



Problem of the Week

Problem A and Solution

Walking With Walden

Problem

Lindsay takes her dog Walden for a walk every day.

- On Monday she took him for a 45 minute walk.
- On Tuesday, they walked for 5 minutes longer than on Monday.
- On Wednesday, they walked for half as much time as Tuesday.
- On Thursday, they walked for 10 minutes less than Monday.
- On Friday, they walked for 15 minutes more than Thursday.
- On Saturday, they walked for twice as long as Monday.

- A) How many minutes did Lindsay spend walking Walden between Monday and Saturday?
- B) Lindsay wants to make sure that Walden is getting enough exercise. How long must Walden's walk be on Sunday to guarantee he walks for at least 6 hours this week?

Solution

A) First we need to determine how long Lindsay walked each day.

- On Tuesday, they walked for $45 + 5 = 50$ minutes.
- On Wednesday, they walked for $50 \div 2 = 25$ minutes.
- On Thursday, they walked for $45 - 10 = 35$ minutes.
- On Friday, they walked for $35 + 15 = 50$ minutes.
- On Saturday, they walked for $45 \times 2 = 90$ minutes.

The total number of minutes Lindsay walked from Monday to Saturday is:

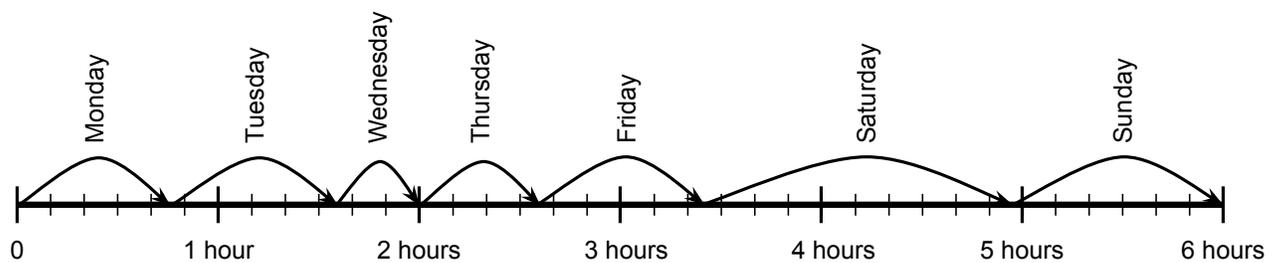
$$45 + 50 + 25 + 35 + 50 + 90 = 295 \text{ minutes.}$$





B) One way to determine how long Lindsay must walk on Sunday is to start by calculating how many minutes there are in 6 hours. Since there are 60 minutes in 1 hour, there are $60 \times 6 = 360$ minutes in 6 hours. Since Lindsay has already walked for 295 minutes, she needs to walk $360 - 295 = 65$ minutes more on Sunday. We could also say that she needs to walk 1 hour and 5 minutes more.

Another way to calculate the required time is to use a timeline that keeps track of how long Walden has been walked during the week:



From the timeline we can see that, by the end of Saturday, Lindsay and Walden have walked 5 minutes short of 5 hours. So, to guarantee a total of 6 hours of exercise, they must walk at least 1 hour and 5 minutes (or 65 minutes) on Sunday.





Teacher's Notes

All of the walking times for the days Tuesday through Sunday can be written as mathematical expressions in terms of the time Lindsay walks on Monday. To do this, we need to interpret the words of the problem into mathematical operations. Suppose we say that m is the number of minutes Lindsay walks on Monday. Then the following expressions describe the other times:

Tuesday: $m + 5$

We determine this by recognizing that *longer* indicates addition.

Wednesday: $(m + 5) \div 2$ or $\frac{1}{2} \cdot (m + 5)$

We determine this by starting with the expression describing Tuesday's walking time, and recognizing that *half* indicates division by 2 or multiplication by $\frac{1}{2}$.

Thursday: $m - 10$

We determine this by recognizing that *less* indicates subtraction.

Friday: $(m - 10) + 15$

We determine this by starting with the expression describing Thursday's walking time, and recognizing that *more* indicates addition.

Saturday: $2 \cdot m$

We determine this by recognizing that *twice* indicates multiplication by 2.

Now the total walking time on Monday through Saturday can be written as:

$$m + (m + 5) + \left(\frac{1}{2} \cdot (m + 5)\right) + (m - 10) + ((m - 10) + 15) + (2 \cdot m)$$

This expression can be simplified. Here is an equivalent expression:

$$6 \cdot m + \left(\frac{1}{2} \cdot (m + 5)\right)$$

We can use this expression to calculate the walking time on Sunday.

Sunday: $360 - (6 \cdot m + \left(\frac{1}{2} \cdot (m + 5)\right))$

Given any value for the time Walden walks on Monday, we can calculate the times he walks on the other days. With these mathematical expressions, we could use a computer program or a spreadsheet to help calculate these values in general. To solve this particular problem, we would set the variable m to have the value 45.

