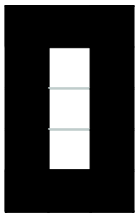
MATHCOUNTS® Problem of the Week Archive

Piece of Cake – April 19, 2021

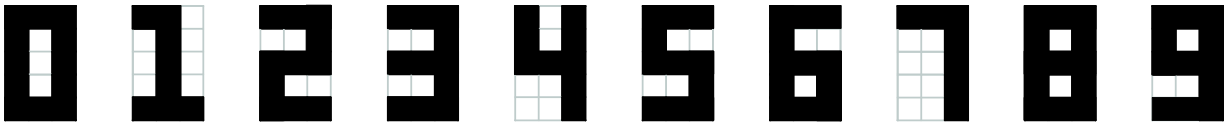
Problems & Solutions

The Cake Place manufactures and sells a cake pan set for creating cakes shaped like any of the digits 0 through 9, as shown.



The set consists of a rectangular, aluminum pan that measures 6" by 10" and some smaller 2" by 2" aluminum inserts. In the bottom of the large, rectangular pan is a grid with grooves used to secure the 2 x 2 inserts in place to cover up the area of the larger pan in which no cake batter will be poured. For example, to create a cake shaped like the number zero, an insert will be placed in the second, third and fourth rows of the second column as illustrated.

Initially, The Cake Place included fifteen 2 x 2 inserts with each cake pan set. The owner would like to minimize costs by reducing the number of inserts included with each set. What is the minimum number of inserts that should be included in each set to ensure that each of the digits 0 through 9 can be created using the cake pan set, as shown?



We can use the figure to count the number of 2 x 2 inserts each digit will use. To make a cake shaped like the digit 8, two inserts are required, while three inserts are needed to make cakes shaped like each of the digits 0, 6 and 9. To make a cake shaped like the digits 2, 3 or 5, you would need four inserts. Finally, creating cakes in the shape of 4, 1 or 7 would require 6, 7 and 8 inserts, respectively. The greatest number of inserts used to create a cake shaped like any of the digits 0 through 9 is eight. That means the minimum number of inserts that should be included in each cake pan set is ***8****.*

It costs The Cake Place 10 cents to manufacture each of the 2 x 2 aluminum inserts. How much will they save on the next batch of 1000 cake pan sets produced by reducing the number of inserts included with each set from 15 to the minimum number of inserts calculated in the previous problem?

*To make 1000 cake pan sets with 15 inserts each will cost The Cake Place 15(1000)(0.10) = 15,000(0.10) = $1500.00. In the previous problem, we determined that the minimum number of inserts that should be included with each cake pan set is 8. To make 1000 cake pan sets with just 8 inserts each will cost 8(1000)(0.10) = 8000(0.10) = $800.00. By reducing the number of inserts included with each cake pan set from 15 to 8, The Cake Place will save 1500 – 800 = $****700.00*** *on the next batch of 1000 cake pan sets produced.*

Kori has purchased one of the cake pan sets to make a cake for her daughter's sweet sixteen party. Kori will make one cake in the shape of the number 1 and another cake in the shape of the number 6. Kori

doesn't want to just divide the batter into two equal parts for the two cakes because she wants the cakes to be proportional in thickness. What is the ratio of the amount of batter that will be used to create the number 1 cake to the amount of batter that will be used to create the number 6 cake? Express you answer as a common fraction.

The number 1 cake will have batter poured into 8/15 of the rectangular pan, and the number 6 cake will have batter poured into 12/15 = 4/5 of the pan. The ratio of the amount of batter that will be used to create the number 1 cake to the amount that will be used to create the number 6 cake is then (8/15)/(4/5) = ***2/3****.*

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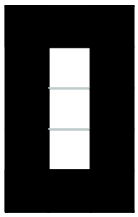

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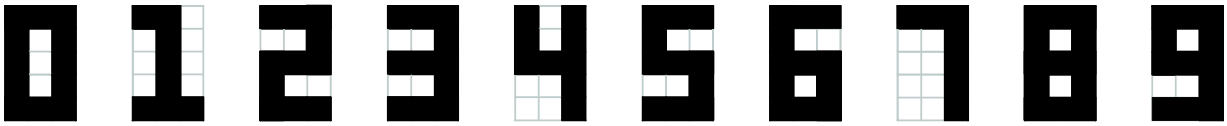

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