

Name: key

Date: \_\_\_\_\_

Period: \_\_\_\_\_

### Analyzing Numerical Data: Using Ratios

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

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**.

need rulers!

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

T1-83/84

$$w:h \\ 2.5:1.5$$

$$w = 2.5 \text{ in}; h = 1.5 \text{ in}$$

2. What is the approximate aspect ratio of one of the white boards?

yardstick / tape measure

longer side = w, shorter side = h

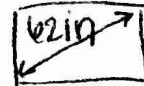
#### Televisions:

3. How do we describe the size of a television?

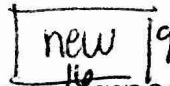
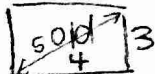
by the diagonal (it's also rectangular)

4. What does it mean to have a 62 inch television?

from one corner to the opposite corner, the tv measures 62 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.



5. Consider an older 25-inch television whose screen has an aspect ratio of 4:3. ~~this is~~ a ratio

we don't know the side lengths

a) What is the **width** of the TV?

$$w = 4(5) = 20 \text{ in}$$

$$\frac{5}{4} = \frac{25}{w}$$

$$5w = 100$$

$$w = 20 \text{ in}$$

b) What is the **height** of the TV?

$$h = 3(5) = 15 \text{ in}$$

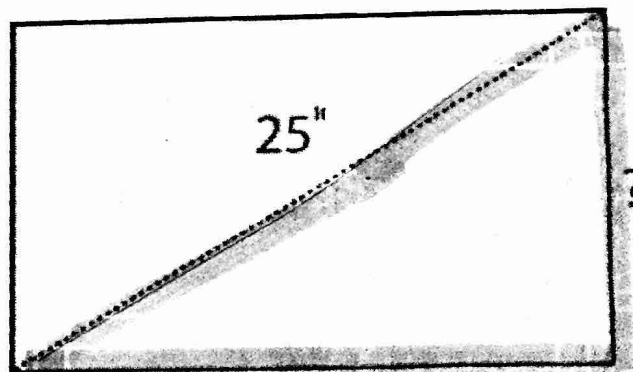
$$\frac{5}{3} = \frac{25}{h}$$

$$5h = 75$$

$$h = 15 \text{ in}$$

c) What is the area of the screen?

$$A = 20 \times 15 = 300 \text{ in}^2$$



$$3(x) = h$$

$$4(x) = w$$

$$(4x)^2 + (3x)^2 = (25)^2$$

$$16x^2 + 9x^2 = 625$$

$$25x^2 = 625$$

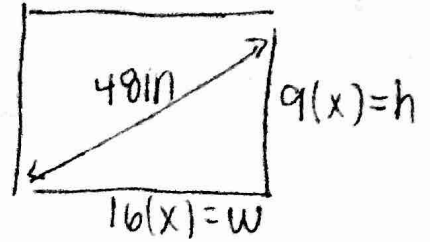
$$x^2 = 25$$

$$x = 5$$

6. Consider a newer 48 inch TV with an aspect ratio of 16:9

a) What is the **width** of the TV?

$$w = 16(2.615) = 41.94 \text{ in}$$



b) What is the **height** of the TV?

$$h = 9(2.615) = 23.535 \text{ in}$$

$$(16x)^2 + (9x)^2 = 48^2$$

$$256x^2 + 81x^2 = 2304$$

$$337x^2 = 2304$$

$$x^2 = \frac{2304}{337}$$

$$x = \sqrt{\frac{2304}{337}} \approx 2.615$$

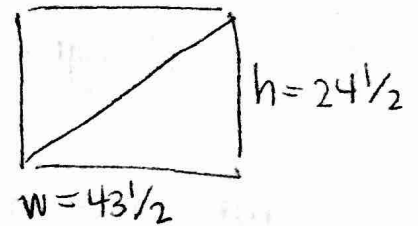
c) What is the area of the **screen**?

$$A = 41.94(23.535) = 984.70 \text{ in}^2$$

7. Consider a TV that is  $43 \frac{1}{2}$  inches wide and  $24 \frac{1}{2}$  inches tall.

a) What is the aspect ratio of this TV?

$$43.5 : 24.5 \Rightarrow \frac{87}{49} = \frac{43.5}{24.5}$$



b) What is the size of the TV?

$$(43.5)^2 + (24.5)^2 = c^2$$

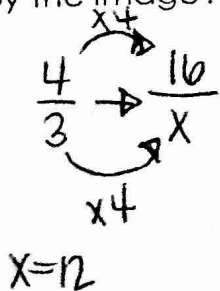
$$2492.5 = c^2$$

$$c = \sqrt{2492.5} = \boxed{49.925 \text{ in}}$$

When movies that were made in one aspect ratio are shown on televisions that have a different aspect ratio the picture doesn't match the size of the screen. Black bars of equal width are used to fill in the rest of the screen.

Figure 1 shows a letterboxed image "wide screen" with an aspect ratio of 16:9 displayed on a screen with an aspect ratio of 4:3.

8. What percent of the screen's area is occupied by the image?



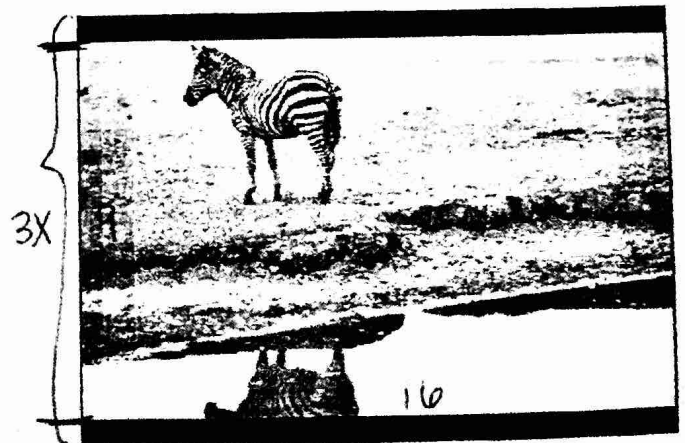
$$\text{screen} = 12$$

$$\text{image is } 9$$

$$\text{only } \frac{9}{12} \text{ is } \%$$

$$\text{occupied}$$

$$= 75\%$$



4X Figure 1  
4:3 screen displaying a 16:9 image  
The height is shorter

9. Some people do not like seeing the letterboxes when watching a 16:9 image on a 4:3 screen. There are two options to get rid of the black boxes.

a) Zoom. The first option is to zoom in so that the picture fills the screen. What does this do to the visible picture?

cuts off the top? bottom of the image

b) Stretch. The other option is to leave the width the same and stretch the height to fill the screen. What does this do to the image?

distorts the image  $\approx$  seems wider than intended/actually is.

c) Of the three options (Letterboxed, Zoom, Stretch) which do you prefer and why?

answers will vary.

Figure 2 shows a pillarboxed 4:3 image displayed on a 16:9 screen. width changes

10. What percent of the screen's area is occupied by the image? Justify your answer.

$\frac{4}{3} = \frac{9}{x}$   $x = 12$  (but screen is 16)  
 $\frac{12}{16} = 75\%$  change  
 $\times 3$  scale factor

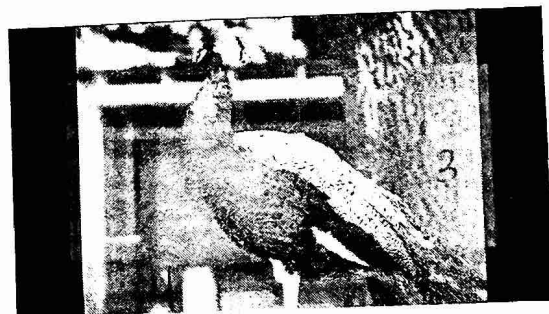


Figure 2  
16:9 screen displaying a 4:3 image

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 pillarboxed, 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.

a) What affect do these options have on the image?

seems taller than intended

b) Of the three options (Pillarboxed, Zoom, Stretch) which do you prefer and why?

answers will vary