

# MATHCOUNTS® Problem of the Week Archive

## Pizza Party Predicament – September 19, 2022

### Problems & Solutions

The MATHCOUNTS Club sponsor at your school is planning a pizza party for the club's 10 Mathletes to kick off the year. The local pizza place has medium and large as the two size options for ordering pizzas. Unlimited toppings are free on either size pizza, so the club needs to decide what size pizzas to order.

The restaurant currently has a special that if you purchase a pizza, each additional pizza of equal or smaller size is just \$5. An 8-slice medium pizza pie has a diameter of 11 inches and costs \$10.99. A 16-slice large pizza pie costs \$15.99 and has a diameter of 16 ½ inches. What is the area of each size pizza? Express your answer as a decimal to the nearest hundredth.

For a circle,  $A = \pi r^2$ . Since we are given the diameter of each size pizza pie, we must first calculate the radius for each. Recall that  $r = d/2$ , so for a medium pizza,  $A = (5.5)^2\pi \approx 95.03 \text{ in}^2$ . For a large pizza,  $A = (8.25)^2\pi \approx 213.82 \text{ in}^2$ .

You would like to order enough pizza so that each club member receives no less than the equivalent of two slices of large pizza. If you decide to get just medium pizzas, how many pizza pies would you need to purchase? How many pizzas would you need if you purchased only large pizzas?

Since  $A = 213.82 \text{ in}^2$  for a large pizza and there are 16 slices, each slice is  $213.82/16 = 13.36375 \text{ in}^2$ . If each club member should get the equivalent of two large slices and there are 10 club members, we need  $13.36375(20) = 267.275$  square inches of pizza and  $267.275/95.03 \approx 2.81$ . Therefore, if you were to buy medium pizzas for the group, you would need **3 medium pizza pies**. Since  $267.275/213.82 = 1.25$ , you would need **2 large pizza pies** if you decided to purchase large pizzas.

The problem does not require students to calculate it, but it may be worthwhile to discuss with them the scenario of purchasing a combination of large and medium pizza pies in order to provide enough pizza for the club members. In this case, purchasing one large and one medium pizza would give you a total of  $213.82 + 95.03 = 308.85 \text{ in}^2$ . That provides enough pizza for each club member to get the equivalent of two large slices of pizza with a few slices left over.

Which option from your solution above results in the best price per square inch?

For three medium pizzas, the total cost is  $\$10.99 + \$10 = \$20.99$ , and the total number of square inches is 285.09. Thus, the price per square inch is  $\$20.99/285.09 \approx \$0.07$ .

For two large pizzas, the total cost is  $\$15.99 + \$5 = \$20.99$ , and the total number of square inches is 427.64. Thus, the price per square inch is  $\$20.99/427.64 \approx \$0.05$ . So, although both options above have the same total cost, **purchasing 2 large pizzas results in the best price per square inch.**

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### ***Problems***

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The restaurant currently has a special that if you purchase a pizza, each additional pizza of equal or smaller size is just \$5. An 8-slice medium pizza pie has a diameter of 11 inches and costs \$10.99. A 16-slice large pizza pie costs \$15.99 and has a diameter of  $16\frac{1}{2}$  inches. What is the area of each size pizza? *Express your answer as a decimal to the nearest hundredth.*

You would like to order enough pizza so that each club member receives no less than the equivalent of two slices of large pizza. If you decide to get just medium pizzas, how many pizza pies would you need to purchase? How many pizzas would you need if you purchased only large pizzas?

Which option from your solution above results in the best price per square inch?