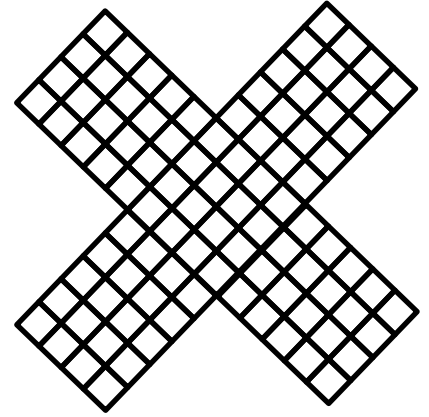


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1. This diagram is the logo of an organization that is trying to stop the killing of elephants for their ivory tusks. Each small 1 by 1 square represents one elephant per day killed in Africa in 2013.



Approximately how many elephants were killed in Africa in 2013 for the ivory in their tusks?

- A. 33,600 B. 35,000 C. 36,500
D. 42,400 E. 45,600
2. On February 8, 2014, American Sage Kotsenburg won the first ever Olympic gold medal in a snow board event called *Slope Style*. In his trick named the Holy Grail, he rotated 1620 degrees. How many rotations is 1620 degrees?

- A. 3 B. 3.5 C. 4 D. 4.5 E. 9

Problems #3 and #4 are from Buehrle's 1886 Exercises in Arithmetic.

3. Harry has 8 hens; each lays an average of 120 eggs a year. The barley on which he feeds them costs him \$8.75 per year. He sells his eggs at 20 cents a dozen. In one year, what profit does Harry make from his hens?
- A. \$7.25 B. \$16 C. \$24.75 D. \$114.50 E. \$183.25
4. One acre of land produces 30,000 pounds of beets. What is the value of the beet crop from 3 acres of land if the beets can be sold at \$2.00 per one thousand pounds?
- A. \$45 B. \$180 C. \$20,000 D. \$45,000 E. \$180,000
5. A rectangle is twice as long as it is wide. Its perimeter is 72 cm. What is its area in square centimeters?
- A. 96 B. 144 C. 256 D. 288 E. 324

Problems #6, #7, and #8, below appeared in the category **Math Problems on a round of **Double Jeopardy** on the January 30, 2014, episode of *Jeopardy*.**

Amazingly, no contestant answered any of these three questions correctly. Can you?

6. A person was in prison for every day of the years 2009 to 2013, inclusive. For how many first days of a month was this person in prison?
- A. 36 B. 47 C. 48 D. 49 E. 60
7. After Barry spends 20% of his savings, he has \$200. How much money did Barry start with?
- A. \$240 B. \$250 C. \$280 D. \$1000 E. \$1200
8. How much does it cost to carpet a rectangular 10 foot by 18 foot room if carpet costs \$10 per square yard?
- A. \$180 B. \$200 C. \$560 D. \$600 E. \$1800

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17. S, T, and L are natural numbers (not necessarily distinct) such that $S \cdot T \cdot L = 180$. What is the minimum possible value of the sum $S+T+L$?

A. 16 B. 17 C. 18 D. 19 E. 20

18. According to Oxfam, in January 2014 the total wealth of the richest 85 people on Earth was 1.7 trillion dollars, the same amount as the total wealth of the poorest 3.5 billion people on Earth. Approximately, what is the average wealth per person of those 3.5 billion people?

A. 6 B. 485 C. 920 D. 4850 E. 5700

19. Here is one more problem from *Buehrle's 1886 Exercises in Arithmetic*.

Five boys earn some money selling fish. The first boy earns 36 cents which is $\frac{1}{5}$ of the whole amount earned; the second boy earns $\frac{1}{6}$ of the whole; the third boy earns $\frac{1}{4}$ of the whole; and the fourth boy earns the same as the second boy. If the fifth boy earns the remainder, how much does he receive?

A. 18¢ B. 24¢ C. 36¢ D. 39¢ E. 69¢

20. Assume that the Earth is a sphere with a radius of 3960 miles. What is the ratio of the diameter of the Earth to the length of its equator?

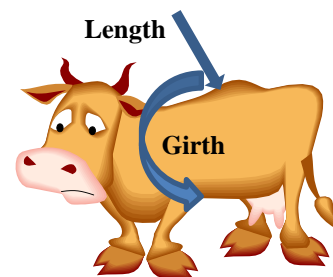
A. π B. 2π C. $\frac{1}{2\pi}$ D. $\frac{2}{\pi}$ E. $\frac{1}{\pi}$

21. Ogilvie's *Ready Reckoner*, published in 1916, provided the following rule for estimating the weight of a cow.

In feet, measure the girth and the length of the cow. Multiply the square of the girth by five times its length. Its weight will be given in pounds by taking away one-third of this product.

Using this rule, what is the weight in pounds of a cow with girth 8 feet and length 6 feet?

A. 57 B. 640 C. 1280
D. 1440 E. 1920



22. If $x < 0$, $y > 0$, and $x + y \neq 0$, which of the following three expressions must be positive?

I. $x(x - y)$ II. $\sqrt[3]{-xy}$ III. $\frac{x^2 y}{x + y}$

A. III only B. II and III only C. I and II only D. I and III only E. I, II, and III

23. Note that $1+3+5 = 3^2$ and that $1+3+5+7 = 4^2$.

If $1+3+5+7+9+\dots+2005+2007+2009+2011+2013 = N^2$. What is N?

A. 1005 B. 1006 C. 1007 D. 1008 E. N is not a Natural Number

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24. A cylindrical jar of honey that is 2 inches in diameter and 6 inches tall costs \$1.80. At the same price per cubic inch, what is the price of a jar of honey that is 4 inches in diameter and 9 inches tall?
- A. \$5.40 B. \$7.20 C. \$8.10 D. \$10.80 E. \$16.20
25. In feet and inches, the heights of the nine players on the 2013-14 *St. Louis Billiken's* men's basketball team who played the most number of minutes were:

6'6"; 5'9"; 6'1"; 6'0"; 6'6"; 6'5"; 6'4"; 6'11"; 6'11"

In inches, what is the positive difference between the median height and the mean height of these nine players?

- A. 0 B. $\frac{4}{9}$ C. $\frac{5}{9}$ D. $\frac{2}{3}$ E. $1\frac{4}{9}$
26. In the 1980's, statisticians analyzing data noticed that a trend that appeared in different groups of data could reveal an opposite trend when the data was combined into one group. They called this phenomenon ***Simpson's Paradox***. As a financial analyst at Google, Zan has studied the occurrence of ***Simpson's Paradox*** in revenue data collected by Google. Here is an example of ***Simpson's Paradox*** from baseball.

For a hitter in baseball, let **H** = number of hits and **B** = number of at-bats. Then a player's *Batting Average* **A** is given by: **A = H/B** and this number is usually rounded to three decimal places. First, complete this table.

Player	1995 statistics			1996 statistics			Combined 1995-96 stats		
	Hits H	At-Bats B	Average A	Hits H	At-Bats B	Average A	Total Hits	Total At-Bats	1995-96 Average
David Justice	104	411	0.253	45	140	0.321			X
Derek Jeter	12	48	0.250	183	582	0.314			Y

Note that David Justice had a higher batting average in both 1995 and 1996. Compute **X – Y**.

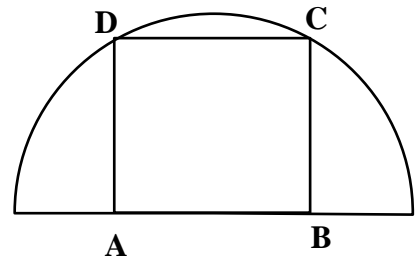
- A. –0.040 B. –0.005 C. 0 D. 0.005 E. 0.040
27. Follow this set of three instructions:
- If –5 is not a non-negative number, write 6 on your paper. Otherwise, write 9.
 - If March is a month or if elephants are red, write 7 on your paper. Otherwise, write –2.
 - If –64 is the cube of an integer, write –5. Otherwise, write 8.

What is the sum of the three numbers that you have written?

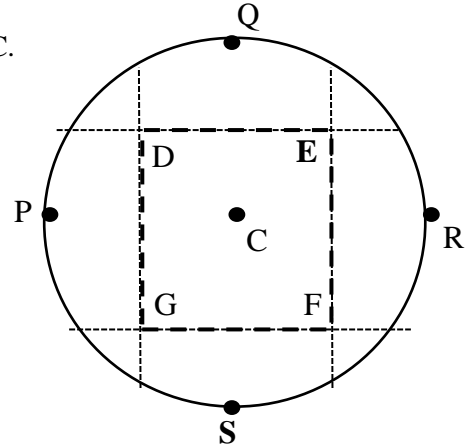
- A. 2 B. 8 C. 11 D. 21 E. 24
28. The length of each leg of an isosceles triangle is a whole number of centimeters. How many such isosceles triangles have a perimeter of 20 centimeters?
- A. 3 B. 4 C. 5 D. 6 E. 7

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29. Square ABCD with side length 6 cm is inscribed in a semi-circle. What per cent of the area of the semi-circle is covered by the square? Round to the nearest whole per cent.



- A. 48% B. 49% C. 50%
- D. 51% E. 52%
30. PR and QS are perpendicular diameters of a circle with center C. Square DEFG is formed by the fold lines when the points P, Q, R, and S are folded onto point C. What is the ratio of the area of circle C to the area of DEFG?



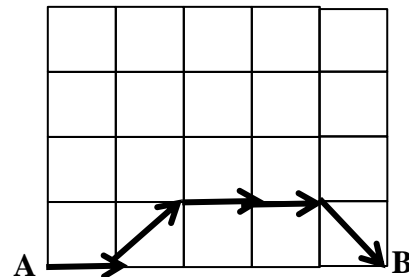
- A. π B. $\frac{\pi}{2}$ C. $\sqrt{3}$
- D. $\sqrt{2}$ E. $2\sqrt{2}$
31. Valerie and Ian have the following conversation.
 Valerie, “If you gave me \$1, we would then have the same amount of money.”
 Ian replies, “If instead you gave me \$6, I would have twice the amount of money that you would have.”

What is the total amount of money that Valerie and Ian have?

- A. \$38 B. \$42 C. \$46 D. \$50 E. \$54
32. Lillian has a large collection of 3 cm by 3 cm tiles and 2 cm by 2 cm tiles. She will use these tiles to completely cover a 7 cm by 18 cm rectangle. The tiles cannot overlap and the tiles cannot extend beyond the tray. She cannot break any of the tiles. How many tiles will she use?
- A. 14 B. 24 C. 25
- D. 28 E. It is impossible for Lillian to complete this task.

33. In a *Motzkin* path on a grid, three types of moves are allowed:

1. One unit right: \rightarrow
2. One diagonal up: \nearrow
3. One diagonal down: \searrow



One *Motzkin* path from A to B is shown on this 5 by 4 grid.

Including the path shown in the diagram, how many different *Motzkin* paths are there from A to B?

(Note: All paths must stay on the grid.)

- A. 17 B. 18 C. 19 D. 20 E. 21

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Problems #39 and #40 below require you to solve a *Kakuro* puzzle. Here is a *Kakuro* puzzle and its solution.

		15	6		
	13			12	12
	10 13				
11			10 11		
10					
		15			

		15	6		
	13	9	4	12	12
	10 13	1	2	3	4
11	9	2	10 11	2	8
10	4	3	2	1	
		15	9	6	

RULES for completing a Kakuro puzzle:

- Fill in each blank square with a natural number from 1 through 9.
- The sum of the numbers in consecutive white squares in each row or column is given.
- In each horizontal or vertical sum, a number CANNOT be repeated. For example, if two numbers sum to 16, they must be 7 and 9, not 8 and 8. (However, the same number could appear in the two sums in one row or column as in the 4th column in the above solution.)

HINT: Certain sums can be achieved in only one or two ways.
For example, if four numbers sum to 28, they must either be 4, 7, 8, and 9 or 5, 6, 8, and 9.

39. Complete this Kakuro puzzle.

What is the **product** of the numbers in the squares labeled A, B, and C?

- A. 320 B. 336
C. 384 D. 432
E. 504

40. See next page for #40.

		29	16		
	17	A		28	16
	29 15				
16			16 16		
29	B				
		13		C	

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40. Complete this Kakuro puzzle.

What is the **product** of the numbers in the squares labeled A, B, and C?

- A. 56 B. 96
- C. 120 D. 140
- E. 160

			8	8		
	7	16	3			
18				A		
					6	21
4			12			
			11			
14	B				5	
				4		
			C			
		22				
			3			