Where is Root 2?

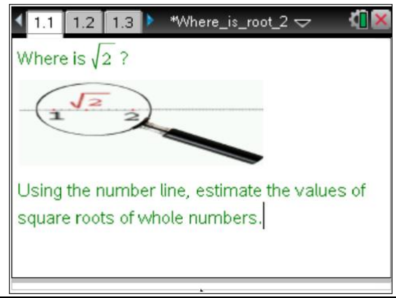
Student Activity

Name ______________

Class ______________

Open the TI-Nspire document Where_is_root_2*.tns.*

In this activity, you will explore how we can use a number line diagram to find rational approximations of irrational numbers.



Move to page 1.2.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. Given right isosceles triangle ΔABC. If AC = BC = 1, what is the exact length of AB? Explain how you found this value.

2. If you were to plot segment AB on the positive side of number line while keeping point A at the origin, what are two consecutive integers between which the point B will land on the number line? Why?

3. Move point B to the x-axis to verify your prediction. What are the lower and upper integer boundaries for the coordinate of the point B? Explain your observations.

4. How can you make a better approximation for the coordinate of the point B?

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Page 1.3 shows the value of the scale that determines the precision with which you are reading the numbers on the given number line. The value of “scale” is equal to the number of digits after the decimal point you can determine in a number plotted on this number line.

5. When scale = 1, what is the smallest division of the number line? Using the number line, find the closest lower and upper boundaries for $\sqrt{2}$ with the given precision.

6. Complete the 2nd row of the table below for the answer you found in Question 5, following the example given in the 1st row of the table. Make sure to include:
   - The scale value and the size of smallest division of the number line.
   - The lower and upper boundaries of $\sqrt{2}$ according to the precision of the number line.
   - The compound inequality for $\sqrt{2}$.
   - The distance between the upper and lower boundaries.
7. Click the right arrow ▸ to change the scale value to 2. What is the smallest division of the number line in this case? Can you make a better approximation of $\sqrt{2}$ using this number line? Why?

8. Complete the remaining rows in the data table. Click the right arrow ▸ to change the scale.

Scale	Smallest division	Lower boundary	Upper boundary	Inequality	Difference between upper and lower boundary
0	1	1	2	$1 < \sqrt{2} < 2$	1
1					
2					
3					
4					
5					
6					

9. As precision of the scale increases, what happens to the lower boundary of $\sqrt{2}$? To the upper boundary of $\sqrt{2}$? To the distance between the boundaries? Support your answers.

10. Record the best approximation for $\sqrt{2}$ based on your data. What is the precision of your approximation? Why?

11. Do you observe a pattern in the decimal approximation of $\sqrt{2}$?

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12. Given right triangle ΔABC, where AC = 1 and BC = 2. What is the exact length of AB? Explain how you found this value.

13. What is the coordinate of the point B if it is plotted on the number line at a distance AB to the right of the origin? What are two consecutive integers between which the point B will land on the number line? Why?

14. Move point B to the positive side of the x-axis to verify your prediction. Record the compound inequality for this case.

15. What is the coordinate of the point B if it is plotted on the number line at a distance AB to the left of the origin? What are two consecutive integers between which point B will land on the number line? Why?

16. Move point B to the negative side of the x-axis to verify your prediction. Record the compound inequality for this case.

17. What is the same and what is different about the location of point B in these two cases?

18. Complete the first row of the data table below. How can you make a better approximation for the coordinate of the point B?

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19. Complete the table as you increase the scale value. Click the right arrow ▸ to change the scale.

Scale	Smallest division	Lower boundary	Upper boundary	Inequality	Difference between upper and lower boundary
0					
1					
2					
3					
4					
5					
6					

20. As precision of the scale increases, what happens to the lower boundary of $-\sqrt{5}$? To the upper boundary of $-\sqrt{5}$? To the distance between the boundaries? Support your answers.

21. Record the best approximation for $-\sqrt{5}$ based on your data. What is the precision of your approximation? Why?

22. Do you observe a pattern in the decimal approximation of $-\sqrt{5}$?

