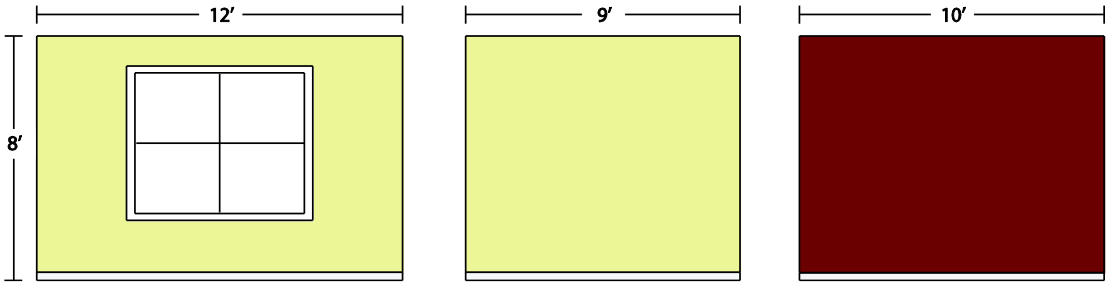
MATHCOUNTS® Problem of the Week Archive

Paint, by the numbers – March 29, 2021

Problems & Solutions



There are three walls in Jordan's living room. The three walls, shown here, are 12 feet, 9 feet and 10 feet wide, respectively. Each wall has a height of 8 feet with a 6-inch baseboard along the bottom. The largest of the three walls contains a window that measures 5 feet by 6 feet. Jordan plans to paint the three walls of his living room by mixing together some paint he already has, which includes white #2, magenta #3, red #4, yellow #5 and green #6. Jordan has decided to paint two of the walls a pale goldenrod and the third wall will be painted burnt umber.

Suppose that 1 gallon of paint is used to cover 400 sq feet. Jordan plans to apply four coats of the goldenrod paint mixture to the 12-foot wall and the 9-foot wall leaving only the window and baseboard unpainted. How many gallons of the goldenrod paint mixture will he need? Express your answer as a decimal to the nearest hundredth.

For the 12-foot wall, the area to be painted is equal to the area of the wall less the area of the baseboard and less the area of the window. The height of the wall excluding the baseboard is 8 – 0.5 = 7.5 feet. The area of that portion of the wall is 7.5(12) = 90 sq ft. The area of the window is 5(6) = 30 sq ft. That means the total area to be painted is 90 – 30 = 60 sq ft. For the 9-foot wall, the area to be painted is the area of the wall less the area of the baseboard. So, the portion of this wall to be painted has an area of 7.5(9) = 67.5 sq ft. Therefore, the total area of the two walls that is to be painted is 60 + 67.5 = 127.5 sq ft. Since Jordan plans to apply four coats, that is equivalent to painting 127.5(4) = 510 sq ft. A gallon of paint covers 400 sq ft, so to paint the two walls, Jordan will need 510/400 = 1.275 ≈ ***1.28*** *gallons of the goldenrod paint mixture.*

To apply two coats of the burnt umber paint mixture to the 10-foot wall, Jordan determines that he will use 3 pints of paint. In order to create the burnt umber mixture, Jordan needs to mix magenta #3, yellow #5 and green #6 in the ratio of 4:9:2, respectively. What is the positive difference between the number of pints of magenta #3 and yellow #5 Jordan will use to create 3 pints of the burnt umber mixture?

Since the paint is to be mixed in the ratio 4:9:2, that means 4/15 of the mixture will be magenta #3, 9/15 of the mixture will be yellow #5 and 2/15 of the mixture will be green #6. The total amount of the burnt umber paint mixture that Jordan is creating is 3 pints. For magenta #3, 4/15 of 3 pints is equal to (4/15)(3) = 0.8 pint. For yellow #5, 9/15 of 3 pints is equal to (9/15)(3) = 1.8 pints. The difference between the number of pints of magenta #3 and yellow #5 used is 1.8 – 0.8 = ***1*** *pint.*

Jordan decides to be on the safe side and create 2 gallons of the goldenrod paint mixture. The formulation for the goldenrod paint mixture calls for the use of white #2, red #4, yellow #5 and light green #9 in the ratio of 2:1:5:10, respectively. Jordan realizes that he does not have light green #9, but sees that he can create it using yellow #5 and green #6 in the ratio 14:1. Assuming Jordan creates the 2 gallons of goldenrod paint mixture correctly, what is the total amount of yellow #5 he used, in gallons? Express your answer as a mixed number.

The amount of yellow #5 to be used, aside from that used to create light green #9, is equal to 5/18 of the 2-gallon goldenrod paint mixture, or (5/18)(2) = 5/9 gallon. The light green #9 paint mixture will be 10/18 of the 2-gallon mixture of goldenrod. That is equivalent to (10/18)(2) = 10/9 gallons. Now, in creating the light green #9 paint mixture, 14/15 of the 10/9 gallons needs to be yellow #5. So, (14/15)(10/9) = 28/27 gallons of yellow #5 will be used to make the light green #9 paint mixture. Therefore, the total number of gallons of yellow #5 used to make the 2-gallon goldenrod paint mixture is 5/9 + 28/27 = 15/27 + 28/27 = 43/27 = ***1 16/27*** *gallons.*

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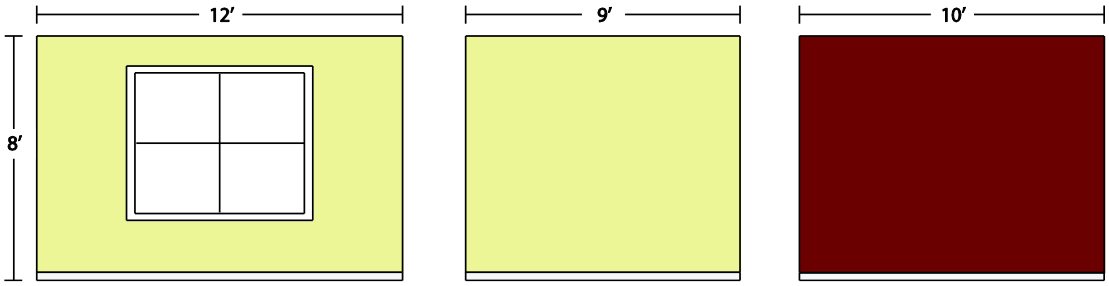

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