

## THE NUMBER LINE

### Performance Standard (6A/6C).H

Find coordinates and distances on a number line:

- *Mathematical knowledge:* Represent, order and compare rational numbers and place them on a number line.
- *Strategic knowledge:* Use appropriate operations, methods, and tools to compute with real numbers.
- *Explanation:* Explain completely and clearly what was done and why it was done.

### Procedures

1. *In order to demonstrate knowledge and use of numbers and their many representations in a broad range of theoretical and practical settings (6A) and compute and estimate using mental mathematics, paper-and-pencil methods, calculators, and computers (6C),* students should experience sufficient learning opportunities to develop the following:
  - Represent, order and compare rational numbers.
  - Place rational numbers on a number line.
  - Select, use, and justify appropriate operations, methods, and tools to compute or estimate with real numbers.
2. Provide each student a copy of "The Number Line" task sheet and the rubric. Have students review and discuss the task to be completed and how the rubric will be used to evaluate it. No rulers are to be used.
3. Have the students work individually to solve the problem. (Do not help the students or guide their thinking as they solve the problem.)
4. Evaluate each student's work using the rubric and its guide to determine the performance level. Give each student a score in each of the three categories, scoring each part of the problem separately (or A, B, C & D can be grouped into one score and E & F into another according to the different parts of standard 6 they assess). Minor errors in computation include making errors in the actual addition or multiplication, rounding incorrectly. Major errors include using the wrong operation or procedures.
  - Parts A through D: The students should place a point on the number line at the appropriate location (Standard 6A). Make sure that the spacing is appropriate. Since they are not using rulers, it may be off slightly, but the spacing should be approximately equal. In B, students who place point D other than  $\frac{3}{4}$  of the way between 0 and 1, do not have a clear understanding of a fraction as a number (many students who have difficulty with this will place it on 3 or between 3 & 4). In C, students without a clear understanding of negative numbers may place the number to the left of  $-1$  instead of between 0 and  $-1$ . These students should receive no more than a 1 in mathematical knowledge for this item. Part D is designed to see if students understand that a repeating decimal can also be represented on a number line. Their description should indicate that they understand point three repeating is the same as one-third.
  - Part E: The students should find there are six equal spaces between 1 and 2, so each space should represent  $\frac{1}{6}$  of a unit (Standard 6C). The point A is on the 4<sup>th</sup> division marking from 1, so its coordinate should be  $\frac{4}{6}$  or  $1\frac{2}{3}$  if they reduce the fraction. Their explanation should clearly include the idea of 6 equal spaces.
  - Part F: The students should determine the coordinate of point B to be  $3\frac{1}{4}$  and then use that to determine the distance between A and B to be  $1\frac{7}{12}$  (Standard 6C). They may subtract the coordinates to find the distance, or some students will count spaces, and add the fractional pieces together to arrive at the same answer. The strategy score should reflect whether their method will work regardless of the coordinate of A and B.

### Examples of Student Work follow

### Resources

- Copies of the "The Number Line" task sheet
- Mathematics Rubric

### Time Requirements

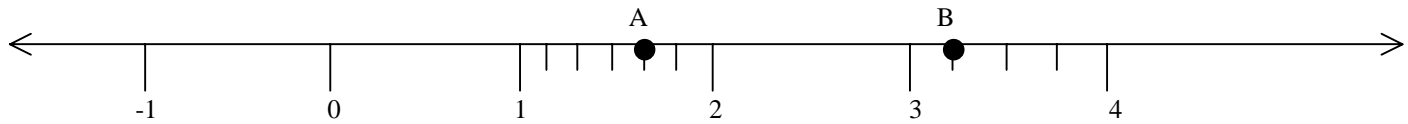
- 15 - 20 minutes

NAME \_\_\_\_\_ DATE \_\_\_\_\_

### THE NUMBER LINE

On the following number line:

- the divisions between 1 and 2 are equally spaced,
- the divisions between 3 and 4 are also equally spaced.



Use your knowledge of real numbers to complete the following tasks:

A. Place the point C on the number line at the coordinate 5. Explain how you decided where to place point C.

B. Place the point D on the number line at the coordinate  $\frac{3}{4}$ . Explain how you decided where to place point D.

C. Place a negative number greater than  $-1$  on the number line and label it with its coordinate. Describe how you decided which number to use and where to put it.

D. Place the point E on the number line at the coordinate  $\overline{-1.3}$ . Explain how you decided where to place point E.

E. Determine and label the coordinate for point A. Explain your reasoning.

F. Determine the distance between point A and point B. Explain your reasoning.

Name \_\_\_\_\_

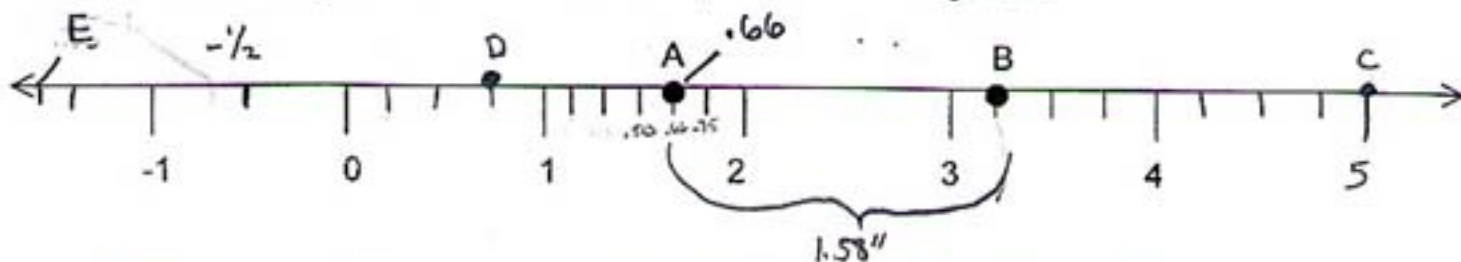
Date 3-20-2001

### The Number Line

On the following number line:

- the divisions between 1 and 2 are equally spaced,
- the divisions between 3 and 4 are also equally spaced.

Use your knowledge of real numbers to complete the following tasks.



- A. Place the point C on the number line at the coordinate 5, and explain how you decided where to place point C.

I had figured that from 3-4 there were quarter inches lines. So I decided to draw those lines. You draw 4 quarter inch lines (4<sup>th</sup> is longer than others) This is because it is the 5<sup>th</sup> inch.

- B. Place the point D on the number line at the coordinate  $\frac{3}{4}$ , and explain how you decided where to place point D.

I drew quarter inch lines by duplicating what I had done in problem A. On the 3<sup>rd</sup> quarter inch line I had placed D, because there are 4 lines in the inch, which make the 3<sup>rd</sup>;  $\frac{3}{4}$ .

- C. Place a negative number greater than  $-1$  on the number line and label it with its coordinate. Describe how you decided which number to use and where to put it.

I had decided to cut  $-1$  to  $0$  in half to  $-\frac{1}{2}$ . It is greater than  $-1$  by  $\frac{1}{2}$  of an inch. I figured everything in that area would be easier to read when you cut the inch in half.

- D. Place the point E on the number line at the coordinate  $-1.\bar{3}$ . Explain how you decided where to place point E.

I went to  $-1$  + went back one-half of an inch + drew a line. That will help you read it. I then went back to  $33$  + placed a line. I am positive of the spot because of where  $-1.25$  +  $-1.5$  is on the scale.

- E. Determine and label the coordinate for point A, and explain your reasoning.

I had looked at the half way mark on the scale, and the last line in the line. I had discovered that the 3<sup>rd</sup> line in the range is .50 + the 5<sup>th</sup> line is .75 so A is  $1.\bar{6}$ .

- F. Determine the distance between point A and point B, and explain your reasoning.

First you take  $1.\bar{66}$  +  $3.25$ . subtract  $3.25$  and  $1.\bar{66}$  you will get about  $1.58$  inches is the difference between point A to B.

$$\begin{array}{r} 3.25 \\ -1.67 \\ \hline 1.58 \end{array}$$

Name Ma. J. Neri

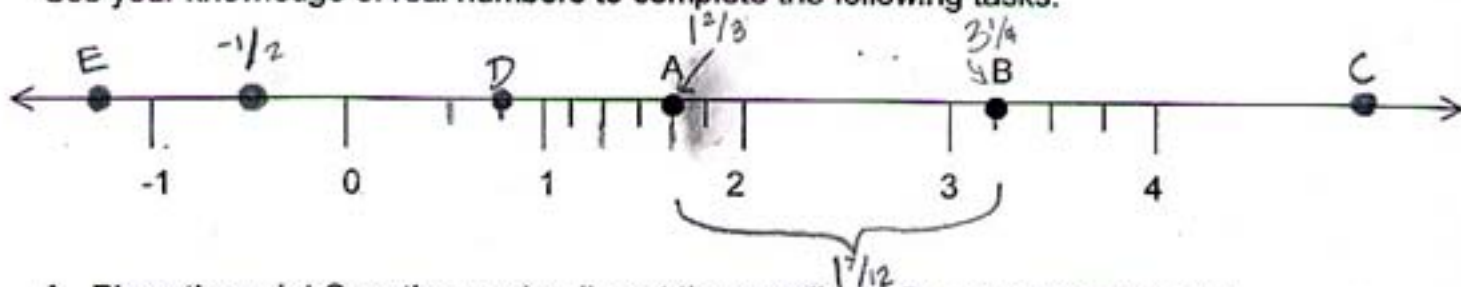
Date 3-19-01

### The Number Line

On the following number line:

- the divisions between 1 and 2 are equally spaced,
- the divisions between 3 and 4 are also equally spaced.

Use your knowledge of real numbers to complete the following tasks.



- A. Place the point C on the number line at the coordinate 5, and explain how you decided where to place point C.

I approximated the distance between -1 and 0. Then, I made a mark for 5 that much space to the right of 4

- B. Place the point D on the number line at the coordinate  $\frac{3}{4}$ , and explain how you decided where to place point D.

I found a mark marking half way between 0 + 1. Then, I put point D half way between  $\frac{1}{2}$  and 1.

- C. Place a negative number greater than -1 on the number line and label it with its coordinate. Describe how you decided which number to use and where to put it.

If it is greater than -1 it has to be more towards the right than -1. I put  $-\frac{1}{2}$  exactly half way between 0 and -1 because it would be easier to find.

D. Place the point E on the number line at the coordinate  $-1.\bar{3}$ . Explain how you decided where to place point E.

I know that  $-1.\bar{3} = -1\frac{1}{3}$ . By looking at the marks placed between 1 + 2 that divided the space into 3 equal parts, I estimated the distance of  $\frac{1}{3}$  of the space to the left of -1 and put point E approx.  $\frac{1}{3}$  to the left of -1.

E. Determine and label the coordinate for point A, and explain your reasoning.

I said it was  $1\frac{2}{3}$  because the space was divided into 6 equal parts + point A was on the 4th line +  $\frac{4}{6} = \frac{2}{3}$ . So it was  $\frac{2}{3}$  to the right of 1.

F. Determine the distance between point A and point B, and explain your reasoning.

$$\frac{1}{3} + 1 + \frac{1}{4} = \boxed{1\frac{7}{12}}$$

I figured the distance between point A and 2 was  $\frac{1}{3}$ . And between 2 and 3, the distance was 1. Also, the space between point B and 3 was  $\frac{1}{4}$  because B was on the 1st line dividing the space into 4 parts. I added those numbers + got  $1\frac{7}{12}$ .