_o).

$$30T_o = 20(2 - T_o)$$

$$30T_o = 40 - 20T_o$$

$$50T_o = 40$$

$$T_o = \frac{4}{5} \text{ seconds}$$

Now we can compute the distance over to the wall.

$$D_o = 30T_o$$

$$D_0 = 30\left(\frac{4}{5}\right)$$

$$D_o = 24 \text{ meters}$$