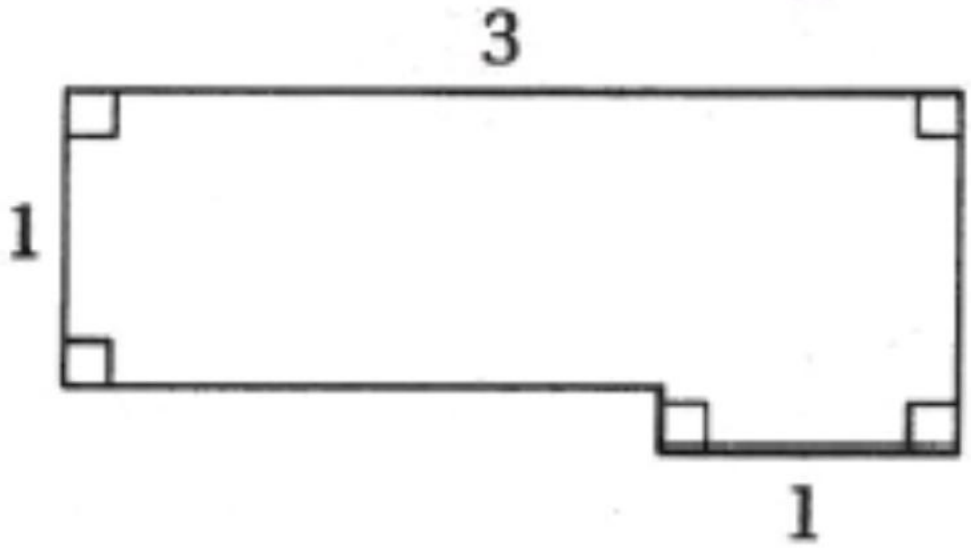
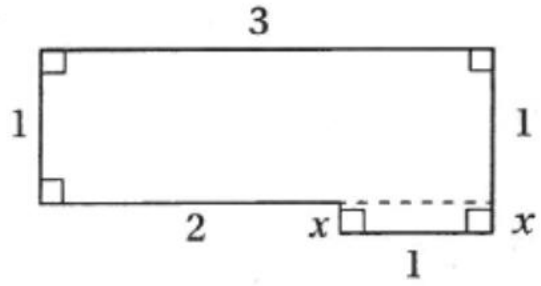
FREE RESPONSE



If the area of the figure above is $\frac{16}{5}$ square units, what is its perimeter?

8.4 or 42/5 Additional Topics (perimeters and area) MEDIUM-HARD



First, drawing a line as shown in the diagram shows that the figure is composed of two rectangles, but the height of the smaller one is unknown. Let's call it x. The area of the larger rectangle is $(3)(1) = 3$, and the area of the smaller rectangle is $(1)(x) = x$. Clearly, the area of the figure must be the sum of these two areas

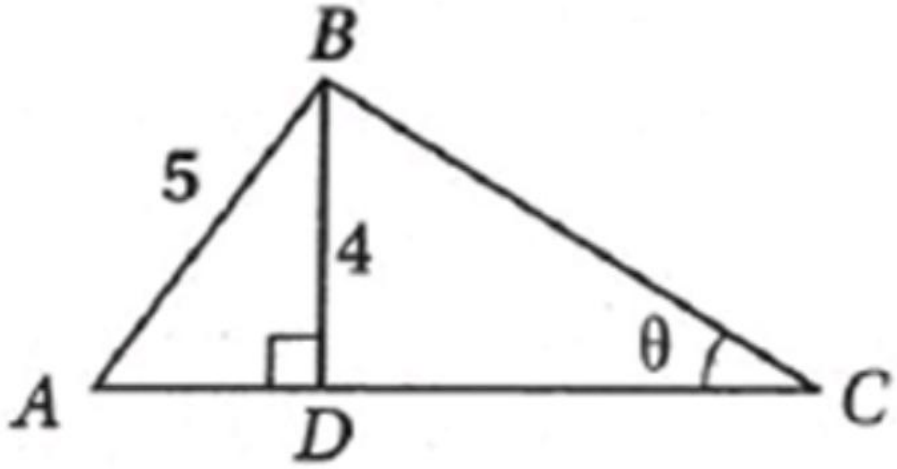
$$\text{Area} = \frac{16}{5} = 3 + x$$

Subtract 3:

$$\frac{16}{5} - 3 = \frac{16}{5} - \frac{15}{5} = \frac{1}{5} = x$$

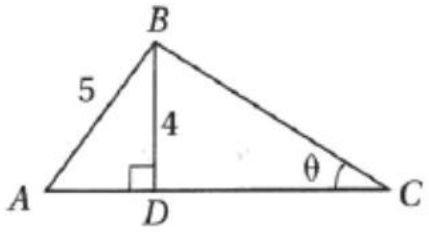
Therefore, the perimeter of the figure is just the sum of the lengths of its sides. If we travel around the figure clockwise from the leftmost side, we get a perimeter of

$$1 + 3 + 1 + \frac{1}{5} + 1 + \frac{1}{5} + 2 = 8 + \frac{2}{5} = 8.4.$$



In the figure above, triangle ABC has an area of 19. What is the value of $\tan \theta$?

8/13 or .615 **Special Topics (trigonometry)**
HARD



Find AD with Pythagorean Theorem: $(AD)^2 + 4^2 = 5^2$
Simplify: $(AD)^2 + 16 = 25$
Subtract 16: $(AD)^2 = 9$
Take square root: $AD = 3$
Or, even better, just notice that triangle ADB is a 3-4-5 right triangle.
Use triangle area formula to find AC:

$$\text{Area} = \frac{1}{2}bh = \frac{1}{2}(AC)(4) = 19$$

Simplify: $2(AC) = 19$

Divide by 2: $AC = \frac{19}{2}$

Find DC: $DC = AC - AD = \frac{19}{2} - 3 = \frac{19}{2} - \frac{6}{2} = \frac{13}{2}$

Find $\tan\theta$: $\tan\theta = \frac{\text{opp}}{\text{hyp}} = \frac{BD}{DC} = \frac{4}{\frac{13}{2}} = 4 \times \frac{2}{13} = \frac{8}{13}$

In the xy-plane, the graph of the equation $y = 3x^2 - kx - 35$ intersects the x-axis at $(5, 0)$. What is the value of k?

8 **Advance Mathematics (quadratics) EASY**

Given equation:	$y = 3x^2 - kx - 35$
Substitute $x = 5$ and $y = 0$:	$0 = 3(5)^2 - k(5) - 35$
Simplify:	$0 = 75 - 5k - 35$
Simplify:	$0 = 40 - 5k$
Add $5k$:	$5k = 40$
Divide by 5:	$k = 8$

If one pound of grain can feed either 5 chickens or 2 pigs, then ten pounds of grain can feed 20 chickens and how many pigs?

12 Problem Solving/Data Analysis (word problem) MEDIUM-HARD

This one is a bit trickier than it looks. We have 10 pounds of grain and have used it to feed 20 chickens. Since one pound of grain feeds 5 chickens, proportionally we need 4 pounds of grain to feed 20 chickens. This leaves us $10 - 4 = 6$ pounds of grain to feed the pigs. Since 1 pound of grain can feed 2 pigs, proportionally 6 pounds of grain can feed 12 pigs.

Section	Price per Ticket	Number Sold
Front Orchestra	\$60	50
Rear Orchestra	\$50	60
First Mezzanine	\$40	x
Second Mezzanine	\$35	y
Third Mezzanine	\$30	100

The table above shows information about the tickets sold for a recent performance by a theater troupe. The total revenue in ticket sales for this performance was \$15,000.

If 15 more tickets were sold in the second mezzanine than in the first mezzanine, what is the total number of tickets that were sold for this performance?

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Front Orchestra	\$60	50
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If 15 more tickets were sold in the second mezzanine than in the first mezzanine, what is the total number of tickets that were sold for this performance?

371 **Problem Solving (extended thinking)**
HARD

The total revenue from the tickets sold is $\$60(50) + \$50(60) + \$40x + \$35y + \$30(100)$. If the total revenue was \$15,000, then $3{,}000 + 3{,}000 + 40x + 35x + 3{,}000 = 15{,}000$

Subtract 9,000: $40x + 35y = 6{,}000$

Divide by 5: $8x + 7y = 1{,}200$

If 15 more tickets were sold in the second mezzanine than the first mezzanine: $y = x + 15$

Substitute $y = x + 15$ in previous equation: $8x + 7(x + 15) = 1{,}200$

Distribute: $8x + 7x + 105 = 1{,}200$

Subtract 105: $15x = 1{,}095$

Divide by 15: $x = 73$

Substitute to find y: $y = x + 15 = 73 + 15 = 88$

Therefore, the total number of tickets sold is $50 + 60 + 73 + 88 + 100 = 371$.

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The table above shows information about the tickets sold for a recent performance by a theater troupe. The total revenue in ticket sales for this performance was \$15,000.

Before the tickets for this performance went on sale, a consultant for the theater had predicted that n, the number of tickets sold per section, would vary with p, the price in dollars for a ticket in that section, according to the formula $n = \frac{2,800}{p}$. By how many tickets did this model underestimate the actual total number of tickets sold?

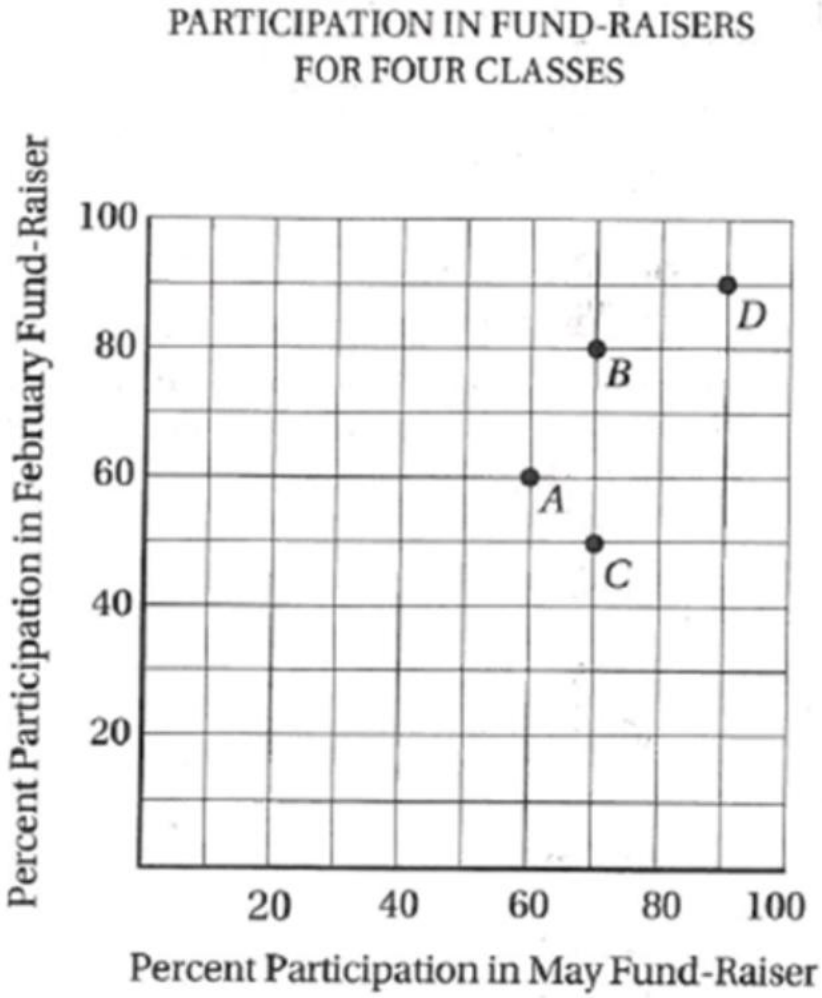
Section	Price Per Ticket	Number Sold	Section Revenue	Predicted Sold	Predicted Revenue
Front Orchestra	$60	50	$3,000	46.667	$2,800
Rear Orchestra	$50	60	$3,000	56	$2,800
First Mezzanine	$40	73	$2,920	70	$2,800
Second Mezzanine	$35	88	$3,080	80	$2,800
Third Mezzanine	$30	100	$3,000	93.333	$2,800
Total		371	$15,000	346	$14,000

25 Problem Solving (extended thinking) HARD

The mathematical model $n = \frac{2,800}{p}$ has embedded in it the predicted revenue per section: np = revenue per section = $2,800. Notice that this prediction is $200 less than the actual average revenue per section of $3,000, so clearly the model underestimated the number of tickets sold per section.

If we want to analyze this situation in detail, we can compare the predicted tickets sold to the actual tickets sold by adding a new column to the table entitled "predicted sold," which we can fill in using the calculations from our model. Also, it might be helpful to also add columns for "total revenue" for each situation.

You might notice that the predicted number of tickets sold in the Front Orchestra and the Third Mezzanine are fractions, which seems strange. (Of course we can't sell a fraction of a ticket!) But even if we round these predictions to the nearest whole numbers, 47 and 93, the total number of tickets is the same: 346, which underestimates the number of tickets sold by 25.



Four different classes at Corbett Elementary School participated in two fund-raisers last year, one in February and another in May. The rates of participation for each class are recorded in the graph above. Which class had the greatest change in percent participation from the February fund-raiser to the May fund-raiser?

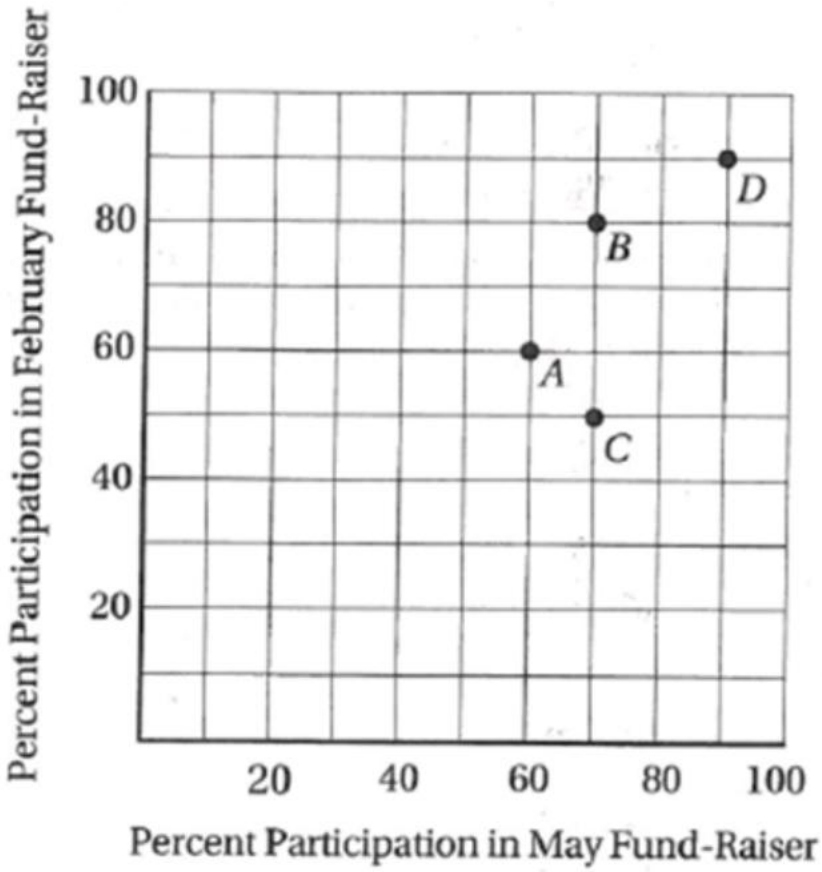
A) Class A

B) Class B

C) Class C

D) Class D

PARTICIPATION IN FUND-RAISERS
FOR FOUR CLASSES



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A) Class A
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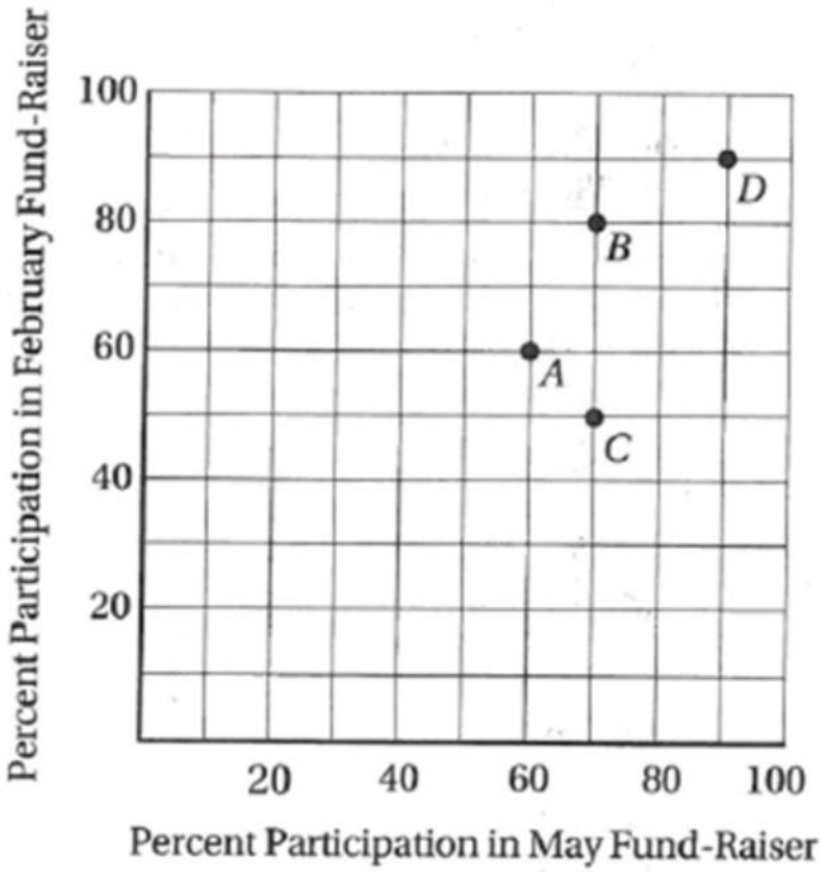
C) Class C
D) Class D

C **Data Analysis (graphs) MEDIUM**

Since there are only four data points, it's not hard to list the February-May ordered pairs. Notice that the February axis is vertical, and the May axis is horizontal, so the typical x-y relationship is reversed:
Class A: February: 60, May: 60
Class B: February: 80, May: 70
Class C: February: 50, May: 70
Class D: February: 90, May: 90
Notice that the only class that saw an increase in percent participation is Class C.

PARTICIPATION IN FUND-RAISERS
FOR FOUR CLASSES



If there were 20 students each in Class A and Class C, and 30 students each in Class B and Class D, how many students participated in the May fund-raiser?

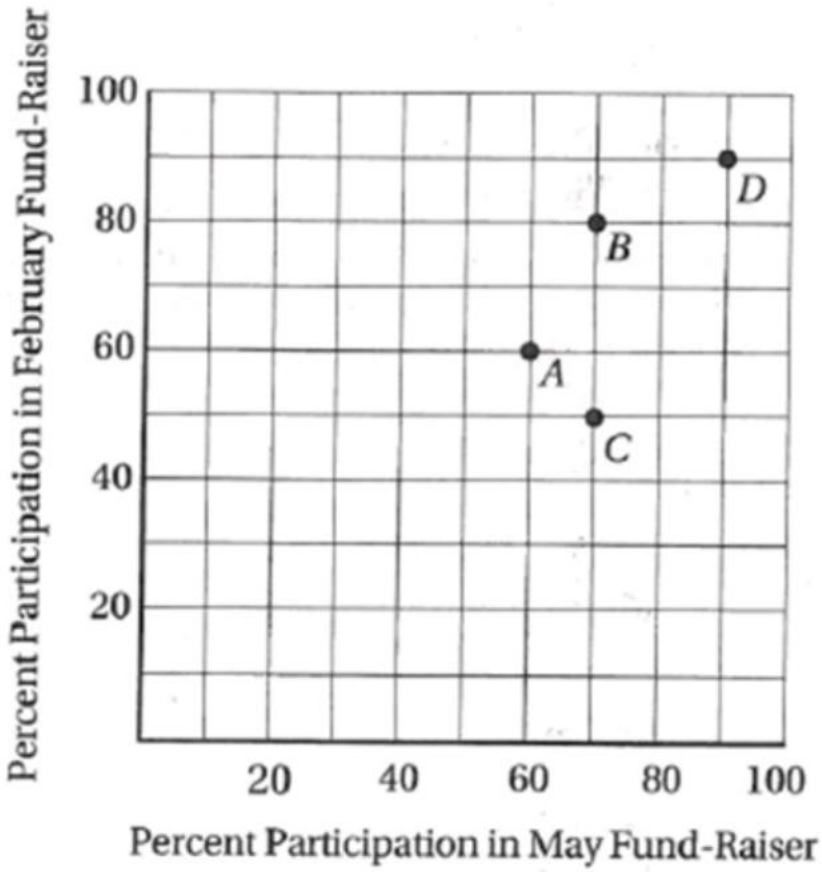
A) 71

B) 72

C) 74

D) 76

PARTICIPATION IN FUND-RAISERS
FOR FOUR CLASSES



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A) 71

B) 72

C) 74

D) 76

C **Data Analysis (graphs) HARD**

We just need to tally the number of students who participated from each class.

Class A: 60% of 20 students = 12 students
Class B: 70% of 30 students = 21 students
Class C: 70% of 20 students = 14 students
Class D: 90% of 30 students = 27 students
12 + 21 + 14 + 27 = 74 students

These 20 Questions were harvested from a single

Practice SAT Test by McGraw Hill 2018

	A question	B answer	C
=			
1	1	A	
2	2	C	
3	3	B	
4	4	A	
5	5	A	
6	6	A	
7	7	C	
8	8	C	
9	9	A	
10	10	B	
11	11	D	
12	12	B	
13	13	8.4	
14	14	8/13	
15	15	8	
16	16	12	
17	17	341	
18	18	25	
19	19	C	
20	20	C	