



# Problem of the Week

## Problem B and Solution

### Screen Size, Now and Then

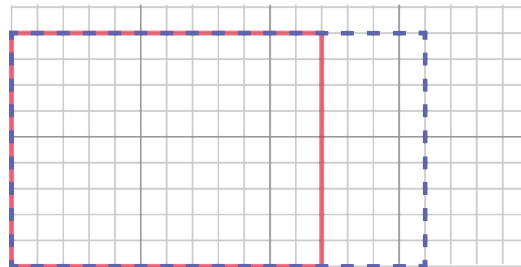
#### Problem

Flat screen TVs usually have a screen ratio of  $16 : 9$ . This means that if the screen is 16 units wide, then it will be 9 units high. If the screen is 32 units wide, then since  $32 = 16 \times 2$ , it will be  $9 \times 2 = 18$  units high, and so on.

- Starting in the bottom-left corner of a grid that is 20 units wide and 10 units high, use a ruler to draw a flat screen TV screen that is 16 units wide and 9 units high.
- Older TVs had a screen ratio of  $4 : 3$ . If an older TV was 9 units high, how many units wide would it be?
- Draw the TV screen from part (b) on the same grid used in part (a), also starting in the bottom-left corner.
- How many more square units of area does the flat screen TV screen have compared to the older TV screen, if they both have a height of 9 units?
- A 4K flat screen TV has  $3840 \times 2160$  pixels. If the screen is 122 cm wide by 69 cm high, how many pixels per  $\text{cm}^2$  are there? Round to the nearest whole number.

#### Solution

- The drawing of the flat screen TV screen on the grid is shown in part (c).
- The screen ratio of an older TV is  $4 : 3$ , so if the the height is 9 units, that means we have multiplied the 3 in our screen ratio by 3 to get 9. So the width would be  $4 \times 3 = 12$  units.
- The grid below shows the flat screen TV with a dashed blue line and the older TV with a solid red line.



- We can count the squares on our grid that are part of the flat screen TV but not the older TV. We notice that the flat screen TV has 4 more squares of width, and since the height is 9 units for both TVs, there are  $4 \times 9 = 36$  more square units of area in the flat screen TV.
- There are  $3840 \times 2160 = 8\,294\,400$  pixels in total, and the area of the TV is  $122 \times 69 = 8418 \text{ cm}^2$ . Thus there are  $8\,294\,400 \div 8418 = 985$  pixels per  $\text{cm}^2$ .