2007 AMC 8 Problems/Problem 1

Problem

Theresa's parents have agreed to buy her tickets to see her favorite band if she spends an average of 10 hours per week helping around the house for 6 weeks. For the first 5 weeks she helps around the house for 8, 11, 7, 12 and 10 hours. How many hours must she work for the final week to earn the tickets?

$\mathrm{(A)}\ 9 \qquad\mathrm{(B)}\ 10 \qquad\mathrm{(C)}\ 11 \qquad\mathrm{(D)}\ 12 \qquad\mathrm{(E)}\ 13$

Solution

Let x be the number of hours she must work for the final week. We are looking for the average, so

$$\frac{8 + 11 + 7 + 12 + 10 + x}{6} = 10$$

Solving gives:

$$\frac{48 + x}{6} = 10$$

$$48 + x = 60$$

$$x = 12$$

So, the answer is $\boxed{\textbf{(D)}\ 12}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by First Problem	Followed by Problem 2
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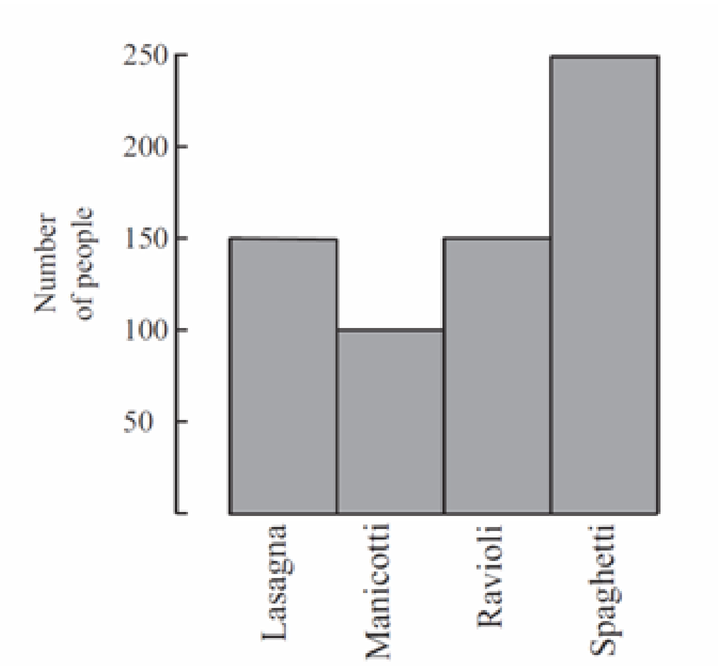
Category: Introductory Algebra Problems

2007 AMC 8 Problems/Problem 2

Problem

650 students were surveyed about their pasta preferences. The choices were lasagna, manicotti, ravioli and spaghetti. The results of the survey are displayed in the bar graph. What is the ratio of the number of students who preferred spaghetti to the number of students who preferred manicotti?



$\mathrm{(A)} \frac{2}{5} \qquad \mathrm{(B)} \frac{1}{2} \qquad \mathrm{(C)} \frac{5}{4} \qquad \mathrm{(D)} \frac{5}{3} \qquad \mathrm{(E)} \frac{5}{2}$

Solution

The answer is (number of students who preferred spaghetti)/(number of students who preferred manicotti)

So,

$$\frac{250}{100}$$

Simplify,

$$\frac{5}{2}$$

The answer is $\boxed{\textbf{(E)}\ \frac{5}{2}}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 1	Followed by Problem 3
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 3

Problem

What is the sum of the two smallest prime factors of 250?

$\textbf{(A)}\ 2 \qquad\textbf{(B)}\ 5 \qquad\textbf{(C)}\ 7 \qquad\textbf{(D)}\ 10 \qquad\textbf{(E)}\ 12$

Solution

We prime factor $250 = 2 \cdot 5^3$. The smallest two are 2 and 5. $2+5=\boxed{\mathrm{C}}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 2	Followed by Problem 4
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 4

Problem

A haunted house has six windows. In how many ways can Georgie the Ghost enter the house by one window and leave by a different window?

$\mathrm{(A)}\ 12 \qquad\mathrm{(B)}\ 15 \qquad\mathrm{(C)}\ 18 \qquad\mathrm{(D)}\ 30 \qquad\mathrm{(E)}\ 36$

Solution

Georgie can enter the haunted house through any of the six windows. Then, he can leave through any of the remaining five windows.

So, Georgie has a total of $6 * 5$ ways he can enter the house by one window and leave by a different window.

Therefore, we have $\boxed{\mathrm{(D)}\ 30}$ ways.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 3	Followed by Problem 5
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 5

Problem

Chandler wants to buy a 500 dollar mountain bike. For his birthday, his grandparents send him 50 dollars, his aunt sends him 35 dollars and his cousin gives him 15 dollars. He earns 16 dollars per week for his paper route. He will use all of his birthday money and all of the money he earns from his paper route. In how many weeks will he be able to buy the mountain bike?

$\mathrm{(A)}\ 24 \qquad\mathrm{(B)}\ 25 \qquad\mathrm{(C)}\ 26 \qquad\mathrm{(D)}\ 27 \qquad\mathrm{(E)}\ 28$

Solution

Let x be the number of weeks.

Thus, we have the equation $50+35+15+16x=500$.

Simplify,

$100+16x=500$

$16x=400$

$x=25$

The answer is $\boxed{\textbf{(B)}\ 25}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 4	Followed by Problem 6
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 6

Problem

The average cost of a long-distance call in the USA in 1985 was 41 cents per minute, and the average cost of a long-distance call in the USA in 2005 was 7 cents per minute. Find the approximate percent decrease in the cost per minute of a long- distance call.

$\mathrm{(A)}\ 7 \qquad\mathrm{(B)}\ 17 \qquad\mathrm{(C)}\ 34 \qquad\mathrm{(D)}\ 41 \qquad\mathrm{(E)}\ 80$

Solution

The percent decrease is (the amount of decrease)/(original amount)

the amount of decrease is $41-7=34$

so the percent decrease is $\frac{34}{41}$ which is about $\boxed{\textbf{(E)}\ 80\%}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 5	Followed by Problem 7
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2007 AMC 8 Problems/Problem 7

Contents

Problem

The average age of 5 people in a room is 30 years. An 18-year-old person leaves the room. What is the average age of the four remaining people?

$\mathrm{(A)}\ 25 \qquad\mathrm{(B)}\ 26 \qquad\mathrm{(C)}\ 29 \qquad\mathrm{(D)}\ 33 \qquad\mathrm{(E)}\ 36$

Solution 1

Let x be the average of the remaining 4 people.

The equation we get is $\frac{4x + 18}{5} = 30$

Simplify,

$4x + 18 = 150$

$4x = 132$

$x = 33$

Therefore, the answer is $\boxed{\textbf{(D)}\ 33}$

Solution 2

Since an 18 year old left from a group of people averaging 30, The remaining people must total $30-18=12$ years older than 30. Therefore, the average is $\frac{12}{4}=3$ years over 30. Giving us $\boxed{\textbf{(D)}\ 33}$

Solution 3

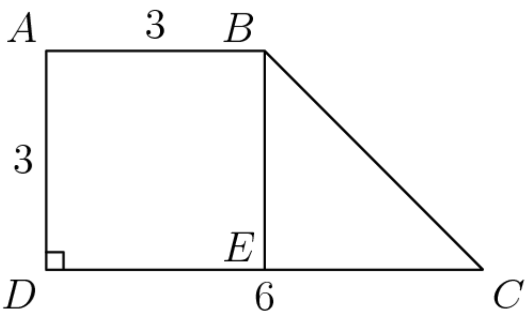
The total ages would be $30*5=150$. Then, if one 18 year old leaves, we subtract 18 from 150 and get 132. Then, we divide 132 by 4 to get the new average, $\boxed{\textbf{(D)}\ 33}$

See Also

2007 AMC 8 Problems/Problem 8

Problem

In trapezoid $ABCD$, AD is perpendicular to DC, AD = AB = 3, and DC = 6. In addition, E is on DC, and BE is parallel to AD. Find the area of $\triangle BEC$.



$\textbf{(A)}\ 3 \qquad \textbf{(B)}\ 4.5 \qquad \textbf{(C)}\ 6 \qquad \textbf{(D)}\ 9 \qquad \textbf{(E)}\ 18$

Solution

We know that $ABED$ is a square with side length 3. We subtract DC and DE to get the length of EC.

$$EC = DC - DE = 6 - 3 = 3$$

We are trying to find the area of $\triangle BEC$.

So, $\dfrac{1}{2} \cdot 3 \cdot 3 = \boxed{\textbf{(B)}\ 4.5}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 7	Followed by Problem 9
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 9

Problem

To complete the grid below, each of the digits 1 through 4 must occur once in each row and once in each column. What number will occupy the lower right-hand square?

1		2	
2	3		
			4

$\mathrm{(A)}\ 1 \qquad \mathrm{(B)}\ 2 \qquad \mathrm{(C)}\ 3 \qquad \mathrm{(D)}\ 4 \qquad \textbf{(E)}\ \text{cannot be determined}$

Solution

The number in the first row, last column must be a 3 due to the fact if a 3 was in the first row, second column, there would be two threes in that column. By the same reasoning, the number in the second row, last column has to be a 1. Therefore the number in the lower right-hand square is $\boxed{\textbf{(B)}\ 2}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 8	Followed by Problem 10
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 10

Problem

For any positive integer n, $\boxed{n}$ to be the sum of the positive factors of n. For example, $\boxed{6} = 1 + 2 + 3 + 6 = 12$. Find $\boxed{\boxed{11}}$.

$\textbf{(A)}\ 13 \qquad \textbf{(B)}\ 20 \qquad \textbf{(C)}\ 24 \qquad \textbf{(D)}\ 28 \qquad \textbf{(E)}\ 30$

Solution

First we find $\boxed{11}$.

$$\boxed{11} = 1 + 11 = 12$$

Then we find $\boxed{12}$.

$$\boxed{\boxed{11}} = \boxed{12} = 1 + 2 + 3 + 4 + 6 + 12 = \boxed{\textbf{(D)}\ 28}$$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 9	Followed by Problem 11
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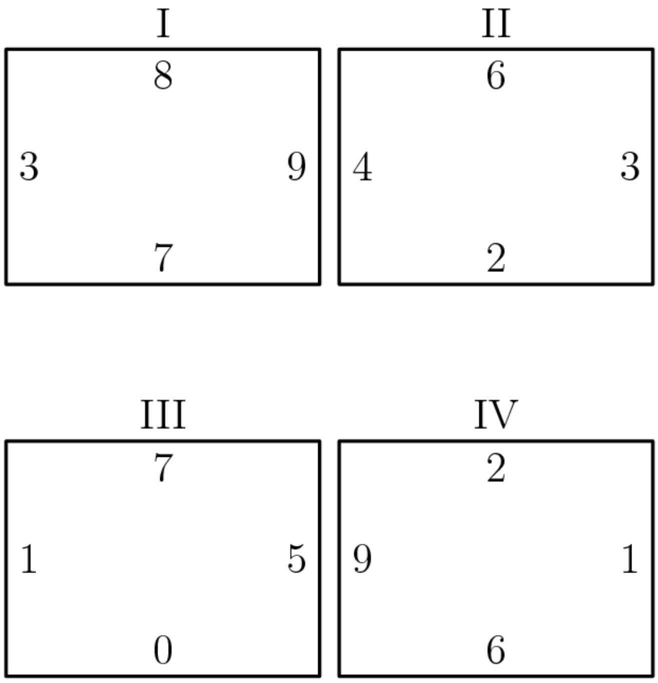
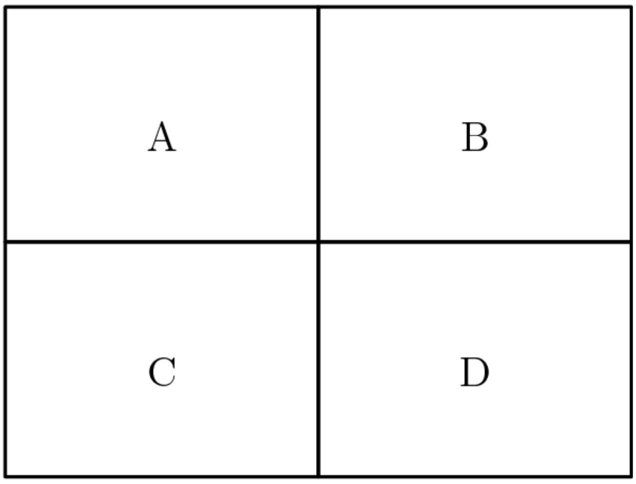
All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 11

Problem

Tiles I, II, III and IV are translated so one tile coincides with each of the rectangles A, B, C and D. In the final arrangement, the two numbers on any side common to two adjacent tiles must be the same. Which of the tiles is translated to Rectangle C?



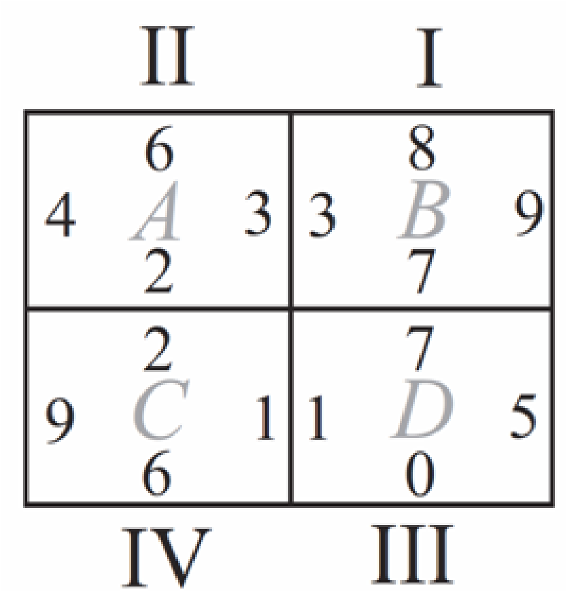


$\textbf{(A)}\ I \qquad \textbf{(B)}\ II \qquad \textbf{(C)}\ III \qquad \textbf{(D)}\ IV \qquad \textbf{(E)}$ cannot be determined

Solution

We first notice that tile III has a 0 on the bottom and a 5 on the right side. Since no other tile has a 0 or a 5, Tile III must be in rectangle D. Tile III also has a 1 on the left, so Tile IV must be in Rectangle C.

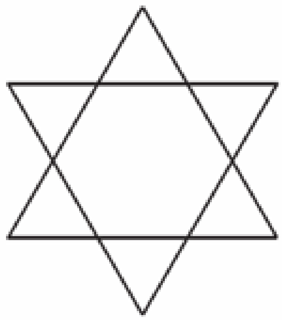
The answer is $\boxed{\textbf{(D)}}$



2007 AMC 8 Problems/Problem 12

Problem

A unit hexagram is composed of a regular hexagon of side length 1 and its 6 equilateral triangular extensions, as shown in the diagram. What is the ratio of the area of the extensions to the area of the original hexagon?



$\mathrm{(A)}\ 1:1 \qquad \mathrm{(B)}\ 6:5 \qquad \mathrm{(C)}\ 3:2 \qquad \mathrm{(D)}\ 2:1 \qquad \mathrm{(E)}\ 3:1$

Solution

The six equilateral triangular extensions fit perfectly into the hexagon meaning the answer is $\boxed{\mathrm{(A)}\ 1:1}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 11	Followed by Problem 13
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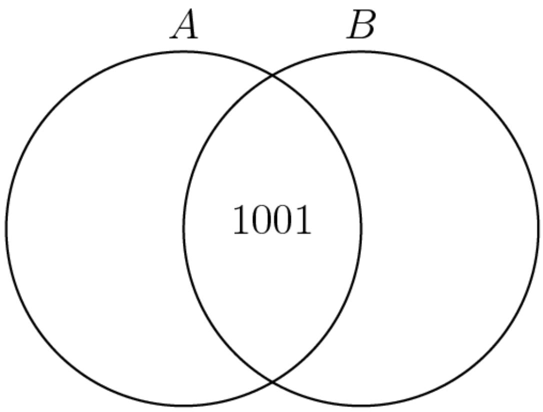
All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 13

Problem

Sets A and B, shown in the Venn diagram, have the same number of elements. Their union has 2007 elements and their intersection has 1001 elements. Find the number of elements in A.



$\mathrm{(A)}\ 503 \qquad \mathrm{(B)}\ 1006 \qquad \mathrm{(C)}\ 1504 \qquad \mathrm{(D)}\ 1507 \qquad \mathrm{(E)}\ 1510$

Solution

Let x be the number of elements in A and B.

Since the union is the sum of all elements in A and B,

and A and B have the same number of elements then,

$2x - 1001 = 2007$

$2x = 3008$

$x = 1504.$

The answer is $\boxed{\textbf{(C)}\ 1504}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 12	Followed by Problem 14
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 14

Problem

The base of isosceles $\triangle ABC$ is 24 and its area is 60. What is the length of one of the congruent sides?

$\mathrm{(A)}\ 5 \qquad \mathrm{(B)}\ 8 \qquad \mathrm{(C)}\ 13 \qquad \mathrm{(D)}\ 14 \qquad \mathrm{(E)}\ 18$

Solution

The area of a triangle is shown by $\frac{1}{2}bh$.

We set the base equal to 24, and the area equal to 60,

and we get the height, or altitude, of the triangle to be 5.

In this isosceles triangle, the height bisects the base,

so by using the pythagorean theorem, $a^2+b^2=c^2$,

we can solve for one of the legs of the triangle (it will be the the hypotenuse, c).

$a = 12$, $b = 5$,

$c = 13$

The answer is $\boxed{\textbf{(C)}\ 13}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 13	Followed by Problem 15
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 15

Problem

Let a, b and c be numbers with $0 < a < b < c$. Which of the following is impossible?

$$\text{(A)}\ a + c < b \qquad \text{(B)}\ a * b < c \qquad \text{(C)}\ a + b < c \qquad \text{(D)}\ a * c < b \qquad \text{(E)}\frac{b}{c} = a$$

Solution

According to the given rules,

Every number needs to be positive.

Since c is always greater than b,

adding a positive number (a) to c will always make it greater than b.

Therefore, the answer is $\boxed{\textbf{(A)}\ a+c<b}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 14	Followed by Problem 16
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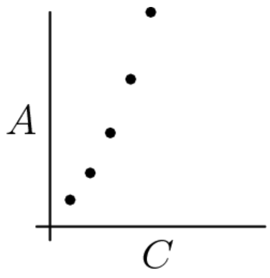
All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 16

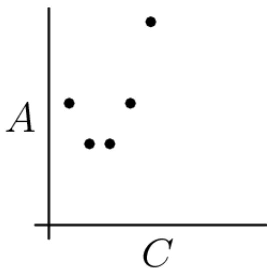
Problem

Amanda Reckonwith draws five circles with radii $1, 2, 3, 4$ and 5. Then for each circle she plots the point (C, A), where C is its circumference and A is its area. Which of the following could be her graph?

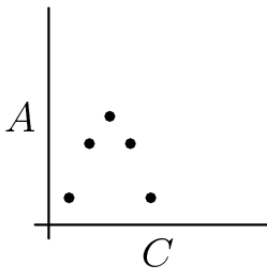
(A)



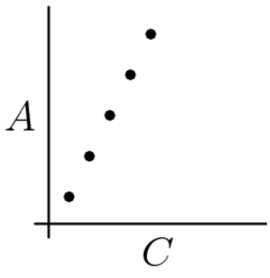
(B)



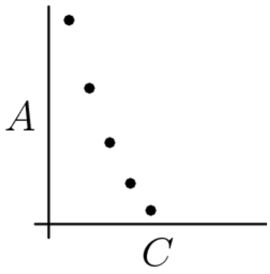
(C)



(D)



(E)



Solution

The circumference of a circle is obtained by simply multiplying the radius by 2π. So, the C-coordinate (in this case, it is the x-coordinate) will increase at a steady rate. The area, however, is obtained by squaring the radius and multiplying it by π. Since squares do not increase in an evenly spaced arithmetic sequence, the increase in the A-coordinates (aka the y- coordinates) will be much more significant. The answer is $\boxed{\textbf{(A)}}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 17

Problem

A mixture of 30 liters of paint is 25% red tint, 30% yellow tint and 45% water. Five liters of yellow tint are added to the original mixture. What is the percent of yellow tint in the new mixture?

$\mathrm{(A)}\ 25 \qquad \mathrm{(B)}\ 35 \qquad \mathrm{(C)}\ 40 \qquad \mathrm{(D)}\ 45 \qquad \mathrm{(E)}\ 50$

Solution

Since 30% of the original 30 liters of paint was yellow, and 5 liters of yellow paint were added to make the new mixture, there are $9+5=14$ liters of yellow tint in the new mixture. Since only 5 liters of paint were added to the original 30, there are a total of 35 liters of paint in the new mixture. This gives 40% of yellow tint in the new mixture, which is $\boxed{\textbf{(C)}\ 40}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 16	Followed by Problem 18
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 18

Problem

The product of the two 99-digit numbers

$303,030,303,...,030,303$ and $505,050,505,...,050,505$

has thousands digit A and units digit B. What is the sum of A and B?

$\mathrm{(A)}\ 3 \qquad \mathrm{(B)}\ 5 \qquad \mathrm{(C)}\ 6 \qquad \mathrm{(D)}\ 8 \qquad \mathrm{(E)}\ 10$

Solution

$303 \times 505 = 153015$

The ones digit plus thousands digit is $5+3=8$.

$30303 \times 50505 = 1530453015$

Note that the ones and thousands digits are, added together, 8. (and so on...) So the answer is $\boxed{\mathrm{(D)}\ 8}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 17	Followed by Problem 19
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 19

Problem

Pick two consecutive positive integers whose sum is less than 100. Square both of those integers and then find the difference of the squares. Which of the following could be the difference?

$\mathrm{(A)}\ 2 \qquad \mathrm{(B)}\ 64 \qquad \mathrm{(C)}\ 79 \qquad \mathrm{(D)}\ 96 \qquad \mathrm{(E)}\ 131$

Solution

Let the smaller of the two numbers be x. Then, the problem states that $2x+1 < 100$. $(x+1)^2 - x^2 = x^2 + 2x + 1 - x^2 = 2x + 1$. $2x+1$ is obviously odd, so only answer choices C and E need to be considered.

$2x+1 = 131$ refutes the fact that $2x+1 < 100$, so the answer is $\boxed{\mathrm{(C)} 79}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 20

Problem

Before district play, the Unicorns had won 45% of their basketball games. During district play, they won six more games and lost two, to finish the season having won half their games. How many games did the Unicorns play in all?

$\textbf{(A)}\ 48 \qquad\textbf{(B)}\ 50 \qquad\textbf{(C)}\ 52 \qquad\textbf{(D)}\ 54 \qquad\textbf{(E)}\ 60$

Solution

At the beginning of the problem, the Unicorns had played y games and they had won x of these games. So we can say that $\frac{x}{y} = 0.45.$ Then, the Unicorns win 6 more games and lose 2 more, for a total of $6 + 2 = 8$ games played during district play. We are told that they end the season having won half of their games, or $0.5.$ We can write another equation: $\frac{x+6}{y+8} = 0.5.$ This gives us a system of equations: $\frac{x}{y} = 0.45$ and $\frac{x+6}{y+8} = 0.5$ We first multiply both sides of the first equation by y to get $x = 0.45y.$ Then, we multiply both sides of the second equation by $(y + 8)$ to get $x + 6 = 0.5(y + 8).$ Applying the Distributive Property gives yields $x + 6 = 0.5y + 4.$ Now we substitute $0.45y$ for x to get $0.45y + 6 = 0.5y + 4.$ Solving gives us $y = 40.$ Since the problem asks for the total number of games, we add on the last 8 games to get the solution $\boxed{\textbf{(A)}\ 48}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 19	Followed by Problem 21
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 21

Problem

Two cards are dealt from a deck of four red cards labeled A, B, C, D and four green cards labeled A, B, C, D. A winning pair is two of the same color or two of the same letter. What is the probability of drawing a winning pair? $\textbf{(A)}\ \frac{2}{7}\qquad\textbf{(B)}\ \frac{3}{8}\qquad\textbf{(C)}\ \frac{1}{2}\qquad\textbf{(D)}\ \frac{4}{7}\qquad\textbf{(E)}\ \frac{5}{8}$

Solution

There are 4 ways of choosing a winning pair of the same letter, and $2\left(\binom{4}{2}\right) = 12$ ways to choose a pair of the same color.

There's a total of $\binom{8}{2} = 28$ ways to choose a pair, so the probability is $\frac{4+12}{28} = \boxed{\textbf{(D)}\ \frac{4}{7}}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 20	Followed by Problem 22
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 22

Problem

A lemming sits at a corner of a square with side length 10 meters. The lemming runs 6.2 meters along a diagonal toward the opposite corner. It stops, makes a 90° right turn and runs 2 more meters. A scientist measures the shortest distance between the lemming and each side of the square. What is the average of these four distances in meters?

$\textbf{(A)}\ 2 \qquad \textbf{(B)}\ 4.5 \qquad \textbf{(C)}\ 5 \qquad \textbf{(D)}\ 6.2 \qquad \textbf{(E)}\ 7$

Solution

Algebraic: The shortest segments would be perpendicular to the square. The lemming went x meters horizontally and y meters vertically. No matter how much it went, the lemming would have been x and y meters from the sides and $10-x$ and $10-y$ meters from the remaining two. To find the average, add the lengths of the four segments and divide by four: $\frac{\cancel{x}+10-\cancel{x}+\cancel{y}+10-\cancel{y}}{4}=5 \boxed{\textbf{(C)}\ 5}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 21	Followed by Problem 23
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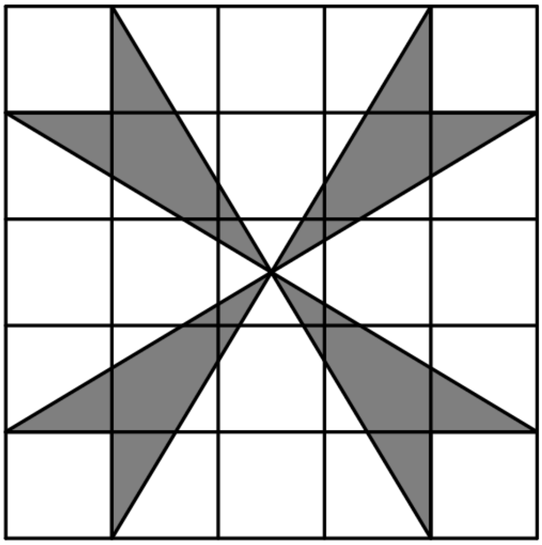
All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 23

Problem

What is the area of the shaded pinwheel shown in the 5×5 grid?



$\textbf{(A)}\ 4 \qquad \textbf{(B)}\ 6 \qquad \textbf{(C)}\ 8 \qquad \textbf{(D)}\ 10 \qquad \textbf{(E)}\ 12$

Solution

The area of the square around the pinwheel is 25. The area of the pinwheel is equal to the square - the white space. Each of the four triangles have a base of 3 units and a height of 2.5 units, and so their combined area is 15 units squared. Then the unshaded space consists of the four triangles with total area of 15, and there are four white corner squares. Therefore the area of the pinwheel is $25-(15+4)$ which is $\boxed{\textbf{(B)}\ 6}$

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 22	Followed by Problem 24
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 24

Problem

A bag contains four pieces of paper, each labeled with one of the digits 1, 2, 3 or 4, with no repeats. Three of these pieces are drawn, one at a time without replacement, to construct a three-digit number. What is the probability that the three-digit number is a multiple of 3?

$\textbf{(A)}\ \frac{1}{4}\qquad\textbf{(B)}\ \frac{1}{3}\qquad\textbf{(C)}\ \frac{1}{2}\qquad\textbf{(D)}\ \frac{2}{3}\qquad\textbf{(E)}\ \frac{3}{4}$

Solution

The combination of digits that give multiples of 3 are (1,2,3) and (2,3,4). The number of ways to choose three digits out of four is 4. Therefore, the probability is $\boxed{\textbf{(C)}\ \frac{1}{2}}$.

See Also

2007 AMC 8 (Problems • Answer Key • Resources (http://www.artofproblemsolving.com/Forum/resources.php?c=182&cid=42&year=2007))	
Preceded by Problem 23	Followed by Problem 25
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All AJHSME/AMC 8 Problems and Solutions	

2007 AMC 8 Problems/Problem 25

Problem

On the dart board shown in the figure below, the outer circle has radius 6 and the inner circle has radius 3. Three radii divide each circle into three congruent regions, with point values shown. The probability that a dart will hit a given region is proportional to the area of the region. When two darts hit this board, the score is the sum of the point values in the regions. What is the probability that the score is odd?

AMC8 2007 25.png $\textbf{(A)}\frac{17}{36} \qquad \textbf{(B)}\frac{35}{72} \qquad \textbf{(C)}\frac{1}{2} \qquad \textbf{(D)}\frac{37}{72} \qquad \textbf{(E)}\frac{19}{36}$

Solution

To get an odd sum, we must add an even number and an odd number. So we have a little casework to do. Before we do that, we also have to figure out some relative areas. You could either find the absolute areas (as is done below for completeness), or apply some proportional reasoning and symmetry to realize the relative areas (which is really all that matters).

To find the areas of the sections, notice that the three smaller sections trisect a circle with radius 3. The area of this entire circle is 9π. The area of each smaller section then must be $\frac{9\pi}{3}$ or 3π. The larger sections trisect an "ring" which is the difference of two circles, one with radius 3, the other radius 6. So, the area of the ring (annulus) is $36\pi - 9\pi$ or 27π. The area of each larger section must be $\frac{27\pi}{3}$ or 9π. Note that the area of the whole circle is 36π.

One smaller section and two larger sections contain an odd number (that is, 1). So the probability of throwing an odd number is $3\pi + (2 \cdot 9\pi) = 21\pi$. Since the area of the whole circle is 36π, the probability of getting an odd is $\frac{21\pi}{36\pi} = \frac{21}{36} = \frac{7}{12}$.

Since the remaining sections contain even numbers (that is, 2), the probability of throwing an even is the complement, or $1 - \frac{7}{12} = \frac{5}{12}$.

Now, the two cases: You could either get an odd then an even, or an even then an odd.

Case 1: Odd then even Multiply the probabilities to get $\frac{7}{12} \cdot \frac{5}{12} = \frac{35}{144}$.

Case 2: Even then odd Multiply the probabilities to get $\frac{5}{12} \cdot \frac{7}{12} = \frac{35}{144}$. Notice that this is the same.

Thus, the total probability of an odd sum is $\frac{35}{144} \cdot \frac{2}{1}$ = $\boxed{B = \frac{35}{72}}$.