This teacher's guide is designed to help teachers conduct a course in fundamental blueprint reading as part of a workplace literacy program. The course offers nine central topics necessary for initial exposure to blueprint reading. Each topic lists several learning objectives, specific terms or vocabulary, and a measurable outcome. The topics in the course are as follows: basic views of objects, meaning of commonly used lines on a blueprint, basic dimensioning conventions, decimal tolerances, precision measuring, blueprint terms used in the title box and note column, symbols commonly used in company blueprints, metric and customary units, and angle measurement. The course uses company blueprints in the lessons. Components of the guide include an instructional guide for basic blueprint reading class, a pretest and a posttest, and 14 lesson plans and exercises. (KC)
Basic Blueprint Reading

A basic blueprint reading class and curriculum was developed in response to a need from a National Workplace Literacy Program partner. All company employees interact or need to interact with company blueprints and be familiar with the basic symbols and principles. Blueprints are drawn using decimal measurement so a decimal review was incorporated into the curriculum.

The learning objectives and outcomes were developed based on the above identified needs. Actual company blueprints were used in the learner activities along with digital calipers, rulers, and protractors. A pre/post assessment was developed and administered to measure student progress.
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INTRODUCTION TO BASIC BLUEPRINT READING

This course is designed to emphasize the basic skills necessary to understand fundamental blueprint reading. The course offers nine central topics necessary for initial exposure to blueprint reading. Each topic lists several learning objectives, specific terms or vocabulary, and a measurable outcome. The order of the topics generally build upon each other, although completion of one topic does not necessarily depend on completion of the previous one. Selection of topics and level of difficulty depends on length of class and expressed and observed needs of the learners.

The topics included in this course are as follows:

- basic views of objects
- meaning of commonly used lines on a blueprint
- basic dimensioning conventions
- decimal tolerances
- precision measuring
- blueprint terms used in the title box and note column
- symbols commonly used in company blueprints
- metric and customary units
- angle measurement

Materials used in this course are as follows:

- company blueprints
- company products or parts that correspond to the blueprint
- digital calipers and other measuring tools used in the company
- calculator, if used

Components included in this course are as follows:

- Instructional Guide for Basic Blueprint Reading class
- pretest and posttest
- possible activities
# Instructional Guide for Basic Blueprint Reading

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<tr>
<td>Basic views</td>
<td>a) Identify the basic views commonly displayed in a technical drawing.</td>
<td>Height</td>
<td>Draw a sketch of a simple object using two or three views on cross-sectioned or plain paper.</td>
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<td></td>
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<td>Width</td>
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<td>Depth</td>
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<td>Plane</td>
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<td></td>
<td>b) Measure the height, width, depth of a simple object.</td>
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<tr>
<td></td>
<td>c) Name the three principle views necessary to describe the shape of an object.</td>
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</tr>
<tr>
<td>Meaning of lines</td>
<td>a) Describe the commonly used lines on a blueprint.</td>
<td>Object or visible line</td>
<td>Identify the lines in a simple blueprint and match them with their meaning.</td>
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<td></td>
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<td>Hidden line</td>
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<td>Center line</td>
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<td>Dimension line</td>
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<td>Extension line</td>
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<td>Projection line</td>
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<td></td>
<td>b) Identify the meaning of commonly used lines in a blueprint.</td>
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</tr>
<tr>
<td>Basic Dimensioning Conventions</td>
<td>a) Name and describe the two ways a blueprint gives a complete description.</td>
<td>Extension line</td>
<td>Identify the four basic lines used in dimensioning on a blueprint.</td>
</tr>
<tr>
<td></td>
<td>Views and Dimensions and Notes</td>
<td>Dimension line</td>
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<td></td>
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<td>Leader</td>
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<td></td>
<td>b) Identify the difference between a dimension line and the visible lines of the drawing</td>
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<td>--------------------</td>
<td>--------------------------------------------------------------------------------------</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Decimal</td>
<td>a) Define tolerance</td>
<td>Tolerance</td>
<td>Add and subtract decimal tolerance on a measurement in order to determine upper and lower limits.</td>
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<td>Tolerances</td>
<td></td>
<td>Upper limit</td>
<td></td>
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<td></td>
<td>b) Add and subtract decimal tolerance attached to a measurement in order to determine upper and lower limits of size. (Example - 1.765 +/- .005)</td>
<td>Lower limit</td>
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<tr>
<td></td>
<td></td>
<td>Sequence</td>
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<td></td>
<td>c) Sequence decimal measurement.</td>
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<td></td>
<td>d) Determine if a product measurement lies within tolerance</td>
<td></td>
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</tr>
<tr>
<td>Precision</td>
<td>a) Identify the common measurement tools used in the company.</td>
<td>Scale markings</td>
<td>State and record decimal measurement of a product using an appropriate measuring tool.</td>
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<td>Measuring</td>
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<td>Graduations</td>
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<td></td>
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<td>Squares</td>
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<td></td>
<td>b) Identify the graduation on the scale of each measurement tool.</td>
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<td>c) Determine the size of the smallest division in one interval on a measurement tool.</td>
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<td></td>
<td>d) Label scale marking on a measurement tool.</td>
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<td></td>
<td>e) Read and record a specific dimension on a measuring tool.</td>
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<td>(If digital calipers are used, practice reading and recording the displayed measurement.)</td>
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<tr>
<td>TOPIC</td>
<td>LEARNING OBJECTIVES</td>
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<td>----------------------------------------------------------------------------</td>
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<tr>
<td>Blueprint Terms - Title Block</td>
<td>a) Locate the title block on a blueprint.</td>
<td>Title block.</td>
<td>Describe each piece of information contained within the title block.</td>
</tr>
<tr>
<td></td>
<td>b) Describe each piece of information contained within the title block.</td>
<td>Drawing title.</td>
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<td>Drawing number.</td>
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<td>Scale</td>
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<td>Tolerance</td>
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<td></td>
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<td>Materials</td>
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</tr>
<tr>
<td>Blueprint Symbols</td>
<td>a) Define GD&amp;T (Geometric Dimensioning and Tolerancing) as a technical drawing language which specifies design requirements in terms of function.</td>
<td>GD&amp;T</td>
<td>Identify symbols and their characteristic in various feature control frames.</td>
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<td></td>
<td>Symbols commonly used in company blueprints</td>
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<td></td>
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<td>Symbol characteristics</td>
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<td>Feature control frame</td>
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<td>b) Identify commonly used symbols and their corresponding characteristics such as // means parallelism.</td>
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<td></td>
<td>c) Locate the box (feature control frame) in which the symbols appear</td>
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</tr>
<tr>
<td>Metric Measurement</td>
<td>a) Define and explain metric length units.</td>
<td>Length</td>
<td>Given a product measurement in U. S. Standard, convert to metric measurement or vice versa.</td>
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<td>Customary Units</td>
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<td>Metric Units</td>
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<td>Decimeter</td>
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<td>b) Demonstrate how metric units are related to corresponding customary units.</td>
<td>Length</td>
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<td></td>
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<td>Customary Units</td>
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<td>Metric Units</td>
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<td>Decimeter</td>
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<td>c) Explain how to convert from one unit to another.</td>
<td>Length</td>
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<td>Customary Units</td>
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<td>Decimeter</td>
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<td>d) Convert customary units to metric measure and vice versa.</td>
<td>Length</td>
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<td></td>
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<td>Customary Units</td>
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<td>Metric Units</td>
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<td>Decimeter</td>
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<td></td>
<td>e) Identify customary and metric measurements on a blueprint.</td>
<td>Length</td>
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<td></td>
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<td>Customary Units</td>
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<td>Metric Units</td>
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<td>Decimeter</td>
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<td>TOPIC</td>
<td>LEARNING OBJECTIVES</td>
<td>TERMS\VOCABULARY</td>
<td>OUTCOME</td>
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<tr>
<td>Angle Measurement</td>
<td>a) Define angle as two lines starting at the same point and extending outward.</td>
<td>Angle, Vertex, Sides, Degrees, Protractor</td>
<td>Use a protractor to measure given angles.</td>
</tr>
<tr>
<td></td>
<td>b) Explain that angles are measured in degrees and that a protractor is a tool that measures angles.</td>
<td></td>
<td>Use a protractor to draw given angles.</td>
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<td></td>
<td>c) Use a protractor to measure an angle.</td>
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<td></td>
<td>d) Using a ruler and protractor, draw a given angle.</td>
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</table>
PRE/POST ASSESSMENT

Directions: Use the attached blueprint to answer the following questions.

1.) What is the name of this product?

2.) What kind of lines are A and B?

3.) What is the overall depth of the product?

4.) What is the overall width of the product?

5.) What is the size of dimension A?

6.) Name the three views that are used to describe the shape and size of the part.

7.) What encircled letter marks a hidden line?

8.) Define the word tolerance as it relates to blueprints.

9.) Determine which of the following product measurements lie within tolerance?
   a. dimension on the print: 3.264
   b. tolerance: ± .005
   c. actual measurements: circle any that are within tolerance

   3.164
   3.253
   3.263
   3.312
   3.269
   3.270

10.) Identify the characteristics of the following Geometric Dimensioning and Tolerancing (GDT) symbols:

    \[ \square \]
    \[ \varnothing \]

11.) Sequence the following decimal measurements from smallest to largest.

    4.54
    .047
    .740
    .007
    .054
    5.075

12.) If an angle measures 40°, what is its complementary angle?
Lesson Plan #1
Blueprint Reading

**Goal:** Understand the basic views of objects.

**Learning Objectives:**
1. Identify the basic views commonly displayed in a technical drawing.
2. Measure the height, width, depth of a simple object.
3. Understand the meaning of tenths and hundredths.

**Instructional Activities:**
1. Administer the Pre/Post Assessment
2. Show the class a simple blueprint and ask them what they know and don't know about the print. This discussion will guide what we specifically cover during the course.
3. Sketch cardboard blocks in different configurations and from different angles. This will lead into a discussion on views (all six).
4. Using one of the sketches, discuss the meaning of height, width and depth. Measure these on several different configurations of blocks.
Lesson Plan #2
Blueprint Reading

**Goal:** Understand the basic views of objects on a blueprint. Understand the meaning of lines on a blueprint.

**Learning Objectives:**
1. Identify the basic views commonly displayed in a technical drawing.
2. Measure the height, width, depth of a simple object.
3. Describe the commonly used lines in a blueprint.
4. Identify the meaning of commonly used lines in a blueprint.

**Instructional Activities:**
1. *Do pages 1-3 in Discovering Basic Math Concepts: Decimal Addition and Subtraction.* These pages cover the meaning and comparing of tenths and the meaning of hundredths.
2. Review the 6 possible views of an object and the 3 necessary ones.
3. Sketch drawings of cardboard blocks in different configurations - introduce hidden lines.
4. Compare an angle bracket (off the production floor) to the blueprint for the bracket, looking at the lines and views shown.
BLANK

.375 DIA. FOR PRESS-IN RECEPTACLE
SOUTHCO PART No. 12-44-101-11

2.567
2.242
1.124
.312
.000
.562
1.125

.166 DIA.
2 PLACES

1.057

.125 RAD.
4 CORNERS

FINISH:
PLATING ZINC DICHROMATE

WHEN USED AS FAN CAGE BRKT RECEPTACLE
(CGDSHPSCFANBRKTREC)

DO NOT USE PRESS-IN RECEPTACLE

MOTI30-000 (CGDSHPSCFANBRKTREC)
(CGDSHPSEOBRTKREC)

MOTI30-000 (FAN CAGE BRACKET RECEPTACLE
/ EARTHQUAKE BAR BRACKET RECEPTACLE)

12 GA. CRS (.104) BEND AL (.044)
REQUIRED (1)

11/22/93 (REV. 2/14/94-2/21/94-2/23/95-10/10/95)
BLUEPRINT READING -

NO. RED. 4
ORDER NO. 4-57
MAT. CAST IRON
ANGLE BRACKET  BP-6A

1994-97 College of Lake County National Workplace Literacy Program

BEST COPY AVAILABLE
Lesson Plan #3
Blueprint Reading

**Goal:** Understand the basic views of objects on a blueprint. Understand the meaning of lines on a blueprint.

**Learning Objectives:**
1.) Identify the basic views commonly displayed in a technical drawing.
2.) Describe the commonly used lines in a blueprint.
3.) Identify the meaning of commonly used lines in a blueprint.
4.) Understand the meaning of hundredths and thousandths.

**Instructional Activities:**
1.) Complete pages 4-7 in *Discovering Basic Math Concepts: Decimal Addition and Subtraction.*
2.) Match the isometric drawing on worksheet 1 to the corresponding views on worksheet 2.
3.) Write in the letters from the isometric drawings on worksheet 3, that correspond to the various planes in the front, top, and side views shown on worksheet 4.
Lesson Plan #4
Blueprint Reading

Goal: Understand the basic views of objects on a blueprint. Understand the meaning of lines on a blueprint.

Learning Objectives:
1.) Identify the basic views commonly displayed in a technical drawing.
2.) Describe the commonly used lines in a blueprint.
3.) Identify the meaning of commonly used lines in a blueprint.
4.) Understand the meaning of the place value of whole and decimal numbers.
5.) Understand how to read and say decimal numbers.

Instructional Activities:
1.) Complete pages 8-11 in Discovering Basic Math Concepts: Decimal Addition and Subtraction.
2.) Find the missing views on worksheet 5 and match them up with the corresponding views on worksheet 6.
3.) Discuss the various lines shown on the handout “A New Language” and using various company blueprints, look for the different kinds of lines on the prints.
<table>
<thead>
<tr>
<th>NAME AND USE</th>
<th>CONVENTIONAL REPRESENTATION</th>
<th>EXAMPLE</th>
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</thead>
<tbody>
<tr>
<td>OBJECT LINE</td>
<td></td>
<td><img src="image" alt="Object Line Example" /></td>
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<tr>
<td>Define shape.</td>
<td></td>
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<td>Outline and detail</td>
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<tr>
<td>objects.</td>
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<tr>
<td>HIDDEN LINE</td>
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<td><img src="image" alt="Hidden Line Example" /></td>
</tr>
<tr>
<td>Show hidden features.</td>
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<td></td>
</tr>
<tr>
<td>CENTER LINE</td>
<td></td>
<td><img src="image" alt="Center Line Example" /></td>
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<tr>
<td>Locate centerpoints</td>
<td></td>
<td></td>
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<tr>
<td>of arcs and circles.</td>
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<tr>
<td>DIMENSION LINE</td>
<td></td>
<td><img src="image" alt="Dimension Line Example" /></td>
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<tr>
<td>Show size or location.</td>
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<tr>
<td>EXTENSION LINE</td>
<td></td>
<td><img src="image" alt="Extension Line Example" /></td>
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<tr>
<td>Define size or location.</td>
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<tr>
<td>LEADER</td>
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<td><img src="image" alt="Leader Example" /></td>
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<tr>
<td>Call out specific</td>
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<td>features.</td>
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<tr>
<td>CUTTING PLANE</td>
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<tr>
<td>Show internal features.</td>
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<tr>
<td>SECTION LINE</td>
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<td><img src="image" alt="Section Line Example" /></td>
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<tr>
<td>Identify internal features.</td>
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<td>BREAK LINE</td>
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<td><img src="image" alt="Break Line Example" /></td>
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<tr>
<td>Show long breaks.</td>
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<tr>
<td>BREAK LINE</td>
<td></td>
<td><img src="image" alt="Break Line Example" /></td>
</tr>
<tr>
<td>Show short breaks.</td>
<td></td>
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</tbody>
</table>

Figure 2-15. Lines on prints have specific meanings.

Lesson Plan #5
Blueprint Reading

Goal: Understand the meaning of lines on a blueprint. Understand the basic dimensioning conventions used on a blueprint.

Learning Objectives:
1.) Learn how to convert inches to millimeters and millimeters to inches.
2.) Describe line terminology such as straight, parallel, perpendicular, vertical and horizontal. Find such lines on a blueprint.
3.) Describe terminology associated with holes such as diameter, radius and circumference. Find such features on a blueprint.
4.) Understand the meaning of the zeros in decimals.

Instructional Activities:
1.) Discuss the equations for converting in. to mm and mm to in. Then solve conversion problems.
3.) Discuss line terminology and find such lines on a blueprint.
4.) Discuss hole terminology and find the symbol for diameter on a blueprint.
Lesson Plan #6
Blueprint Reading

**Goal:** Understand the basic views of objects on a blueprint. Understand the meaning of lines on a blueprint. Understand the basic dimensioning conventions used on a blueprint. Understand the meaning a symbols used on a blueprint.

**Learning Objectives:**
1.) Name the three principle views necessary to describe the shape of an object.
2.) Identify the meaning of commonly used lines on a blueprint.
3.) Identify the diameter symbol on a blueprint.
4.) Describe the use of a datum on a blueprint.

**Instructional Activities:**
1.) Review the equations for converting in. to mm and mm to in.
2.) Administer the quiz over learning objectives 1-3 above.
3.) Discuss the use of a datum on blueprints. Look at a simple blueprint that uses a datum for dimensioning.
Match the following words to the lettered items on the print:

1. __ visible line
2. __ extension line
3. __ dimension line
4. __ center line
5. __ dimension
6. __ leader

8. __ view

What does this (Φ) symbol mean?

10. What is another name for visible line?
   a) solid line
   b) object line
   c) hidden line

9. __ view
Goal: Understand the meaning of lines on a blueprint.
Understand the basic dimensioning conventions used on a blueprint.
Understand the meaning a symbols used on a blueprint.

Learning Objectives:
1.) Identify angles between 0 and 90 degrees.
2.) Label scale markings on a protractor.
3.) Read and record specific angle dimensions on a protractor.
4.) Identify angles on a blueprint.
5.) Identify the meaning of terms associated with angles such as acute, obtuse and right.

Instructional Activities:
1.) Review the use of a datum on blueprints. Look at a simple blueprint that uses a datum for dimensioning.
2.) Discuss a full circle and the associated 0, 90, 180, 270, and 360 degrees of a circle.
3.) Complete pages 75-77 in Math Matters For Adults: Measurement, Geometry, and Algebra.
4.) Using a protractor, measure angles on various company products. Look at these angles on the corresponding blueprint.
Lesson Plan #8
Blueprint Reading

**Goal:** Understand the meaning of lines on a blueprint.
Understand the basic dimensioning conventions used on a blueprint.
Understand the meaning of symbols used on a blueprint.

**Learning Objectives:**
1.) Identify the meaning of the terms complementary and supplementary angles.
2.) Name and describe the two ways a blueprint gives a complete description.
   *(Views and Dimensions and Notes)*
3.) Identify the meaning of section, break and hidden lines on a blueprint.
4.) Identify commonly used GD & T (Geometric Dimensioning and Tolerancing) symbols and their corresponding characteristics, such as perpendicularly and squareness.

**Instructional Activities:**
1.) Review the degrees of angles of a circle.
3.) Complete pages 78-79 in *Math Matters For Adults: Measurement, Geometry, and Algebra*.
4.) Look at a company print that includes the following items; section lines, break lines, hidden lines, and various geometric dimensioning symbols. Go out on the plant floor and look at the cabinet that corresponds with this print. Point out the views that the section lines, on the print, are showing.
5.) Discuss and show examples of various fasteners used at the company. Discuss how these are indicated on a blueprint (the notes must be read on the print - they give the specific fastener info.).
Lesson Plan #9
Blueprint Reading

Goal: Understand the meaning of lines on a blueprint.
Understand the basic dimensioning conventions used on a blueprint.
Understand the meaning of symbols used on a blueprint.

Learning Objectives:
1.) Understand how to use a protractor to measure angles.
2.) Understand how to work with complementary angles on a blueprint.
3.) Add and subtract decimal tolerance attached to a measurement in order to determine upper and lower limits of size.
4.) Identify the common measurement tools used in the company.

Instructional Activities:
1.) Complete the worksheet on measuring angles.
2.) Look at company prints and corresponding parts that contain angles. Discuss measuring techniques that relate to complementary angles.
4.) Using a hole caliper, learn how to measure hole mid-points on various company parts. Look at the corresponding prints for the measurements.
Complete the measurements of the following angles.

**ACTIVITY 1**

1. \( \angle ABC \) __________
2. \( \angle ABD \) __________
3. \( \angle ABE \) __________
4. \( \angle ABF \) __________
5. \( \angle ABG \) __________

6. \( \angle HIJ \) __________
7. \( \angle HIK \) __________
8. \( \angle HIL \) __________
9. \( \angle HIM \) __________
SAMPLE BLUEPRINT

RAD. 2 CORNERS

3.290 ± 0.020

1.610 ± 0.005

2.63 ± 0.010

.29 ± 0.010

1.313

1/4" RAD. 4 CORNE

2 HOLES, THRU 9/32 ± 0.03

71°

1/32

TOLERANCES, UNLESS OTHERWISE SPECIFIED

LAST DIGIT SHOWN

0

0.0

0.000

0.000

± 0.065

± 0.030

± 0.010

± 0.003

ANGULAR ± 1/2°

BEST COPY AVAILABLE

NEW RELEASE

CHANGE

BY

PRINT & BILL OF MATERIALS ARE NOT TO BE USED WITHOUT THE WRITTEN CONSENT OF CULLIGAN USA.

DO NOT SCALE FROM DRAWING.
Lesson Plan #10
Blueprint Reading

**Goal:** Understand the meaning of lines on a blueprint. Understand the basic dimensioning conventions used on a blueprint. Understand the meaning of symbols used on a blueprint. Understand how to use the precision measuring tools employed at GMP.

**Learning Objectives:**
1.) Name and describe the two ways a blueprint gives a complete description.
2.) Locate the title block on a blueprint.
3.) Describe each piece of information contained within the title block.
4.) Add and subtract decimal tolerance attached to a measurement in order to determine upper and lower limits of size.
5.) Identify the common measurement tools used in the company.
6.) Identify commonly used GD & T symbols and their corresponding characteristics.

**Instructional Activities:**
1.) Complete the worksheet on identifying information found in the title block and elsewhere on a Maxtec blueprint.
2.) Discuss *feature control frame*.
3.) Guest speaker from Quality Control will show the class the various measuring tools that are used at the company.
Print Reading Activities

Using the attached print, answer the following questions.

1.) What company does this print come from?

2.) What is the name of the part?

3.) What revision (issue) is this print?

4.) Are the dimensions in inches or millimeters?

5.) What is the angle of the bend?

6.) What finish is to be used?

7.) What material must be used?

8.) What are the tolerances?
9.) For the dimension .70, what are the upper and lower limits of the tolerance?

10.) For the dimension .543, what are the upper and lower limits of the tolerance?

11.) What is the scale of the drawing?

12.) What 3 items are necessary to interpret a print?
   a.
   b.
   c.

13.) Explain what this Geometric Dimensioning and Tolerancing symbol, //, means.

14.) What does this Geometric Dimensioning and Tolerancing symbol, O, mean?
NOTE:
1. MTL: .0478 (18 gauge) CRS, COMMERCIAL QUALITY & TEMPER.
2. FINISH: ZINC PLATE

MAXTEC

UNLESS OTHERWISE SPECIFIED
1. ALL DIMENSIONS ARE IN INCHES
2. ALL BENDS ARE 90°
3. TOLERANCES:
   FRACTIONS ± 1/64
   DECIMAL (TWO PLACE) ± .010
   DECIMAL (THREE PLACE) ± .005
   HOLES ± .003
   ANGLES ± 1°
   DO NOT SCALE DRAWING.
Lesson Plan #11  
Blueprint Reading

**Goal:** Understand how to use the precision measuring tools employed at GMP.

**Learning Objectives:**
1.) Identify the common measurement tools used in the company.
2.) Identify the graduation on the scale of each measurement tool.
3.) Determine the size of the smallest division in one interval on a measurement tool.
4.) Read and record a specific dimension on a measuring tool.

**Instructional Activities:**
1.) Determine the size of the smallest division in one interval on the scales and calipers used at the company.
2.) Discuss the graduations on the various scales and calipers used at the company.
3.) Using scales and calipers, practice measuring and reading various objects.
Lesson Plan #12
Blueprint Reading

Goal: Understand the basic views in a blueprint.
Understand the meaning of lines used in a blueprint.
Understand the basic dimensioning conventions used in a blueprint.
Understand how to calculate decimal tolerances used on a blueprint.
Understand how to use precision measuring tools.
Understand symbols used on a blueprint.

Learning Objectives:
1.) Measure the height, width, and depth of a simple object.
2.) Label the three principle views necessary to describe the shape of an object.
3.) Label the commonly used lines on a blueprint.
4.) Add and subtract decimal tolerance attached to a measurement in order to determine upper and lower limits of size.
5.) Read and record a specific dimension on a measuring tool.
6.) Label the commonly used geometric dimensioning symbol for diameter on a blueprint in the correct location.

Instructional Activities:
1.) Complete the worksheet, “You want us to do what?”. They will work in pairs to do this exercise.
2.) After everyone has finished, we will go around to each pair and have them show the structure that they made and the corresponding blueprint. The class members will have an opportunity to share any comments they may have about each project.
"You want us to do what???

Well, I want you to follow the set of instructions below and show me just how much you have gained from this blueprint reading class. Please read over the directions very carefully, ask any questions that you may have, do what the directions tell you to do and HAVE FUN!!!

You will be working in pairs:

Step 1: Take the 3 pieces of wood that you have been given and nail them together into whatever shape you choose.

Step 2: Sketch the 3 views of your structure that are necessary in order to interpret the blueprint of this structure. Label the views on the paper. (front, etc.) Make sure that the views are drawn in the correct position on the paper. Also, write "front" on whatever piece of wood that you see in the front view of your blueprint.

Step 3: Label at least one example of each of the following on your views.

- height (point this out with a leader line)
- width (use a leader to show this)
- depth (use a leader to show this)
- visible line
- hidden line
- dimension line
- dimension (measure the structure and give the true dimension of one part)
- extension line
- angle (measure the angle on the piece of wood that has one and indicate the degrees of the angle on your drawing)

Step 4: For the dimension that you have shown in step #3, assuming a tolerance of + .005, give the upper and lower limits of this dimension. Write them in the space below.
Step 5: Pretend that there is a hole somewhere on your structure. Draw in the hole with a pen or pencil. Indicate the diameter of the hole (measure the drawn hole with the caliper) and use the Geometric Dimensioning and Tolerancing symbol to show this on the blueprint that you have drawn of your structure.

Step 6: Check your work by reading back over each direction after you have finished all of the steps. Check to make sure that you have completed every step correctly. Then put your structure and blueprint in the bag that has the same number on it as your pieces of wood. Be sure to write your names on the blueprint.
Goal: Understand the basic dimensioning conventions used in a blueprint. Understand how to calculate decimal tolerances used on a blueprint. Understand symbols used on a blueprint. Understand the information found in a title block on a blueprint.

Learning Objectives:
1.) Define tolerance.
2.) Add and subtract decimal tolerance attached to a measurement to determine upper and lower limits of size.
3.) Sequence decimal measurements.
4.) Determine if a product measurement lies within tolerance.
5.) Locate the title block on a blueprint.
6.) Describe each piece of information found in a title block.
7.) Define GDT.
8.) Identify commonly used symbols and their corresponding characteristics such as // means parallelism.
9.) Locate the feature control frame where the GDT symbols are found.

Instructional Activities:
1.) Complete the Class Activities worksheet.
2.) Look at various blueprints to identify the different kinds of title blocks used by different companies and what the enclosed information means.
3.) Examine blueprints to find the feature control frames and the GDT symbols found within.
4.) Three students retook the first test in an effort to bring up their scores.
Class Activities

1.) Identify the smallest interval on the scales that you are given.

2.) Define the word tolerance.

3.) Sequence the following decimal measurements from smallest to largest.

   .026   .050   .260   .005   2.60   .015

4.) Determine which of the following product measurements lie within tolerance.

   a. dimension on the print: 3.264
   b. tolerance: +.005
   c. actual measurements: circle any that are within the tolerance
      3.164
      3.253
      3.263
      3.312
      3.269
      3.270

5.) Define GDT.

6.) Identify the characteristics of the following GDT symbols:

   //
   ∅
   ∧
   ⊥
   <
Lesson #14
Blueprint Reading

We will be reviewing for the final test today at the beginning of class. Then the second half of class will be spent taking the test. I want to give it today so that if a student doesn't understand something, I can reteach it and they can have another chance to take the test again next Tuesday.
You're almost finished!!!!

You just need to show me a few more things that you have learned in this class. So, read each question very carefully, take your time working on each problem and check over your work before you hand me your paper when you are finished. Any questions??? Ask now!!!

1.) Sequence the following decimal measurements from smallest to largest.
   4.54    .047    .740    .405    .007    .054    5.075

2.) Write out the names of the following decimal numbers.
   
   .200 ___________________________  tens / tenths

   .20 ___________________________  hundreds / hundredths

   .2 ___________________________  thousands / thousandths

3.) Identify the smallest interval on the scale below. Write the amount in decimal form to the thousandth.

   1  2  3  4  5  6  7  8  9

4.) Define the word tolerance.
5.) Determine the upper and lower limits of the tolerance from the following information.

   a. dimension on the print: 23.668
   b. tolerance: +/- .005

   Upper limit__________
   Lower limit__________

6.) Match the following symbols with their characteristics.

   \( \perp \) \hspace{1cm} ___ cylindricity
   \( \varnothing \) \hspace{1cm} ___ angularity
   \( \parallel \) \hspace{1cm} ___ perpendicularity
   \( \delta \) \hspace{1cm} ___ diameter
   \( < \) \hspace{1cm} ___ parallelism

7.) If an angle measures 40°, what is its complementary angle?

8.) Using the title block below, list the following information:
   a. company name
   b. title of part
   c. number of print
   d. material

| TOLERANCES |
|---|---|---|---|
| DECIMAL | TITLE | MOTO13-134 | SCALE |
| ± | KEY HOLE BRACKET | | |
| FRACTIONAL | MATERIAL | 14 GA. CRS (.075) | |
| ± | BY | DATE 7/21/98 | |
| ANGULAR | TAPE No. K-362 | NUMBER | A-3013-34 |
| ± | TOOL No. | | |
| LOC. | | | |
Linear Measurement

A. Steel Rule (English)

- read measurements and measure lengths on decimal-inch steel rules

Steel rules (or tapes) are widely used for applications which do not require a high degree of precision. The steel rule is often the most practical measuring instrument to use for checking dimensions where stock allowances for finishing are provided. Steel rules are also used for locating roughing cuts on machined pieces and for determining the approximate locations of parts for machine setups. Steel rules used in the machine shop are generally six inches long.

Reading Decimal-Inch Rules

An enlarged decimal-inch rule is shown. The top scale is graduated in hundredths of an inch (0.01”). The bottom scale is graduated in fiftieths of an inch (0.02”). On the top scale there are 100 divisions per inch. On the bottom scale there are fifty divisions per inch. The longer lines represent tenths.

\[
\begin{array}{c}
.01 \quad .20 \quad .5 \quad 1.1 \\
100 \quad 50 \quad 1 \\
\end{array}
\]

NOTE: Two hundredths = one fiftieth or \( \frac{2}{100} = \frac{1}{50} \) or .02 = one fiftieth
e.g. Read the following measurements on the enlarged decimal-inch rule shown above:

- length A: 0.13”
- length B: 0.70” = .7”
- length C: \( \frac{28}{50} = .56” \)

Often the edge of an object being measured does not fall exactly on a rule graduation. In these cases, read the measurement to the nearer rule graduation.

e.g. Read the following measurements, to the nearer graduation, on the enlarged decimal-inch rule shown:

- A = .2”
- B = .5”
- C = .72”
One more time with decimals!!!!

Write the numerals for the following numbers:

1.) forty-five hundredths __________
2.) six inches nine tenths __________
3.) thirteen inches two thousandths __________
4.) seven hundred thousandths __________
5.) thirty hundredths __________
6.) five hundred twenty-four __________
7.) eighty-six inches ten hundredths __________
8.) seventy-seven thousandths __________
9.) ninety-one hundredths __________
10.) one hundred inches one hundred thousandths __________

Write out the names of the following numbers:

1.) 56.087 ______________________________
2.) .705 ______________________________
3.) 4.900 ______________________________
4.) .003 ______________________________
5.) 8.820 ______________________________
6.) 306.60 ______________________________

Reduce the following numbers to the nearest thousandths:

1.) 5.9087  2.) .0774  3.) .3025  4.) .9528
Bibliography


Mercer County Community College, Division of Corporate and Community Program, Trenton, NJ. Elaine S. Weinberg, Director,

*Basic Strategies in Blueprint Reading for United Technologies-Automotive*. Jacqueline Shuler, 1994 Vision, National Workplace Literacy Grant; Chris Walsh, Project Director, Orangeburg-Calhoun Technological College, 3250 St. Matthews Rd., Orangeburg, SC 29115
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