Learning Objectives

After completing this chapter, you will be able to do the following:

- Describe and control associative dimensions.
- Control the appearance of existing dimensions and dimension text.
- Update dimensions to reflect the current dimension style.
- Override dimension style settings and match dimension properties.
- Change dimension line spacing and alignment.
- Break dimension, extension, and leader lines.
- Create inspection dimensions.
- Edit existing multileaders.

You can modify dimensions using standard editing tools such as ERASE and STRETCH. AutoCAD also provides specific tools to adjust dimensions. This chapter describes techniques for editing dimension placement, value, and appearance.

AssOCIATIVE DimENSIONING

A dimension is a group of elements treated as a single object. For example, you can access the ERASE tool and pick any portion of the dimension to erase the entire dimension. Additionally, dimensions reference objects or points. When you edit dimensioned objects with tools such as STRETCH, MOVE, ROTATE, and SCALE, dimensions change accordingly. See Figure 21-1.

An associative dimension forms by default when you select objects or pick points using object snaps. For example, if you dimension the $\emptyset 1.0$ circle in Figure 21-1 using the DIMDIAMETER tool, and then change size of the circle to $\emptyset 2.00$, the diameter dimension adapts to show the correct size of the modified circle. Create associative dimensions when possible and practical by selecting objects or using object snaps. Associative dimensions relate best to object size and make revisions easier.

A non-associative dimension forms when you select points without using object snaps. A non-associative dimension is still a single object that updates when you make changes to the dimension, such as stretching the extension line origin. Non-associative dimensions are appropriate when associative dimensions would result in unnecessary complexity or when the object changes.
Editing Dimensions

Chapter 21

AutoCAD and Its Applications—Basics

You can edit individual dimension properties without exploding a dimension using dimension shortcut menu options or the Properties palette to create a dimension style override.

**NOTE**

The **DIMREASSOCIATE** tool allows you to change the overridden value of an associated dimension back to the actual associated dimension value. Access the **DIMREASSOC** tool and select associative dimensions to change. The **DIMREASSOCIATE** tool creates an associative dimension, but does not change an overridden dimension value.

Definition Points

Definition points, or defpoints, form automatically when you create a dimension. Use the **Node** object snap to snap to a definition point. If you select an object to edit and want to include dimensions in the edit, you must include the definition points in the selection set. AutoCAD automatically creates a Defpoints layer and places definition points on the layer. By default, the Defpoints layer does not plot. You can only plot definition points if you rename the Defpoints layer and then set the renamed layer to plot. Definition points are displayed even if you turn off or freeze the layer.

**Exercise 21-1**

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-1.

**CAUTION**

A dimension is a single object even though it consists of extension lines, a dimension line, arrowheads, and text. You may be tempted to explode the dimension using the **EXPLODE** tool to modify individual dimension elements. You should rarely, if ever, explode dimensions. Exploded dimensions lose layer assignment and association to related features and dimension styles.

**PROFESSIONAL TIP**

You can edit individual dimension properties without exploding a dimension using dimension shortcut menu options or the Properties palette to create a dimension style override.

**NOTE**

To disassociate a dimension from an object, grip-edit the dimension to stretch an appropriate grip point away from the associated object, or use the **DIMDISASSOCIATE** tool.

**NOTE**

The **DIMDISASSOCIATE** tool is not to be confused with the **DIMREASSOCIATE** tool, that allows you to change the overridden value of an associated dimension back to the actual associated dimension value. Access the **DIMREASSOC** tool and select associative dimensions to change. The **DIMREASSOCIATE** tool creates an associative dimension, but does not change an overridden dimension value.

**NOTE**

Refer to the **Associative** property in the **General** area of the **Properties** palette to determine whether a dimension is associative.

**PROFESSIONAL TIP**

Dimension tools allow you to dimension a drawing, but do not control object size and location. Chapter 22 explains how to use dimensional constraints to control object size and location. If you anticipate creating a drawing with features that will require significant or constant change, you may want to use dimensional constraints instead of, or in addition to, traditional dimensioning tools.

**Associating Dimensions with Objects**

Dimensions are associated with objects by default when you select objects or pick points using object snaps. To deactivate associative dimensioning for new objects, access the **Options** dialog box and deselect the **Make new dimensions associative** check box in the **Associative Dimensioning** area of the **User Preferences** tab.

Often the easiest way to convert a non-associative dimension to an associative dimension is to select the dimension to grip-edit, stretching the appropriate grip to the corresponding object snap point using the appropriate object snap mode. You can also convert dimensions using the **DIMREASSOCIATE** tool. Select the dimension to associate with an object. An X marker appears at a dimension origin, such as the origin of a linear dimension extension line or the center of a radial dimension. Select a point on an object to associate with the marker location. Repeat the process to locate the second object point for the first extension line, if required.

**Figure 21-1.** An example of a revised drawing. Dimensions adjust to the modified geometry, and the dimension values update to reflect the size and location of the modified geometry.

![Original Drawing](image1.png)

![Revised Drawing](image2.png)
Dimension Editing Tools

As the drawing process evolves and design changes occur, you will find it necessary to make changes to dimensioned objects and dimensions. AutoCAD includes dimension-specific editing tools and techniques to help you adjust dimensions as necessary.

Dimension Shortcut Menu Options

Select a dimension and then right-click to display the shortcut menu shown in Figure 21-2. The Dim Text position cascading submenu provides options to adjust the dimension value location. Pick Above dim line to move the dimension text above the dimension line. Select Centered to center the dimension text on the dimension line. Pick Home text to reposition the text at its original position. Move text alone allows you to move the text away from the dimension line. Move with leader allows you to move the text away from the dimension line and attach a leader from the text to the dimension line. Move with dimension line allows you to move the text, but maintain alignment between the text and the dimension line.

The Precision cascading submenu includes options to adjust the number of decimal places displayed with a dimension value. The Precision cascading submenu often provides the easiest way to specify an alternative tolerance. Use the Dim Style cascading submenu to assign a different dimension style to the dimension or to save a new dimension style based on the properties of the selected dimension.

Pick the Flip Arrow option to flip the direction of a dimension arrowhead to the opposite side of the extension line or object that the arrow touches. For example, if arrowheads and the dimension value are crowded inside extension lines, flip the arrowheads to the outside of extension lines to make the dimension easier to read. If the selected dimension includes two arrowheads, only the arrowhead closest to the point you pick when you select the dimension (not the right-click point) flips. This allows you to control the arrowheads independently.

Assigning a Different Dimension Style

To assign a different dimension style to existing dimensions, use the options on the Dim Style cascading submenu of the dimension shortcut menu. Another option is to pick the dimensions to change and select a different dimension style from the Dimension Style drop-down list on the Home or Annotation ribbon tab. A third option is to select the dimensions to change and choose a different dimension style from the Quick Properties panel or the Properties palette.

The Update dimension tool provides another technique to change the dimension style assigned to existing dimensions. Before you access the Update dimension tool, set the dimension style to be assigned to existing dimensions current. Then access the Update dimension tool and pick the dimensions to change them to the current style.

Editing the Dimension Value

The DDEDIT tool allows you to add a prefix or suffix to the dimension value or edit the dimension text format. For example, use the DDEDIT tool to add a diameter symbol to a linear diameter dimension if you forgot to use the Mtext or Text option of the DIMLINEAR tool. See Figure 21-3. Access the DDEDIT tool and select a dimension to enter the mtext editor. The highlighted value represents the current dimension value. Add to or modify the dimension text and then close the text editor. The DDEDIT tool continues, allowing you to edit other text if necessary.

CAUTION

You can replace the highlighted dimension value, but this action disassociates the dimension value with the object or points it dimensions. Therefore, leave the default value intact whenever possible.

Exercise 21-2

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-2.

Editing Dimension Text Placement

Proper dimensioning practice requires dimensions that are clear and easy to read. This sometimes involves moving the text of adjacent dimensions to separate the text elements. See Figure 21-4. You can use the dimension shortcut menu to adjust dimension text position, but the quickest method is to use grips. Select the dimension, pick the dimension text grip, and stretch the text to the new location. AutoCAD automatically reestablishes the break in the dimension line when you pick the new location.
Using the DIMTEDIT Tool

The DIMTEDIT tool allows you to change the placement and orientation of existing dimension text. Access the DIMTEDIT tool and select the dimension to alter. Specify a new point to stretch the text and automatically reestablish the break in the dimension line.

The DIMTEDIT tool also provides options to relocate dimension text to a specific position and rotate the text. However, it is usually quicker to select the appropriate button from the expanded Dimensions panel of the Annotation ribbon tab or select a similar option from the dimension shortcut menu. Use the Text Angle (Angle) option to rotate the dimension text. Select the Left Justify (Left) option to move horizontal text to the left and vertical text down. Use the Center Justify (Center) option to center the text on the dimension line. Choose the Right Justify (Right) option to move horizontal text to the right and vertical text up. Select the Home option to relocate text back to the original position. Figure 21-5 shows the result of using each DIMTEDIT tool option.

**PROFESSIONAL TIP**

Activate the Place text manually check box in the Fit tab of the New (or Modify) Dimension Style dialog box to provide greater flexibility for the initial placement of dimensions when necessary.

Exercise 21-3

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-3.

Using the DIMEDIT Tool

The DIMEDIT tool, not to be confused with the DIMTEDIT tool, provides Home and Rotate options that function the same as the Home and Angle options of the DIMTEDIT tool. The New option is similar to using the DDEDIT tool to edit dimension values. When you activate the New option, the multiline text editor appears with the associated dimension value highlighted. Add to or modify the dimension text and then close the text editor.

Oblique Extension Lines

The Oblique option is unique to the DIMEDIT tool and allows you to change the extension line angle without affecting the associated dimension value. Figure 21-6A shows an example of adjusting the placement of dimensions when space is limited by changing existing linear dimensions to use oblique extension lines. Figure 21-6B shows dimensions with oblique extension lines.
shows an example of using oblique extension lines to orient extension lines properly with the angle of the stairs in a stair section. Notice that the associated values and orientation of the dimension lines in these examples do not change. To create oblique extension lines, dimension the object using the DIMALIGNED and DIMLINEAR tools as appropriate, even if the dimensions are crowded or overlap. Then access the Oblique option of the QDIM tool. The quickest way to access the Oblique option is to pick the corresponding button from the expanded Dimensions panel of the Annotation ribbon tab. Then pick the linear and aligned dimensions to be redrawn at an oblique angle and specify the obliquing angle. Plan carefully to make sure you enter the correct obliquing angle. Obliquing angles originate from 0° East and revolve counterclockwise. Enter a specific value or pick two points to define the obliquing angle.

Supplemental Material

Isometric Dimensions
The Oblique option of the QDIM tool is one option for dimensioning isometric drawings. For information about constructing dimensions for isometric views, go to the Student Web site (www.g-wlearning.com/CAD), select this chapter, and select Isometric Dimensions.

Exercise 21-4
Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-4.

Editing Dimensions with the QDIM Tool
The QDIM tool provides options for replacing, adding, removing, and rearranging existing linear or ordinate dimensions. The QDIM tool does not change diameter or radius dimensions. Access the QDIM tool and select the dimensions to modify, and any other objects to dimension. The QDIM tool replaces the selected dimensions and adds dimensions to selected objects. Right-click or press [Enter] or the space bar to display a preview of the dimensions attached to the cursor.

The Continuous option changes selected linear dimensions to chain dimensions. The Baseline option changes selected linear dimensions to baseline dimensions. The Ordinate option changes selected linear dimensions to rectangular coordinate dimensions without dimension lines. You must reselect the location of the dimensions. If the QDIM tool does not reference the appropriate datum, use the datum Point option before locating the dimensions to specify a different datum point.

Use the Edit option before locating the dimensions to add dimensions to, or remove dimensions from, the current set. Marks indicate the points acquired by the QDIM tool. Use the Add function to specify a point to add a dimension, or use the Remove function to specify a point to remove the corresponding dimension. Right-click or press [Enter] or the space bar to return to the previous prompt and continue using the QDIM tool.

To create the dimensions shown in Figure 21-7A, access the QDIM tool and select the existing dimensions. Then activate the Baseline option, followed by the Edit option. Choose the Add function and pick the point to add. Right-click or press [Enter] or the space bar, and then specify the location of the first dimension line.

Figure 21-7. Use the QDIM tool to change the arrangements or type of existing dimensions and add or remove dimensions.

Exercise 21-5
Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-5.

Overriding Dimension Style

A drawing often includes dimensions that require settings slightly different from the assigned dimension style. These dimensions may be too few to merit creating a new style. Perform a dimension style override for these situations. For example, use a dimension style with an Offset from origin value of 0.63 to conform to ASME standards for most dimensions. Apply a dimension style override with an Offset from origin value of 0 to three dimensions that should not display an extension line offset.

Existing Dimensions
The Properties palette is an effective tool for overriding the dimension style assigned to existing dimensions. The Properties palette divides dimension properties into several categories. See Figure 21-4. To change a property, access the proper category, pick the property to highlight, and adjust the corresponding value. Most changes made using the Properties palette override the dimension style assigned to the selected dimension. The changes do not alter the original dimension style and do not apply to new dimensions.

NOTE
The Quick Properties panel provides a limited number of dimension properties and style overrides.

New Dimensions
Use the Dimension Style Manager to override the dimension style assigned to dimensions you are about to create. An example of an override is including a text prefix for a few dimensions. Select the dimension style to override from the Styles list and then pick the Override button to open the Override Current Style dialog box.
The **Override** button is only available for the current style. The **Override Current Style** dialog box includes the same tabs as the **New Dimension Style** and **Modify Dimension Style** dialog boxes. Make the necessary changes and pick the **OK** button. The override is current and appears as a branch under the original style labeled `<style overrides>`. Close the **Dimension Style Manager** and draw the unique dimensions.

To clear style overrides, return to the **Dimension Style Manager** and set a different style current. The override settings are lost when you set a different style, including the parent style, current. To incorporate the overrides into the overridden style, right-click on the `<style overrides>` name and select **Save to current style**. To save the changes to a new style, pick the **New...** button. Then select `<style overrides>` in the **Start With** drop-down list in the **Create New Dimension Style** dialog box. In the **New Dimension Style** dialog box, pick **OK** to save the overrides as a new style.

**PROFESSIONAL TIP**

Carefully evaluate the dimensioning requirements in a drawing before performing a style override. It may be better to create a new style. Consider generating a new dimension style if several dimensions require the same overrides. If only one or two dimensions need the same changes, an override is usually more productive.

**Exercise 21-6**

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-6.

**Using the MATCHPROP Tool**

The **MATCHPROP** tool allows you to copy, or “paint,” properties from one object to other objects, including dimensions. You can match properties in the same drawing or between drawings. Access the **MATCHPROP** tool, pick the source dimension with the desired properties, and then pick the destination dimensions to change. Press [Enter] or the space bar, or right-click and select **Enter** to exit. The style of the source dimension is applied to destination dimensions. If you override the dimension style of the source dimension, the “base” style is applied along with the dimension style override. Reapplying the “base” style removes the overrides.

**NOTE**

The **Property Settings** dialog box, available by selecting the **Settings** option before picking the destination objects, includes a **Dimension** check box. AutoCAD checks the box by default, allowing you to match dimensions.

**Exercise 21-7**

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-7.

**Using the DIMSPACE Tool**

The amount of space between a drawing view and the first dimension line and the space between dimension lines vary depending on the drawing and industry or company standard. ASME standards recommend a minimum spacing of .375″ (10 mm) from a drawing feature to the first dimension line and a minimum spacing of .25″ (6 mm) between dimension lines. A minimum spacing of 3/8″ is common for architectural drawings. These minimum recommendations are generally less than the spacing required by actual company or school standards. A value of .5 (12 mm) or .75 (19 mm) is usually more appropriate.
Typically, the spacing between dimension lines is equal, and chain dimensions align. See Figure 21-9. You generally determine the correct location and spacing of dimension lines before and while dimensioning. However, you can adjust dimension line spacing and alignment after you place dimensions. This is a common requirement when there is a need to increase or decrease the space between dimension lines, such as when the drawing scale changes, or when dimensions are unequally spaced or misaligned.

The STRETCH, DIMEDIT, and QDIM tools or grips are common methods for adjusting the location and alignment of dimension lines. However, you must determine the exact location or amount of stretch applied to each dimension line before using these tools. An alternative is to use the DIMSPACE tool, which allows you to adjust the space equally between dimension lines or to align dimension lines.

Access the DIMSPACE tool and select the base dimension, followed by each dimension to space. Right-click or press [Enter] or the space bar to display the Enter value or [Auto]: prompt. Enter a value to space the dimension lines equally. For example, enter .5 to space the selected dimension lines .5″ apart. Enter a value of 0 to align the dimensions. See Figure 21-10. Use the Auto option to space dimension lines using a value that is twice the height of the dimension text.

**Exercise 21-8**

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-8.

ASME and many other drafting discipline standards state that when dimension, extension, or leader lines cross a drawing feature or another dimension, neither line is broken at the intersection. See Figure 21-11. However, you can use the DIMBREAK tool to create breaks if desired.

Access the DIMBREAK tool and select the dimension to break. This dimension contains the dimension, extension, or leader line to break across an object. If you pick a single dimension to break, the Select object to break dimension or [Auto/Restore/Manual]: prompt appears.

The Auto option is the default and breaks the dimension, extension, or leader line at the selected object. The Dimension Break setting of the current dimension style controls the break size. Pick additional objects if necessary to break the dimension at additional locations. See Figure 21-12. Use the Manual option to define the size of the break by selecting two points along the dimension, extension, or leader line, instead of using the break size set in the current dimension style. Activate the Restore option to remove a break created using the DIMBREAK tool.
Another technique is to use the Multiple option to select more than one dimension. Right-click or press [Enter] or the space bar after you select dimensions to display the Enter an option [Break/Restore] prompt. Select the Break option to break the selected dimension, extension, or leader lines everywhere they intersect another object. Use the Restore option to remove breaks created using the DIMBREAK tool.

**Exercise 21-9**

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-9.

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**Creating Inspection Dimensions**

Inspections and tests occur throughout the design and manufacturing of a product. Tests help ensure the correct size and location of product features. In some cases, size and location dimensions include information about how frequently a test on the dimension occurs for consistency and tolerance during the manufacturing process. See Figure 21-13. Use the DIMINSPECT tool to add inspection information to most types of existing dimensions.

Access the DIMINSPECT tool to display the Inspection Dimension dialog box, shown in Figure 21-14. Pick the Select dimensions button to which you want to apply inspection information. You can select multiple dimensions, although the same inspection specifications apply to each. Pick the appropriate radio button in the Shape area to define the shape of the inspection dimension frame.

The inspection dimension contains the inspection label, the dimension value, and the inspection rate. Select the None option to omit frames around values.

Pick the Label check box to include a label, and type the label in the text box. The label appears on the left side of the inspection dimension and identifies the dimension. The inspection dimension shown in Figure 21-13 is labeled A. The dimension frame houses the dimension value specified when you created the dimension. The length of the part shown in Figure 21-13 is 2.500, as created when using the DIMLINEAR tool. The Inspection rate check box is active by default. Enter a value in the text box to indicate how often to test the dimension. In this example, the inspection rate of 100% means that the manufacturer must check the length of the part for tolerance every time the part is added to an assembly.

To remove an inspection dimension, access the DIMINSPECT tool, pick the Select dimensions button in the Inspection Dimension dialog box, and choose the dimensions from which you want to remove inspection information. Right-click or press [Enter] or the space bar to return to the Inspection Dimension dialog box, and pick the Remove Inspection button to return the dimension to its condition prior to adding the inspection content.
Editing Multileaders

Edit multileaders using methods similar to those you use to edit dimensions. Use editing tools such as STRETCH, MOVE, ROTATE, and SCALE as needed. Grips are particularly effective for adjusting the location of leader elements. Use the grips at the arrowhead to relocate the arrowhead. Use the grips at each end of a landing to stretch the landing, but be careful not to violate drafting standards. Use the grips at the middle of a landing or with leader content to relocate content.

To make changes to multileader text, double-click on the text to re-enter the mtext editor. Use the Properties palette or Quick Properties panel to override specific multileader properties. You can also use the MATCHPROP tool. In addition to these general multileader editing techniques, specific tools allow you to add and remove leader lines and space, align, and group multileader objects. Select a multileader and right-click to display a shortcut menu with specific options for adjusting multileaders and assigning a different multileader style.

Adding and Removing Multiple Leader Lines

The MLEADEREDIT tool provides options for adding leader lines to, and removing leader lines from, an existing multileader object. Multiple leaders are not a recommended ASME standard, but they are appropriate for some applications, such as welding symbols. See Figure 21-15. Multiple leaders are also appropriate for some architectural or related drawings.

To add a leader line to a multileader object, pick the Add Leader button from the ribbon and select the multileader to receive the additional leader line. You can also select the multileader, right-click, and choose Add Leader. Pick a location for the additional leader line arrowhead. You can place as many additional leader lines as needed without accessing the tool again. When you are finished, press [Enter], [Esc] or the space bar or right-click and select Enter. All leader lines are grouped to form a single multileader object.

To remove an unneeded leader line, pick the Remove Leader button from the ribbon and select the multileader object that includes the leader to remove. You can also select the multileader, right-click, and choose Remove Leader. Select the leader lines to remove and press [Enter], [Esc] or the space bar or right-click and select Enter.

NOTE

If you type MLEADEREDIT to access the tool, you must activate the Remove leaders option to remove leader lines.

PROFESSIONAL TIP

To adjust the properties of a specific leader line in a group of leaders attached to the same content, hold down [Ctrl] and pick the leader to modify. Then access the Properties palette. Options specific to the selected leader appear, and all other properties are filtered out.

Adding and Removing Multiple Leader Lines

Exercise 21-10

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-10.

Exercise 21-11

Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-11.

Aligning Multileaders

An advantage of using multileaders is the ability to space and align leaders in an easy-to-read pattern. You typically determine the correct location and spacing of leaders before and while dimensioning. However, you can adjust leader spacing and alignment after you place multileaders. This is a common requirement when there is a need to increase or decrease the space between leaders, such as when the drawing scale changes, or when leaders are unequally spaced or misaligned. See Figure 21-16.

The STRETCH tool and grips are common methods for adjusting the location and alignment of leaders. However, you must determine the exact location of or amount of stretch applied to each leader before using these tools. An alternative is to use the MLEADERALIGN tool, which allows you to align and adjust the space between leaders.

Access the MLEADERALIGN tool and select the leaders to space and align. You can use the MLEADERALIGN tool to adjust the location of a single leader in reference to another leader, but for most applications, you should select several leaders. Select each leader to space or align and right-click or press [Enter] or the space bar. When a prompt asks you to select the multileader to align to, activate Options to change the multileader alignment.

Use Current Spacing Option

Apply the Use current spacing option to align and space the selected leaders equally according to the distance between one of the selected leaders and the next closest leader. Select the multileader with which all other leaders should align and space. Then specify the direction of the leader arrangement by entering or picking a point. The space between leaders is maintained if possible, depending on the selected direction. See Figure 21-17.

Distribute Option

Select the Distribute option to align and distribute the leaders, or place them at equally spaced locations between two points. The first point you specify identifies the location of one of the leaders and determines where distribution begins. The second point you specify identifies the location of the last leader. All other leaders are distributed equally between the two points. Leaders align with the first point. See Figure 21-18.
Equally spaced and aligned leaders improve drawing readability. Unequally spaced and misaligned leaders decrease readability.

Figure 21-16. Leaders that are equally spaced and aligned improve drawing readability.

Figure 21-17. Using the Use current spacing option to align and equally space leaders.

Figure 21-18. Using the Distribute option to align and equally space leaders. This example uses horizontally aligned points.

Figure 21-19. Using the make leader segments Parallel option to make leader lines parallel to each other.

Specify Spacing Option
Choose the Specify spacing option to align and equally space the selected leaders according to the distance, or clear space, between the extents of the content of each leader. Select the multileader with which all other leaders should align and space. Specify the direction of the leader arrangement by entering or picking a point. See Figure 21-20.

Make Leader Segments Parallel Option
Use the make leader segments Parallel option to make all the selected leader lines parallel to one of the selected leader lines. Select an existing leader to keep in the same location and at the same angle. All other leaders form parallel to the selection. The length of each leader line, except for the leader aligned to, increases or decreases in order to become parallel with the first leader. See Figure 21-19.

Grouping Multileaders
You can group separate multileaders created using a Block multileader content style to use a single leader line. This practice is common when adding balloons to assembly drawings. Grouped balloons allow you to identify closely related clusters of assembly components, such as a bolt, washer, and nut. See Figure 21-21. Use the MLEADERCOLLECT tool to group multiple existing leaders using a single leader line.
Access the `MLEADERCOLLECT` tool and select the leaders to group. The order in which you select leaders determines how the leaders are grouped. Select leaders in a sequential order, ending with the leader line to keep.

The options illustrated in Figure 21-22 are available after you select the leaders. Select the **Horizontal** option to align grouped content horizontally, or the **Vertical** option to align grouped content vertically. Pick a point to locate the grouped leader. Select the **Wrap** option to wrap grouped content to additional lines as needed when the number of items exceeds a specified width or quantity. Enter the width at the `Specify width` prompt, or use the **Number** option to enter a quantity not to exceed before the grouped leaders wrap. Then pick a point to locate the grouped leader.

Access the `MLEADERCOLLECT` tool and select the leaders to group. The order in which you select leaders determines how the leaders are grouped. Select leaders in a sequential order, ending with the leader line to keep.

The options illustrated in Figure 21-22 are available after you select the leaders. Select the **Horizontal** option to align grouped content horizontally, or the **Vertical** option to align grouped content vertically. Pick a point to locate the grouped leader. Select the **Wrap** option to wrap grouped content to additional lines as needed when the number of items exceeds a specified width or quantity. Enter the width at the `Specify width` prompt, or use the **Number** option to enter a quantity not to exceed before the grouped leaders wrap. Then pick a point to locate the grouped leader.

**Figure 21-20.** Using the **Specify spacing** option to align and equally space leaders.

**Figure 21-21.** An example of grouped balloons identifying closely related parts. Some of the parts or features may be hidden.

**Figure 21-22.** Options for grouping leaders using the `MLEADERCOLLECT` tool.

**NOTE**
You can only use the `MLEADERCOLLECT` tool to group symbols attached to leaders created using the **Block** content style.

**Exercise 21-13**
Access the Student Web site (www.g-wlearning.com/CAD) and complete Exercise 21-13.
Chapter Test

Answer the following questions. Write your answers on a separate sheet of paper or go to the Student Web site (www.g-wlearning.com/CAD) and complete the electronic chapter test.

1. Define associative dimension.
2. Why is it important to have associative dimensions for editing objects?
3. Which Options dialog box setting controls associative dimensioning?
4. Which tool allows you to convert non-associative dimensions to associative dimensions?
5. Which tool allows you to convert associative dimensions to non-associative dimensions?
6. What are definition points?
7. Which four tool options related to dimension editing appear in the shortcut menu when you right-click on a dimension?
8. Name three methods of changing the dimension style of a dimension.
9. How does the Dimension Update tool affect selected dimensions?
10. Explain how to add a diameter symbol to a dimension text value using the DDEDIT tool.
11. Name the tool that allows you to control the placement and orientation of an existing associative dimension text value.
12. Name two applications in which you might need to create oblique extension lines.
13. Which tool and option can you use to add a new baseline dimension to an existing set of baseline dimensions?
14. When you use the Properties palette to edit a dimension, what is the effect on the dimension style?
15. How do you access the Property Settings dialog box?
16. Which tool can you use to adjust the space equally between dimension lines or align dimension lines without having to determine the exact location or amount of stretch needed?
17. What two options are available when you use the Multiple option of the DIMBREAK tool?
18. What tool allows you to add information about how frequently the manufacturer should test a dimension for consistency and tolerance during the manufacturing of a product?
19. Name an application in which leaders with multiple leader lines are common.
20. Identify the four options available to change multileader alignment.

Drawing Problems

- Start AutoCAD if it is not already started. Start a new drawing for each problem using an appropriate template of your choice.
- The template should include layers and text, dimension, multileader, and table styles, when necessary, for drawing the given objects. Add layers and text, dimension, multileader, and table styles as needed.
- Draw all objects using appropriate layers and text, dimension, multileader, and table styles, justification, and format.
- Follow the specific instructions for each problem. Use only drawing and editing tools and techniques you have already learned. Use your own judgment and approximate dimensions when necessary.
- Apply dimensions accurately using ASME or appropriate industry standards.

Note: Some of the problems in this chapter are built on problems from previous chapters. If you have not yet completed those problems, complete them now.

Basic

1. Open P18-9 and save the file as P21-1. The P21-1 file should be active. Edit the drawing as follows:
   A. Erase the front (circular) view.
   B. Stretch the vertical dimensions to provide more space between dimension lines. Be sure the space you create is the same between all vertical dimensions.
   C. Stagger the existing vertical dimension text numbers if they are not staggered as shown in the original problem.
   D. Erase the 1.750 horizontal dimension and then stretch the 5.255 and 4.250 dimensions to make room for a new baseline dimension from the baseline to where the 1.750 dimension was located. This should result in a new baseline dimension that equals 2.750. Be sure all horizontal dimension lines are equally spaced.
   E. Resave the file.
2. Open P19-1 and save the file as P21-2. The P21-2 file should be active. Edit the drawing as follows:
   A. Stretch the total length from 3.500 to 4.000, leaving the holes the same distance from the edges.
   B. Fillet the upper-left corner. Modify the 3X R.250 dimension accordingly.
   C. Resave the drawing.
3. Open P18-12 and save the file as P21-3. The P21-3 file should be active. Edit the drawing as follows:
   A. Stretch the bathroom 8'-0" wide by stretching the walls and vanity that are currently 6'-0" wide to 8'-0". Do this without increasing the size of the water closet compartment. Provide two equally spaced oval sinks where there is currently one. Resave the drawing.
4. Open P19-19 and save the file as P21-4. The P21-4 file should be active. Edit the drawing as follows:
   A. Lengthen the part .250 on each side for a new overall dimension of 6.500.
   B. Change the width of the part from 3.000 to 3.500 by widening an equal amount on each side.
   C. Resave the drawing.
5. Open P19-17 and save the file as P21-5. The P21-5 file should be active. Edit the drawing as follows:
   A. Shorten the .75 thread on the left side to .50.
   B. Shorten the .388 hexagon length to .300.
   C. Resave the drawing.

6. Draw the shim shown at A. Then edit the .150 and .340 values using oblique dimensions as shown at B. Save the drawing as P21-6.

Intermediate

7. Draw and dimension the swivel screw shown. Save the drawing as P21-7.

8. Open P19-4 and save the file as P21-8. The P21-8 file should be active. Edit the drawing as follows:
   A. Use the existing drawing as the model and make four copies.
   B. Leave the original drawing as it is and edit the other four pins in the following manner, keeping the .125 hole exactly in the center of each pin.
   C. Give one pin a total length of 1.500.
   D. Create the next pin with a total length of 2.000.
   E. Edit the third pin to a length of 2.500.
   F. Change the last pin to a length of 3.000.
   G. Organize the pins on your drawing in a vertical row ranging in length from the smallest to the largest. You may need to change the drawing limits.
   H. Resave the drawing.

9. Open P19-5 and save the file as P21-9. The P21-9 file should be active. Edit the drawing as follows:
   A. Modify the spline to have twelve projections, rather than eight.
   B. Change the angular dimension, linear dimension, and 8X dimension to reflect the modification.
   C. Resave the drawing.

10. Open P19-11 and save the file as P21-10. The P21-10 file should be active. Edit the drawing as follows:
    A. Stretch the total length from 6.500 to 7.750.
    B. Add two more holes that continue the equally spaced pattern of .625 apart.
    C. Change the 8X .625(+.025) dimension to read 10X .625(+.025).
    D. Resave the drawing.

Advanced

11. Draw and dimension the door elevation shown at A. Save the drawing as P21-7A. Open P21-7A and save the file as P21-7B. The P21-7B file should be active. Edit the drawing as shown at B.
12. Open P18-17 and save the file as P21-12. The P21-12 file should be active. Make the client-requested revisions to the floor plan as shown. Make sure the dimensions reflect the changes.

13. Design and draw a vice clamp similar to the vice clamp shown in Figure 21-16. Add balloons and a parts list to the drawing. Save the drawing as P21-13.

14. Open P8-20 and save the file as P21-14. The P21-14 file should be active. Add balloons and a parts list to the drawing of the nut driver.

15. Open P12-17 and save the file as P21-15. The P21-15 file should be active. Dimension the most important views of the anchor. Erase the undimensioned views.

16. Draw and dimension the stairs cross section shown. Use oblique dimensions where necessary. Save the drawing as P21-16.

17. Use a word processor to write a report of at least 250 words explaining the importance of associative dimensioning. Site at least three examples from actual industry applications. Show at least four drawings illustrating your report.

AutoCAD Certified Associate Exam Practice

Answer the following questions. Write your answers on a separate sheet of paper.

1. Which of the following tools can you use to add a prefix to an existing linear dimension value? Select all that apply.
   A. DDEDIT
   B. DIMEDIT New option
   C. DIMLINEAR Mtext option
   D. DIMTEDIT
   E. QDIM Edit option

2. Which of the following tools allows you to space dimensions equally? Select all that apply.
   A. DIMBASELINE
   B. DIMBREAK
   C. DIMORDINATE
   D. DIMSPACE
   E. MATCHPROP
3. Which of the following tools allow you to adjust the location and alignment of dimension lines? Select all that apply.
   A. DDDEDIT
   B. DIMSPACE
   C. DMTEDIT
   D. QDIM
   E. STRETCH

AutoCAD Certified Professional Exam Practice
Follow the instructions in each problem. Write your answers on a separate sheet of paper.

1. Navigate to this chapter on the Student Web site and open CPE-21align.dwg. Use the appropriate tool to align leaders 1 and 3 horizontally with leader 2, as shown. Use Ortho to ensure that the balloon alignment is exactly horizontal. What are the coordinates of the balloon grip on leader 1?

2. Navigate to this chapter on the Student Web site and open CPE-21distribute.dwg. Use the appropriate tool to distribute the four leaders equally between Point A and Point B. What are the coordinates of the balloon grip of leader 4?