

Mathematics

Quarter 1 - Module 6: Estimating Square Root of a Whole Number & Plotting Irrational Numbers on a Number Line



AIRs - LM

MATHEMATICS 7

Quarter 1 - Module 6: Estimating Square Root of a Whole Number & Plotting Irrational Numbers on a Number Line
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Region I

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MATHEMATICS

**Quarter 1 - Module 6:
Estimating Square Root of a Whole
Number & Plotting Irrational
Numbers on a Number Line**



Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



Target

In the previous module, you've learned how to determine the square root of a number using two integers. In this module, you will learn how to estimate the square root of a number and how to plot it on a number line.

This module will illustrate another type of sequence which is of equal importance with the previous learned type of sequence.

After going through this module, you are expected to:

Learning Competencies:

- estimate the square root of a whole number to the nearest hundredth. **(M7NS-Ig-3)**
- plot irrational numbers (up to square roots) on a number line. **(M7NS-Ig-4)**

Learning Competencies:

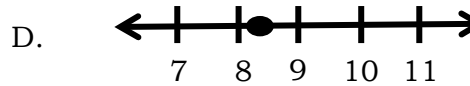
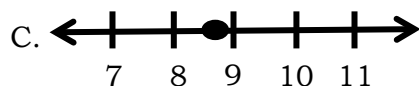
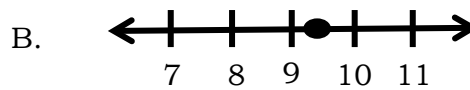
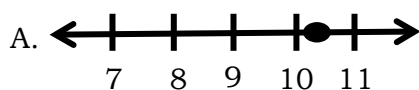
1. Identify perfect square from non-perfect square numbers.
2. Enumerate the steps in estimating the square root of a whole number to the nearest hundredth.
3. Plot rational numbers on a number line.

Before you start doing the activities in this lesson, let's find out how much you already know about this module by answering the pre-assessment on the next page.

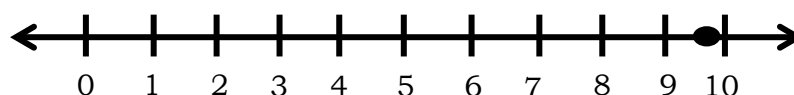
PRE – ASSESSMENT

Directions: Read each statement below carefully. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

- Which of the following is defined as a number that cannot be expressed as a quotient of two integers?
A. irrational B. positive C. rational D. real
- Which of the following is an irrational number?
A. -2 B. 0 C. $\frac{1}{2}$ D. $\sqrt{5}$
- Between which two consecutive integers does $\sqrt{7}$ lie?
A. 1 and 2 B. 2 and 3 C. 3 and 4 D. 4 and 5
- Which irrational number can you find between 8 and 9?
A. $\sqrt{25}$ B. $\sqrt{50}$ C. $\sqrt{75}$ D. $\sqrt{100}$
- Which of the following has 4.5 as its square root?
A. $\sqrt{20.25}$ B. $\sqrt{20.26}$ C. $\sqrt{20.27}$ D. $\sqrt{20.28}$
- Which of the following has 2.57 as its square root?
A. $\sqrt{6.6047}$ B. $\sqrt{6.6048}$ C. $\sqrt{6.6049}$ D. $\sqrt{6.6050}$
- What is the value of $\sqrt{15}$ to the nearest whole number?
A. 1 B. 2 C. 3 D. 4
- Which of the following is closest to 3?
A. 2.25 B. 2.56 C. 2.89 D. 3.24
- Which of the following is closest to 7?
A. 6.8644 B. 6.9169 C. 6.9696 D. 7.0225
- What is the value of $\sqrt{80}$ to the nearest tenth?
A. 6.1 B. 6.2 C. 6.3 D. 6.4
- What is the value of $\sqrt{38}$ to the nearest hundredth?
A. 6.16 B. 6.17 C. 6.18 D. 6.19
- Where can you locate $\sqrt{3}$ on the number line?
A. between 1 and 2 B. between 2 and 3
C. between 3 and 4 D. between 4 and 5
- What irrational number will use 7 and 8 as two consecutive integers in finding its square root?
A. $\sqrt{45}$ B. $\sqrt{55}$ C. $\sqrt{65}$ D. $\sqrt{75}$
- Which of the following shows the location of $\sqrt{85}$ on the number line?



- Which of the following corresponds the point on the given number line?



- A. $\sqrt{79}$ B. $\sqrt{99}$ C. $\sqrt{119}$ D. $\sqrt{139}$

Lesson 1: Estimating Square Root of a Whole Number to the Nearest Hundredth



Jumpstart

Activity 1: Identify Me!

Tell whether the given is perfect square or non-perfect square.

1. $\sqrt{5}$

2. $\sqrt{16}$

3. $\sqrt{25}$

4. $\sqrt{28}$

5. $\sqrt{42}$

6. $\sqrt{56}$

7. $\sqrt{81}$

8. $\sqrt{91}$

9. $\sqrt{144}$

10. $\sqrt{264}$



Discover

Any number that cannot be expressed as a quotient of two integers is an **irrational number**. The numbers $\sqrt{2}$, $\sqrt{12}$, $\sqrt{40}$, $\sqrt{55}$ and $\sqrt{90}$ are some examples of it because their square roots are not perfect squares.

The following examples will help you estimate the square root of an irrational number to the nearest hundredth.

Example 1. Estimate $\sqrt{12}$ to the nearest hundredth.

Step 1: Identify the two consecutive integers between which the irrational number lies.

12 is between 9 and 16 therefore, $\sqrt{12}$ must be between $\sqrt{9}$ and $\sqrt{16}$
also $\sqrt{12}$ is between 3 and 4. In symbol, $3 < \sqrt{12} < 4$.

Step 2: Take the square of 3.5, the midway of 3 and 4.

$$(3.5)^2 = 12.25$$

Since $12.25 > 12$, then $\sqrt{12}$ is closer to 3 than to 4.

Step 3: Compute for the squares of numbers between 3 and 3.5
(Estimate to the nearest tenth)

$$(3.1)^2 = 9.61$$

$$(3.2)^2 = 10.24$$

$$(3.3)^2 = 10.89$$

$$(3.4)^2 = 11.56$$

$$(3.5)^2 = 12.25$$



Note:

The arrow indicates
that $\sqrt{12}$ lies between
3.4 and 3.5.

Step 4: Take the square of 3.45, the midway of 3.4 and 3.5.

$$(3.45)^2 = 11.9025$$

Since $11.9025 < 12$, then $\sqrt{12}$ is closer to 3.5 than 3.4.

Step 5: Continue computing for the squares of numbers between 3.45 and 3.49.

$$(3.45)^2 = 11.9025$$

$$(3.46)^2 = 11.9716$$

$$(3.47)^2 = 12.0409$$



Note:

The arrow indicates
that $\sqrt{12}$ lies between
3.46 and 3.47.

Since 12 is closer to 11.9716 than 12.0409, then $\sqrt{12}$ is approximately equal to 3.46.

Example 2. Estimate $\sqrt{40}$ to the nearest hundredth.

Step 1: Identify the two consecutive integers between which the irrational number lies.

40 is between 36 and 49 therefore, $\sqrt{40}$ must be between $\sqrt{36}$ and $\sqrt{49}$
also $\sqrt{40}$ is between 6 and 7. In symbol, $6 < \sqrt{40} < 7$.

Step 2: Take the square of 6.5, the midway of 6 and 7.

$$(6.5)^2 = 42.25$$

Since $42.25 > 40$, then $\sqrt{40}$ is closer to 6 than to 7.

Step 3: Compute for the squares of numbers between 6 and 6.5.

(Estimate to the nearest tenth)

$$(6.1)^2 = 37.21$$

$$(6.2)^2 = 38.44$$

$$(6.3)^2 = 39.69$$

$$(6.4)^2 = 40.96 \quad \leftarrow$$

Note:

The arrow indicates that $\sqrt{40}$ lies between 6.3 and 6.4.

Step 4: Take the square of 6.35, the midway of 6.3 and 6.4.

$$(6.35)^2 = 40.3225$$

Since $40.3225 > 40$, then $\sqrt{40}$ is closer to 6.3 than 6.4.

Step 5: Continue computing for the squares of numbers between 6.31 and 6.34.

$$(6.31)^2 = 39.8161$$

$$(6.32)^2 = 39.9424 \quad \leftarrow$$

$$(6.33)^2 = 40.0689$$

Note:

The arrow indicates that $\sqrt{40}$ lies between 6.32 and 6.33.

Since 40 is closer to 39.9424 than 40.0689, then $\sqrt{40}$ is approximately equal to 6.32.

Example 3. Find the rational number with two decimal places between which $\sqrt{175}$ lie.

Solution:

Since 175 is between 169 and 196, $\sqrt{175}$ must be between $\sqrt{169}$ and $\sqrt{196}$. Hence, we have $\sqrt{169} < \sqrt{175} < \sqrt{196}$
 $13 < \sqrt{175} < 14$

By estimation we have:

$$(13.1)^2 = 171.61$$

$$(13.2)^2 = 174.24$$

$$(13.3)^2 = 176.89 \quad \leftarrow$$

So, $\sqrt{175}$ lies between 13.2 and 13.3.

Estimating further, we have:

$$(13.21)^2 = 174.5041$$

$$(13.22)^2 = 174.7684$$

$$(13.23)^2 = 175.0329 \quad \leftarrow$$

Therefore, $\sqrt{175}$ is approximately equal to 13.23.

Lesson 1: Plotting Irrational Numbers on a Number Line

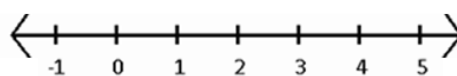


Jumpstart

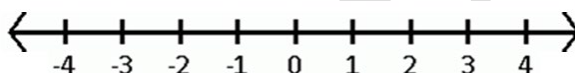
Activity 2: Locate Me?

We can locate rational numbers on the real number line. Locate and plot the following rational numbers on the number line.

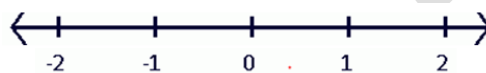
1. 5



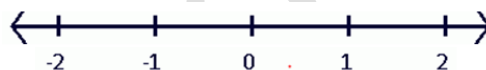
2. -4



3. $\frac{1}{2}$



4. 1.75



5. $-\frac{5}{3}$





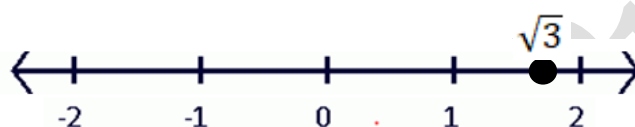
Discover

Aside from rational numbers, irrational numbers can also be located on the number line. Using the following examples, you will learn the process of plotting irrational number on a number line.

Example 1. Locate $\sqrt{3}$ on a number line.

Solution:

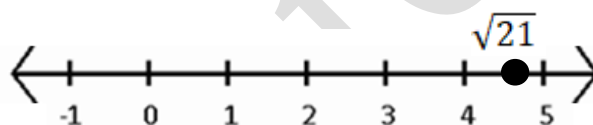
This number is between 1 and 2, principal roots of 1 and 4. Since 3 is closer to 4 than to 1 then $\sqrt{3}$ is closer to 2. Plot $\sqrt{3}$ closer to 2.



Example 2. Locate $\sqrt{21}$ on a number line.

Solution:

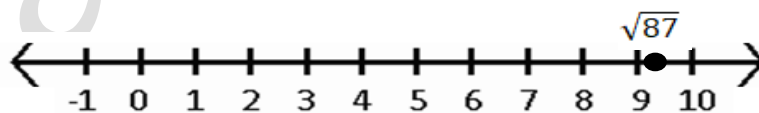
This number is between 4 and 5, principal roots of 16 and 25. Since 21 is closer to 25 than to 16 then $\sqrt{21}$ is closer to 5. Plot $\sqrt{21}$ closer to 5.



Example 3. Locate $\sqrt{87}$ on a number line.

Solution:

This number is between 9 and 10, principal roots of 81 and 100. Since 87 is closer to 81 than to 100 then $\sqrt{87}$ is closer to 9. Plot $\sqrt{87}$ closer to 9.





Explore

Activity 3: Try Me!

Estimate each square root to the nearest tenth.

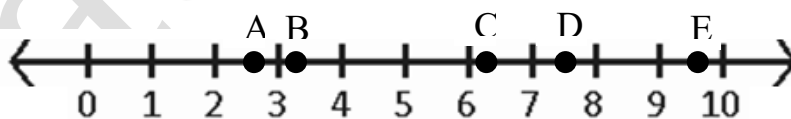
1. $\sqrt{5}$
2. $\sqrt{50}$
3. $\sqrt{85}$
4. $\sqrt{101}$
5. $\sqrt{136}$

Activity 4: Plot Me!

A. Label and plot the following on the number line.

1. $\sqrt{7}$
2. $\sqrt{23}$
3. $\sqrt{84}$
4. $\sqrt{105}$
5. $\sqrt{250}$

B. Which point on the number line below corresponds the following.



1. $\sqrt{57}$
2. $\sqrt{6}$
3. $\sqrt{99}$
4. $\sqrt{38}$
5. $\sqrt{11}$



Deepen

Activity 5: Try Me More!

Estimate each square root to the nearest hundredth.

1. $\sqrt{15}$
2. $\sqrt{54}$
3. $\sqrt{110}$
4. $\sqrt{148}$
5. $\sqrt{250}$

Activity 6. Draw Me!

Draw a number line and plot the following.

1. $\sqrt{15}$
2. $\sqrt{54}$
3. $\sqrt{110}$
4. $\sqrt{148}$
5. $\sqrt{250}$



Gauge

Directions: Read each statement below carefully. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which of the following is an irrational number?
A. -1 B. $\frac{3}{4}$ C. $\sqrt{8}$ D. 5
2. Which of the following is defined as a number that cannot be expressed as a quotient of two integers?
A. irrational B. positive C. rational D. real
3. Between which two consecutive integers does $\sqrt{13}$ lie?
A. 1 and 2 B. 2 and 3 C. 3 and 4 D. 4 and 5
4. Which irrational number can you find between 9 and 10?
A. $\sqrt{70}$ B. $\sqrt{90}$ C. $\sqrt{110}$ D. $\sqrt{130}$
5. Which of the following has 6.2 as its square root?
A. $\sqrt{35.44}$ B. $\sqrt{36.44}$ C. $\sqrt{37.44}$ D. $\sqrt{38.44}$
6. Which of the following has 13.21 as its square root?
A. $\sqrt{174.0145}$ B. $\sqrt{174.1054}$ C. $\sqrt{174.4105}$ D. $\sqrt{174.5041}$
7. Which of the following is closest to $\sqrt{35}$?
A. 6 B. 7 C. 8 D. 9
8. Which of the following is closest to 10?
A. 9.61 B. 10.24 C. 10.89 D. 11.56
9. Which of the following is closest to 12?
A. 11.9025 B. 11.9716 C. 12.0409 D. 12.1104
10. To the nearest tenth, what is the value of $\sqrt{20}$?
A. 4.3 B. 4.4 C. 4.5 D. 4.6
11. To the nearest hundredth, what is the value of $\sqrt{50}$?
A. 7.11 B. 7.12 C. 7.13 D. 7.14
12. Where can you locate $\sqrt{60}$ on the number line?
A. between 1 and 2 B. between 3 and 4
C. between 5 and 6 D. between 7 and 8
13. What irrational number will use 5 and 6 as two consecutive integers in finding

its square root?

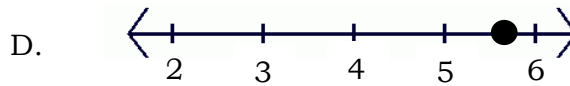
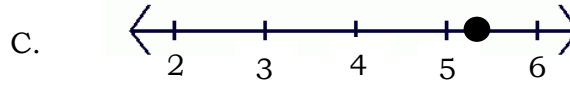
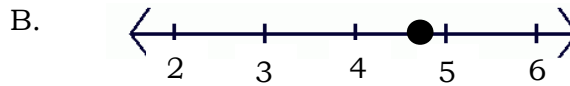
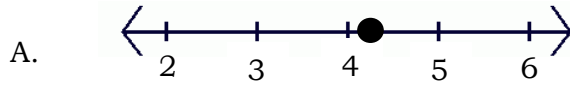
A. $\sqrt{32}$

B. $\sqrt{42}$

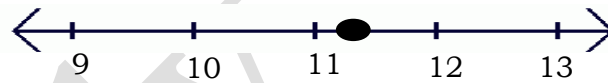
C. $\sqrt{52}$

D. $\sqrt{62}$

14. Which of the following shows the location of $\sqrt{27}$ on the number line?



15. Which of the following corresponds the point on the given number line



A. $\sqrt{130}$

B. $\sqrt{150}$

C. $\sqrt{170}$

D. $\sqrt{190}$

References

A. Books

- Mathematics Grade 7 Learner's Material, First Edition, 2013
- Mathematics Grade 7 Teacher's Guide, First Edition, 2013
- Bernabe, J. G. Elementary Algebra, 2009

B. Online Resources

- <https://www.mathwarehouse.com/number-lines/number-line-maker.php>

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