

Technical Design - Scale Reading and Measurement

Overview:

Students will understand drawing scale and learn to make scaled measurements with the decimal (mechanical engineers) and metric scales. They will learn how to convert fractional readings into their decimal equivalents and learn the proper techniques for making measurements. They will also know how to identify the increment and ratio of each scale.

Essential Questions:

- Why are standardized units of measurement necessary?
- How would using non-standardized units of measurement affect an engineer's ability to communicate?
- Why don't we use one unit of measure for length rather than several (i.e. feet, inch, meter, cm, etc)?
- Why do architects and engineers draw plans at various scales?
- Why do architects and engineers use different scales?
- What advantages does a mechanical engineering scale have over a metric scale?
- How is an engineering scale like a metric scale?
- How do you read a decimal or metric scale?
- Why would an engineer need to convert a fractional scale reading to a decimal equivalent?
- How do engineers and architects represent large projects on a sheet of paper?
- How do engineers in the US (who use US Imperial Units – inches, feet, etc) work with engineers in South America (who use SI Metric Units – mm, meters, etc)?

Pre-Assessment – Decimal Scale (Mechanical Engineers)

Measure each line below using the Decimal Scale and print the answer in the space provided:

	<i>Your Answer</i>	<i>Correct Answer</i>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Who develops the Standards for Scale Reading and Measurement?

1. A.N.S.I _____
2. I.S.O. _____

Technical Design - Scale Reading and Measurement





Key Words Associated with Scales and Measurement:

Fractional	Full Scale or Full Size	Ratio
Decimal	Half Size	Reduction
Metric	Quarter Size	Tolerance
Increments	Double Size	Divisions

What is a Scale and its purpose?

Scale Etiquette:

Shapes of Scales:

-  _____
-  _____
-  _____
-  _____

Technical Design - Scale Reading and Measurement

Types of Scales and Selections

1. _____
2. _____
3. _____
4. _____

Different Examples of Scales or Measuring Devices:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

What units of measurements can scales read?

1. _____
2. _____
3. _____
 - a. _____
 - b. _____
 - c. _____
 - d. _____

Technical Design - Scale Reading and Measurement

Scale Reading Accuracy: (Increments)

Fractional: _____

Decimal: _____

Metric: _____

Scale Accuracy versus CAD:

- Accuracy of a Decimal Scale .01
- Accuracy of CAD .000001

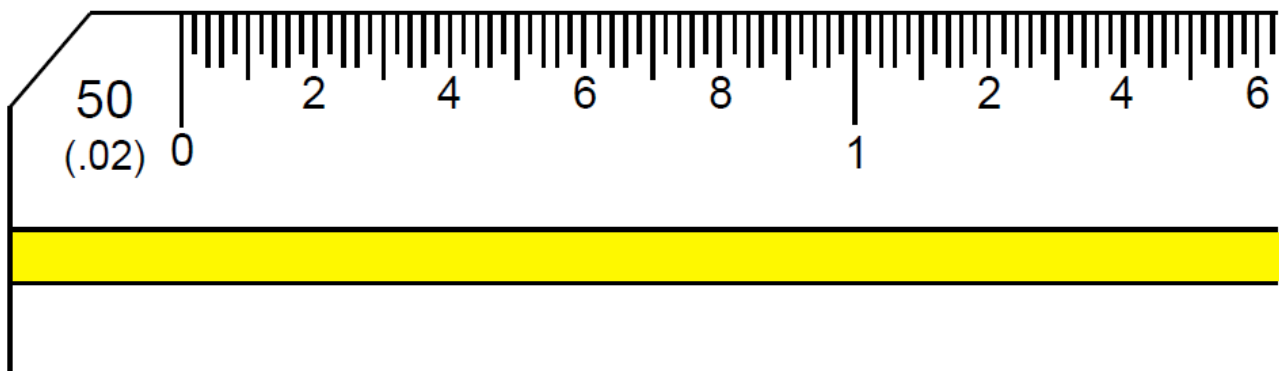
Decimal Equivalent:

X.	Whole Number
.X	Tenths on an Inch
.XX	Hundredths of an Inch
.XXX	Thousandths of an Inch
.XXXX	Ten Thousandths of an Inch
.XXXXX	Hundred Thousandths of an Inch
.XXXXXX	Millionths of an Inch

Scale Factors on a Drawing:

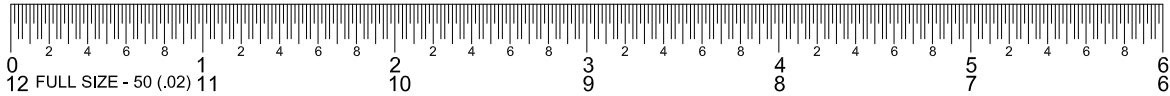
1. FULL _____
2. _____

Mechanical Engineering Scale Reading: (see Decimal Inch Scale Size Sheet Handout)



DECIMAL-INCH SCALE

DECIMAL-INCH SCALE (1:1)



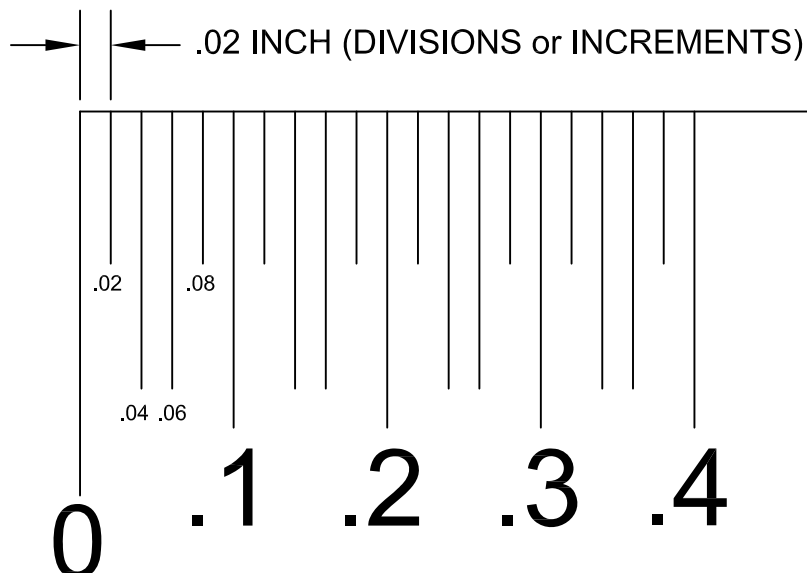
ACTUAL VIEW OF SCALE "FULL SIZE"

ENLARGED VIEW - ONE INCH



DETAILED VIEW SHOWING DECIMAL VALUES

ENLARGED VIEW - TENTHS OF AN INCH



DETAILED VIEW SHOWING ALL DECIMAL VALUES OF EACH INCREMENT

Layout the following corresponding decimal measurements on the construction lines provided.

1.52 ·

2.43 ·

2.98 ·

3.99 ·

.88 ·

1.00 ·

5.61 ·

5.31 ·

4.22 ·

6.57 ·

3.50 ·

2.22 ·

.50 ·

4.90 ·

6.00 ·

3.33 ·

1.81 ·

1.04 ·

2.95 ·

1.48 ·

4.27 ·

4.60 ·

6.99 ·

NAME:

HR:

DATE:

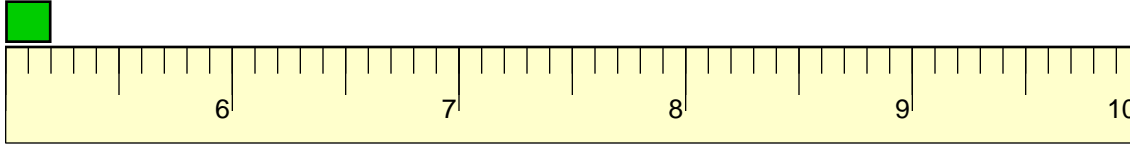
Name : _____

Score : _____

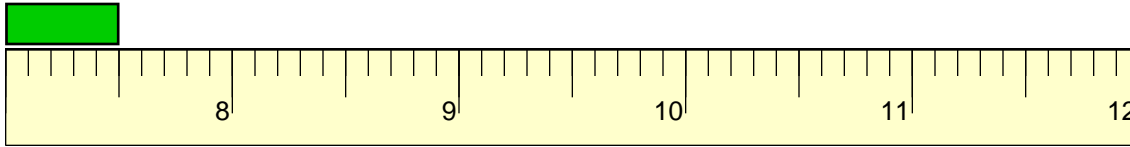
Teacher : _____

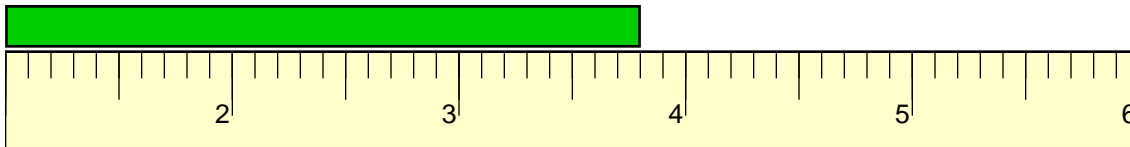
Date : _____

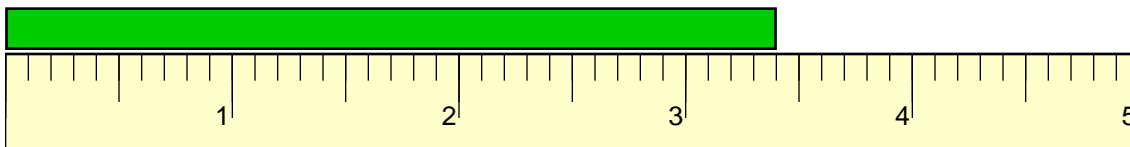
Reading a Decimal Ruler

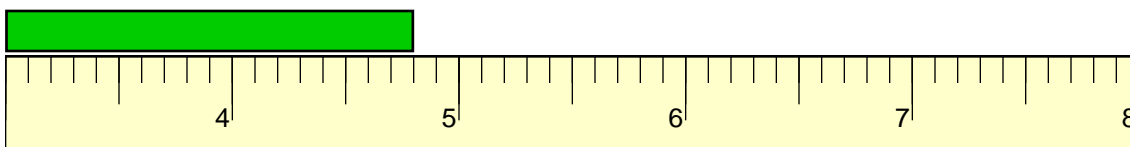


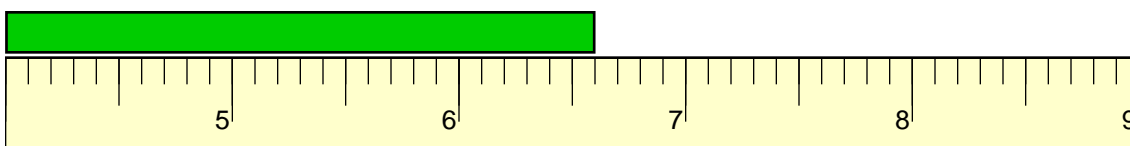
How many Inches ?

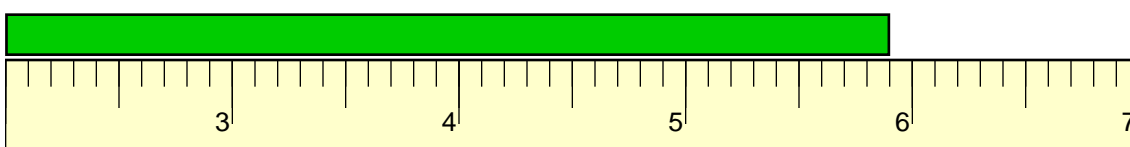


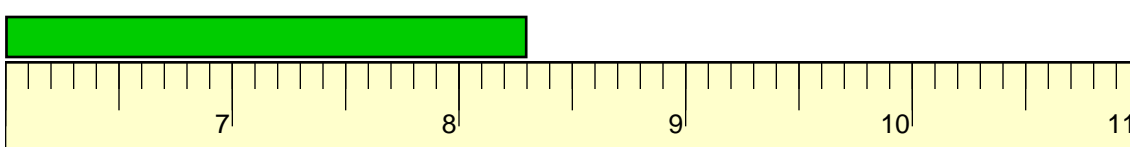












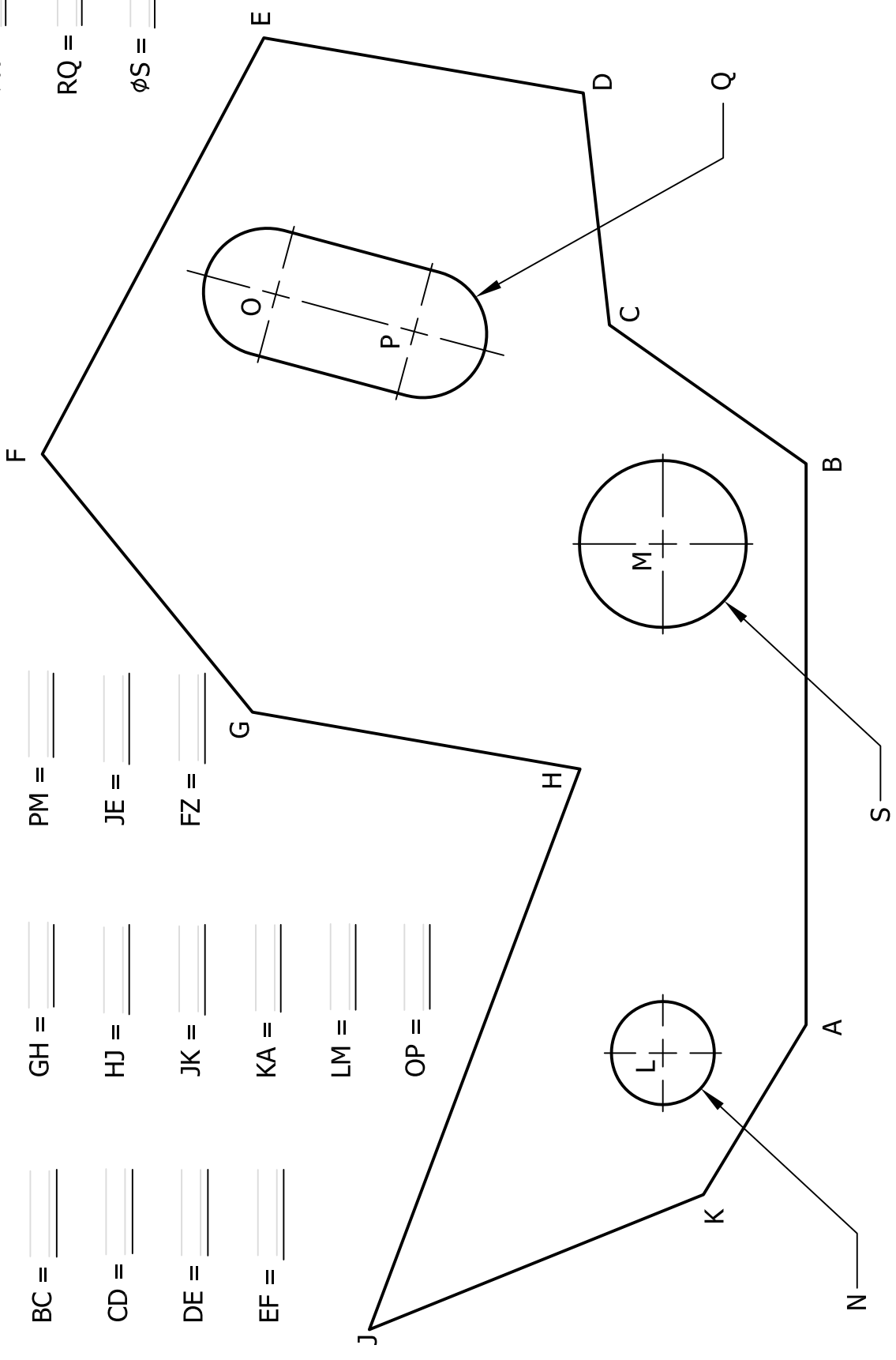


MEASURE THE DISTANCE BETWEEN POINTS IN DECIMAL INCHES

- AB = _____ FG = _____ LO = _____
- BC = _____ GH = _____ PM = _____
- CD = _____ HJ = _____ JE = _____
- DE = _____ JK = _____ FZ = _____
- EF = _____ KA = _____
- LM = _____
- OP = _____

MEASURE THE RADIAL SIZES IN DECIMAL INCHES

- $\phi N =$ _____
- RQ = _____
- $\phi S =$ _____



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DECIMAL INCH MEASUREMENT

DWG NO.:

SCALE: FULL DATE: _____

DRAWN BY: _____

HOUR: _____

SCORE: _____

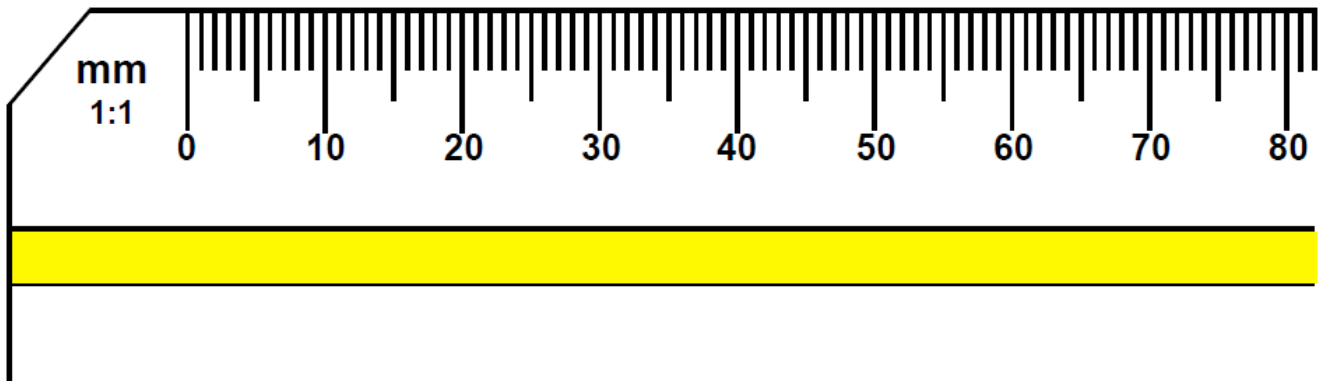
Technical Design - Scale Reading and Measurement

Pre-Assessment – Metric Scale (mm)

Measure each line below using the Metric Scale and print the answer in the space provided:

	<i>Your Answer</i>	<i>Correct Answer</i>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Metric Scale Reading: (see Metric Scale Size Sheet Handout 1:100)



Post-Assessment – Metric Scale (mm)

Measure each line below using the Metric Scale and provide the answer in the space provided:

	<i>Your Answer</i>	<i>Correct Answer</i>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Metric Scale Assignment:

1. Worksheet #1: *Layout Metric Lines*
2. Worksheet #2: *Reading a Metric Scale*
3. Drawing #1: *Metric Measurement Drawing*

Technical Design - Scale Reading and Measurement

How to convert metric to decimal and decimal to metric:

Review Essential Questions:

- Why are standardized units of measurement necessary?

- How would using non-standardized units of measurement affect an engineer's ability to communicate?

- Why don't we use one unit of measure for length rather than several (i.e. feet, inch, meter, cm, etc)?

- Why do architects and engineers draw plans at various scales?

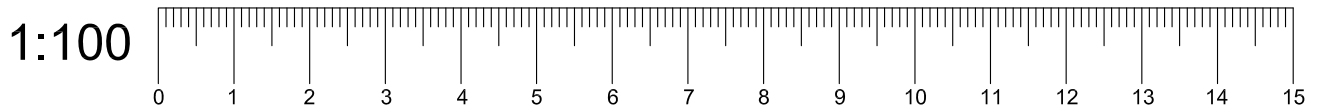
- Why do architects and engineers use different scales?

- What advantages does an engineering scale have over a metric scale?

- How is an engineering scale like a metric scale?

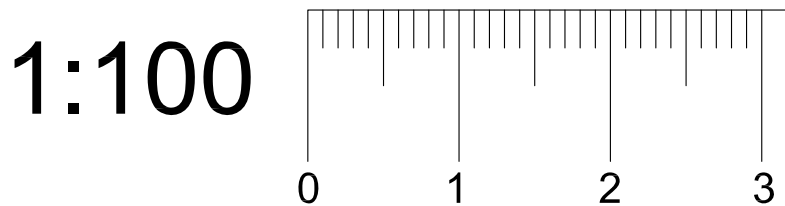
METRIC SCALE

METRIC SCALE (mm)



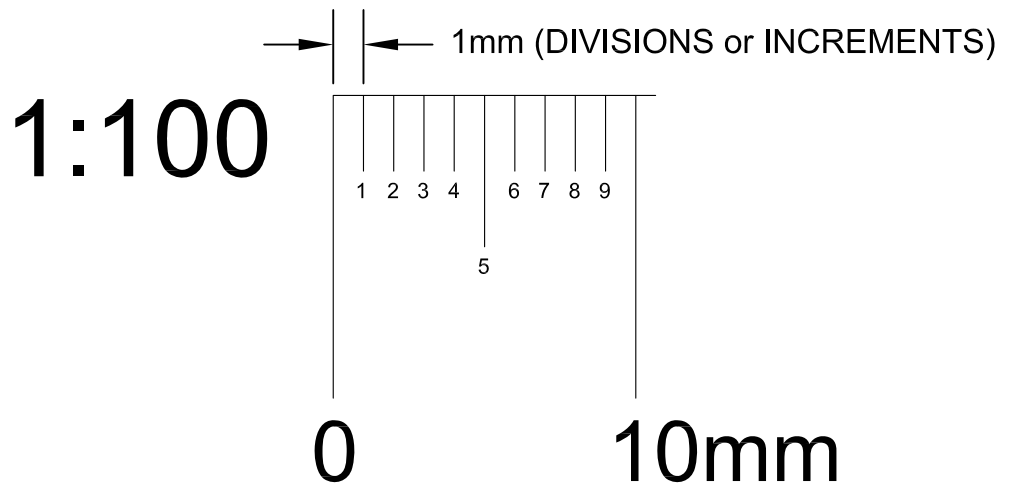
ACTUAL VIEW OF SCALE "FULL SIZE"

ENLARGED VIEW - 30mm



DETAILED VIEW SHOWING METRIC (mm) VALUES

ENLARGED VIEW - 10mm



DETAILED VIEW SHOWING ALL METRIC (mm) VALUES OF EACH INCREMENT

Layout the following corresponding metric measurements on the construction lines provided.

10 °

25 °

47 °

85 °

95 °

122 °

139 °

150 °

57 °

175 °

163 °

20 °

30 °

40 °

52 °

133 °

8 °

5 °

66 °

121 °

18 °

100 °

150 °

NAME:

HR:

DATE:

Name : _____

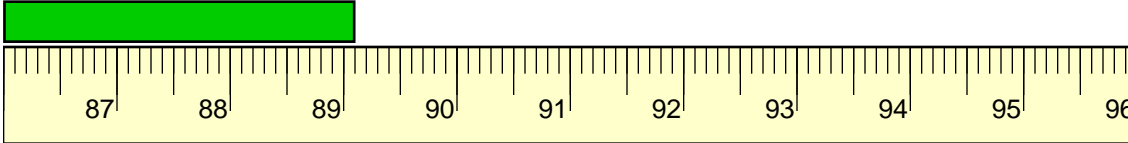
Score : _____

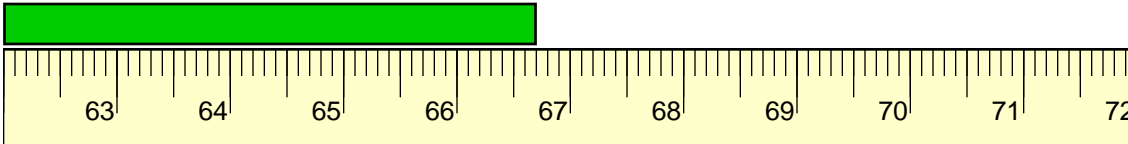
Teacher : _____

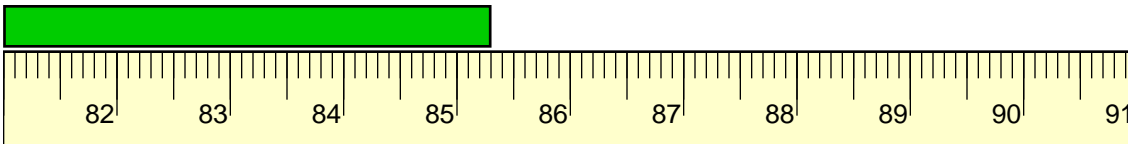
Date : _____

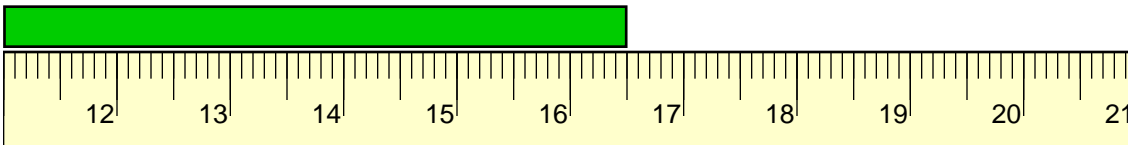
Reading a Metric Scale

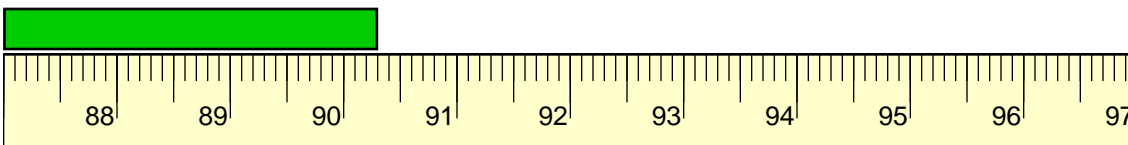
How many Millimeters ?

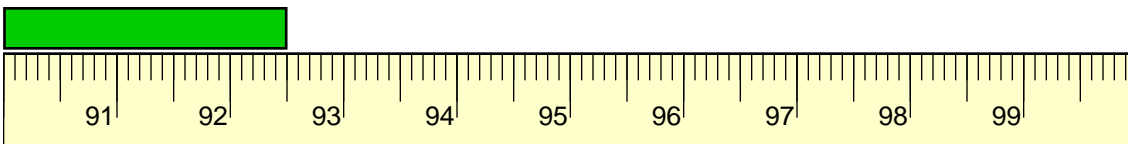


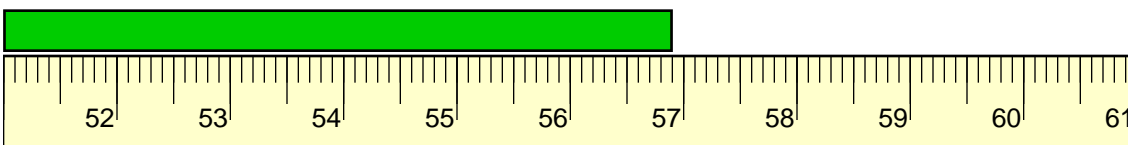


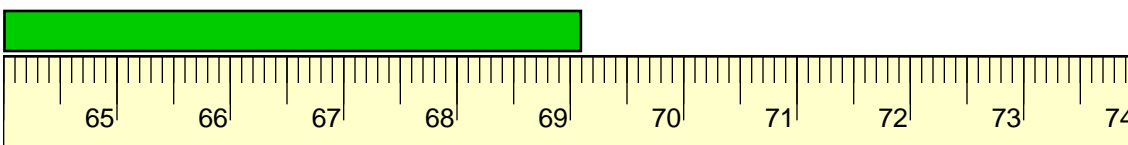












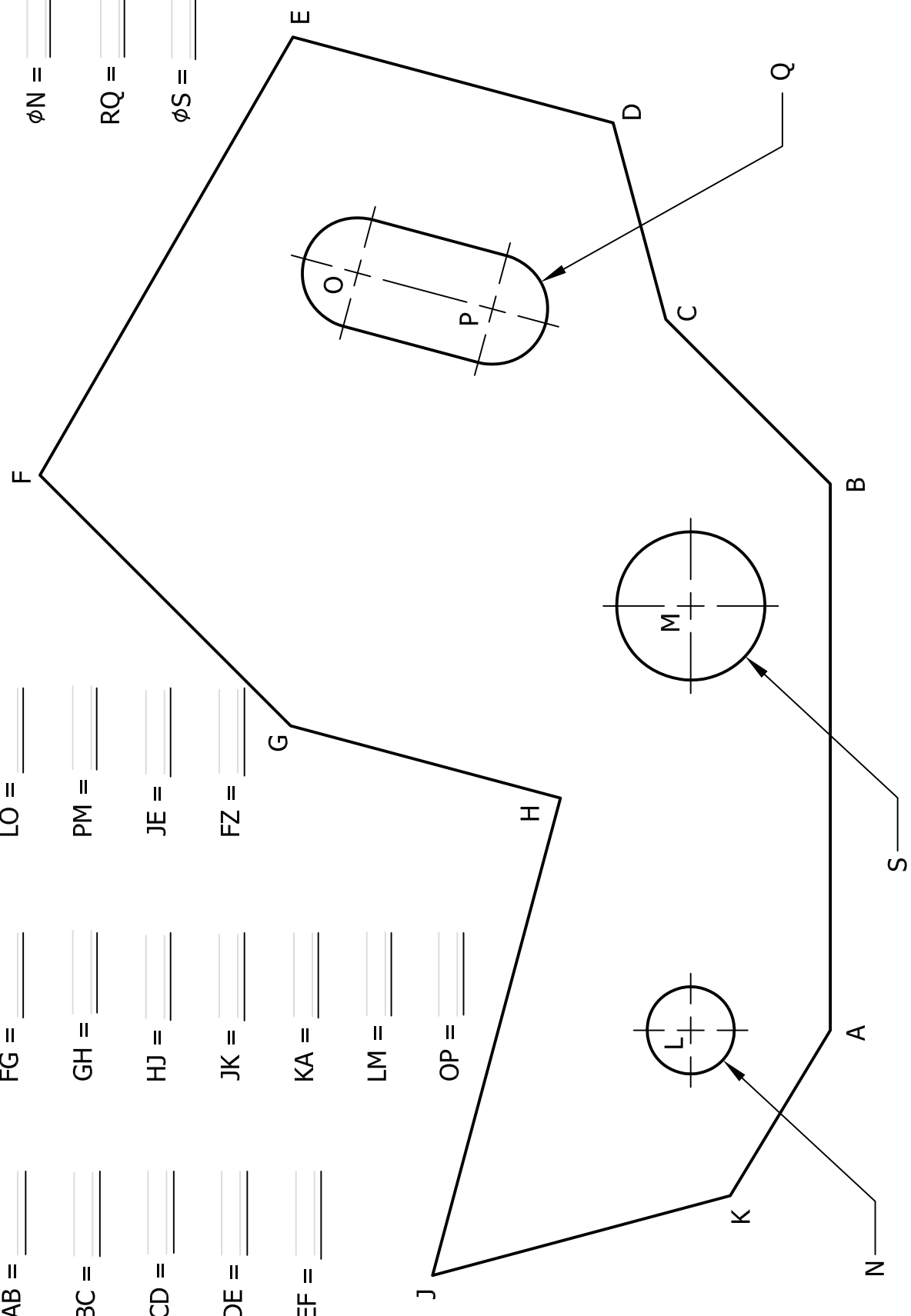



MEASURE THE DISTANCE BETWEEN POINTS IN MILLIMETERS

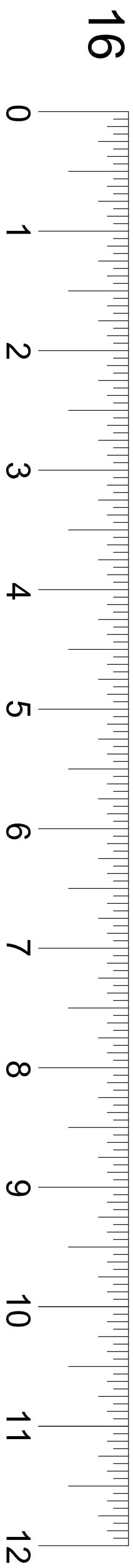
- AB = _____ FG = _____ LO = _____
- BC = _____ GH = _____ PM = _____
- CD = _____ HJ = _____ JE = _____
- DE = _____ JK = _____ FZ = _____
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MEASURE THE RADIAL SIZES IN MILLIMETERS

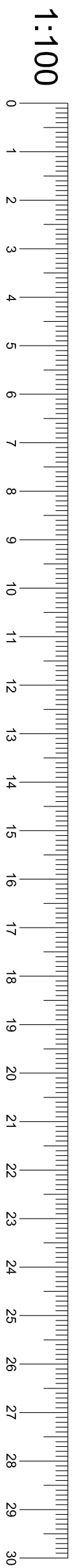
- $\phi N =$ _____
- RQ = _____
- $\phi S =$ _____



	DAKOTA HIGH SCHOOL - DESIGN TECH		METRIC MEASUREMENT		DWG NO.: _____
	SCALE: FULL	DATE: _____	DRAWN BY: _____	HOUR: _____	SCORE: _____



ENGINEER'S SCALE (FRACTIONAL)



METRIC SCALE (mm)



DECIMAL-INCH SCALE



DAKOTA HIGH SCHOOL		SCALE READING		DWG NO.:
SCALE: FULL	DATE: FEB 9TH, 2015	DRAWN BY: MR. MITCHELL	HOUR: ALL	GRADE: