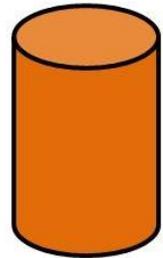


# 三視圖 Views of Objects

Class: \_\_\_\_\_ Name: \_\_\_\_\_

## 1. Warm-up: Observe the cylinder

Here is a cylinder. Tom and Mary are looking at this cylinder from different directions. Here are the shapes they see.



<p>Tom: I see a circle.</p> <div style="text-align: center; margin-top: 20px;"> </div>	<p>Mary: I see a rectangle.</p> <div style="text-align: center; margin-top: 20px;"> </div>
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Observe the cylinder and determine which direction they observing from the cylinderd.

## 2. Observing objects from different directions

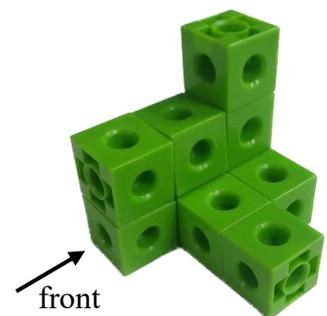
When viewing the same object from different directions, its appearance varies. The outline of a three-dimensional object observed from a particular direction is referred to as the view of that object.

When observing a three-dimensional object, we typically identify the front of the object first and then correspondingly determine the back, left, right, and top of the object.



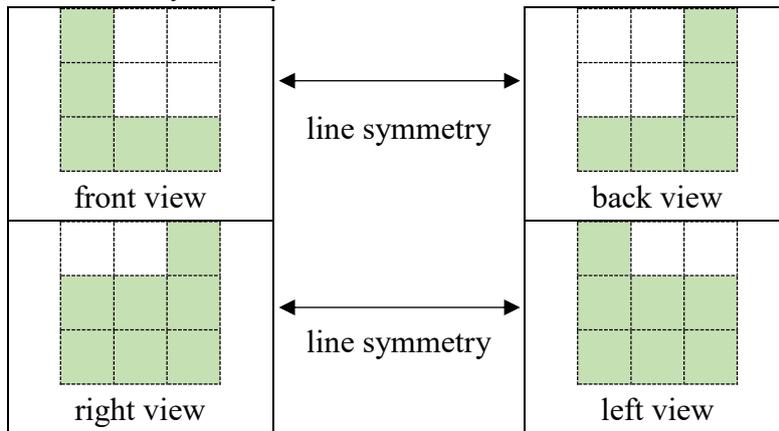
Here is an object made from linking cubes. Use linking cubes to make the same object on the right by yourselves and answer the following questions.

<p>(1) Draw the result by seeing the object from the <b>front</b>.</p> <div style="text-align: center; margin-top: 20px;"> </div> <p style="text-align: center;">front view</p>	<p>(2) Draw the result by seeing the object from the <b>back</b>.</p> <div style="text-align: center; margin-top: 20px;"> </div> <p style="text-align: center;">back view</p>
<p>(3) Draw the result by seeing the object from the <b>right</b>.</p> <div style="text-align: center; margin-top: 20px;"> </div> <p style="text-align: center;">right view</p>	<p>(4) Draw the result by seeing the object from the <b>left</b>.</p> <div style="text-align: center; margin-top: 20px;"> </div> <p style="text-align: center;">left view</p>



What do you find between the four results above?

The front view and the back view have a line symmetry, and the right view and the left view also have a line symmetry.

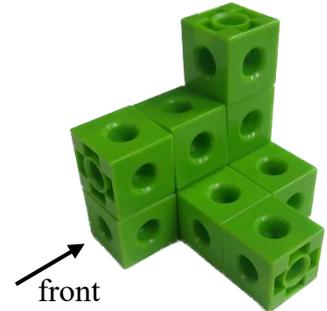


If we know the front view of the object, we also know what the back view of the object is like. As a result, we only need the front view or the back view. Similarly, we only need one of the side views: the right view or the left view.

Generally, we refer to the front view, right view, and top view of a three-dimensional object collectively as the three views.

Let's look at the object from top to bottom, and answer the following two questions.

<p>(1) Which direction is depicted in Figure 1 when observed from top to bottom?</p> <p>Figure 1</p>	<p>(2) Which direction is depicted in Figure 2 when observed from top to bottom?</p> <p>Figure 2</p>
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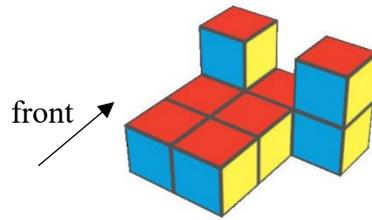


We can find the top view is different if we look from different directions. For the convenience of communication, we define the top view as drawn from the front of the object.

### 3. Draw three views of an object

#### Example

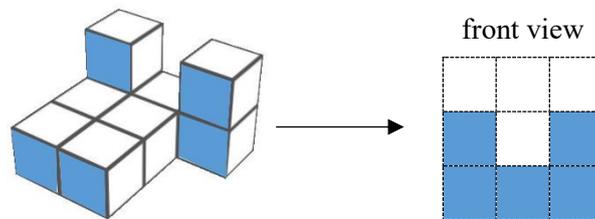
Draw the top view, right view, and front view of the given object.



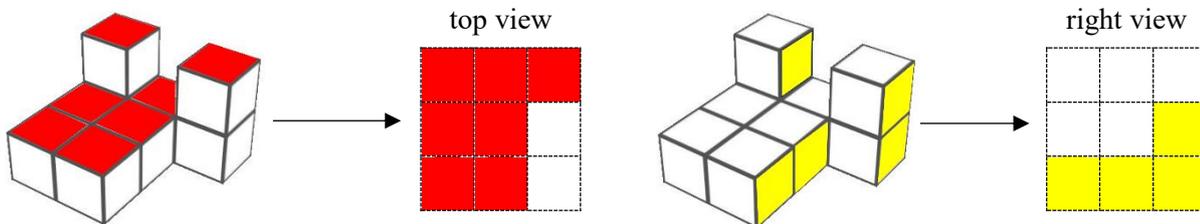
#### [Solution]

We can make the same object by linking cubes and then draw the results, but here we want to introduce a way without using linking cubes.

The object has been colored blue, red, and yellow. The blue sides are what we see from the front, so we can draw the front view.



Similarly, the red sides and yellow sides are what we see from the top and the right respectively. Therefore, we get the top view and the right view of the object.

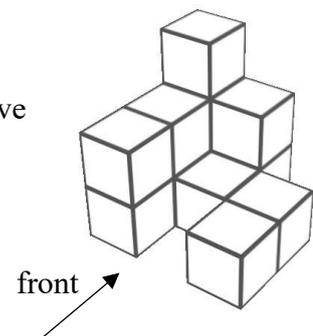


#### Exercise

Draw the top view, right view, and front view of the given object.

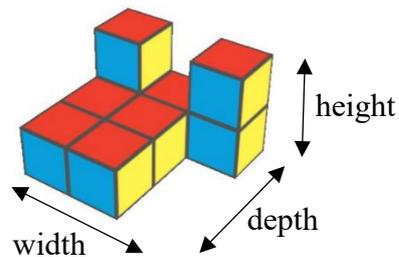
[Hint]: We can color the object as we do in the previous example or observe the object after making the same object by linking cubes.

front view	right view	top view																																				
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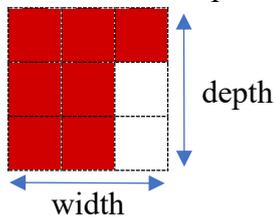


#### 4. Supplementary material

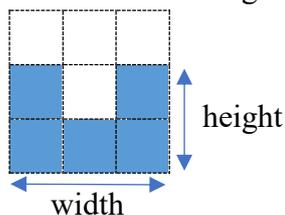
We can see the width, height, and depth of the object. We want to find their relationship with the three views.



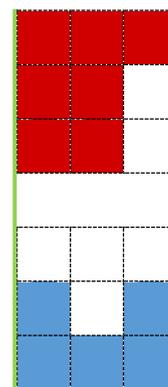
The top view shows the width and depth of the object.



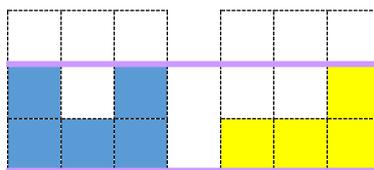
The front view shows the width and height of the object.



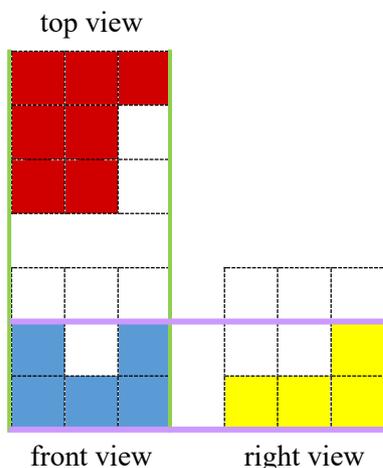
The top view and the front view must have the same width. Therefore, if a line drawn on the left side of the top view aligns with the front view, then a line drawn on the right side of the top view must align with the right side of the front view. That is, the line we drew along the left side is parallel to the line along the right side.



Similarly, the right view shows the depth and height of the object, so the front view and the right view must have the same height. Therefore, if a line drawn on the top of the front view aligns with the right view, then a line drawn on the bottom of the front view must align with the bottom of the right view.



When drawing the three views in engineering, we usually place the top view above the front view and the right view on the right of the front view.



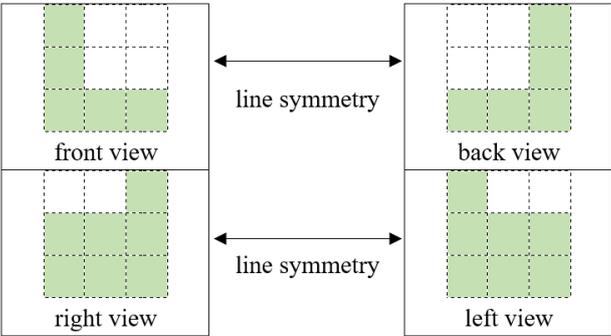
### 一、設計理念：

1. 三視圖可直接翻譯為 Three-view drawing，但國外課程在上此單元時標題通常為 Views of Objects，而三視圖直接稱為 Three views，故本份學習單的英文標題選用 Views of Objects。
2. 後視圖可稱為 back view 或 rear view，本份學習單選用 back view。
3. 本份學習單第 4 點提及「長、寬、高及其對應在三視圖中的關係」屬補充內容，非數學課綱內的教材。
4. 課程中教師宜發實體教具給學生觀察，從中了解一個立體圖形從不同方向所看到的結果。

### 二、英文詞彙：

中文	英文
三視圖	three views
前視圖	front view
後視圖	back view / rear view
左視圖	left view
右視圖	right view
上視圖	top view
線對稱	line symmetry

### 三、教學參考範例：

<p>1 【三視圖】 Three views</p>	<p>What do you find between the four results above? The front view and the back view have a line symmetry, and the right view and the left view also have a line symmetry.</p>  <p>The diagram shows four views of a 3D object on a grid. The front view (top-left) has a vertical bar of 3 units and a horizontal bar of 3 units. The back view (top-right) is its mirror image. The right view (bottom-left) has a horizontal bar of 3 units and a vertical bar of 3 units. The left view (bottom-right) is its mirror image. Dashed lines indicate the vertical axes of symmetry for the front-back and right-left pairs. Arrows labeled 'line symmetry' connect the pairs.</p>
	<p>We just drew the front, back, right, and left views of the object. Take a look at these four drawings. Can we find any relationship among them?</p> <p>We have learned line symmetry in the previous section. We can use it to describe the relationship. The front view and the back view are line symmetry, with a vertical line as the axis of line symmetry. Similarly, the right view and the left view are also line symmetry.</p>

1  
【三視圖】  
Three views

If we know the front view of the object, we also know what the back view of the object is like. As a result, we only need the front view or the back view. Similarly, we only need one of the side view: the right view or the left view.

Generally, we refer to the front view, right view, and top view of a three-dimensional object collectively as the three views.

The result we find is really useful. If we only have the front view of the object, can we figure out what the object looks like from the back? The answer is yes. We only need to draw a line symmetry figure of the front view and we get the back view of the object. This also works on the right view and back view of the object, too. If we know the right view of the object, we can get the left view by drawing a line symmetry figure. As a result, one of the front view or the back view is necessary, and one of the right view and the back view is necessary.

Generally, we group the front view, right view, and top view of a three-dimensional object and call them the “three views”.

Let’s look at the object from top to bottom, and answer the following two questions.

(1) Which direction is depicted in Figure 1 when observed from top to bottom?

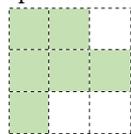


Figure 1

(2) Which direction is depicted in Figure 2 when observed from top to bottom?

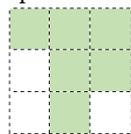
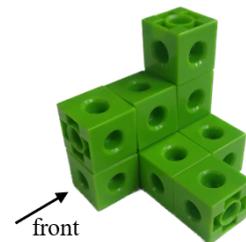


Figure 2



We can find the top view is different if we look from different directions. For the convenience of communication, we define the top view as drawn from the front of the object.

We just discussed the front view, the back view, the right view, and the left view of the object. Now, let’s focus on the last one – the front view.

Look at the object we make by linking cubes from the top. Which figure is the result, figure 1, figure 2, or none of them? If we cannot find the result in Figure 1 or Figure 2, rotate the object and we can see one of them soon. If we see the object from a different direction, the result we see from the top is different. The front of the object is given. Try to find which direction is depicted in Figure 1 and Figure 2.

Figure 1 is depicted from the front, and Figure 2 is depicted from the right. For the convenience of communication, we define the top view as depicted from the front. Therefore, Figure 1 is the top view of the object.