MILE MARKERS

What's the longest you've ever driven in a car?
If you could drive anywhere, where would you want to go?
What kind of things do you do to pass the time on long trips?

When you're done with this activity, you should have a good idea how to find solutions to absolute value problems by using a graph or table.

Mile markers help drivers know where they are on a highway. Every mile along the highway is marked with a sign telling how many miles you are from the beginning of the highway. (For example, mile marker 289 on I-90 in Spokane means you are 289 miles from the beginning of the I-90 in Seattle.)

AdventureLand Theme Park hosts some of the most amazing roller coasters. Located on highway 314 at mile marker 80, AdventureLand is a favorite place for many people to visit.

1. Draw a quick picture to show where AdventureLand is along highway 314. Be sure to include mile markers in your picture.

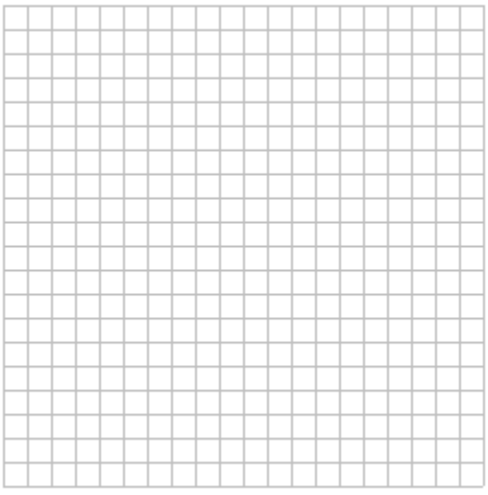
2. How far are you from AdventureLand if you've just passed mile marker 120? Mile Marker 60?

3. What mile marker(s) could you be at if you were 50 miles from AdventureLand?

4. Complete the table below to show how the distance to AdventureLand relates to the mile marker number.

Mile Marker #	20	40	60	80	100	120	140	160	180
Distance to AdventureLand (miles)									

5. Create a graph to show the relationship between *Distance to AdventureLand (in miles)* and *Mile Marker #*.



6. Try to write an equation that would model this situation.

7. Perhaps you saw that the equation $D(m) = |m - 80|$ models the relationship between the distance, *D*, in miles to AdventureLand where *m* is the mile marker number. Let's look at why.

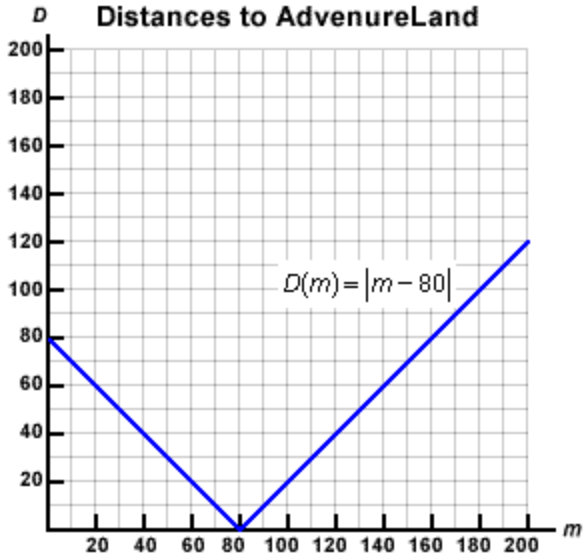
   - At mile marker 50, you are 30 miles from AdventureLand. That would be seen as $D(50) = |50 - 80|$
     $= |-30|$
     $= 30$
   - At mile marker 110, you are also 30 miles from AdventureLand. That's the same as $D(110) = |110 - 80|$
     $= |30|$
     $= 30$
   - Use the rule $D(m) = |m - 80|$ to show that you are 60 miles from AdventureLand at mile markers 20 and 140.

   - Look at some other mile marker numbers and see if you can explain why the rule $D(m) = |m - 80|$ really describes "distance from mile marker #80."

8. Your graph from #5 should look like the one to the right.

   - Using the graph, find the value of *D*(20) and explain what it means.

   - Using the graph, find the value of *D*(140) and explain what it means.



9. For what mile marker #'s is the distance to AdventureLand less than 60 miles?
   Explain how you can see this from the graph.

10. For what mile marker #'s is the distance to AdventureLand more than 40 miles?
Explain how you can see this from the graph.

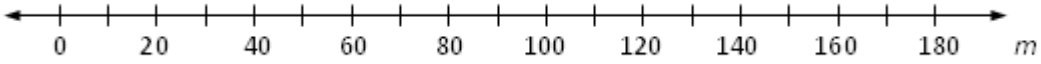
11. The table shows how $D(m) = |m - 80|$ varies.
Remember *D* is the distance in miles to AdventureLand and *m* is the mile marker number.

m	*D*(*m*)
0	80
10	70
20	60
30	50
40	40
50	30
60	20
70	10
80	0
90	10
100	20
110	30
120	40
130	50
140	60
150	70

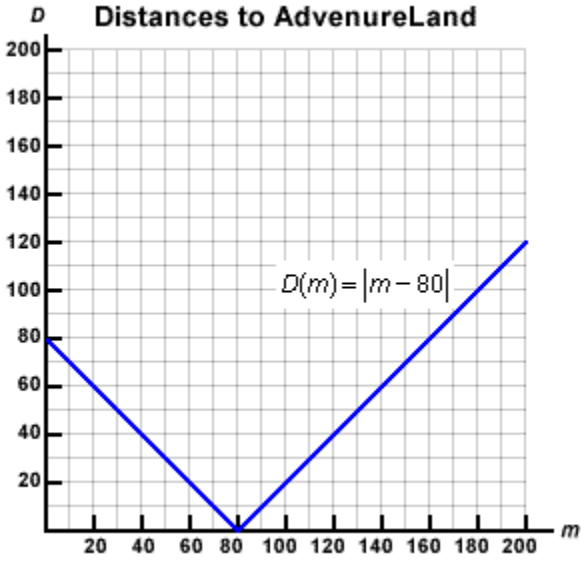
- Looking at the table, for what values of *m* do you see that *D*(*m*) = 50?
What does that mean for this situation?

- Looking at the table, for what values of *m* do you see that *D*(*m*) ≤ 50?
What does that mean for this situation?

- Using a number line, show all the mile marker #'s for which *D*(*m*) ≤ 50.



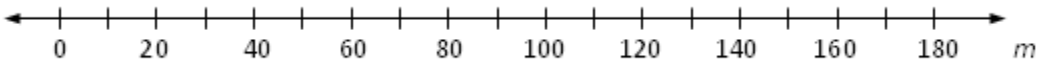
12. A graph of $D(m) = |m - 80|$ is shown to the right.



- Looking at the graph, for what values of *m* do you see that *D*(*m*) = 40? What does that mean for this situation?

- Looking at the graph, for what values of *m* does *D*(*m*) ≥ 40?
What does that mean for this situation?

- Using a number line, show when *D*(*m*) ≥ 40.



- Looking at the graph or table, for what values of *m* do you see that $|m - 80| \le 20$?
What does that mean for this situation?

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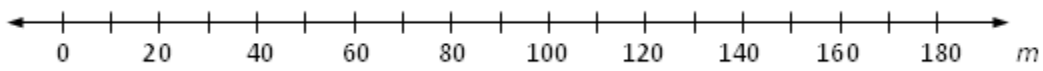
- Using a number line, show when $|m-80| \leq 20$.



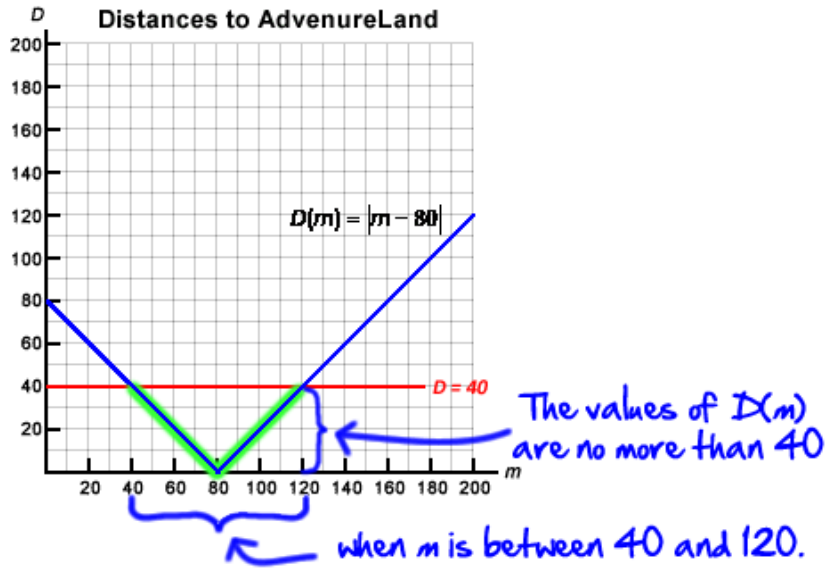
What does that mean for the situation?

13. In the last problems, you were solving inequalities involving an absolute value.
Take a close look at the solution to $|m-80| \le 40$.

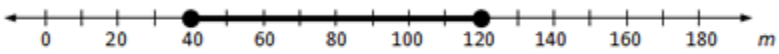
m	$D(m)$
0	80
10	70
20	60
30	50
40	40
50	30
60	20
70	10
80	0
90	10
100	20
110	30
120	40
130	50
140	60
150	70

The values of D(m) are no more than 40

when m is between 40 and 120.



The solution to $|m-80| \le 40$ can be easily seen in both the graph and table.
Plotting a graph of $D(m) = |m-80|$ and looking at a table of values for $D(m) = |m-80|$ helps to see that the solution is $40 \le m \le 120$.



So when you're between mile markers 40 and 120, you are within 40 miles of AdventureLand.

- Do you like the table or graph better to find solutions? Explain.

- Do you like the notation $40 \le m \le 120$ or the number line better? Explain.

14. Create your own graph or table to solve the inequality $|m-189| \le 100$.

Give your answer in symbols or using a number line.