## The following are not in Enable, but will appear on midterm 2 and the final exam.

Another way to interpret |x-a| is the distance between x and a. For instance, the distance between -5 and 7 is |-5-7|, which is |-12| or 12.

Translate the following sentences into absolute value equations or inequalities by turning each of them into a sentence of the form "the distance between and is ".

The **blue** numbers represent distances, and the **orange** numbers represent points on a number line.

- eg. the distance between x and 9 is 2 ANSWER: |x-9|=2
- eg. x is closer than 6 away from 3 ANSWER: |x-3| < 6 ie. the distance between x and 3 is less than 6
- eg. x and -2 are at least 5 apart ANSWER:  $|x (-2)| \ge 5$  OR  $|x + 2| \ge 5$  ie. the distance between x and -2 is greater than or equal to 5
- [1] -8 is 4 away from x
- [2] 7 and x are farther than 3 apart
- [3] x and 3 are separated by no more than 7
- [4] x is within 7 of 3
- [5] x is at most 7 away from 3
- [6] x is a maximum of 3 away from 7
- [7] x and 7 are no closer than 3 away from each other
- [8] x and 3 are separated by at least 7
- [9] x is beyond 3 of 7
- [10] x is no farther than 7 away from 3
- [11] x is no less than 7 away from 3
- [12] x is a minimum of 3 away from 7
- [13] 7 and x are closer than 3 apart

## **SOLUTIONS**

- [1] -8 is 4 away from x
  - the distance between x and -8 is 4

|x - -8| = 4 or |x + 8| = 4

- [2] 7 and x are farther than 3 apart
  - the distance between x and 7 is greater than 3

|x-7|>3

- [3] x and 3 are separated by no more than 7
  - the distance between x and 3 is less than or equal to 7
- $|x-3| \leq 7$

- [4] x is within 7 of 3
  - the distance between x and 3 is less than or equal to 7
- $|x 3| \le 7$

- [5] x is at most 7 away from 3
  - the distance between x and 3 is less than or equal to 7
- $|x 3| \le 7$

- [6] x is a maximum of 3 away from 7
  - the distance between x and  $\overline{7}$  is less than or equal to 3
- $|x 7| \leq 3$

- [7] x and 7 are no closer than 3 away from each other
  - the distance between x and 7 is greater than or equal to 3
- $|x 7| \ge 3$

- [8] x and 3 are separated by at least 7
  - the distance between x and 3 is greater than or equal to 7
- $|x-3| \ge 7$

- [9] x is beyond 3 of 7
  - the distance between x and 7 is greater than 3

|x - 7| > 3

- [10] x is no farther than 7 away from 3
  - the distance between x and 3 is less than or equal to 7
- $|x 3| \le 7$

- [11] x is no less than 7 away from 3
  - the distance between x and 3 is greater than or equal to 7
- $|x 3| \ge 7$

- [12] x is a minimum of 3 away from 7
  - the distance between x and 7 is greater than or equal to 3
- $|x 7| \ge 3$

- [13] 7 and x are closer than 3 apart
  - the distance between x and 7 is less than 3

|x-7| < 3