10

Technology and Livelihood Education

Quarter 1 - Module 5
Operate CAD Software and Computer Hardware
(Manipulating CAD Features: Dimensions)

Technical Drafting NC II

ALTERNATIVE DELIVERY MODE
ADM

10

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Quarter 1 - Module 5
Operate CAD Software and Computer Hardware
(Manipulate CAD Features: Dimensions)

Technical Drafting NC II

DepED
DEPARTMENT OF EDUCATION

ICT-Technical Drafting – Grade 10
Alternative Delivery Mode
Quarter 1 – Module 5: Operate CAD Software and Computer Hardware
(Manipulating CAD features: Dimensions)

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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 SLMS 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 test. And read the instructions carefully before performing each task.

If you have 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.

Notes to the Teacher
This contains helpful tips or strategies that will help you in guiding the learner.

For the facilitator:

Hi, as a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Kindly, advise the learner's parents or guardians of the same procedure since they will be the primary supporters in the learners' progress. Please, do not forget to remind the learner to use separate sheets in answering all of the activities found in the learning module

For the learner:

Hello learner, Welcome to the Technical Drafting NC II Alternative Delivery Mode (ADM) Module on Manipulating CAD features: Dimensions. I hope you are ready to

progress in your Grade 10 TLE in Technical Drafting with this learning module. This is designed to provide you with interactive tasks to further develop the desired learning competencies prescribed in our curriculum. With this, you are expected to appreciate staking through the information and activity given.

This module has the following parts and corresponding icons:

ICON	LABEL	DETAIL
	What I Need to Know	This contains the learning objectives which you need to accomplish.
	What I know	This evaluates what you know about the lesson you are to learn.
	What's In	This connects the current lesson with a topic necessary in your understanding.
	What's New	This introduces the lesson through an activity.
	What Is It	This contains a brief discussion of the learning module lesson.
	What's More	These are activities to check your understanding of the lesson.
	What I have Learned	This summarizes the important ideas presented in the lesson.
	What I Can Do	This is a real-life application of what you have learned.
	Assessment	This is a post assessment of what you have learned.
	Additional Activity	This is an activity that will strengthen your knowledge about the lesson.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

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Lesson 1

Manipulating CAD Features: Dimensions

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

What I Need to Know

This module was designed and written to guide you to acquire the learning competencies and develop your skills in AutoCAD dimensions in ICT-Technical Drafting. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. However, the order in which you read the module can be changed to correspond with the textbook you are now using.

Quarter/Week	Q1/W5
Learning Competency Code	TLE_ICTTD9-12CA-Ic-j- 2
Learning Competency	**LO 1. Operate CAD software and computer hardware**
	1.3 Manipulate CAD features as per job requirement: Dimensions

Learning Objectives:

After going through this module, you are expected to:

1. identify the alphabet of lines and its functions;
2. familiarize the different types of dimensions used in AutoCAD
3. draw and apply proper dimensioning in the drawing; and,
4. develop traits such as patience, creativity, independence, and passion towards learning.

What I Know

Multiple Choice.

Directions: Choose the letter of the best answer. Write the chosen letter on the separate sheet of paper.

1. What alphabet of line has a heavy solid line in ink, medium weight in pencil and sometimes called object lines?
   A. Center line
   B. Visible line
   C. Hidden line
   D. Leader line
2. This type of line is represented by a series of medium weight dashes 1/8"long and spaced 1/16" apart.
   A. Center line
   B. Hidden line
   C. Leader line
   D. Cutting plane line
3. Which of the line is used to locate centers of objects, arcs and circles?
   A. Center line
   B. Leader line
   C. Section line
   D. Phantom line
4. Which of the alphabet of line has long line followed by two short dashes used to show alternate position of amoving part?
   A. Leader line
   B. Center line
   C. Hidden line
   D. Phantom line
5. It is a medium line with arrowhead to show notes or label for size or special information about a feature.
   A. Object line
   B. Leader line
   C. Section line
   D. Cutting plane line
6. Which of the following indicates the direction in which the value applies?
   A. Arrowhead
   B. Dimension line
   C. Extension line
   D. Numerical value
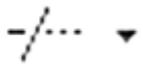7. Which of the following is the visible line?
   A.

   C.

   B.

   D.

8. Which of the following is the dimension line?

2

A.   C.

– – – – – – – – – – – – ·

B.   D.

◄──────────────────────►   ──── ── ── ────── ·

9. Which of the following types of dimensions will you use if you want
   to create a diameter dimension for a circle or an arc?
   A. Angular   C. Diameter
   B. Aligned   D. Radius
10. What will you use if you want to measure the angle between
    selected objects or the 3 points?
    A. Angular   c. Ordinate
    d. Diameter   d. Radius
11. Which of the following gives the actual distance of the objects?
    A. notes   C. value
    B. text   D. Numerical value
12. Which of the following is the First Step in setting new dimension
    style in AutoCAD?
    A. Select the NEW button.
    B. Enter Dimension-*Arch* in the New Style Name box.
    C. Select the Dimension Style Manager command by typing the
       DIMSTYLE.
    D. Select the Primary Units tab and change your settings to match
       the setting shown below.
13. Circles are dimensioned by giving the diameter while arcs are
    dimensioned by giving what dimension?
    A. Arrowheads   C. Diameter
    B. Arc   D. Radius
14. In following the guidelines in dimensioning, which of the following
    statement applies accuracy?
    A. Correct values must be given.
    B. Dimensions must be place in appropriate positions
    C. Appropriate line quality must be used for legibility.
    D. Nothing must be left out, and nothing must be duplicated.

15. Which of the following measures the horizontal or vertical
    distanced from an origin point?
    A. Circumference   C. Radial
    B. Datum   D. Linear

What's In

Modify Command Review
Directions. Name the modifying commands below. Write your answer on your answer sheet provided.

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

5. _____   6. _____   7. _____   8. _____

9.   10.

What's New

Q and A

Directions. In this next module, we get to know about the alphabet of lines and different types of dimensions in AutoCAD. Formulate statement on what, how, and what if questions about this topic. Write your answer on the answer sheet provided.

What

How

What if

What Is It

Technical Sketching deals with making working sketches or drawings in pencil, developing skills in pencil techniques using different kinds of lines in such drawing. Correct practice and exercise will enable you to gain more experience. The acquisition of better technique in sketching without the use of instruments is always a procedure before starting mechanical drawing.

The weight of the lines is determined by the degree of hardness of the pencil used, and not by the amount of pressure exerted on the pencil.

For finished inked drawings, three weights of lines, heavy, medium, and light are considered desirable and for pencil drawings, the medium and light lines.

Certain conventional lines have been developed and standardized by long usage in industry and they are referred to as the alphabet of lines.

ALPHABET OF LINES

1. Visible Lines or outline
This is a heavy solid line in ink, medium weight in pencil. They are sometimes called object lines. The thickness of the lines may vary to suit the size of the drawing.

2. Hidden lines
This type of lines is represented by a series of medium weight dashes 1/8" long and spaced 1/16" apart. They show surfaces or edges hidden from view by other parts of the object.

HIDDEN LINES
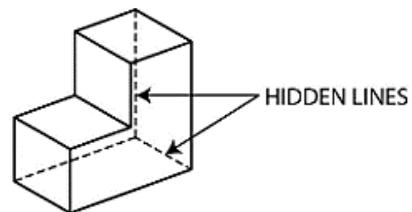
3. Cutting plane lines
These are used to indicate an imaginary cut through an object along the line. It is made with long heavy dashes alternating with two small dashes. They show where a part is mentally cut in half to better see the interior detail.

CUTTING PLANE LINE
THICK
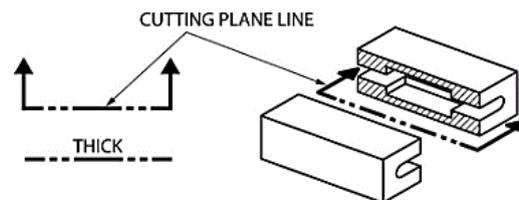
4. Center lines

These lines are used to locate centers of objects, arcs and circles. They are drawn by a series lightweight long and short dashes. The short dashes are about 1/8" long and the long dashes ¾"in length and the spaces between dashes are about 1/16.

5. Dimension lines

They are light in weight and broken in the middle to provide space for dimensions. Arrow heads are placed at the ends of these lines to show the points where the dimension end.
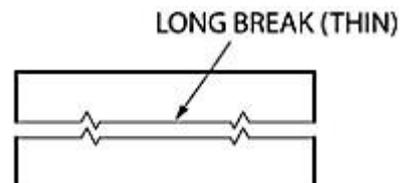
6. Extension lines

These are lines used to show clearly the dimension limits.

7. Break lines

These are lines used to show the fact that a part has been cut off or broken out.

a. Long break lines-these lines are light in weight with definite breaks

LONG BREAK (THIN)

b. Short break lines- these are indicated with a heavy freehand line.

SHORT BREAK (THICK)
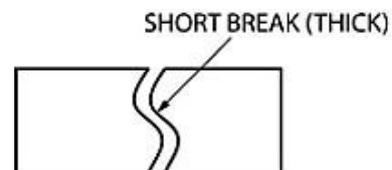
8. Section lines

These are light lines used in making sectional views. They are spaced evenly to make a shaded effect.

9. Leader line
Medium line with arrowhead to show notes or label for size or special information about a feature.

Ø.50

LEADER LINE
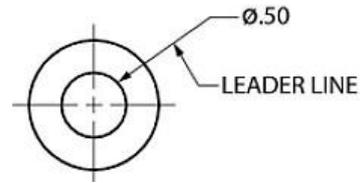
10. Phantom line
Long line followed by two short dashes use to show alternate position of amoving part.

Dimensioning a drawing

The value of a working drawing lies in the clearness with which it shows the complete story of the size and shape of an object. The lines properly located and drawn give the shape; the size is told by proper dimensioning. The dimensions placed on the drawing are limited to those necessary for the workman to understand,interpret and execute the drawing with least effort.

Lines and Symbols Used in Dimensioning

1. Dimension line- fine broken line that contrast well with the outline of the object. It should contact the extension lines with long, slim arrowheads.

Dimension line

—15.0—
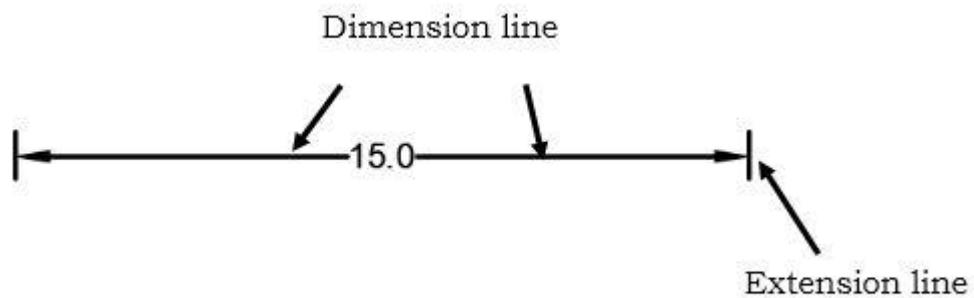
Extension line

Fig.01

2. Extension line is the fine line which is used to clearly show the dimension limits. See Figure 1
3. Center lines are the light broken lines which are sometimes used as an extension line.

Center line

7
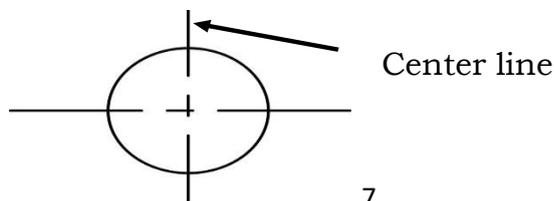
4. Leader lines- the straight lines leading from a dimensions value or an exploratory note to the feature on the drawing to which the notes apply. An arrowhead is used on the pointing end but never on the note end. The note end of the leader line should terminate with a short horizontal bar at the mid-height of the letterings.

Leader line

2.5 Drill

Note end

Pointing

end
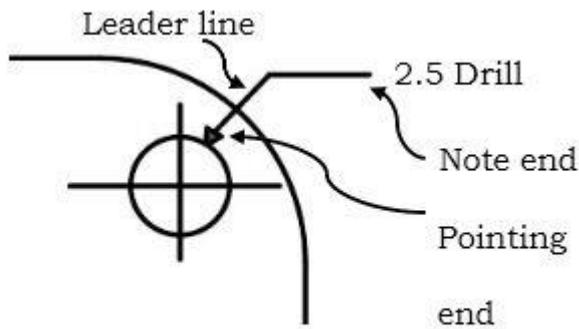
5. Arrowheads indicate the direction in which the value applies. They are drawn in freehand either on one or two strokes.

Arrowheads
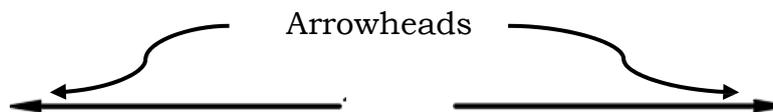
6. Numerical Value gives the actual distance of the objects. They are the figures for dimension values which must be lettered in vertical or inclined styles.

Numerical value

15.0
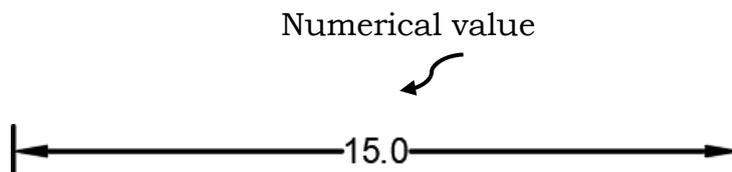
7. Notes- provides a means of explanatory information along with a size. Notes applying to the object as a whole are given leader in some convenient place in the drawing.

Note
2.5 Drill
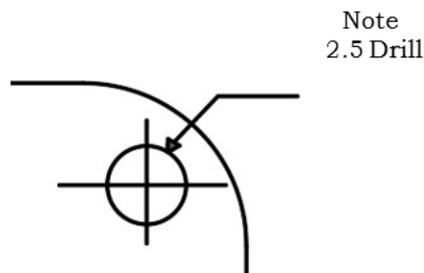
Systems of Placing Dimensions

Two methods of Placing dimensions

A. Unidirectional
This is sometimes called the horizontal system. The figures are oriented to read from the bottom of the drawing. The guideline is horizontal regardless of the direction of the dimension.
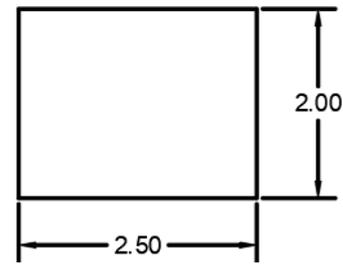
B. Aligned
The figures are oriented to be readable from a position perpendicular to the dimension line with the fraction bar in line with the dimension line
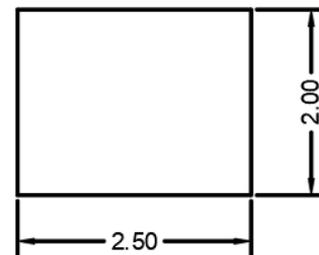
The purpose of dimensioning is to provide a clear and complete description of an object. A complete set of dimensions will permit only one interpretation needed to construct the part. Dimensioning should follow these guidelines.

Accuracy: correct values must be given.
Clearness: dimensions must be placed in appropriate positions.
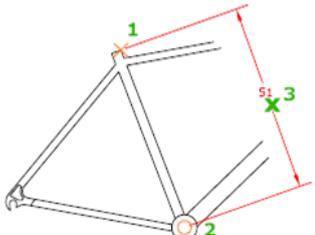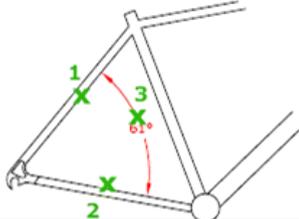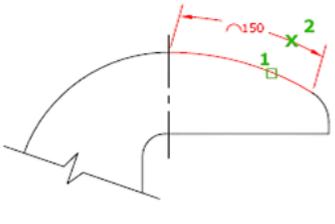Completeness: nothing must be left out, and nothing duplicated.
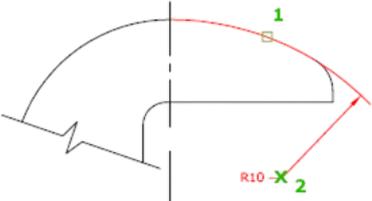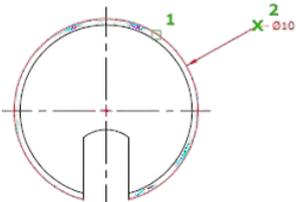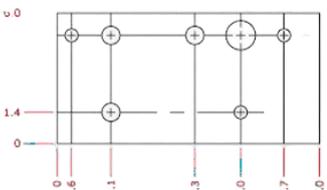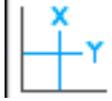Readability: the appropriate line quality must be used for legibility.

Dimensions in AutoCAD are located at the *Home Tab-Annotation Group.*

Below are the different types of dimensions commonly used in AutoCAD.

| Dimension Type	Icon	Descriptions
1. Linear Keystroke: DIMLIN/DIMLINEAR		Creates a linear dimension with a horizontal, vertical, or rotated dimension line. This command replaces theDIMHORIZONTAL and

		DIMVERTICAL command.

2. Aligned Keystroke: DIMALI/DIMALIGNED 		Creates a linear dimension that is aligned with the origin points of the extension line.
3. Angular Keystroke: DIMANG/ DIMANGULAR 		Creates an angular dimension. Measures the angle between selected objects or 3 points. Object that can be selected include arcs, circles, and lines, among others.
4. Arc Length Keystroke: DIMARC 		Creates an arc length dimension. Measures the distance along an arc or polyline are segment. The extension lines of an arc length dimension can be orthogonal or radial. An arc symbol is displayed either above or preceding the dimension text.

5. Radius Keystroke: DIMRAD/ DIMRADIUS		Creates a radius dimension for a circle or an arc. It measures the radius of a selected circle or arc and displays the dimension text with a radius symbol in front of it.
6. Diameter Keystroke: DIMDIA/DIMDIAMETR		Creates a diameter dimension for a circle or an arc.
7. Ordinate Keystroke: DIMORD/DIMORDINATE		Create ordinate dimensions. Measure the horizontal or vertical distanced from an origin point called the datum
8. Jogged Keystroke: DIMJOGGED		Create jogged dimensions for circles and arcs.

Some General Rules for dimensioning:

1. Avoid crossing leader, long leaders. Leader lines should be straight, not curved, and point to the center of the arc or circle at an angle between 30° –60°.
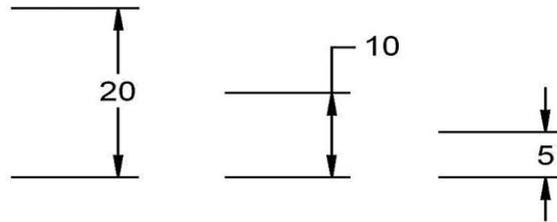

2. The spacing between dimension lines should be uniform throughout the drawing.
3. Do not dimension inside an object or have the dimension line touch the object unless clearness is gained.
4. Dimension text should not cross dimension, extension or visible lines.
5. Dimension lines should not cross extension lines or other dimension lines.

6. Dimensions should not be duplicated, or the same information given in two different ways.
7. Center lines are used as extension lines in dimensioning distances of circles.
8. Hidden lines should not be dimensioned unless necessary.
9. Circles are dimensioned by giving the diameter. Arcs are dimensioned by giving radius. Arcs are dimension by means of arcs and arrowheads.
10. Arrowheads are drawn between the extension lines if possible. If space is limited, they may be drawn on the outside
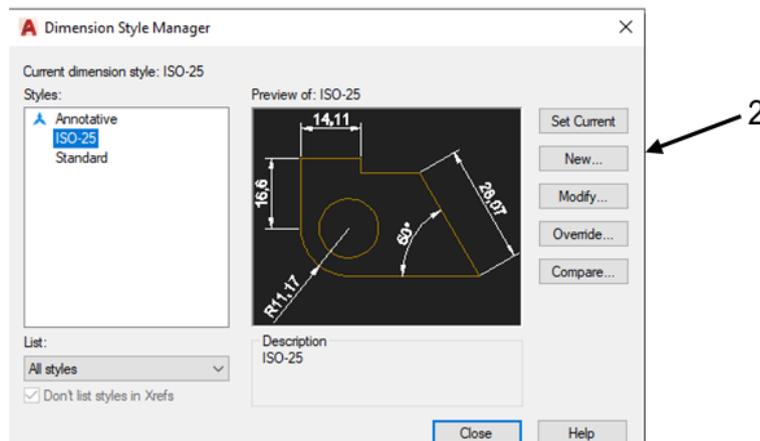
Dimension styles control a dimension's format and appearance. They help you establish and enforce drafting standards and make changes to dimensions formats and behavior easier to implement.
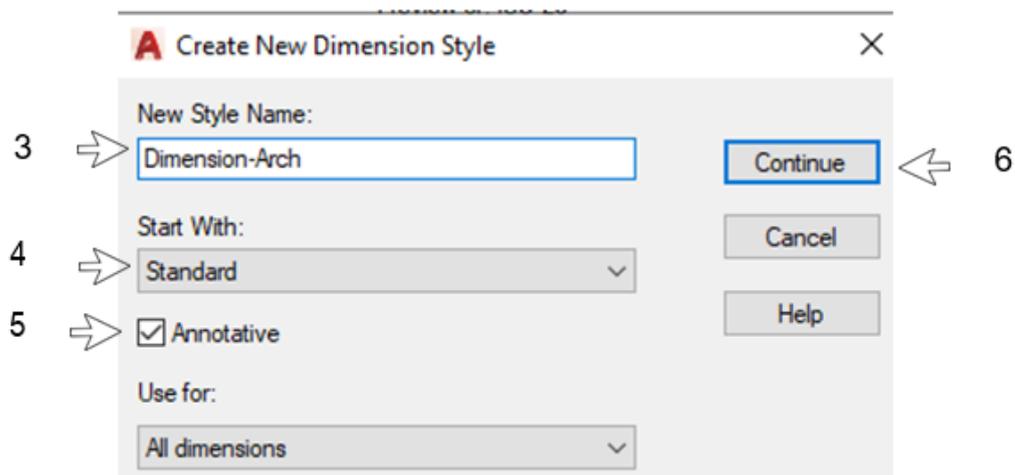
Steps in setting New Dimension style in AutoCAD

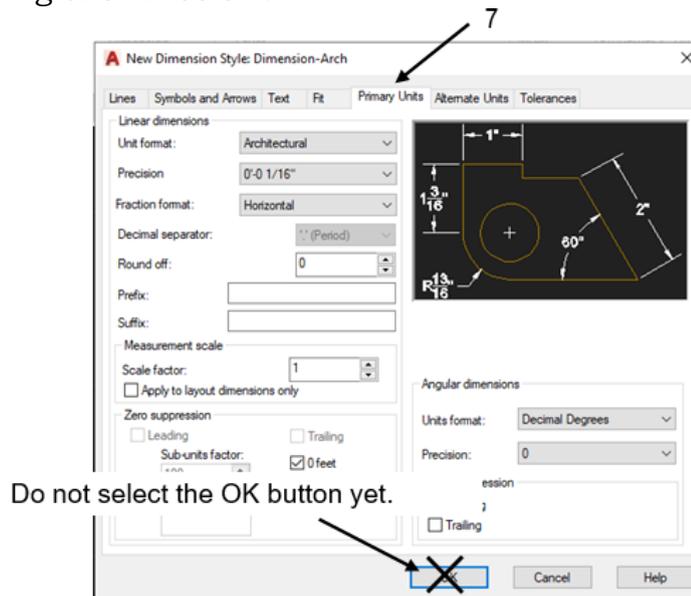1. Select the **Dimension Style Manager** command by typing the **DIMSTYLE.**
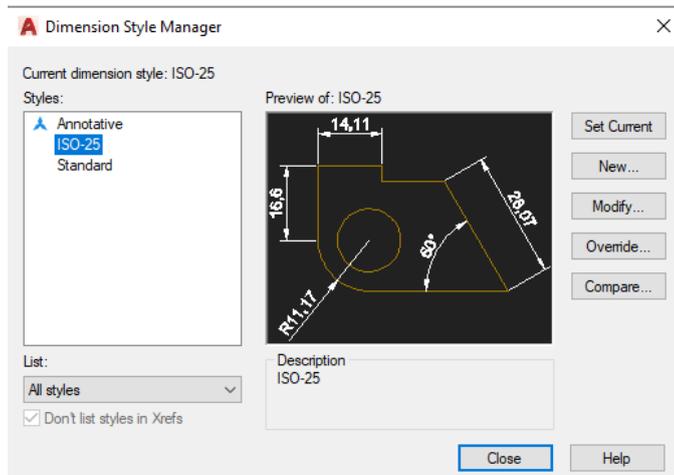
2. Select the **NEW** button.
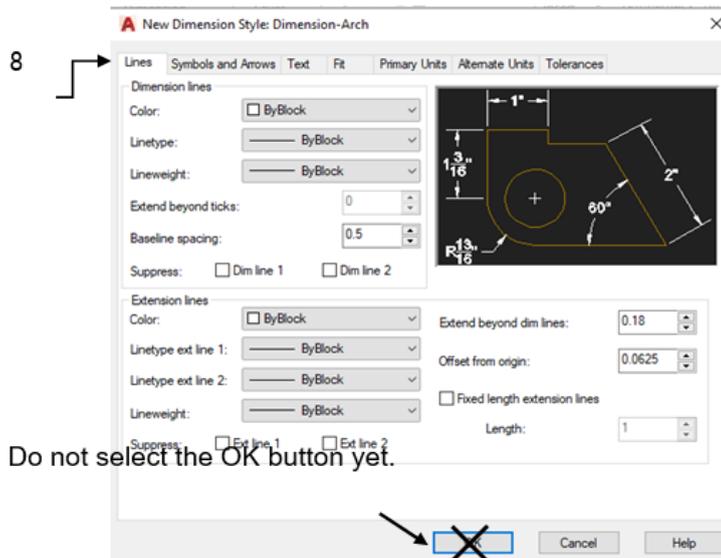

3. Enter *Dimension-Arch* in the *New Style Name* box.
4. Select Standard in the *Start With* box.
5. Select *Annotative* box.
6. Select the **Continue** button.

7. Select the Primary Units tab and change your settings to match the setting shown below.

8. Select the *Lines tab* and change your settings to match the setting shown below.

9. Select the **Symbols and Arrow tab** and change your settings to match the setting shown below.
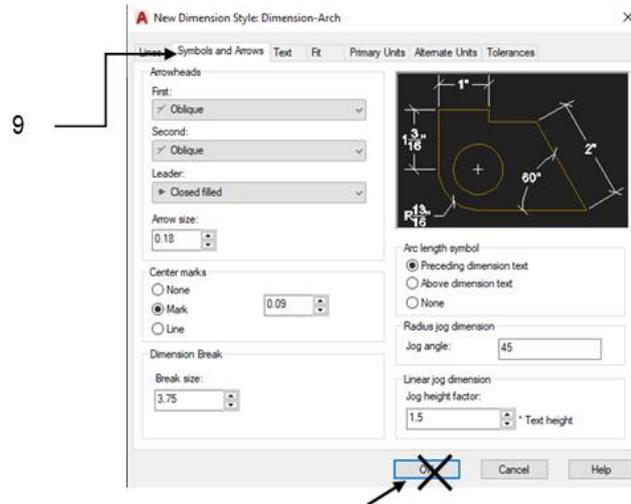
Do not select the OK button yet.

10. Select the **Text tab** and change your settings to match the settings shown below.
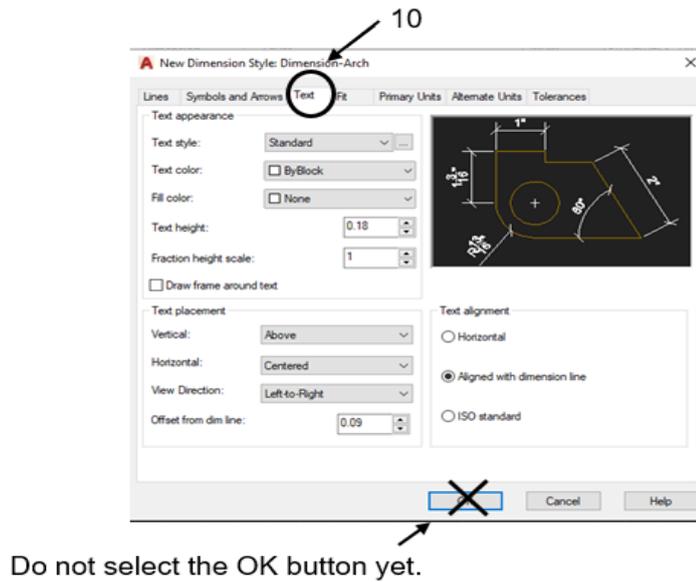
Do not select the OK button yet.

11. Select the **Fit tab** and change your settings to match the settings shownbelow.

11
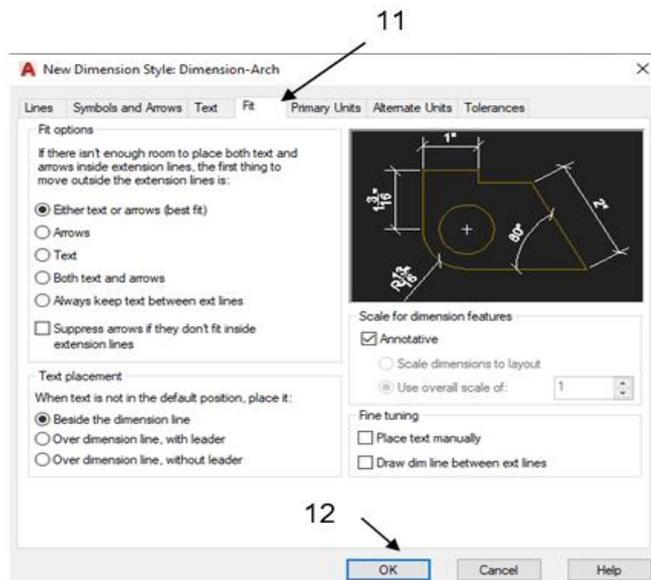
12. Now select the OK.

Your new Dimension-Arch dimension style should now in the list.

13. Select the Set Current button to make your new style Dimension-Arch the style that will be used.
14. Select the close button

13

14

Note: You can always modify or change your dimension style by clicking the *Modify* button.

What's More

Draw your Answer.
Directions. Identify and draw what is being asked. Draw your answer on the answer sheet provided.

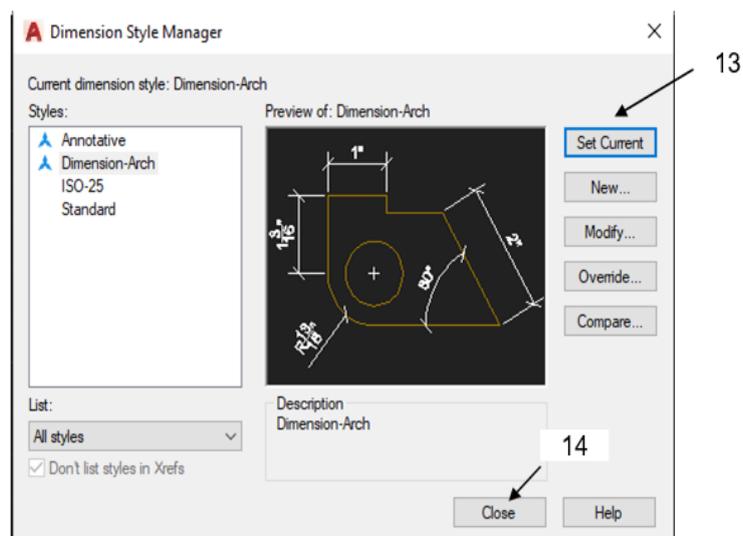|		
1. This is a heavy solid line in ink, medium weight in pencil. They are sometimes called object lines.	2. It measures the radius of a selected circle or arc and displays the dimension text with a radius symbol in front of it.	3. These are light lines used in making sectional views.
4. These are lines used to show clearly the dimension limits.	5. Arrow heads are placed at the ends of these lines to show the points where the dimension end.	6. It is a dimension type in AutoCAD that creates a linear dimension with a horizontal, vertical, or rotated dimension line.
7. They are drawn by a series lightweight long and short dashes.	8. Create jogged dimensions for circles and arcs.	9. It is a dimension types that creates an angular dimension.
10. These lines are used to locate centers of objects, arcs and circles.		

What I Have Learned

Directions. Answer the questions briefly. In what practical day to day activity or situation can you see yourself applying this lesson? Expound your answer if possible. Write your answer on the answer sheet provided.

_____

_____

_____

What I Can Do

Hello learners! There are two (2) sets of activity. **Activity 1** is for those who have computer devices and AutoCAD software. **Activity 2** is for those who don't have any computer devices. You can choose any activity that applicable on you.

Activity 1: Hands-on Activity
Directions.

1. Create a New Dimension Style and name it as Dimension-Exercise.
   - Set the primary units as decimal.
   - Set precision into two decimal piont.
   - Text height is 0.18
2. Redraw the given object and follow the dimensions.
3. Apply proper dimensioning in your drawing. Make sure you follow the rules for dimensioning.
4. Save your work as <lastName_FirstName_Dimension_Exer>.dwg

NOTE: All Offset distances is 0.10 and All Fillet radius is 0.40

Performance Criteria

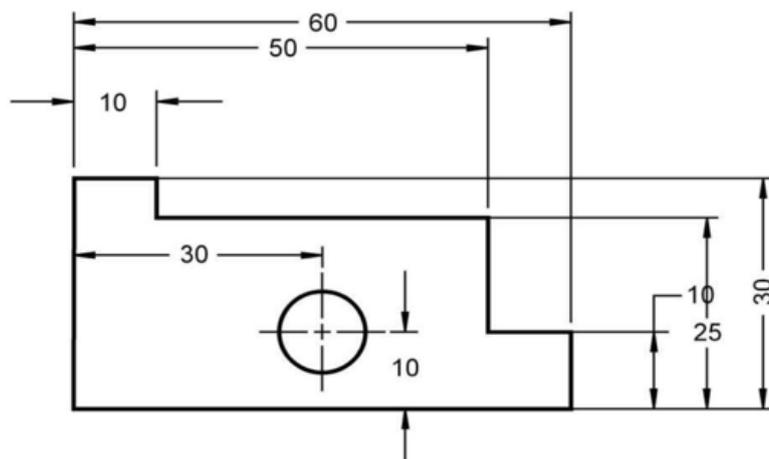| Criteria	Levels of Assessment				Score
	Excellent (10 pts)	Very satisfactory (8 pts)	Satisfactory (5 pts)	Needs Improvement (3 pt)	
Followed the instructions Followed the given instructions/procedure from start to finish, observed correct usage of command tools					
Proficiency Perform task with competence and exceptional performance					
Accuracy Perform the task with no errors					
Use of AutoCAD command tools Demonstrate high degree of competency with AutoCAD commands. Can prioritize commands and tools usage to create and modify objects.					
Completeness Drawings are completed quickly and efficiently with no errors					
Total					

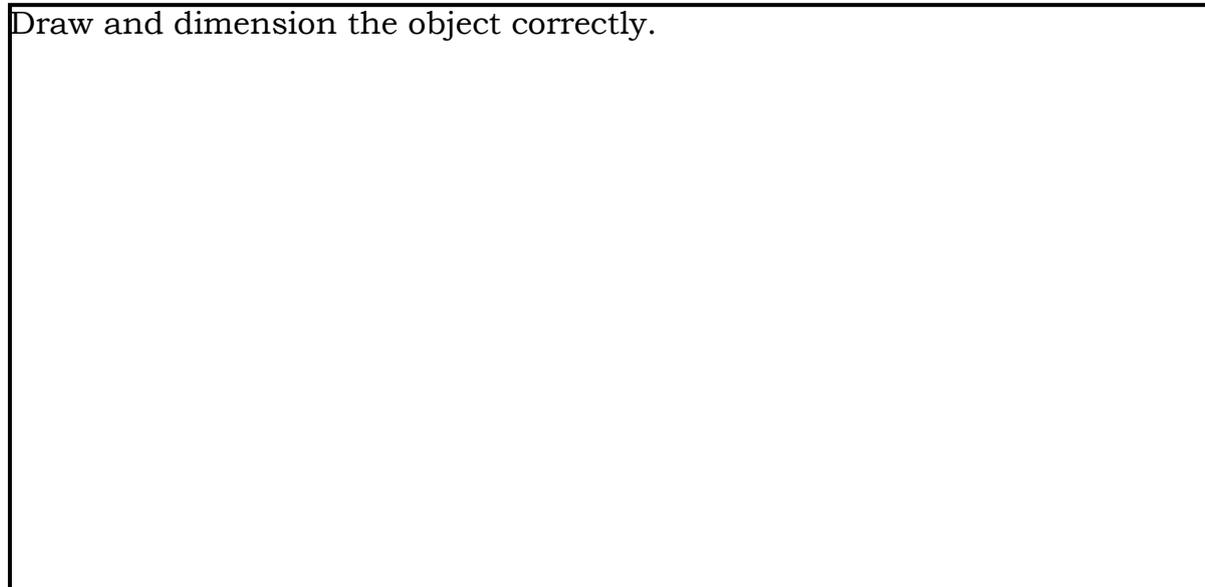## Activity 2: Dimensioning Exercise

Direction: List the dimensioning mistakes in the figure below. Draw and dimension the object correctly in the box provided below. Write your answer on the answer sheet provided.

List of Dimensioning Mistakes:

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

Draw and dimension the object correctly.

Performance Criteria

Criteria	Levels of Assessment				Score
	Excellent (10 pts)	Very satisfactory (8 pts)	Satisfactory (5 pts)	Needs Improvement (3 pt)	
Followed the instructions Followed the given instructions/procedure from start to finish, observed correct usage of command tools					
Accuracy Dimension the object correctly.					
Neatness Has no visible erasures and unnecessary marks					
Completeness Listed all the 5 dimensioning mistakes in the object.					
Time management Drawings are completed quickly and efficiently and submitted on time					
Total					

Multiple Choice.

Directions: Choose the letter of the best answer. Write the chosen letter on the answer sheet provided.

1. Which of the following indicates the direction in which the value applies?
   A. Arrowhead
   B. Dimension line
   C. Extension line
   D. Numerical value

2. Which of the alphabet of lines has long line followed by two short dashes used to show alternate position of amoving part?
   A. Leader line
   B. Center line
   C. Hidden line
   D. Phantom lines

3. This type of line is represented by a series of medium weight dashes 1/8"long and spaced 1/16" apart.
   A. Center line
   B. Hidden line
   C. Leader line
   D. Cutting plane line

4. Which of the lines is used to locate centers of objects, arcs and circles?
   A. Center line
   B. Leader line
   C. Section line
   D. Phantom line

5. It is a medium line with arrowhead to show notes or label for size or special information about a feature.
   A. Object line
   B. Leader line
   C. Section line
   D. Cutting plane line

6. Which of the following gives the actual distance of the objects?
   A. Notes
   B. Text
   C. Value
   D. Numerical value

7. Which of the following measures the horizontal or vertical distanced from an origin point?
   A. Circumference
   B. Datum
   C. Radial
   D. Linear

8. Which of the following is the First Step in setting new dimension style in AutoCAD?
   A. Select the NEW button.
   B. Enter Dimension-*Arch* in the New Style Name box.
   C. Select the Dimension Style Manager command by typing the DIMSTYLE.
   D. Select the Primary Units tab and change your settings to match the setting shown below.

9. Which of the following is the visible line?

A.

―――――――――――

C.

――――― ‒ ‒ ―――――

B.

←‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ·

D.

――――― ‒‒ ‒‒ ―――

10. Which of the following type of dimensions will you use if you want to create a diameter dimension for a circle or an arc?
   A. Angular   C. Diameter
   B. Aligned   D. Radius

11. What will you use if you want to measure the angle between selected objects or the 3 points?
   A. Angular   c. Ordinate
   d. Diameter   d. Radius

12. Circles are dimensioned by giving the diameter while arcs are dimensioned by giving what dimension?
   A. Arrowheads   C. Diameter
   B. Arc   D. Radius

13. What alphabet of lines has a heavy solid line in ink, medium weight in pencil and sometimes called object lines?
   A. Center line   C. Hidden line
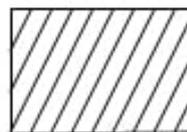   B. Visible line   D. Leader line

14.   Which of the following is the dimension line?

A.

‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ‒ ·

C.

B.

←――――――――――→

D.

――――― ‒‒ ‒‒ ―――

15. In following the guidelines in dimensioning, which of the following statement applies accuracy?
    A. Correct values must be given.
    B. Dimensions must be place in appropriate positions
    C. Appropriate line quality must be used for legibility.
    D. Nothing must be left out, and nothing must be duplicated.

Additional Activity

Directions. Think of at least three (3) synonyms and antonyms for the vocabulary word found in the box. Define the vocabulary word in your own words and use in a sentence. Write your answer on the answer sheet provided.

Let's Brainstorm!

Vocabulary Word: Dimensions

Synonyms:
_____
_____
_____
_____
_____

Antonyms:
_____
_____
_____
_____
_____

Definition in your own words:
_____
_____
_____
_____
_____

Use in a sentence:
_____
_____
_____
_____
_____

Answer Key

What I Know	What's In	What's New	What's More
1. B	1. Rotate	Answers may vary	1. Visible
2. B	2. Array		2. Radius
3. A	3. Offset		3. Section line
4. D	4. Scale		4. Extension line
5. B	5. Chamfer		5. Dimension line
6. A	6. Explode		6. Linear
7. A	7. Copy		7. Center line
8. B	8. Trim		8. Jogged
9. C	9. Erase		9. Angular
10. A	10. move		10. Center line
11. D			
12. B			
13. D			
14. A			
15. B			

What I Have Learned

Answers may vary

What I Can Do

Performance output will be evaluated through given rubrics

Assessment

1. A
2. D
3. B
4. A
5. B
6. D
7. B
8. B
9. A
10. C
11. A
12. D
13. B
14. B
15. A

Additional Activity

Answers may vary

References

Costin, Ric. 2021. "The Language Of Lines".
      Openoregon.Pressbooks.Pub. Accessed July 30.
      https://openoregon.pressbooks.pub/blueprint/chapter/
      unit-1-the-language-of-lines/.

William Anderson . 2019 (School work helper Editorial Team)
      Https://schoolworkhelper.net/Tutor and Freelance Writer. Science
      Teacher and Lover of Essays. Article Last Reviewed: 2019 | St.
      Rosemary Institution © 2010-2020 | Creative Commons 4.0, Author:,
      and Tutor and Freelance Writer. Science Teacher and Lover of Essays.
Article Last Reviewed: 2019 | St. Rosemary Institution © 2010-2020 | Creative
      Commons 4.0. "TECHNICAL DRAWING & ALPHABET OF LINE."
      SchoolWorkHelper. https://schoolworkhelper.net/technical-drawing-
      alphabet-of-line/.

Wilke, Shelly. "Chapter 4 Dimensioning - 2010." SlideShare. October
      28, 2015.
      https://www.slideshare.net/shellymulholland/chapter-4-
      dimensioning-2010.