



Visualization Chapter 3

2D and 3D Drawings

2D and 3D Drawings

The engineering design process has many steps that utilize drawing skills. The initial conception stage might involve sketching and simple drawings. The production of a new or improved product might require multiple technical drawings. Being able to make 2D and 3D sketches and drawings of your ideas lets you share them with others throughout the process.

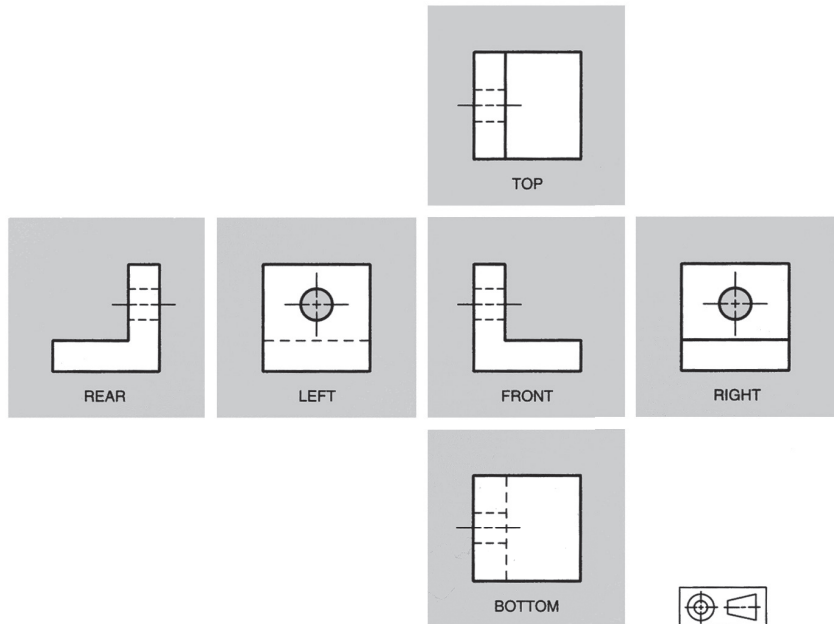
We are used to looking at the world in three dimensions, but a lot of engineering drawings are not 3D. They are multiview 2D drawings made with a technique called orthographic projection. These drawings are the basis for production in engineering and technology fields.

Over the years, standards have been developed to make these drawings consistent, and therefore readable by designers, engineers, product manufacturers, and those in marketing who will create advertising to sell the product. These multiview drawings have their own types of lines. Solid lines are used for features that are visible, dashed lines for features that are hidden, and crossed lines to show the center of an object. The following exercises will provide examples of these drawings and help you improve your visualization skills in both 2D and 3D.

Exercises

There are six standard views of an object that can be created using orthographic projection techniques. These views are mutually perpendicular: front, top, left side, right side, bottom, and rear. They have a standard arrangement, as shown in the picture.

Notice that all of the features line up top to bottom and side to side. In this conventional arrangement, the choice of the front view typically shows the characteristic shape of an object and its natural position. Also note that when you cannot see a feature it is still represented with dashed lines that have segments of equal length. The center of a circle or hole is shown with a center line, another type of dashed line that has a long segment followed by a short segment, then another long segment.



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(A) U.S. Standard Third-Angle Projection



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Exercise 1 You need to be able to visualize in both 2D and 3D, to look at a 2D multiview drawing and know what the object looks like in 3D, and look at a 3D object or virtual model and know what its 2D views would look like.

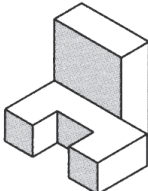
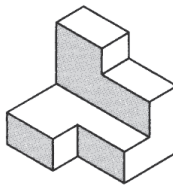
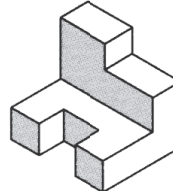
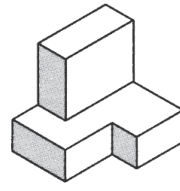
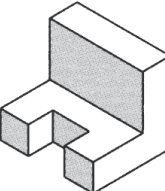
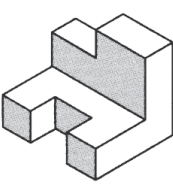
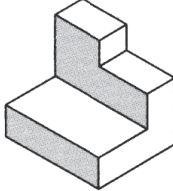
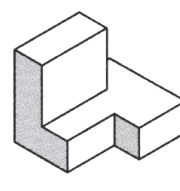
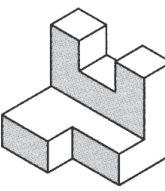
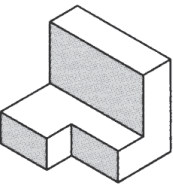
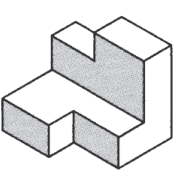
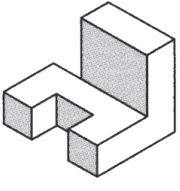
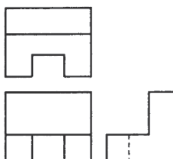
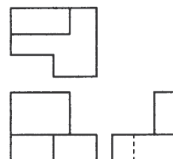
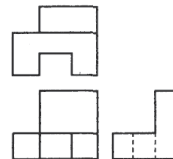
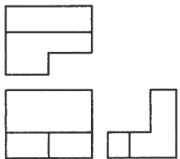
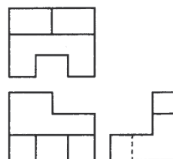
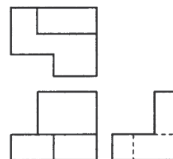
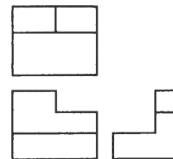
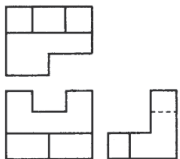
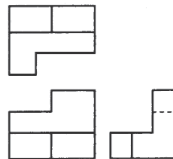
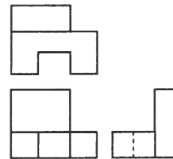
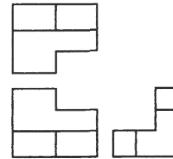
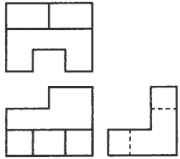
1. Select an everyday object you can place in front of you—something simple, like a coffee mug or even your shoe.
2. Using a piece of grid paper or plain paper, sketch all six views of the object using the standard multiview orientation. Scale your views so all six of them will fit on the sheet of paper. Make sure your front view shows the most characteristic shape of the object. All views must align, side to side and top to bottom. For example, your object will not be wider in the top view than it is in the front view, nor will it be taller in the right side view than it is in the front view. Also make sure you use dashed lines to show objects that are hidden in the view. If you have any circular objects such as cylinders or holes, mark their center with a center line.
3. After you have completed your sketches, look at the views. Did you need all of them to fully describe the object? Probably not. Many objects can be completely described with three views, typically the top, front, and right side. Some small, thin objects can be fully described in two views, or even in one view.



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Exercise 2 Match these 3D objects with their 2D multiview drawings.

 A	 B	 C	 D
 E	 F	 G	 H
 J	 K	 L	 M
 1	 2	 3	 4
 5	 6	 7	 8
 9	 10	 11	 12

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<p>N</p>	<p>O</p>	<p>P</p>	<p>Q</p>
<p>R</p>	<p>S</p>	<p>T</p>	<p>U</p>
<p>V</p>	<p>W</p>	<p>X</p>	<p>Y</p>
<p>13</p>	<p>14</p>	<p>15</p>	<p>16</p>
<p>17</p>	<p>18</p>	<p>19</p>	<p>20</p>
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