

## Analyzing Numerical Data: Using Ratios

### I.B Student Activity Sheet 4: Ratios in the Media

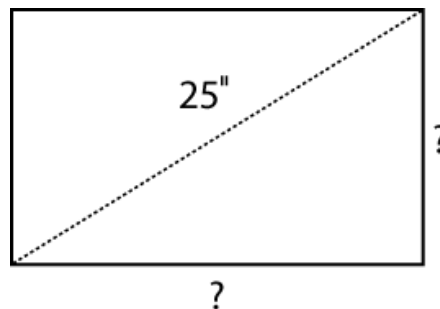
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For a rectangular shape such as a display screen, the longer side is called the width ( $W$ ) and the shorter side is the height ( $H$ ). The aspect ratio is  $W:H$  or  $W/H$ .

1. What is the approximate aspect ratio of the screen on your graphing calculator? Consider only the window, not the entire screen.

The size of a television is the length of the diagonal of its screen in inches. The aspect ratio of the screens of older televisions is 4:3, while the aspect ratio of newer wide-screen televisions is 16:9.

2. Find the width and height of an older 25-inch television whose screen has an aspect ratio of 4:3.



Find the area of this screen.

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3. Repeat this process to find the width and height of a newer 48-inch television whose screen has an aspect ratio of 16:9.

Determine the area of the screen of a newer 48-inch television whose screen has an aspect ratio of 16:9.

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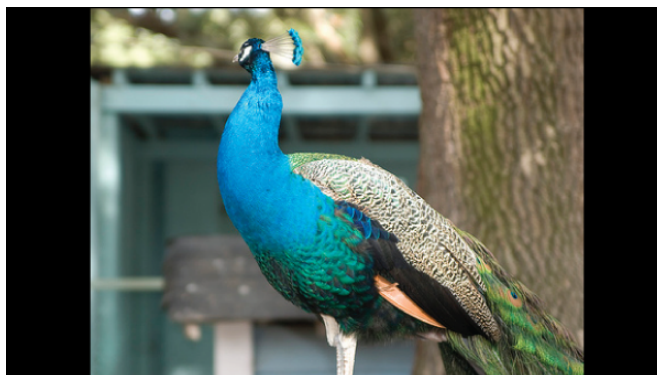
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When movies that were made in one aspect ratio are shown on televisions that have a different aspect ratio, black bars of equal width cover a portion of the screen. Portions of the screen are not needed to project images that were created with different **aspect ratios**.



**Figure 1**  
4:3 screen displaying a 16:9 image



**Figure 2**  
16:9 screen displaying a 4:3 image

4. Figure 1 shows a letterboxed image with an aspect ratio of 16:9 displayed on a screen with an aspect ratio of 4:3. What percent of the screen's area is occupied by the image? Justify your answer.

Some people do not like seeing the letterboxes when watching a 16:9 image on a 4:3 display, as shown in Figure 1. What would happen to the image if it filled the height of the TV?

Figure 2 shows a pillarboxed 4:3 image displayed on a 16:9 screen. What percent of the screen's area is occupied by the image? Justify your answer.

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People who own a wide-screen television can choose one of three views of a 4:3 image on their display.

- The normal view shows the pillarboxes, as shown in Figure 2.
- Another option is to stretch the width of the image, keeping the height the same.
- A third option is to zoom in on the image, making the width of the image take the full width of the display.

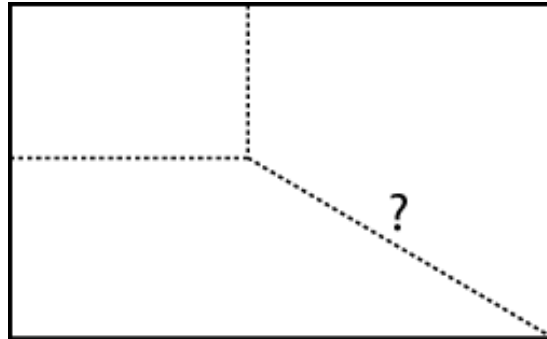
What affect do these options have on the image?

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5. **EXTENSION:** When changing the size of a rectangular image using a computer-drawing program, how can you maintain the same aspect ratio? Investigate this scenario using a drawing program within a computer application.



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6. **EXTENSION:** Today most movies made for theaters are shot on film with an aspect ratio of 1.85:1 or 2.35:1. When a film with an aspect ratio of 1.85:1 is shown on a newer wide-screen 16:9 television, minor letterboxing often occurs, but the resulting black bars are usually not visible. Research commonly used aspect ratios and the history associated with this concept.

Why are all aspect ratios identified as something to 1? Or perhaps even recorded as a decimal value?

Express 16:9 to a value in ratio to 1.

A movie with an aspect ratio of 1.85:1 is shown as a letterboxed image on a newer 50-inch 16:9 television. Calculate the height of the image, the height of each barely visible black bar at the top and bottom of the screen, and the percent of the screen's area that is occupied by the image. Use a variety of representations to justify your response.

A movie with an aspect ratio of 2.35:1 is shown as a letterboxed image on an older 25-inch 4:3 television. Find the height of the image, the height of each black bar at the top and bottom of the screen, and the percent of the screen's area that is occupied by the image. Use a variety of representations to justify your response.

Based on your analysis of television aspect ratios, why do you think the consumer market has moved having wide-screen TV in the home?

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7. **EXTENSION:** Using appropriate measuring devices, determine the aspect ratio of several objects.

Item	Length	Width	Aspect Ratio	
Sheet of paper	11 inches	8.5 inches	11:8.5	1.3
Index card				

A first-class piece of mail (letter or postcard) must have an aspect ratio that falls between 1.3 and 2.5, inclusive. What are some typical sizes of envelopes and postcards? Justify your reasoning.

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8. **EXTENSION:** The involvement of aspect ratios in taking and printing photographs is essentially the same as it is in showing movies on a television set. Common still photography aspect ratios are 4:3 (most point-and-shoot digital cameras) and 3:2 (35-mm film). Common U.S. print sizes (in inches) are 4 x 5, 4 x 6, 5 x 7, 8 x 10, and 11 x 14. Verify the following statement regarding image and print size using a variety of representations.

*If your camera uses a 4:3 aspect ratio, but you want a 4 x 6 (3:2) print, many megapixels are wasted (11%).*

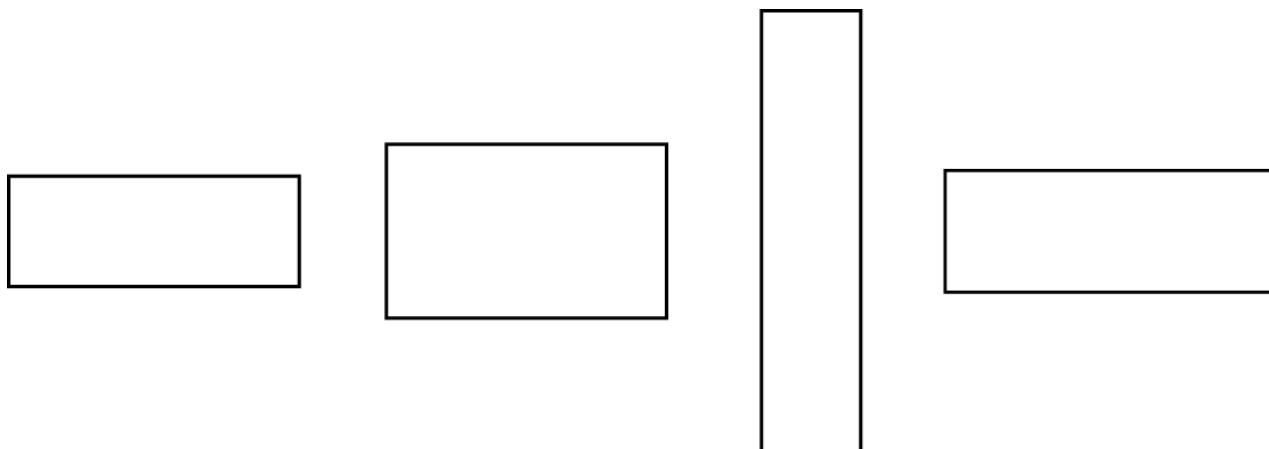


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9. **EXTENSION:** Some figures have what is known as a *golden ratio*, which is an aspect ratio that is considered to be visually appealing. Rectangles that have a golden aspect ratio are often called *golden rectangles*. Which of the following rectangles is a golden rectangle?



The aspect ratio of the second rectangle from the left is the golden ratio. Conduct research on how the value of the golden ratio is found and why figures with this aspect ratio are considered to be visually appealing.

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10. **REFLECTION:** How does learning about the various uses of aspect ratio affect your buying habits of products with a visual screen? What types of questions might you ask a sales representative or product help screen online?