

## IMPERIAL MEASUREMENT: UNDERSTANDING MEASUREMENT

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Manufacturing Technology

TMJ10 / TIJ10

Summer 2022

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# Introduction

**Course Code:** TIJ10

**Broad base Technology:** Manufacturing Technology

**Destination:** TMJ20/TMJ3C

**Grade Level:** 9

**Project Name:** Imperial Measurement Reading a Rule

## Project Outline

This project is designed as a grade 9 beginner project. The purpose of this lesson is to refresh or teach imperial ruler reading. This project can be used as a refresher project for a student moving from TMJ20 to TMJ3C or as a way of introducing the skill of Imperial Measurement to a student new to Manufacturing Technology.

## Prior Knowledge

- Elementary level numeracy skills

## Student Activities

[Reading Imperial Measurement Slide Show](#)

[Inch rule reading - Whole inches Google Quiz](#)

[Inch rule reading - Whole inches PDF](#)

[Inch rule reading - Half inches Google Quiz](#)

[Inch rule reading - Half inches PDF](#)

[Inch rule reading - Quarter inches Google Quiz](#)

[Inch rule reading - Quarter inches PDF](#)

[Inch rule reading - Eighth inches Google Quiz](#)

[Inch rule reading - Eighth inches PDF](#)

[Inch rule reading - Sixteenth inches Google Quiz](#)

[Inch rule reading - Sixteenth inches PDF](#)

[Practical Line Measurement Handout](#)

## Activity 1 – Introduction of the Imperial System

The goal for this activity is to introduce students to Imperial measurement and how to accurately read the Imperial measurement scale.

- Students will go over the slide show with the instructor and practice as a class in real time.
- This will introduce the students to basic imperial measurement.

Time Required: .5 hours

## Activity 2 – Imperial Scale Practice

The goal for this activity is for students to practice and expand on their knowledge learned during Activity 1. Students will use the Google quizzes or PDF handouts to select the correct measurement from the labeled Imperial scale.

- Students will complete the Google quizzes as a formative learning activity to expand the knowledge earned in Activity 1.
- Students will have the option to redo the quizzes learning was not demonstrated.

Time Required: 1 hour

## Activity 3 – Application of Measurement

The goal for this activity is for students to practice the skill of measuring using a Ruler or Tape Measure. This skill will be expanded upon during the semester while working in the shop/classroom on practical projects.

- Students will be given a Tape Measure or a Ruler and will measure each line and record their measurement on the handout.
- This activity will allow students to use measuring tools to practice the hands-on skill of measurement.

## Planning Notes

The following are suggestions when planning to instruct on this lesson:

- What previous knowledge do the students have of fractions?
- What previous knowledge do the students have of Imperial Measurement?
- Ensure all materials and tools are on hand

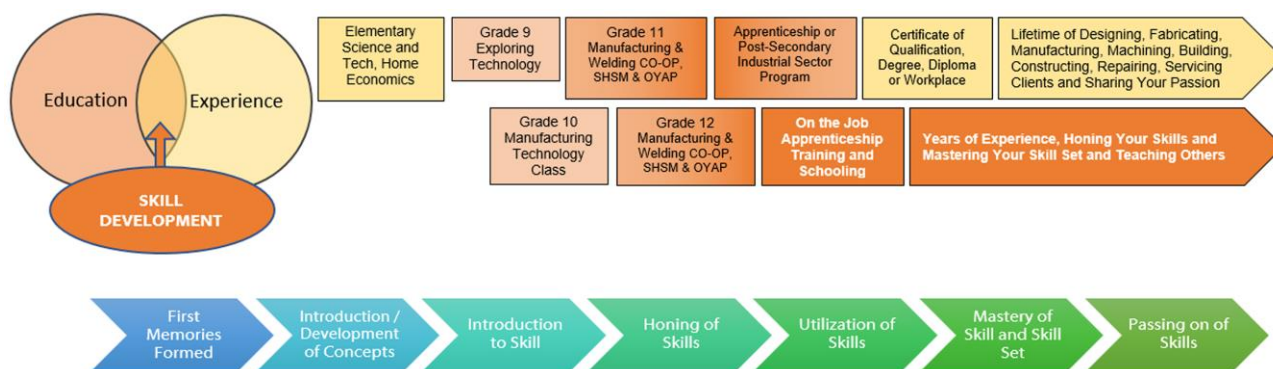
## Skilled Trades and Apprenticeship Opportunities

Some examples of Skilled Trades and Apprenticeship opportunities are:

- Tool and Die Maker
- Machine Tool Builder and Integrator
- General Machinist
- Millwright
- Mold Maker
- Etc.

## Skills Continuum

As students pursue their careers in the Manufacturing technology industry, they will have opportunities to build on the skills learned during this assignment, as the curriculum expectations met during this project are aligned with the Level 1 Common Core apprenticeship standard.



## Career and Industry Extensions

Students can explore career connections and opportunities in the following fields:

- Tool and Die Maker
- Machine Tool Builder and Integrator
- General Machinist
- CNC machine operator
- Engineering
- Mold Maker

## Resources

### Files

[Reading Imperial Measurement Slide Show Google Slides](#)

[Reading Imperial Measurement Slide Show PDF](#)

[Inch rule reading - Whole inches Google Quiz](#)

[Inch rule reading - Whole inches PDF](#)

[Inch rule reading - Half inches Google Quiz](#)

[Inch rule reading - Half inches PDF](#)

[Inch rule reading - Quarter inches Google Quiz](#)

[Inch rule reading - Quarter inches PDF](#)

[Inch rule reading - Eighth inches Google Quiz](#)

[Inch rule reading - Eighth inches PDF](#)

[Inch rule reading - Sixteenth inches Google Quiz](#)

[Inch rule reading - Sixteenth inches PDF](#)

## Lesson Plan

[Lesson Plan](#) [\(see Appendix H\)](#)

## Handouts

[Practical Line Measurement Handout](#)

[Inch rule reading - Whole inches PDF](#)

[Inch rule reading - Half inches PDF](#)

[Inch rule reading - Quarter inches PDF](#)

[Inch rule reading - Eighth inches PDF](#)

[Inch rule reading - Sixteenth inches PDF](#)

## Tools/Equipment

- Computer/ Tablet / Smartphone / Internet Access
- Tape Measure or Rule
- Pencil
- Eraser

## Instructional Strategies

Teachers may use any of the following instructional strategies; 3-Part lesson, lecture, storyboard, word wall, think-pair-share, placemat activity, rapid write, K-W-L, anticipation chart, ABC taxonomy, think aloud, analyzing text, Cornell note taking, exit ticket/ticket out the door, plus/minus/delta, etc.

## The Hook / Motivational Strategies

Leading Question: “Why do you all feel that measurement is an important skill to know?”  
“Why is it important to have an understanding of Imperial measurement?” “

Have a class discussion on the above questions and write all student ideas on the board and expand on them.



## Learning Goals and Success Criteria

Learning goals and success criteria are the foundation on which students base their ability to monitor their learning and determine next steps. Applicable learning goals may include any of the following,

- Students will learn about the various methods in measuring.
- Students will gain knowledge of content (e.g., math facts, computational strategies, terminology, mathematical models)
- Students will demonstrate an understanding of content (e.g., concepts, theories, procedures, principles, mathematical processes)

Success criteria may include any of the following,

- I will be able to identify different measurements.
- I will be able to understand the benefits of measurement.
- I will be more comfortable measuring in front of my peers.

Teachers may use the [Learning Goals and Success Criteria Viewing Guide](#) as a resource should they require assistance

## Overall and Specific Expectations in Support of Ontario Curriculum Grades 9 - 10 Technological Education

### Overall Expectations

A1. Demonstrate an understanding of the fundamental concepts and skills required in the planning and development of a product or service, including the use of a design process and/or other problem-solving processes and techniques;

B1. Use problem-solving processes and project-management strategies in the planning and fabrication of a product or delivery of a service;

D1. Follow safe practices and procedures when using materials, tools, and equipment;

## Specific Expectations

A2.3 Use metric and imperial units of measurement (e.g., metric: degrees Celsius, joules, micrometers [microns], millimeters, kilohms, L/100 km, tonnes; imperial: degrees Fahrenheit, BTUs, knots, mils, inches, feet, miles per gallon, pounds per square inch, tons) and the abbreviations or symbols associated with them correctly and as appropriate to the task;

B2.2 Make accurate measurements using a variety of tools (e.g., ruler, scale, tape measure, caliper, micrometer, thermometer, measuring cup), in metric or imperial units, as appropriate;

D2.4 Demonstrate an understanding of the Essential Skills that are important for success in the technology industries, as identified in the Ontario Skills Passport (e.g., reading text, writing, document use, computer use, oral communication, numeracy, thinking skills);

## Applicable SAFEDocs and ToolSAFE videos

Please refer to the [OCTE SAFEDocs for BBT Technology](#) for safety documents in order to properly address and instruct this project.

## Project Challenges

[Practical Line Measurement Handout](#)

## Differentiation of the Project / Activity

This project can be differentiated by:

- Using different types of learning materials
- Working in groups, have students teach one another
- Measurement quiz could be made into a Google Form

Teachers can also refer to the [Differentiation Scrapbook](#) to take into account for learner ability, multiple intelligences, exceptional students, and ESL learners.

# Assessment and Evaluation

## Assessment As Learning

- Ask questions and make suggestions based on observation
- Assess students' cognition about their learning (asking them "Why" and "How" they are completing a certain operation)
- Students monitor their own learning and ask questions as needed

## Assessment For Learning

- Provide feedback to students about their learning and how to improve
- Create differentiated teaching strategies and learning opportunities
- Identify particular learning needs of students

## Assessment Of Learning

- Students will complete a quiz to assess their understanding of the lessons

## Religious Considerations

The [Ontario Catholic School Graduate Expectations](#) (OCSGEs) were developed to provide a framework to represent the distinctiveness and purpose of Catholic education in Ontario. This project does not have any religious context, however, provides foundations and framework for success in manufacturing, design, construction, and transportation skilled trades, STEM - science, technology, engineering, and mathematics, etc.

## Career and Industry Extensions

Students can explore career opportunities in the Manufacturing Industry including:

- |                      |  |
|----------------------|--|
| - General Machinist  | - Machine Tool Builder and Integrator    |
| - Millwright         | - Mechanical Engineer                    |
| - Tool and Die Maker | - Manufacturing Engineering Technologist |

## Ethical Considerations

The purposes of the ethical considerations and standards are to inspire members to care, provide respect, develop trust and integrity. Participants should be able to reflect on the learning and identify responsibilities and make ethical decisions.

## Environmental Considerations

Mathematical calculations and concepts are evident in everyday life. There are ways to Reduce, Reuse, Recycle and measure various environmental impacts. Teachers are encouraged to bring environmental considerations that are local to their school, community and city or town.

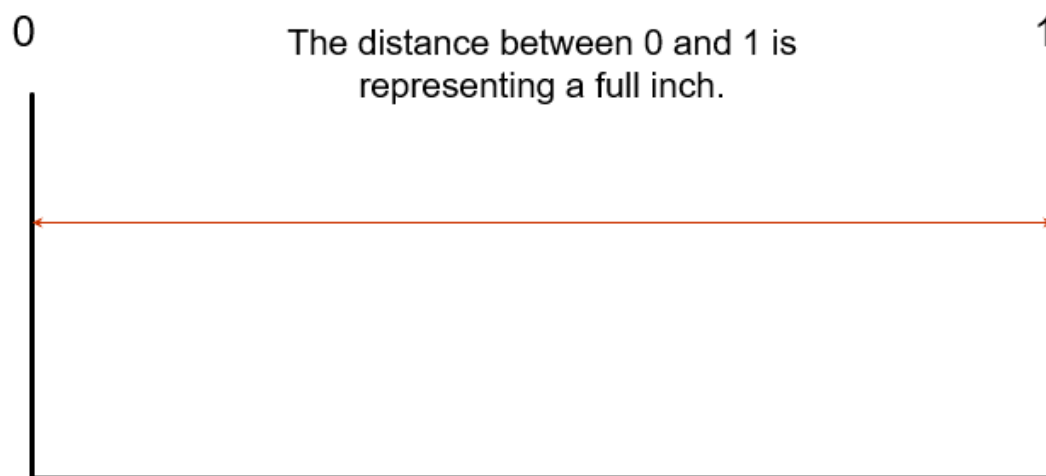
## Reflection or Design Report

Teachers may wish to have the students complete a design report, reflection or create a foldable document to consolidate their learning. This would be a nice way to capture the student's understanding in a summative format and be used in preparation for their examination, entering post-secondary education or the workforce.

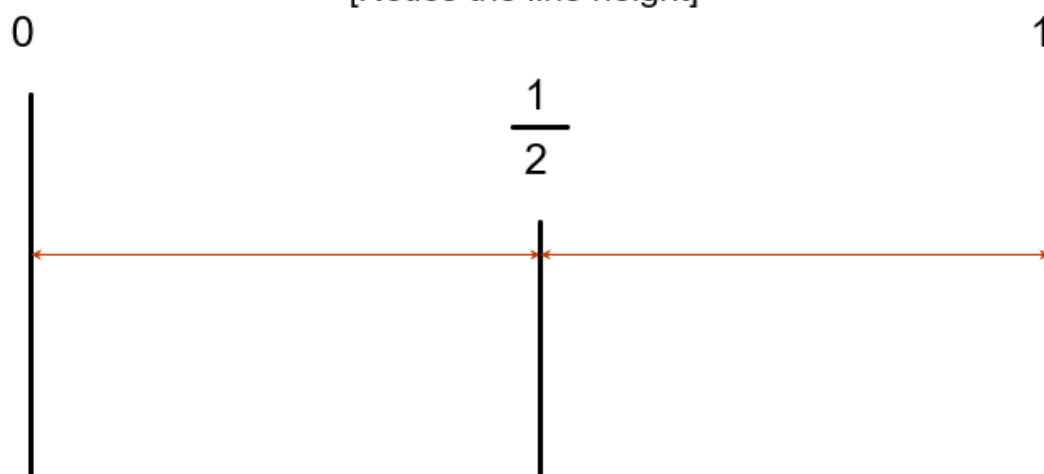
# Reading Imperial Measurements Using a Ruler with Precision

***Accuracy Counts***

***Measure Twice Cut Once***



The full inch is divided into two sections.  
The number of sections determines the denominator.  
[Notice the line height]

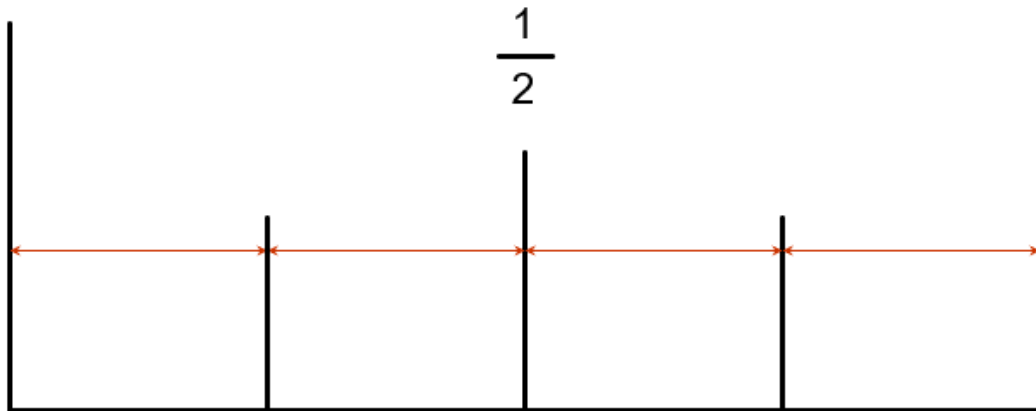


Each half inch section is divided into two sections.

Notice the line height. It's getting smaller.

Remember the number of sections determines the denominator.

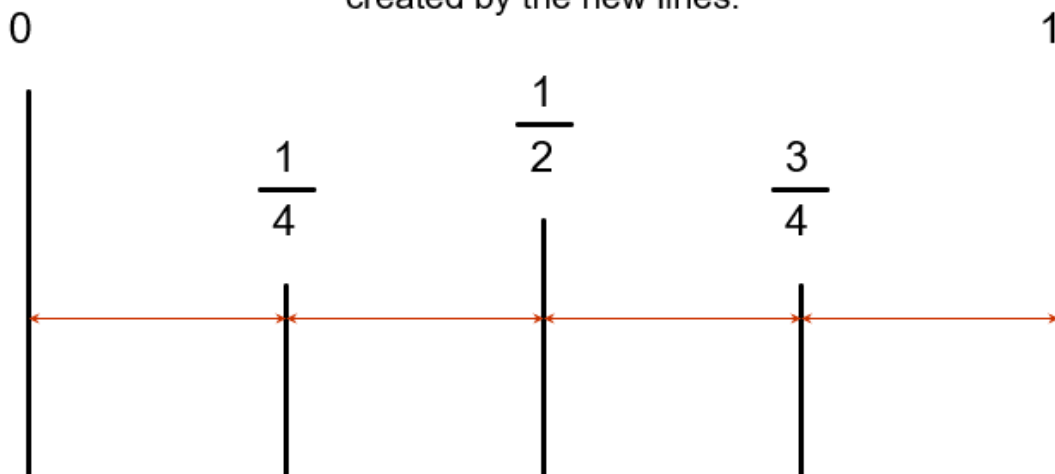
0 What will the denominator be for the new lines? 1



Each half inch section is divided into two sections.

Notice the line height. It's getting smaller.

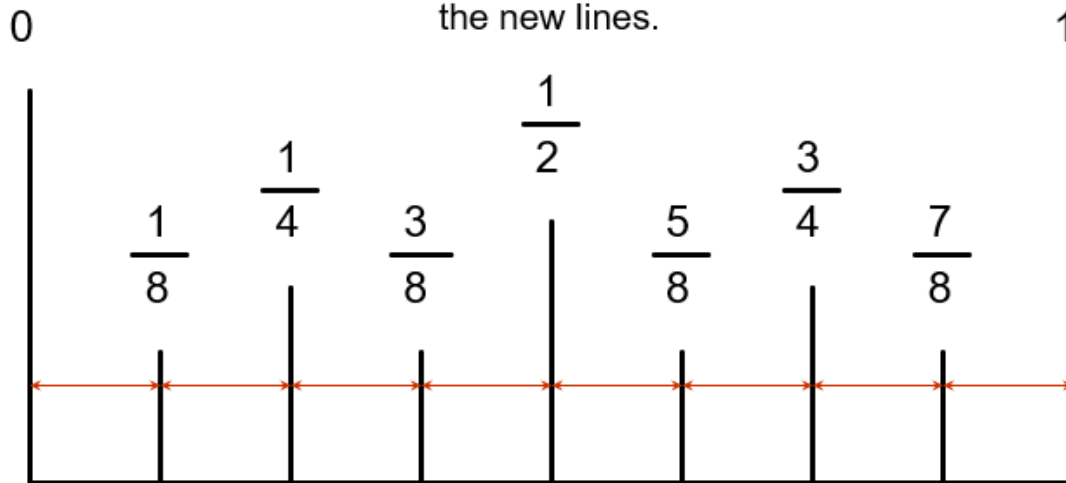
The denominator is 4 because of the 4 sections created by the new lines.



Each **fourth** inch section, also known as “quarter inch”, is divided into two sections.

Notice the line height. It's getting smaller.

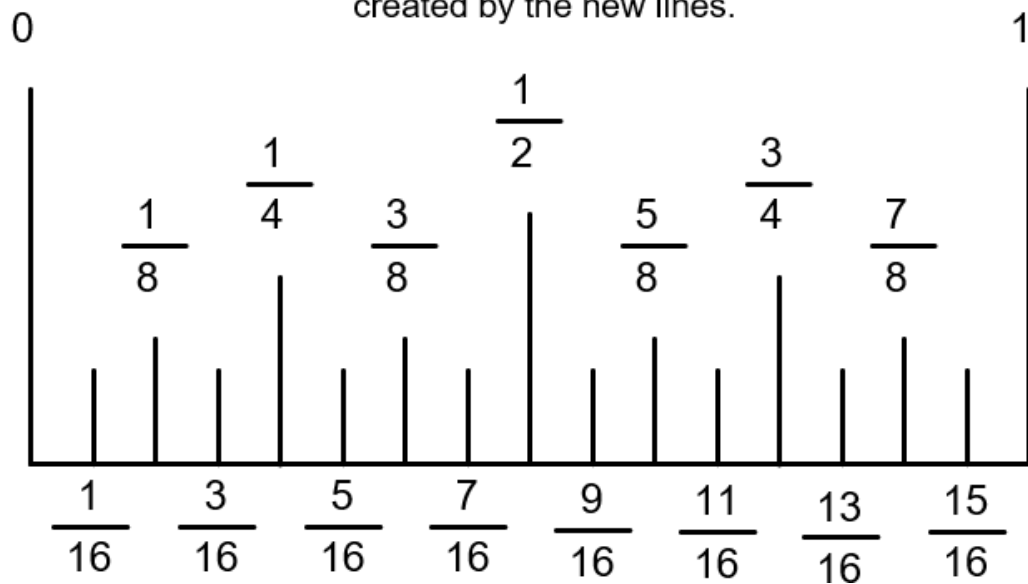
The denominator is **8** because of the **8** sections created by the new lines.



Each **eighth** inch section is divided into two sections.

Notice the line height. It's getting smaller.

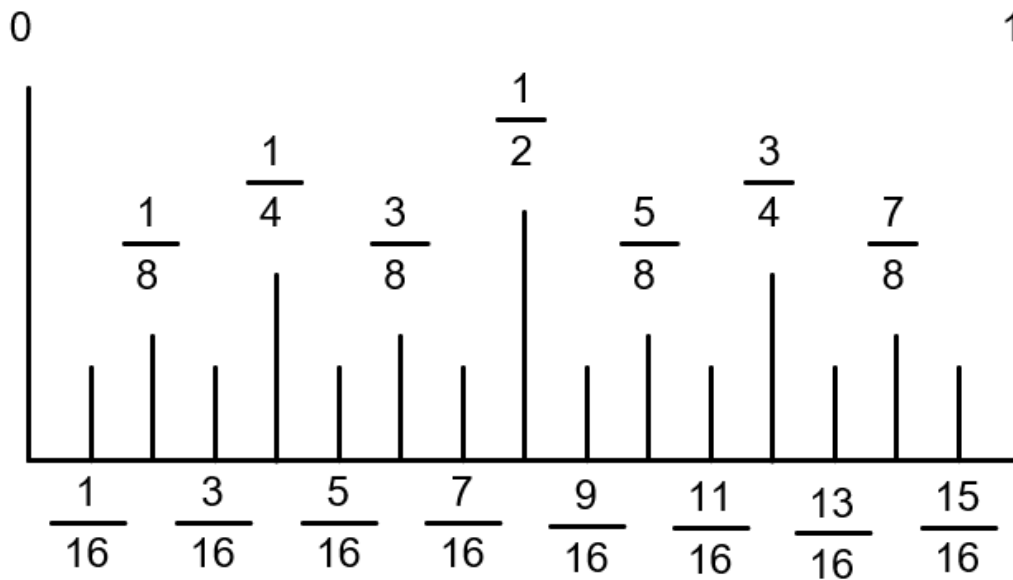
The denominator is **16** because of the **16** sections created by the new lines.





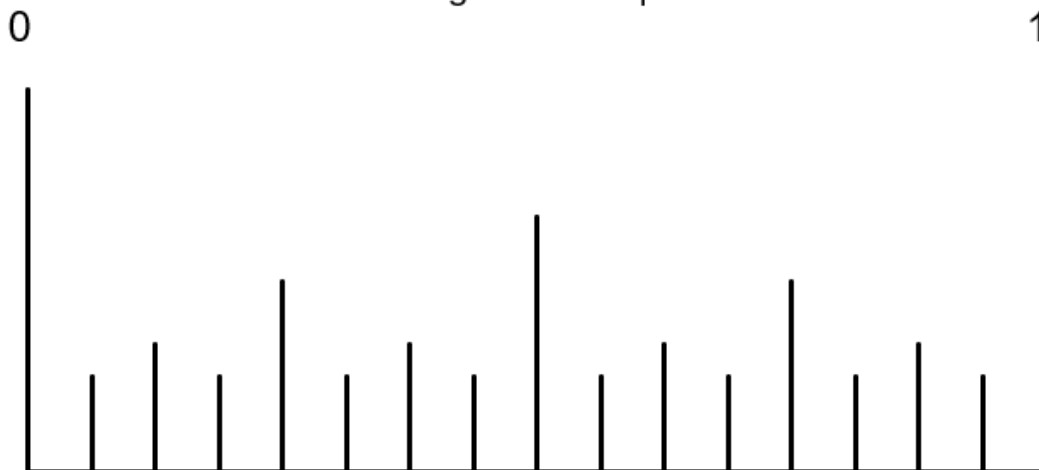
You now **know** all the fractions on a common school ruler.

How can you tell the fractions just by looking at the line heights?



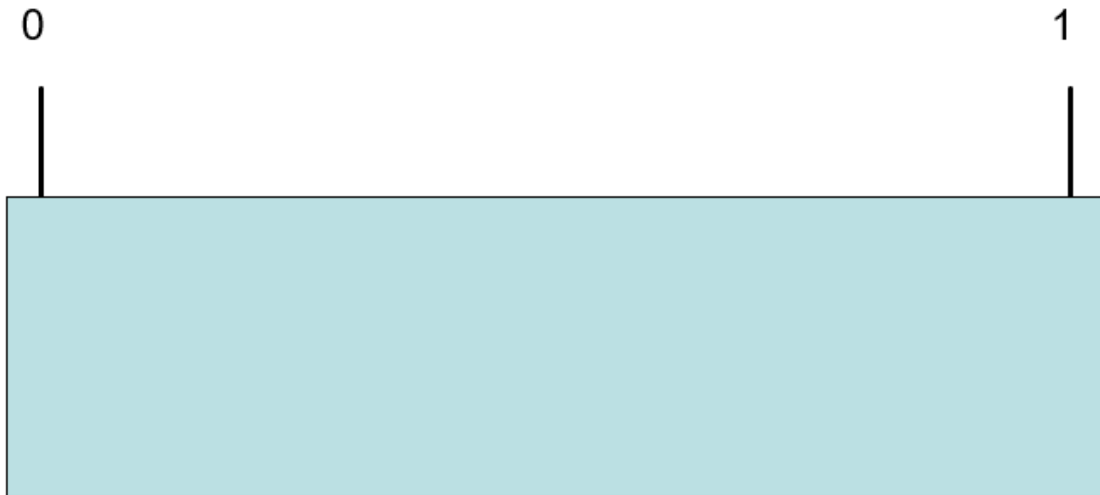
PAY CLOSE ATTENTION NOW

You can tell what the fraction is for each line by covering the lines up.



PAY CLOSE ATTENTION NOW

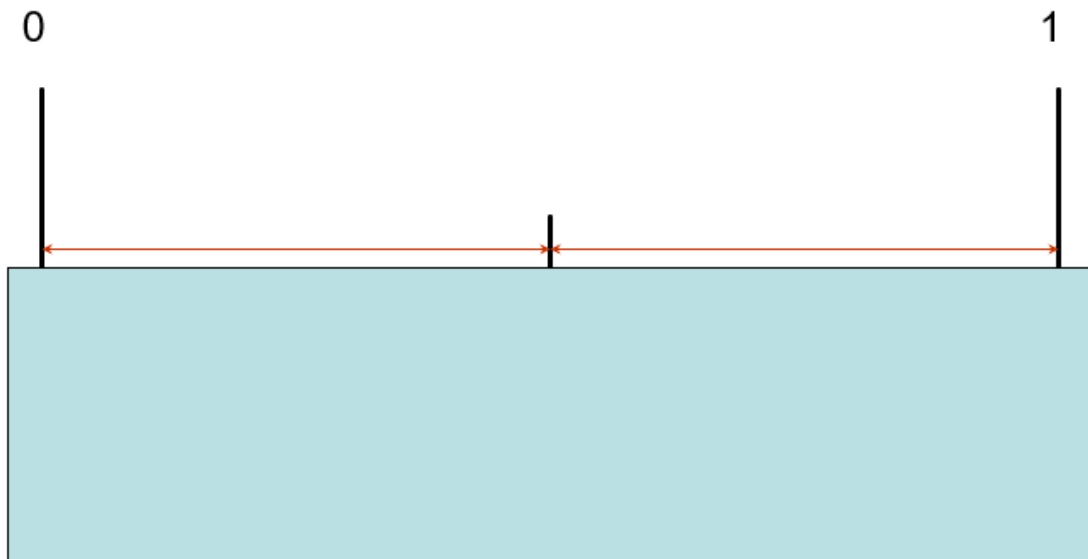
Cover the lines up.



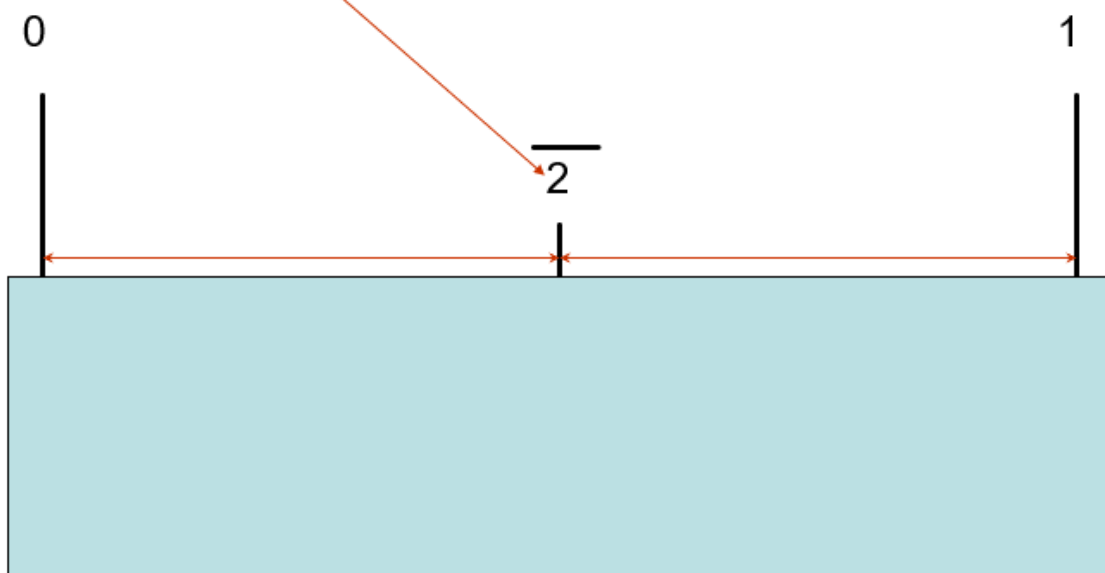
PAY CLOSE ATTENTION NOW

NOW expose the first set of lines.

HOW many sections are created?

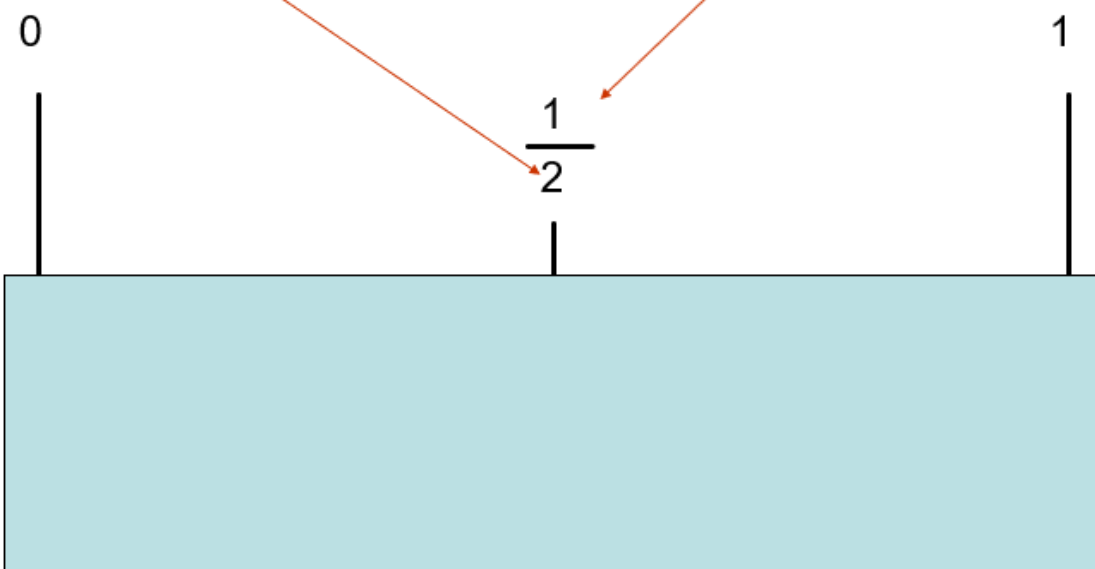


2 sections. That tells me the denominator

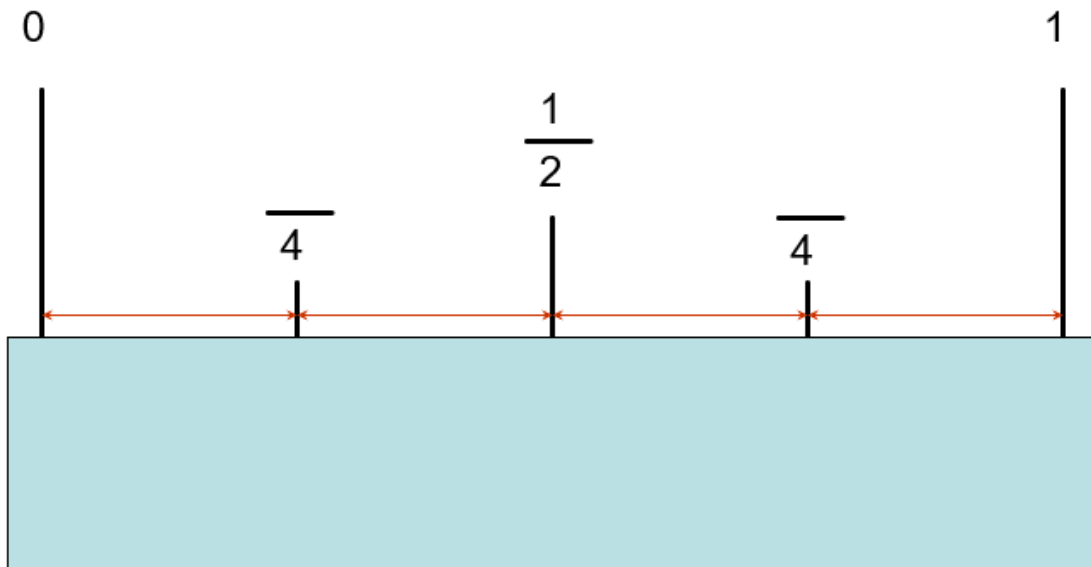


Count by odd numbers for the numerator.

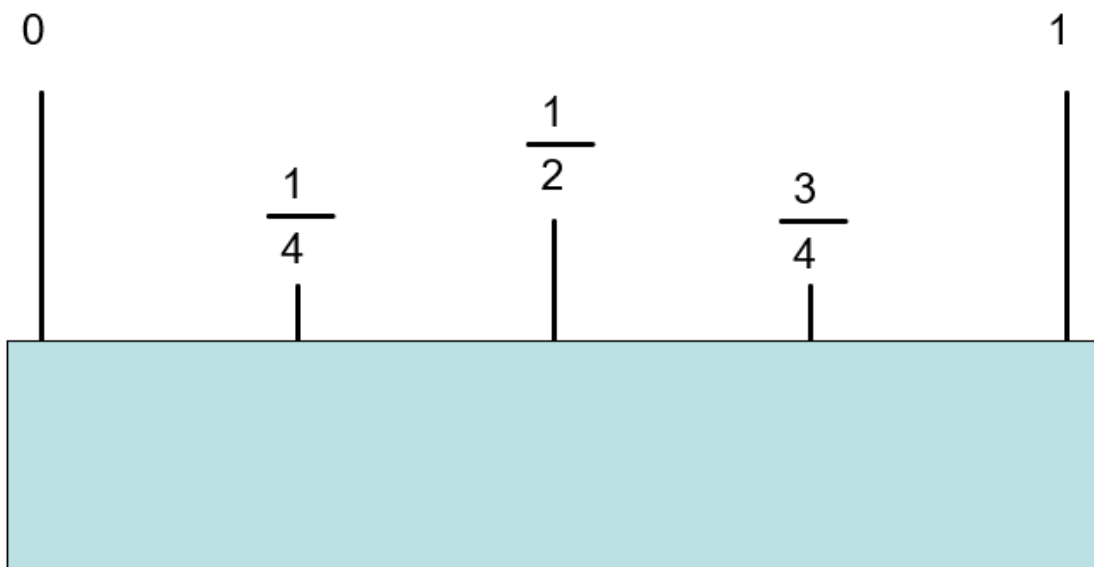
Remember the 2 sections. That tells me the denominator.



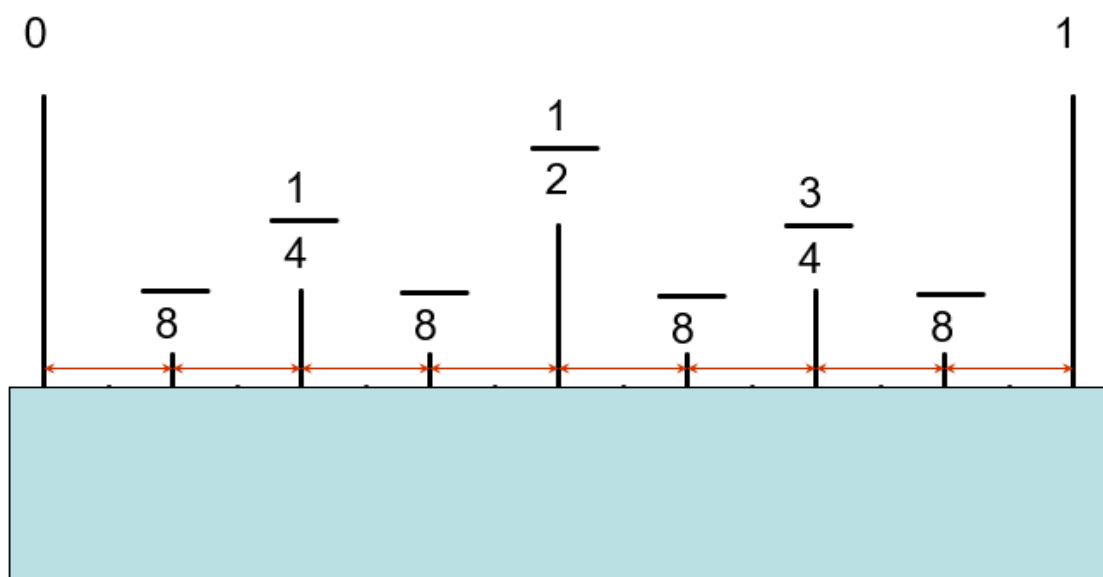
Expose the next set of lines.  
The number of sections created tells me the denominator.



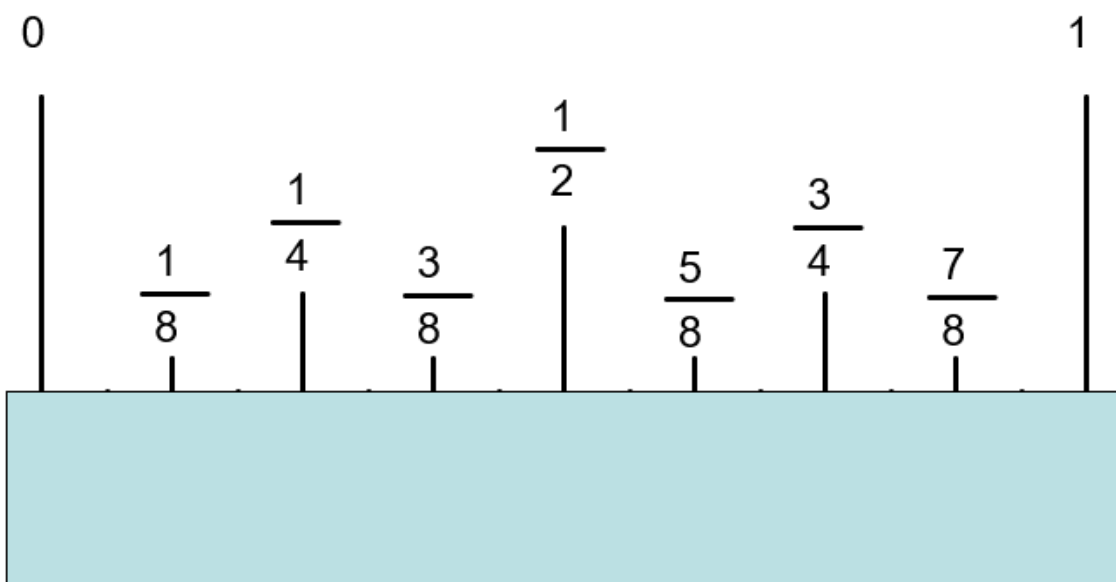
Count by odd numbers for the numerators.



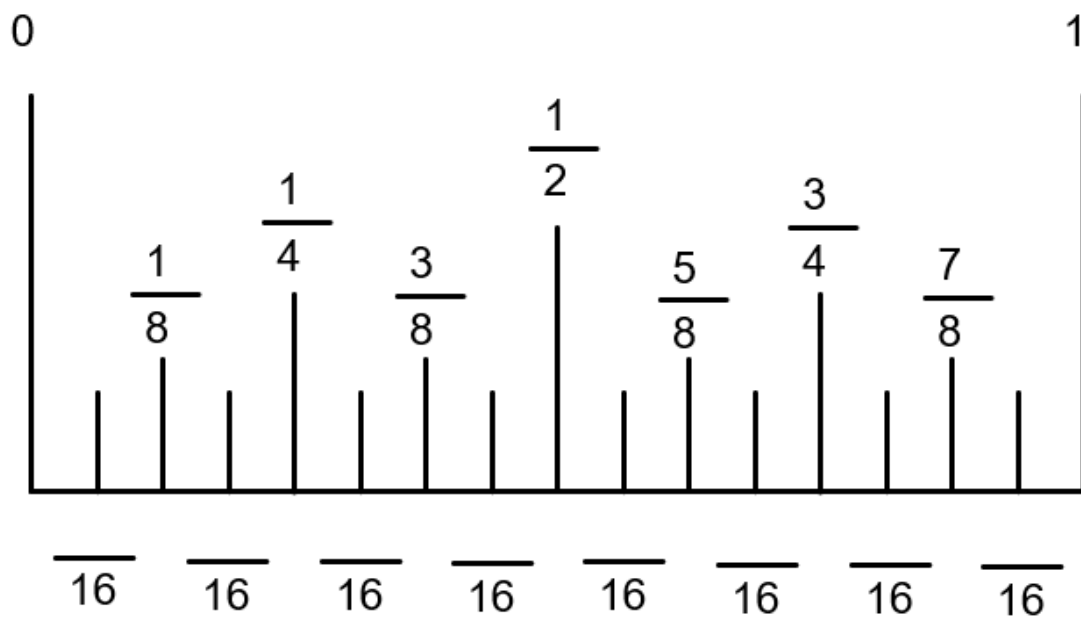
Expose the next set of lines.  
The number of sections created tells me the denominator.



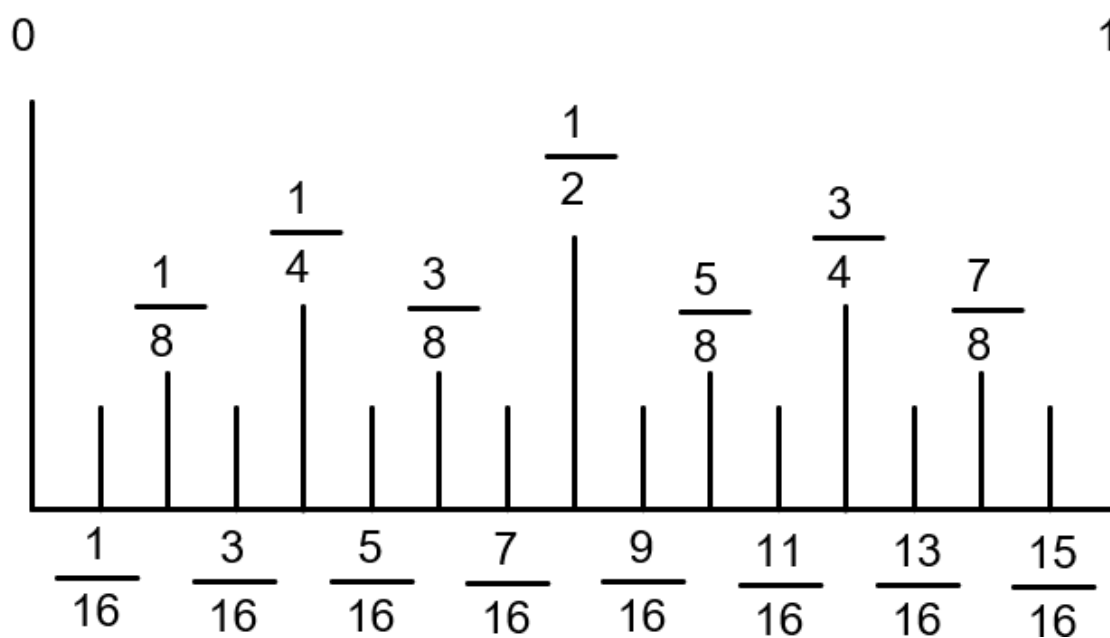
Count by odd numbers for the numerators.



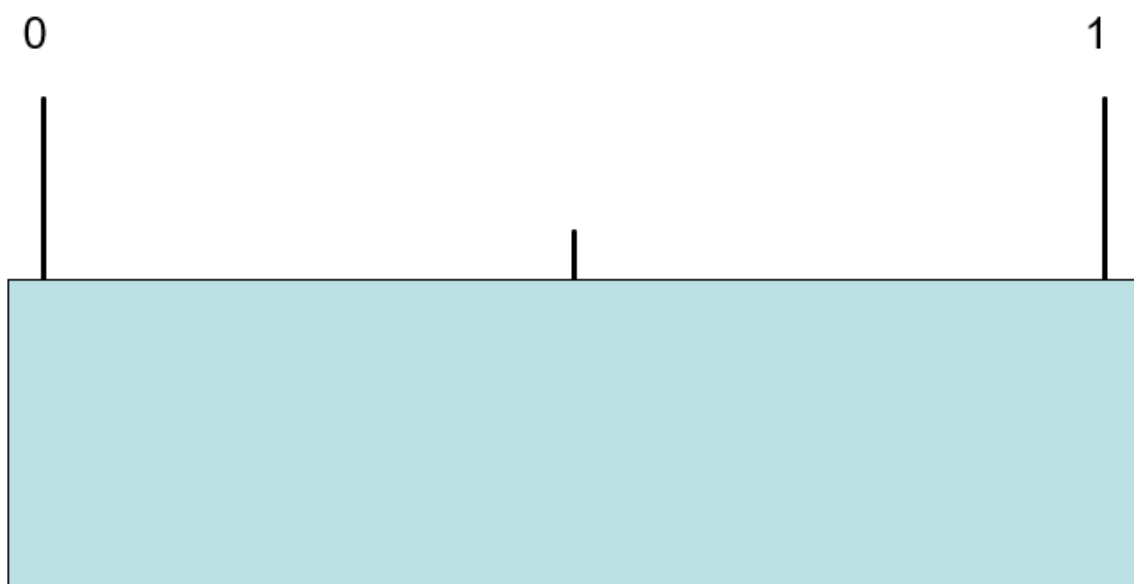
Expose the next set of lines.  
The number of sections created tells me the denominator.



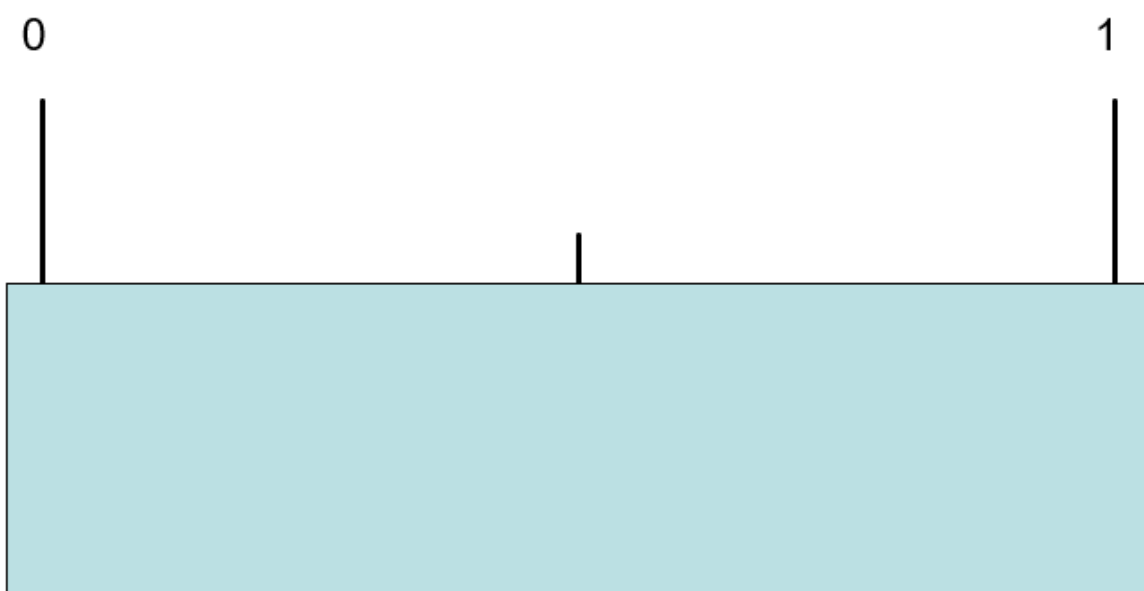
Count by odd numbers for the numerators.



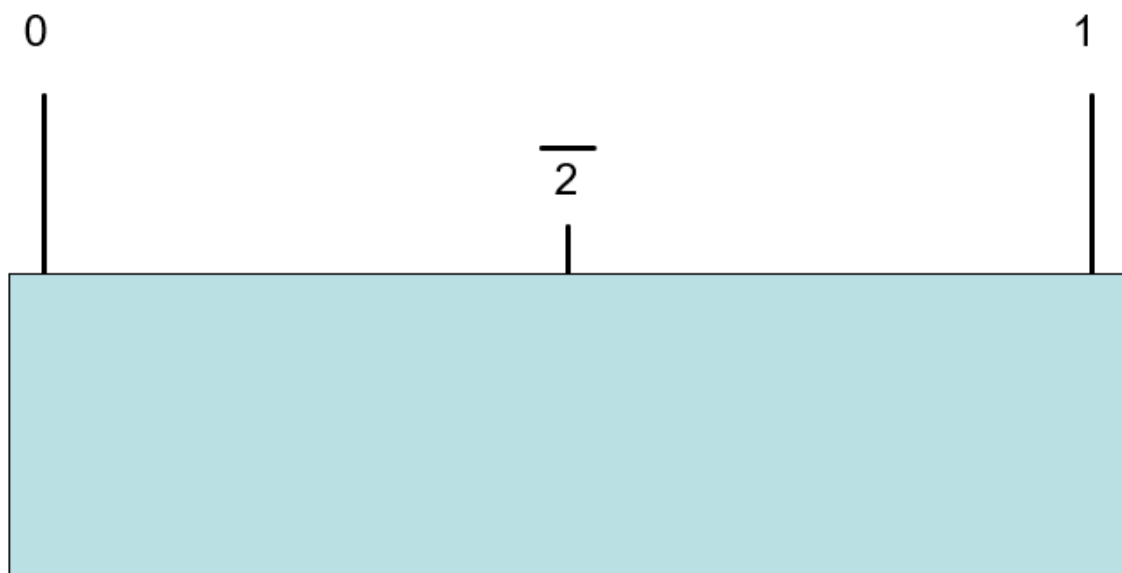
You try it.  
Expose the first set of lines.



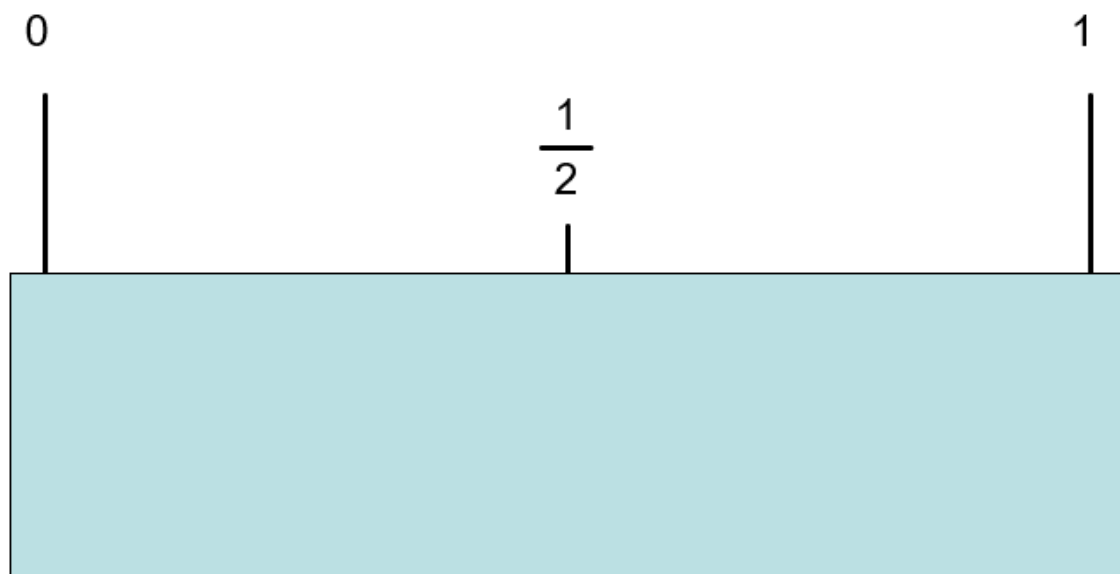
What is the denominator?



The denominator is 2.  
Now what is the numerator?



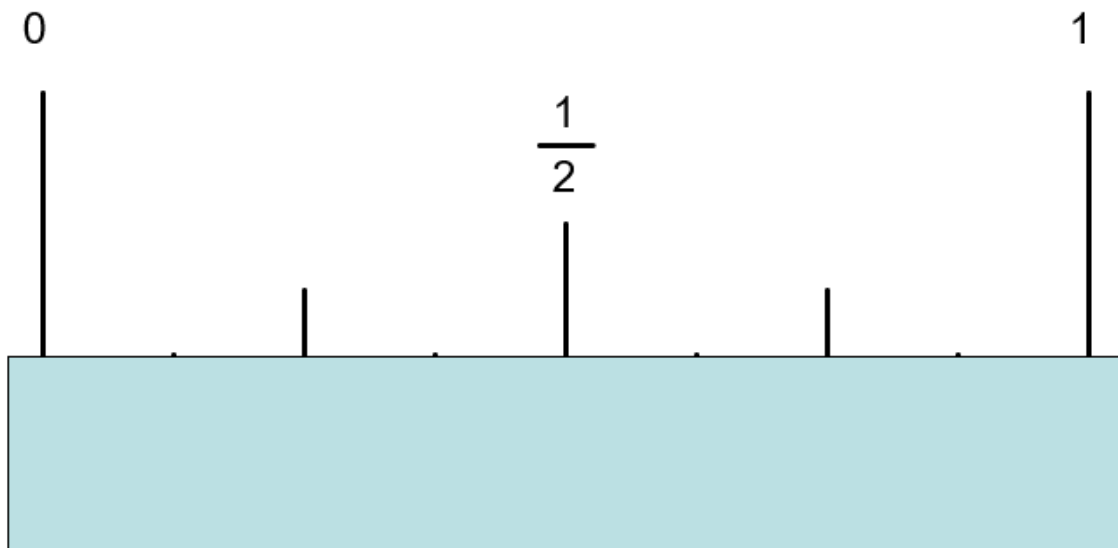
The numerator is 1. It's the first odd number.  
Now try the next set of lines.





The denominator will be 4.

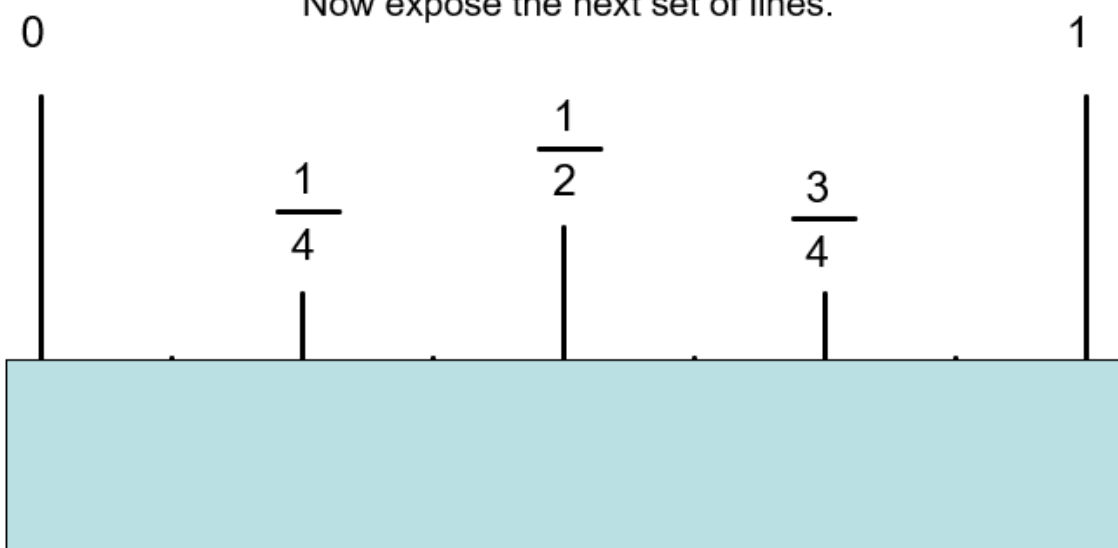
The numerators will be 1 and 3. Count by odd numbers.



The denominator will be 4.

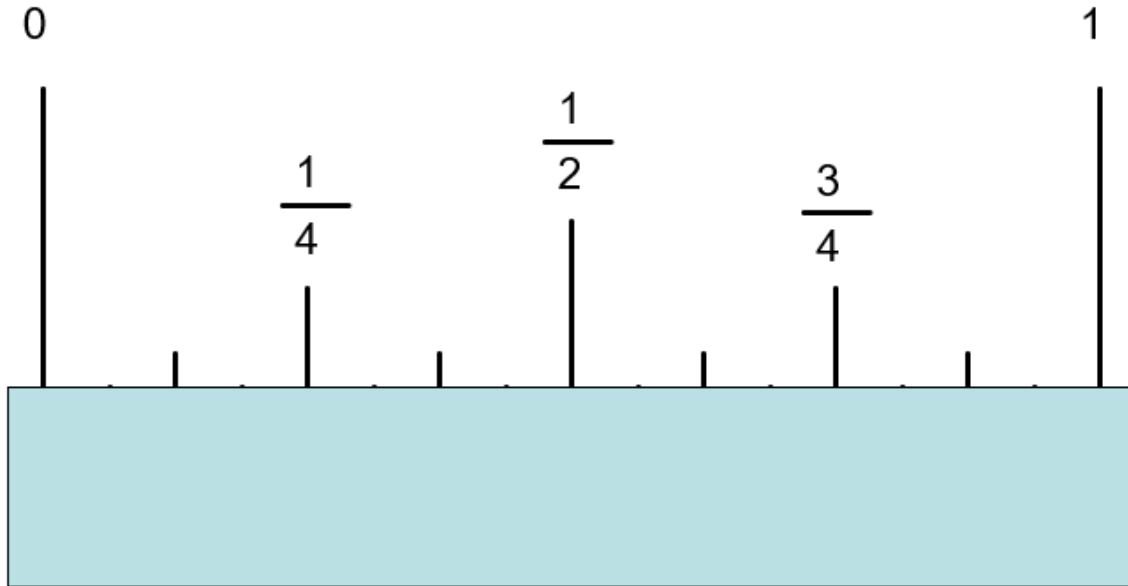
The numerators will be 1 and 3. Count by odd numbers.

Now expose the next set of lines.



What will denominator be?

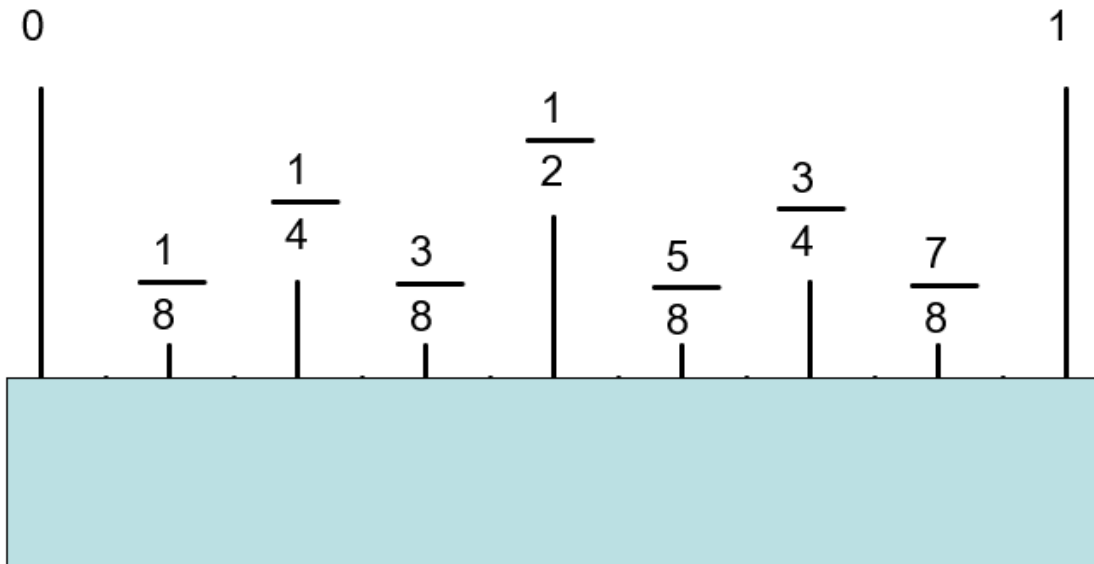
The numerators will be? Remember, count by odd numbers.



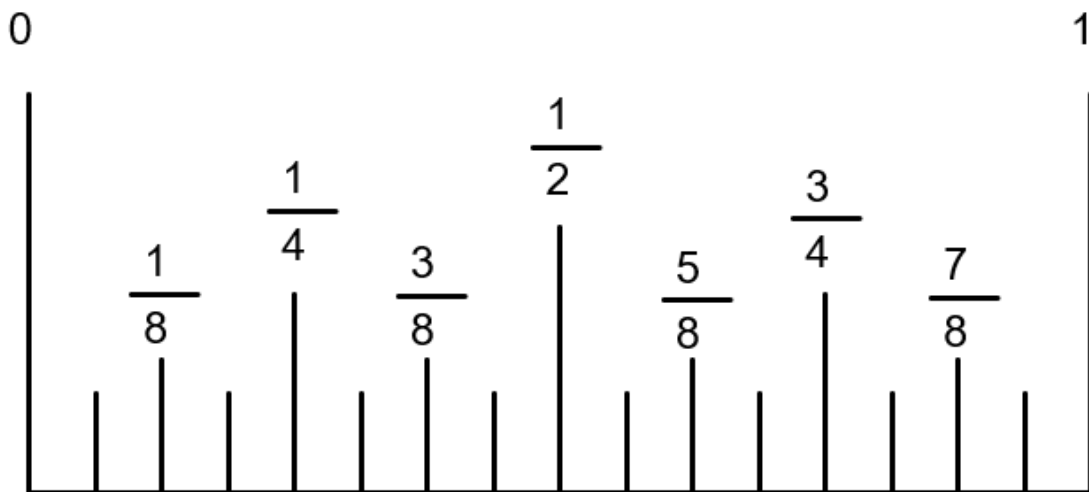
The denominator will be 8.

And the numerators will be 1,3,5 and 7.

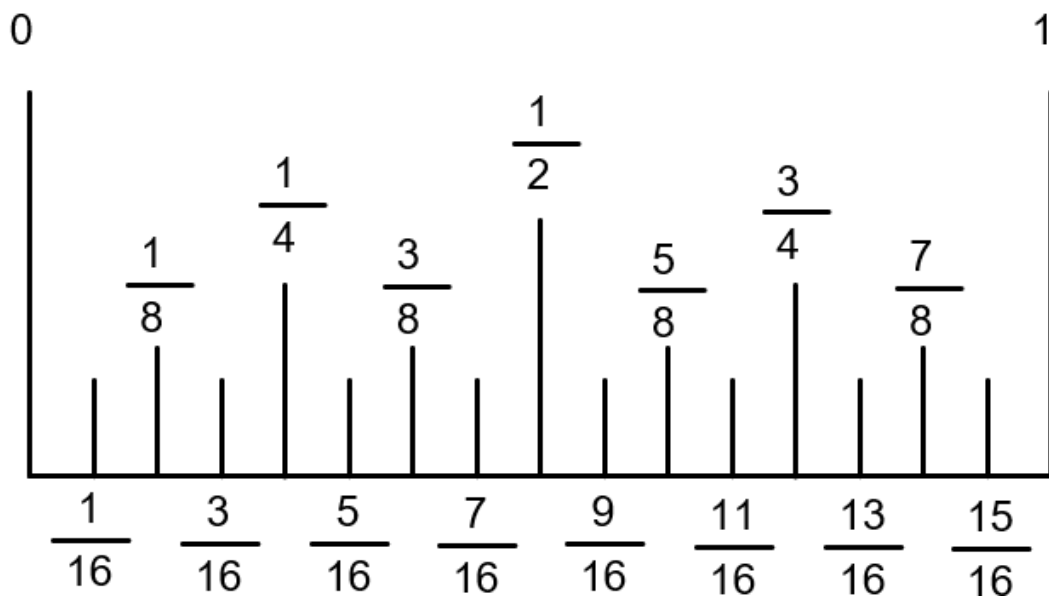
Now expose the last set of lines.



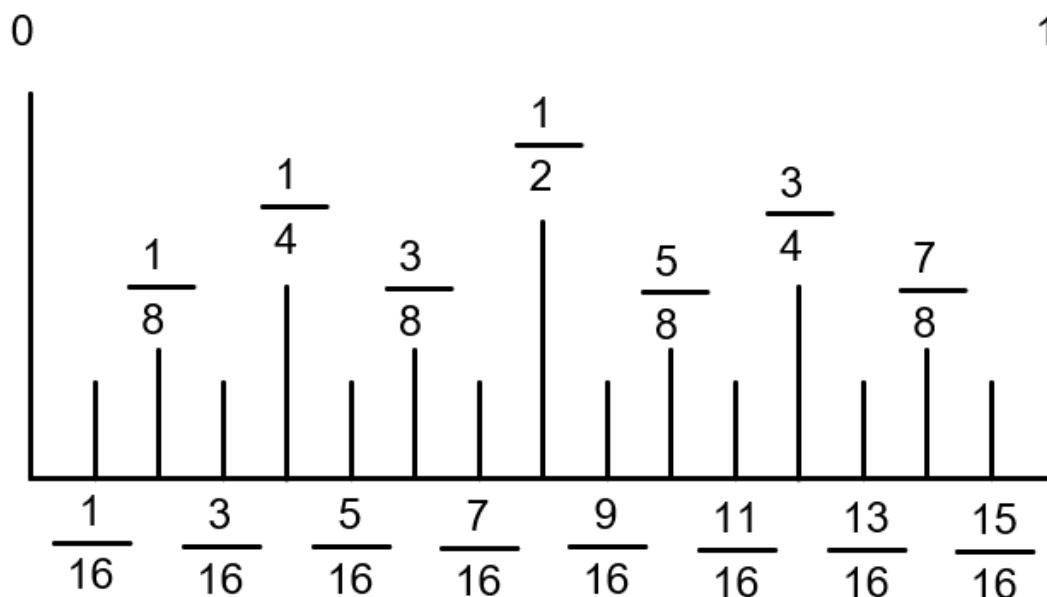
What will denominator be?  
 The numerators will be? Remember, count by odd numbers.



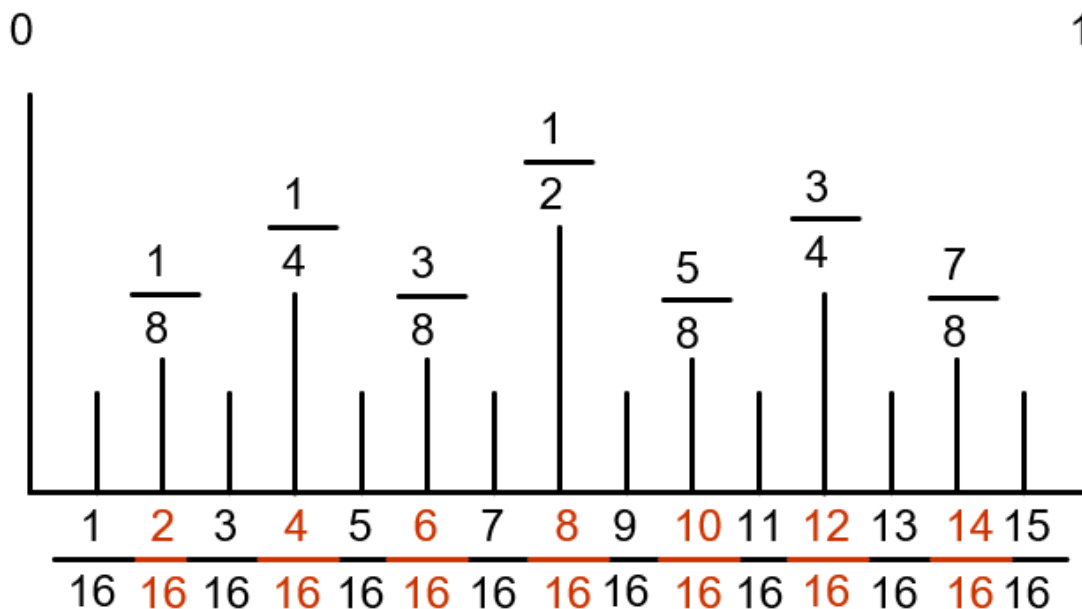
The denominator will be 16?  
 The numerators will be? 1,3,5,7,9,11,13 and 15.  
 Remember, you count by odd numbers.



Why do we count by odd number?  
 Remember math class and reducing fractions.  
 We only have odd number in the numerators because  
 an even number could be reduced.



All the red fractions can be reduced. Do you see any patterns?



# Take the Measuring Test

## Appendix B – Inch Rule Reading “Whole Inches”

7/18/22, 10:12 AM

Inch Rule Reading "Whole Inches"

### Inch Rule Reading "Whole Inches"

Use the "Whole Inches Worksheet" in the "Reading The Inch Rule" assignment to complete this quiz.

The respondent's email (null) was recorded on submission of this form.

1. Email \*

\_\_\_\_\_

2. What measurement is shown in question 1?

1 point



Mark only one oval.

- ☐ 3
- ☐ 4
- ☐ 1
- ☐ 6

3. What measurement is shown in question 2?

1 point



Mark only one oval.

- ☐ 3  
☐ 4  
☐ 1  
☐ 6

4. What measurement is shown in question 3?

1 point

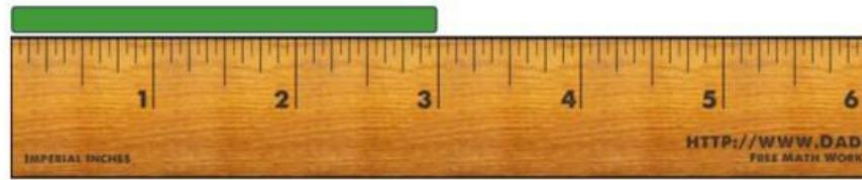


Mark only one oval.

- ☐ 3  
☐ 4  
☐ 1  
☐ 6

5. What measurement is shown in question 4?

1 point



Mark only one oval.

- ☐ 3
- ☐ 4
- ☐ 1
- ☐ 6

6. What measurement is shown in question 5?

1 point



Mark only one oval.

- ☐ 3
- ☐ 4
- ☐ 1
- ☐ 2

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## Appendix C – Inch Rule Reading: “Half Inches”

7/18/22, 10:12 AM

Inch Rule Reading "Half Inches 1"

### Inch Rule Reading "Half Inches 1"

Use the "Whole Inches Worksheet" in the "Reading The Inch Rule" assignment to complete this quiz.

The respondent's email (null) was recorded on submission of this form.

1. Email \*

\_\_\_\_\_

2. What measurement is shown in question 1?

1 point



Mark only one oval.

- ☐ 1-1/4
- ☐ 1-1/2
- ☐ 1-3/4
- ☐ 1-1/8

3. What measurement is shown in question 2?

1 point



Mark only one oval.

- ☐ 4
- ☐ 4-1/2
- ☐ 4-1/8
- ☐ 4-1/16

4. What measurement is shown in question 3?

1 point



Mark only one oval.

- ☐ 3
- ☐ 3-1/2
- ☐ 3-1/8
- ☐ 3-1/16

5. What measurement is shown in question 4?

1 point



Mark only one oval.

- ☐ 2-1/12
- ☐ 2
- ☐ 1-3/4
- ☐ 2-1/4

6. What measurement is shown in question 5?

1 point



Mark only one oval.

- ☐ 4-1/2
- ☐ 4
- ☐ 4-3/4
- ☐ 4-1/4

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## Appendix D – Inch Rule Reading: “Quarter Inches”

7/18/22, 10:12 AM

Inch Rule Reading "Quarter Inches 1"

### Inch Rule Reading "Quarter Inches 1"

Use the "Whole Inches Worksheet" in the "Reading The Inch Rule" assignment to complete this quiz.

The respondent's email (null) was recorded on submission of this form.

1. Email \*

\_\_\_\_\_

2. What measurement is shown in question 1?

1 point

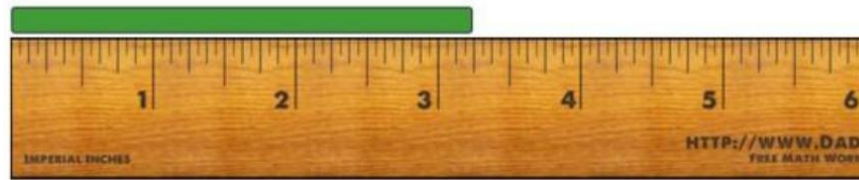


Mark only one oval.

- ☐ 4  
☐ 3  
☐ 2  
☐ 1

3. What measurement is shown in question 2?

1 point



Mark only one oval.

- ☐ 3-1/4
- ☐ 3-1/2
- ☐ 3-3/4
- ☐ 3-2/4

4. What measurement is shown in question 3?

1 point



Mark only one oval.

- ☐ 4-1/4
- ☐ 4-1/2
- ☐ 4-3/4
- ☐ 4-2/4

5. What measurement is shown in question 4?

1 point



Mark only one oval.

- ☐ 2-1/4
- ☐ 2-1/2
- ☐ 2-3/4
- ☐ 2-2/4

6. What measurement is shown in question 5?

1 point



Mark only one oval.

- ☐ 4-1/4
- ☐ 4-1/2
- ☐ 4-3/4
- ☐ 4-2/4

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## Appendix E – Inch Rule Reading: “Eighth Inches”

7/18/22, 10:11 AM

Inch Rule Reading "Eighth Inches 1"

### Inch Rule Reading "Eighth Inches 1"

Use the "Whole Inches Worksheet" in the "Reading The Inch Rule" assignment to complete this quiz.

The respondent's email (null) was recorded on submission of this form.

1. Email \*

\_\_\_\_\_

2. What measurement is shown in question 1?

1 point



Mark only one oval.

- ☐ 3-1/2
- ☐ 3-3/8
- ☐ 3-7/16
- ☐ 3-5/8

3. What measurement is shown in question 2?

1 point



Mark only one oval.

- ☐ 4-1/2
- ☐ 4-3/8
- ☐ 4-7/16
- ☐ 4-1/8

4. What measurement is shown in question 3?

1 point



Mark only one oval.

- ☐ 3-1/2
- ☐ 3-3/8
- ☐ 3-3/4
- ☐ 3-1/8



5. What measurement is shown in question 4?

1 point



Mark only one oval.

- ☐ 4-1/2
- ☐ 4-3/8
- ☐ 4-3/4
- ☐ 4-1/8

6. What measurement is shown in question 5?

1 point



Mark only one oval.

- ☐ 3-1/2
- ☐ 3-3/8
- ☐ 3-3/4
- ☐ 3-1/8

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## Appendix F - Inch Rule Reading: "Sixteenth Inches"

7/18/22, 10:13 AM

Inch Rule Reading "Sixteenth Inches"

### Inch Rule Reading "Sixteenth Inches"

Using the picture in each question, select the measurement that best fits.

The respondent's email (null) was recorded on submission of this form.

1. Email \*

\_\_\_\_\_

2. What measurement is shown in question 1?

1 point



Mark only one oval.

- ☐ 9/16  
☐ 11/16  
☐ 10/16  
☐ 5/16

3. What measurement is shown in question 2?

1 point



Mark only one oval.

- ☐ 2 - 9/16
- ☐ 1 - 15/16
- ☐ 2 - 1/16
- ☐ 1 - 1/16

4. What measurement is shown in question 3?

1 point



Mark only one oval.

- ☐ 2 - 3/8
- ☐ 1 - 7/8
- ☐ 2 - 1/16
- ☐ 1 - 15/16

5. What measurement is shown in question 4?

1 point



Mark only one oval.

- ☐ 3 - 3/8
- ☐ 3 - 7/8
- ☐ 3 - 13/16
- ☐ 3 - 15/16

6. What measurement is shown in question 5?

1 point



Mark only one oval.

- ☐ 2 - 3/8
- ☐ 2 - 7/16
- ☐ 2 - 13/16
- ☐ 2 - 1/16

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## Appendix G - Inch Ruler Reading Practical Measurement Assignment.

**Task:** Using a ruler (rule), Measure the below lines 1-12 and record the measurement in the space provided. Make sure you bring the fraction to lowest terms. If you have any trouble please review the slide show "Reading Imperial Measurements Using a Ruler With Precision". If you are still stuck, ask the instructor.

1. \_\_\_\_\_

Answer:\_\_\_\_\_

2. \_\_\_\_\_

Answer:\_\_\_\_\_

3. \_\_\_\_\_

Answer:\_\_\_\_\_

4. \_\_\_\_\_

Answer:\_\_\_\_\_

5. \_\_\_\_\_

Answer:\_\_\_\_\_

6. \_\_\_\_\_

Answer:\_\_\_\_\_

7. \_\_\_\_\_

Answer:\_\_\_\_\_

8. \_\_\_\_\_

Answer:\_\_\_\_\_



## Appendix H – Measurement Lesson Plan

### Measurement Lesson Plan

<b>TEACHER:</b>	<b>CURRICULUM SUBJECT:</b> TIJ 10
<b>GRADE:</b> 9 Integrated Technology	<b>UNIT:</b> 1
<b>LESSON TOPIC:</b>  Imperial Measurement	<b>MATERIALS/ VISUAL AIDS:</b>  <ul style="list-style-type: none"> <li>• Tape measure</li> <li>• Rulers</li> </ul>
<b>INTRODUCTION/ MOTIVATION:</b>  Imperial measurement is an industry standard	<b>PERFORMANCE CRITERIA (STUDENTS EXPECTATIONS):</b>  Students will be required to understand the imperial measurement in order to manufacture projects in the construction lab.
<b>EXPECTATIONS:</b>  <ul style="list-style-type: none"> <li>• SPV.01, SPV.04, SP1.07,SP1.08</li> <li>• ICV.03, ICV.04, ICV.05, IC1.05,</li> </ul>	<b>MATERIALS/ VISUAL AIDS:</b>  <ul style="list-style-type: none"> <li>• tape measures</li> <li>• rulers</li> <li>• copies of google quizzes</li> <li>• copy of Line Measurement handout</li> </ul>
<b>TEACHING/ LEARNING CONTENT:</b>  <ul style="list-style-type: none"> <li>• Use overhead for the Reading Imperial Measurements Using a Ruler With Precision, see if students understand the different increments</li> <li>• Review fractions in lowest terms on board ( ex. <math>\frac{2}{4} = \frac{1}{2}</math>) if needed</li> <li>• Explain lowest common denominator</li> <li>• Demonstrate some examples</li> <li>• Allow time for questions or concerns</li> <li>• Distribute Google Quizzes</li> <li>• Provide time for students to begin assignment</li> </ul>	
<b>SUMMARY/ RECAPITULATION:</b>  Imperial measurement will be the standard measurement used in the Manufacturing shop/ Class. Students are required to dialogue with proper terminology.	

**EVALUATION/ ASSIGNMENT:**

Students are required to complete the Line Measurement worksheet and submit it for marking. This material will also be part of a future test.

**LESSON NOTES/ REFLECTION:**



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