AMC8 Past Paper Collections

Year 2020 — 2000

Updated on: January 1, 2021

2020	2009
2019	2008
2018	2007
2017	2006
2016	2005
2015	2004
2014	2003
2013	2002
2012	2001
2011	2000
2010	1999

Answer Keys

|	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
2020																									
2019	D	E	E	D	B	C	A	E	B	B	D	A	A	C	B	D	B	C	C	D	E	E	B	B	C
2018	A	D	D	C	E	C	B	C	B	C	C	B	A	D	D	C	A	E	C	A	E	B	D	C	E
2017	A	E	C	D	B	D	A	D	D	C	C	D	B	C	D	D	C	B	D	B	A	D	C	D	B
2016	C	A	A	B	E	B	C	C	C	D	B	B	D	A	C	D	D	E	C	A	B	C	C	A	B
2015	A	D	D	E	A	B	E	D	C	B	B	C	D	C	D	B	D	B	A	D	C	C	D	B	C
2014	A	E	B	E	C	D	B	D	D	A	A	B	D	B	C	B	B	D	A	B	A	E	A	C	B
2013	A	D	E	C	E	C	C	C	C	C	D	B	A	C	B	E	B	B	D	C	E	E	E	C	A
2012	E	B	B	C	E	E	B	D	C	D	D	A	C	B	D	C	B	A	C	B	D	D	C	A	C
2011	E	E	D	C	D	D	C	B	E	C	A	B	C	C	D	C	A	D	D	D	C	D	D	A	A
2010	C	D	C	C	B	E	B	D	D	B	B	D	E	C	C	B	D	C	C	A	C	E	B	A	E
2009	E	D	C	B	D	A	C	B	B	D	D	D	B	B	D	D	B	C	D	D	D	D	B	E	E
2008	B	A	A	C	E	D	E	D	D	D	A	C	C	C	B	D	D	E	B	B	C	A	C	C	A
2007	D	E	C	D	B	E	D	B	B	D	D	A	C	C	A	A	C	D	C	A	D	C	B	B	B
2006	D	C	A	B	D	C	B	E	C	A	C	D	D	B	C	E	B	D	D	C	A	D	A	A	B
2005	B	C	D	C	B	C	B	E	D	D	C	D	C	B	C	D	E	C	A	A	C	E	B	B	A
2004	B	B	A	B	D	C	B	B	D	E	C	B	E	C	C	C	D	A	B	D	D	B	D	C	D
2003	E	C	D	C	B	B	A	A	C	E	B	E	B	D	B	D	E	D	C	D	B	C	A	B	C
2002	D	A	C	B	C	A	E	D	B	E	C	B	E	B	E	E	C	E	D	D	E	C	B	B	B
2001	D	D	E	E	C	B	A	E	D	A	C	A	D	C	A	E	B	D	D	A	D	E	D	B	D
2000	B	A	D	E	C	A	B	D	D	E	C	D	C	D	C	C	A	E	C	A	B	C	B	D	B
1999	A	C	D	A	D	E	E	A	C	E	D	B	C	D	D	B	C	E	B	B	B	D	C	D	A
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25

Q1. Luka is making lemonade to sell at a school fundraiser. His recipe requires 4 times as much water as sugar and twice as much sugar as lemon juice. He uses 3 cups of lemon juice. How many cups of water does he need?

   A) 6   **B)** 8   **C)** 12   **D)** 18   **E)** 24

Q2. Four friends do yardwork for their neighbors over the weekend, earning $15, $20, $25, and $40, respectively. They decide to split their earnings equally among themselves. In total how much will the friend who earned $40 give to the others?

   A) 5   **B)** 10   **C)** 15   **D)** 20   **E)** 25

Q3. Carrie has a rectangular garden that measures 6 feet by 8 feet. She plants the entire garden with strawberry plants. Carrie is able to plant 4 strawberry plants per square foot, and she harvests an average of 10 strawberries per plant. How many strawberries can she expect to harvest?

   A) 560   **B)** 960   **C)** 1120   **D)** 1920   **E)** 3840

Q4. Three hexagons of increasing size are shown below. Suppose the dot pattern continues so that each successive hexagon contains one more band of dots. How many dots are in the next hexagon?
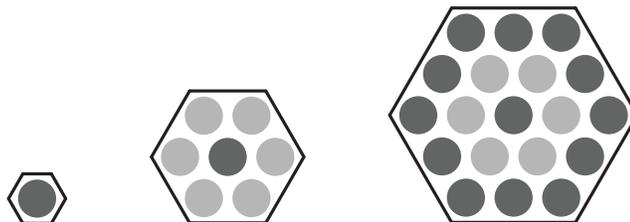
   A) 35   **B)** 37   **C)** 39   **D)** 43   **E)** 49

Q5. Three fourths of a pitcher is filled with pineapple juice. The pitcher is emptied by pouring an equal amount of juice into each of 5 cups. What percent of the total capacity of the pitcher did each cup receive?

   A) 5   **B)** 10   **C)** 15   **D)** 20   **E)** 25

Q6. Aaron, Darren, Karen, Maren, and Sharon rode on a small train that has five cars that seat one person each. Maren sat in the last car. Aaron sat directly behind Sharon. Darren sat in one of the cars in front of Aaron. At least one person sat between Karen and Darren. Who sat in the middle car?

   A) Aaron   **B)** Darren   **C)** Karen   **D)** Maren   **E)** Sharon

Q7. How many integers between 2020 and 2400 have four distinct digits arranged in increasing order? (For example, 2347 is one integer.)

   A) 9   **B)** 10   **C)** 15   **D)** 21   **E)** 28

Q8. Ricardo has 2020 coins, some of which are pennies (1-cent coins) and the rest of which are nickels (5-cent coins). He has at least one penny and at least one nickel. What is the difference in cents between the greatest possible and least possible amounts of money that Ricardo can have?

   A) 8062   **B)** 8068   **C)** 8072   **D)** 8076   **E)** 8082

Q9. Akash's birthday cake is in the form of a $4 \times 4 \times 4$ inch cube. The cake has icing on the top and the four side faces, and no icing on the bottom. Suppose the cake is cut into 64 smaller cubes, each measuring $1 \times 1 \times 1$ inch, as shown below. How many small pieces will have icing on exactly two sides?
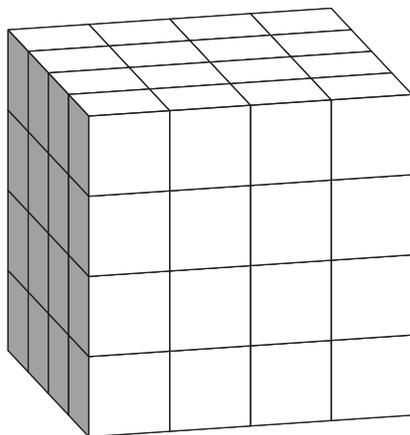

A) 12   **B)** 16   **C)** 18   **D)** 20   **E)** 24

Q10. Zara has a collection of 4 marbles: an Aggie, a Bumblebee, a Steelie, and a Tiger. She wants to display them in a row on a shelf, but does not want to put the Steelie and the Tiger next to one another. In how many ways can she do this?

A) 6   **B)** 8   **C)** 12   **D)** 18   **E)** 24

Q11. After school, Maya and Naomi headed to the beach, 6 miles away. Maya decided to bike while Naomi took a bus. The graph below shows their journeys, indicating the time and distance traveled. What was the difference, in miles per hour, between Naomi's and Maya's average speeds?
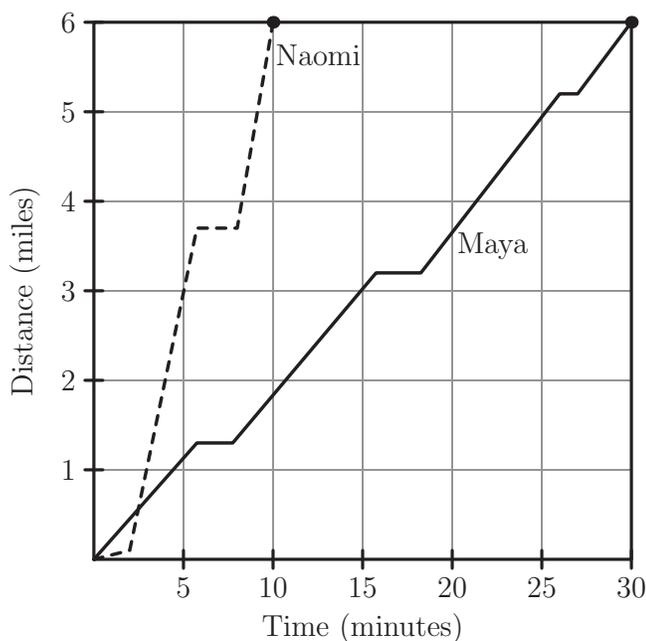
A) 6   **B)** 12   **C)** 18   **D)** 20   **E)** 24

Q12. For a positive integer n, the factorial notation $n!$ represents the product of the integers from n to 1. (For example, $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$.) What value of N satisfies the following equation?

$$5! \cdot 9! = 12 \cdot N!$$

A) 10   **B)** 11   **C)** 12   **D)** 13   **E)** 14

Q13. Jamal has a drawer containing 6 green socks, 18 purple socks, and 12 orange socks. After adding more purple socks, Jamal noticed that there is now a 60% chance that a sock randomly selected from the drawer is purple. How many purple socks did Jamal add?

     A) 6   **B)** 9   **C)** 12   **D)** 18   **E)** 24

Q14. There are 20 cities in the County of Newton. Their populations are shown in the bar chart below. The average population of all the cities is indicated by the horizontal dashed line. Which of the following is closest to the total population of all 20 cities?
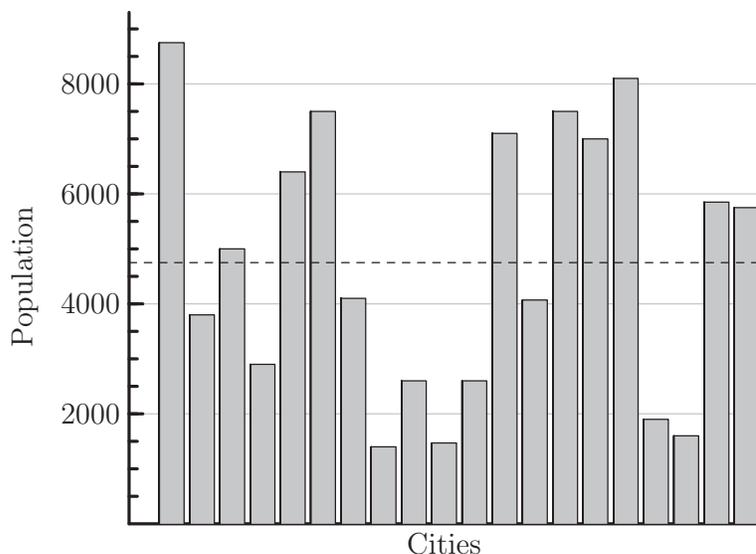
     A) 65,000   **B)** 75,000   **C)** 85,000   **D)** 95,000   **E)** 105,000

Q15. Suppose 15% of x equals 20% of y. What percentage of x is y?

     A) 5   **B)** 35   **C)** 75   **D)** $133\frac{1}{3}$ **E)** 300

Q16. Each of the points $A, B, C, D, E,$ and F in the figure below represents a different digit from 1 to 6. Each of the five lines shown passes through some of these points. The digits along each line are added to produce five sums, one for each line. The total of the five sums is 47. What is the digit represented by B?
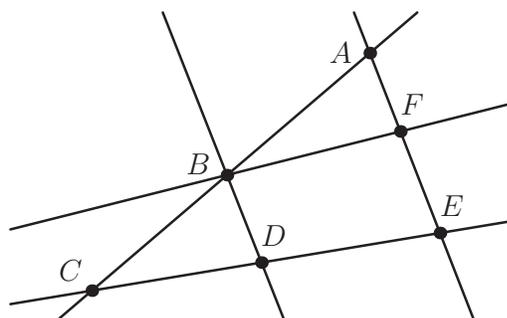
     A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q17. How many factors of 2020 have more than 3 factors? (As an example, 12 has 6 factors, namely $1, 2, 3, 4, 6,$ and 12.)

    A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 10

Q18. Rectangle $ABCD$ is inscribed in a semicircle with diameter $\overline{FE}$, as shown in the figure. Let $DA = 16$, and let $FD = AE = 9$. What is the area of $ABCD$?
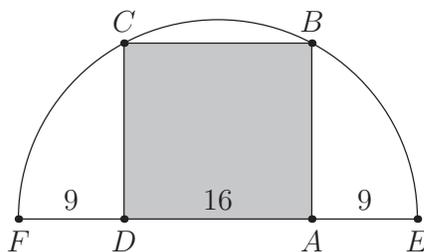

    A) 240   **B)** 248   **C)** 256   **D)** 264   **E)** 272

Q19. A number is called flippy if its digits alternate between two distinct digits. For example, 2020 and 37373 are flippy, but 3883 and 123123 are not. How many five-digit flippy numbers are divisible by 15?

    A) 3   **B)** 4   **C)** 5   **D)** 6   **E)** 8

Q20. A scientist walking through a forest recorded as integers the heights of 5 trees standing in a row. She observed that each tree was either twice as tall or half as tall as the one to its right. Unfortunately some of her data was lost when rain fell on her notebook. Her notes are shown below, with blanks indicating the missing numbers. Based on her observations, the scientist was able to reconstruct the lost data. What was the average height of the trees, in meters?

Tree 1	__ meters
Tree 2	11 meters
Tree 3	__ meters
Tree 4	__ meters
Tree 5	__ meters
Average height	__ .2 meters

   **A)** 22.2   **B)** 24.2   **C)** 33.2   **D)** 35.2   **E)** 37.2

Q21. A game board consists of 64 squares that alternate in color between black and white. The figure below shows square P in the bottom row and square Q in the top row. A marker is placed at P. A step consists of moving the marker onto one of the adjoining white squares in the row above. How many 7-step paths are there from P to Q? (The figure shows a sample path.)
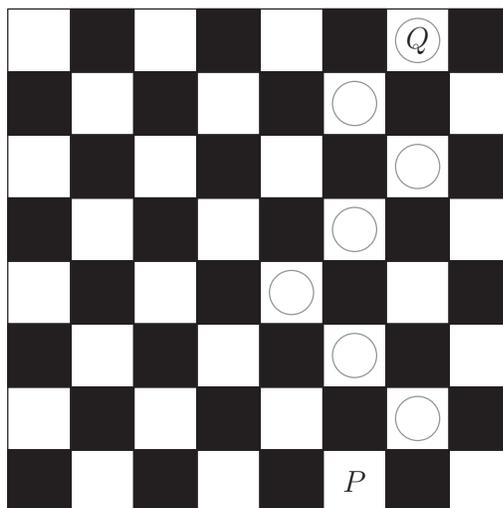
A) 28   **B)** 30   **C)** 32   **D)** 33   **E)** 35

Q22. When a positive integer N is fed into a machine, the output is a number calculated according to the rule shown below.
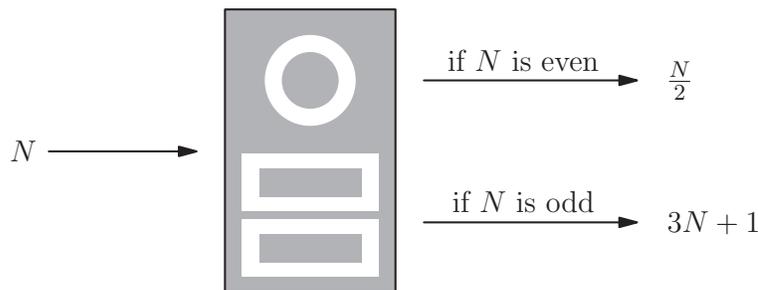
For example, starting with an input of $N = 7$, the machine will output $3 \cdot 7 + 1 = 22$. Then if the output is repeatedly inserted into the machine five more times, the final output is 26.

$$7 \to 22 \to 11 \to 34 \to 17 \to 52 \to 26$$

When the same 6-step process is applied to a different starting value of N, the final output is 1. What is the sum of all such integers N?

$$N \to \underline{\quad} \to \underline{\quad} \to \underline{\quad} \to \underline{\quad} \to \underline{\quad} \to 1$$

A) 73   **B)** 74   **C)** 75   **D)** 82   **E)** 83

Q23. Five different awards are to be given to three students. Each student will receive at least one award. In how many different ways can the awards be distributed?

**A)** 120   **B)** 150   **C)** 180   **D)** 210   **E)** 240

Q24. A large square region is paved with n^2 gray square tiles, each measuring s inches on a side. A border d inches wide surrounds each tile. The figure below shows the case for $n = 3$. When $n = 24$, the 576 gray tiles cover 64% of the area of the large square region. What is the ratio $\dfrac{d}{s}$ for this larger value of n?
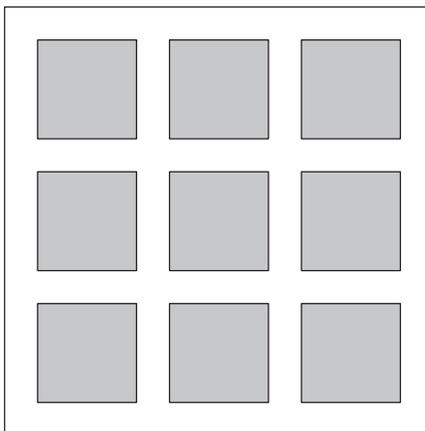
A) $\dfrac{6}{25}$ **B)** $\dfrac{1}{4}$ **C)** $\dfrac{9}{25}$ **D)** $\dfrac{7}{16}$ **E)** $\dfrac{9}{16}$

Q25. Rectangles R_1 and R_2, and squares S_1, S_2, and S_3, shown below, combine to form a rectangle that is 3322 units wide and 2020 units high. What is the side length of S_2 in units?
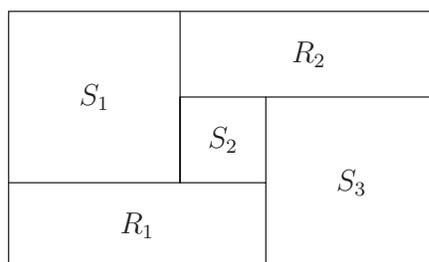

A) 651   **B)** 655   **C)** 656   **D)** 662   **E)** 666

非淡泊无以明志，非宁静无以致远。

Q1. Ike and Mike go into a sandwich shop with a total of $30.00 to spend. Sandwiches cost $4.50 each and soft drinks cost $1.00 each. Ike and Mike plan to buy as many sandwiches as they can and use the remaining money to buy soft drinks. Counting both soft drinks and sandwiches, how many items will they buy?

A) 6   **B)** 5   **C)** 8   **D)** 9   **E)** 2

Q2. Three identical rectangles are put together to form rectangle $ABCD$, as shown in the figure below. Given that the length of the shorter side of each of the smaller rectangles is 5 feet, what is the area in square feet of rectangle $ABCD$?
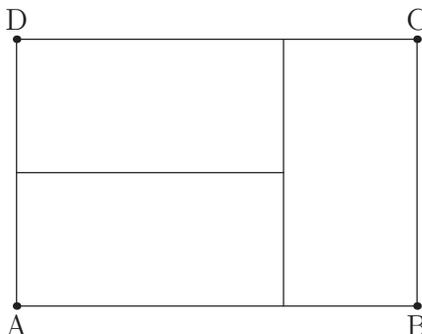
A) 45   **B)** 75   **C)** 100   **D)** 125   **E)** 150

Q3. Which of the following is the correct order of the fractions $\frac{15}{11}, \frac{19}{15}$, and $\frac{17}{13}$, from least to greatest?

A) $\frac{15}{11} < \frac{17}{13} < \frac{19}{15}$ **B)** $\frac{15}{11} < \frac{19}{15} < \frac{17}{13}$ **C)** $\frac{17}{13} < \frac{19}{15} < \frac{15}{11}$ **D)** $\frac{19}{15} < \frac{15}{11} < \frac{17}{13}$ **E)** $\frac{19}{15} < \frac{17}{13} < \frac{15}{11}$

Q4. Quadrilateral $ABCD$ is a rhombus with perimeter 52 meters. The length of diagonal $\overline{AC}$ is 24 meters. What is the area in square meters of rhombus $ABCD$?
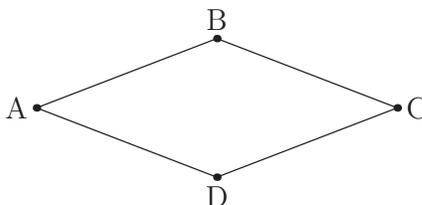

**A)** 60   **B)** 90   **C)** 105   **D)** 120   **E)** 144

Q5. A tortoise challenges a hare to a race. The hare eagerly agrees and quickly runs ahead, leaving the slow-moving tortoise behind. Confident that he will win, the hare stops to take a nap. Meanwhile, the tortoise walks at a slow steady pace for the entire race. The hare awakes and runs to the finish line, only to find the tortoise already there. Which of the following graphs matches the description of the race, showing the distance d traveled by the two animals over time t from start to finish?
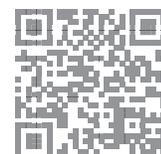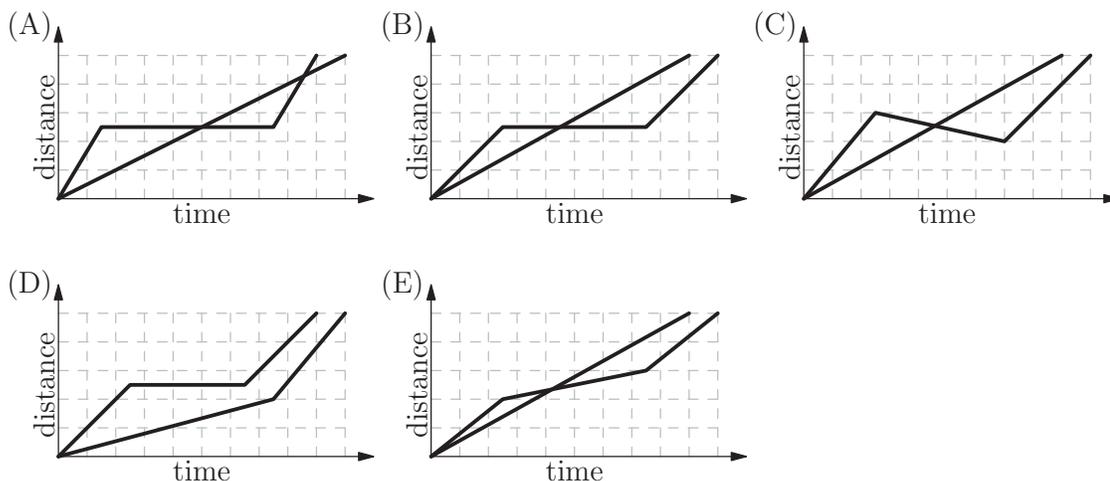
Q6. There are 81 grid points (uniformly spaced) in the square shown in the diagram below, including the points on the edges. Point P is in the center of the square. Given that point Q is randomly chosen among the other 80 points, what is the probability that the line PQ is a line of symmetry for the square?
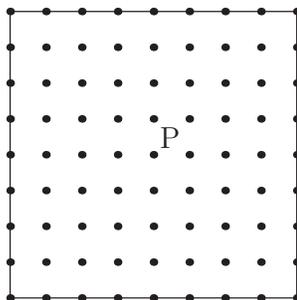
A) $\frac{1}{5}$ **B)** $\frac{1}{4}$ **C)** $\frac{2}{5}$ **D)** $\frac{9}{20}$ **E)** $\frac{1}{2}$

Q7. Shauna takes five tests, each worth a maximum of 100 points. Her scores on the first three tests are 76, 94, and 87. In order to average 81 for all five tests, what is the lowest score she could earn on one of the other two tests?

A) 48   **B)** 52   **C)** 66   **D)** 70   **E)** 74

Q8. Gilda has a bag of marbles. She gives 20% of them to her friend Pedro. Then Gilda gives 10% of what is left to another friend, Ebony. Finally, Gilda gives 25% of what is now left in the bag to her brother Jimmy. What percentage of her original bag of marbles does Gilda have left for herself?

A) 20   **B)** $33\frac{1}{3}$ **C)** 38   **D)** 45   **E)** 54

Q9. Alex and Felicia each have cats as pets. Alex buys cat food in cylindrical cans that are 6 cm in diameter and 12 cm high. Felicia buys cat food in cylindrical cans that are 12 cm in diameter and 6 cm high. What is the ratio of the volume one of Alex's cans to the volume one of Felicia's cans?

A) $1:4$ **B)** $1:2$ **C)** $1:1$ **D)** $2:1$ **E)** $4:1$

Q10. The diagram shows the number of students at soccer practice each weekday during last week. After computing the mean and median values, Coach discovers that there were actually 21 participants on Wednesday. Which of the following statements describes the change in the mean and median after the correction is made?


Number of students at soccer practice
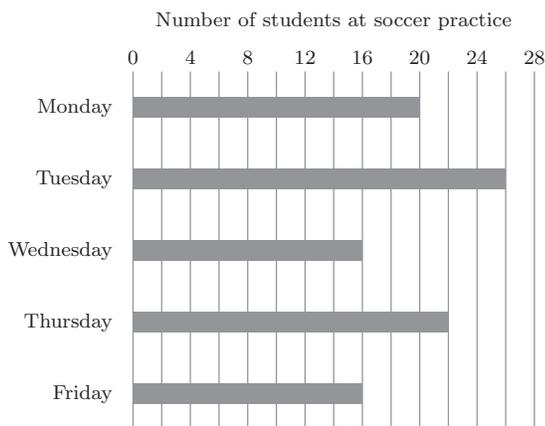
A) The mean increases by 1 and the median does not change.

B) The mean increases by 1 and the median increases by 1.

C) The mean increases by 1 and the median increases by 5.

D) The mean increases by 5 and the median increases by 1.

E) The mean increases by 5 and the median increases by 5.
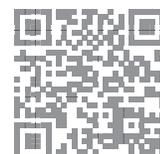
Q11. The eighth grade class at Lincoln Middle School has 93 students. Each student takes a math class or a foreign language class or both. There are 70 eighth graders taking a math class, and there are 54 eight graders taking a foreign language class. How many eighth graders take "only" a math class and "not" a foreign language class?

    A) 16   **B)** 23   **C)** 31   **D)** 39   **E)** 70

Q12. The faces of a cube are painted in six different colors: red (R), white (W), green (G), brown (B), aqua (A), and purple (P). Three views of the cube are shown below. What is the color of the face opposite the aqua face?
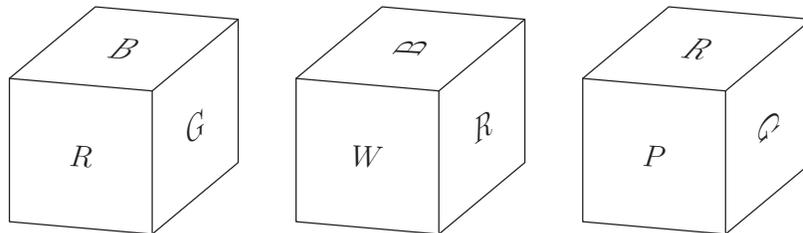
    A) red   **B)** white   **C)** green   **D)** brown   **E)** purple

Q13. A "palindrome" is a number that has the same value when read from left to right or from right to left. (For example 12321 is a palindrome.) Let N be the least three-digit integer which is not a palindrome but which is the sum of three distinct two-digit palindromes. What is the sum of the digits of N?

    A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

Q14. Isabella has 6 coupons that can be redeemed for free ice cream cones at Pete's Sweet Treats. In order to make the coupons last, she decides that she will redeem one every 10 days until she has used them all. She knows that Pete's is closed on Sundays, but as she circles the 6 dates on her calendar, she realizes that no circled date falls on a Sunday. On what day of the week does Isabella redeem her first coupon?

   **A)** Monday   **B)** Tuesday   **C)** Wednesday   **D)** Thursday   **E)** Friday

Q15. On a beach 50 people are wearing sunglasses and 35 people are wearing caps. Some people are wearing both sunglasses and caps. If one of the people wearing a cap is selected at random, the probability that this person is is also wearing sunglasses is $\frac{2}{5}$. If instead, someone wearing sunglasses is selected at random, what is the probability that this person is also wearing a cap?

    A) $\frac{14}{85}$ **B)** $\frac{7}{25}$ **C)** $\frac{2}{5}$ **D)** $\frac{4}{7}$ **E)** $\frac{7}{10}$

Q16. Qiang drives 15 miles at an average speed of 30 miles per hour. How many additional miles will he have to drive at 55 miles per hour to average 50 miles per hour for the entire trip?

    A) 45   **B)** 62   **C)** 90   **D)** 110   **E)** 135

Q17. What is the value of the product

$$\left(\frac{1\cdot 3}{2\cdot 2}\right)\left(\frac{2\cdot 4}{3\cdot 3}\right)\left(\frac{3\cdot 5}{4\cdot 4}\right)\cdots\left(\frac{97\cdot 99}{98\cdot 98}\right)\left(\frac{98\cdot 100}{99\cdot 99}\right)?$$

    A) $\frac{1}{2}$ **B)** $\frac{50}{99}$ **C)** $\frac{9800}{9801}$ **D)** $\frac{100}{99}$ **E)** 50

Q18. The faces of each of two fair dice are numbered 1, 2, 3, 5, 7, and 8. When the two dice are tossed, what is the probability that their sum will be an even number?

    A) $\frac{4}{9}$ **B)** $\frac{1}{2}$ **C)** $\frac{5}{9}$ **D)** $\frac{3}{5}$ **E)** $\frac{2}{3}$
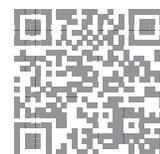
Q19. In a tournament there are six teams that play each other twice. A team earns 3 points for a win, 1 point for a draw, and 0 points for a loss. After all the games have been played it turns out that the top three teams earned the same number of total points. What is the greatest possible number of total points for each of the top three teams?

A) 22 **B)** 23 **C)** 24 **D)** 26 **E)** 30

Q20. How many different real numbers x satisfy the equation

$$(x^2 - 5)^2 = 16?$$

A) 0 **B)** 1 **C)** 2 **D)** 4 **E)** 8

Q21. What is the area of the triangle formed by the lines $y = 5$, $y = 1 + x$, and $y = 1 - x$?

A) 4 **B)** 8 **C)** 10 **D)** 12 **E)** 16

Q22. A store increased the original price of a shirt by a certain percent and then lowered the new price by the same amount. Given that the resulting price was 84% of the original price, by what percent was the price increased and decreased?

A) 16 **B)** 20 **C)** 28 **D)** 36 **E)** 40

Q23. After Euclid High School's last basketball game, it was determined that $\frac{1}{4}$ of the team's points were scored by Alexa and $\frac{2}{7}$ were scored by Brittany. Chelsea scored 15 points. None of the other 7 team members scored more than 2 points. What was the total number of points scored by the other 7 team members?

A) 10 **B)** 11 **C)** 12 **D)** 13 **E)** 14

Q24. In triangle ABC, point D divides side $\overline{AC}$ so that $AD : DC = 1 : 2$. Let E be the midpoint of $\overline{BD}$ and let F be the point of intersection of line BC and line AE. Given that the area of $\triangle ABC$ is 360, what is the area of $\triangle EBF$?
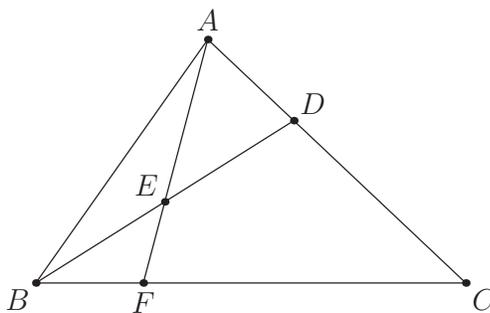

A) 24 **B)** 30 **C)** 32 **D)** 36 **E)** 40

Q25. Alice has 24 apples. In how many ways can she share them with Becky and Chris so that each of the three people has at least two apples?

A) 105 **B)** 114 **C)** 190 **D)** 210 **E)** 380

Q1. An amusement park has a collection of scale models, with a ratio $1:20$, of buildings and other sights from around the country. The height of the United States Capitol is 289 feet. What is the height in feet of its duplicate to the nearest whole number?

    A) 14   **B)** 15   **C)** 16   **D)** 18   **E)** 20

Q2. What is the value of the product

$$\left(1+\frac{1}{1}\right)\cdot\left(1+\frac{1}{2}\right)\cdot\left(1+\frac{1}{3}\right)\cdot\left(1+\frac{1}{4}\right)\cdot\left(1+\frac{1}{5}\right)\cdot\left(1+\frac{1}{6}\right)?$$

    A) $\frac{7}{6}$ **B)** $\frac{4}{3}$ **C)** $\frac{7}{2}$ **D)** 7   **E)** 8

Q3. Students Arn, Bob, Cyd, Dan, Eve, and Fon are arranged in that order in a circle. They start counting: Arn first, then Bob, and so forth. When the number contains a 7 as a digit (such as 47) or is a multiple of 7 that person leaves the circle and the counting continues. Who is the last one present in the circle?

    A) Arn   **B)** Bob   **C)** Cyd   **D)** Dan   **E)** Eve

Q4. The twelve-sided figure shown has been drawn on 1 cm $\times$ 1 cm graph paper. What is the area of the figure in cm^2?
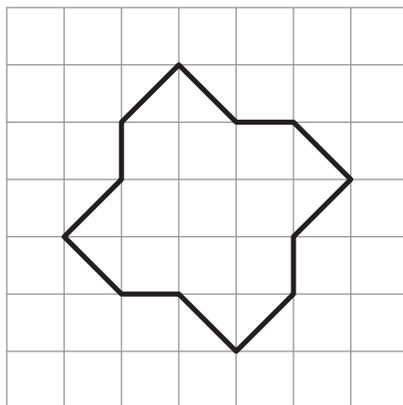
    A) 12   **B)** 12.5   **C)** 13   **D)** 13.5   **E)** 14

Q5. What is the value of $1+3+5+\cdots+2017+2019-2-4-6-\cdots-2016-2018$?

    A) -1010 **B)** -1009 **C)** 1008   **D)** 1009   **E)** 1010

Q6. On a trip to the beach, Anh traveled 50 miles on the highway and 10 miles on a coastal access road. He drove three times as fast on the highway as on the coastal road. If Anh spent 30 minutes driving on the coastal road, how many minutes did his entire trip take?

    A) 50   **B)** 70   **C)** 80   **D)** 90   **E)** 100

Q7. The 5-digit number $\underline{2}\,\underline{0}\,\underline{1}\,\underline{8}\,\underline{U}$ is divisible by 9. What is the remainder when this number is divided by 8?

    A) 1   **B)** 3   **C)** 5   **D)** 6   **E)** 7

Q8. Mr. Garcia asked the members of his health class how many days last week they exercised for at least 30 minutes. The results are summarized in the following bar graph, where the heights of the bars represent the number of students.
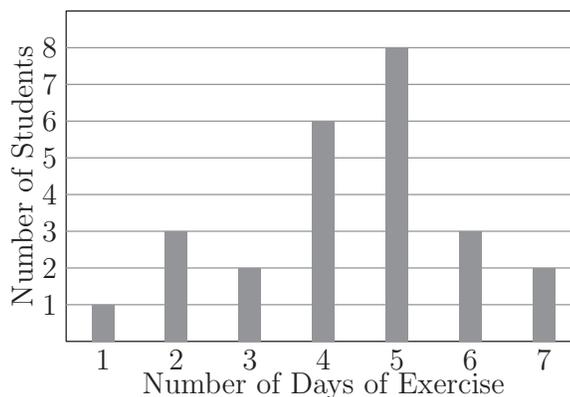
What was the mean number of days of exercise last week, rounded to the nearest hundredth, reported by the students in Mr. Garcia's class?

A) 3.50   **B)** 3.57   **C)** 4.36   **D)** 4.50   **E)** 5.00

Q9. Bob is tiling the floor of his 12 foot by 16 foot living room. He plans to place one-foot by one-foot square tiles to form a border along the edges of the room and to fill in the rest of the floor with two-foot by two-foot square tiles. How many tiles will he use?

A) 48   **B)** 87   **C)** 89   **D)** 96   **E)** 120

Q10. The harmonic mean of a set of non-zero numbers is the reciprocal of the average of the reciprocals of the numbers. What is the harmonic mean of 1, 2, and 4?

A) $\frac{3}{7}$ **B)** $\frac{7}{12}$ **C)** $\frac{12}{7}$ **D)** $\frac{7}{4}$ **E)** $\frac{7}{3}$

Q11. Abby, Bridget, and four of their classmates will be seated in two rows of three for a group picture, as shown.

$$\begin{matrix} X & X & X \\ X & X & X \end{matrix}$$

If the seating positions are assigned randomly, what is the probability that Abby and Bridget are adjacent to each other in the same row or the same column?

A) $\frac{1}{3}$ **B)** $\frac{2}{5}$ **C)** $\frac{7}{15}$ **D)** $\frac{1}{2}$ **E)** $\frac{2}{3}$

Q12. The clock in Sri's car, which is not accurate, gains time at a constant rate. One day as he begins shopping he notes that his car clock and his watch (which is accurate) both say 12:00 noon. When he is done shopping, his watch says 12:30 and his car clock says 12:35. Later that day, Sri loses his watch. He looks at his car clock and it says 7:00. What is the actual time?

**A)** $5:50$ **B)** $6:00$ **C)** $6:30$ **D)** $6:55$ **E)** $8:10$

Q13. Laila took five math tests, each worth a maximum of 100 points. Laila's score on each test was an integer between 0 and 100, inclusive. Laila received the same score on the first four tests, and she received a higher score on the last test. Her average score on the five tests was 82. How many values are possible for Laila's score on the last test?
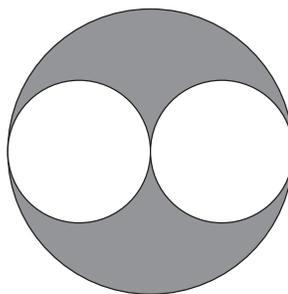
A) 4   **B)** 5   **C)** 9   **D)** 10   **E)** 18

Q14. Let N be the greatest five-digit number whose digits have a product of 120. What is the sum of the digits of N?

A) 15   **B)** 16   **C)** 17   **D)** 18   **E)** 20

Q15. In the diagram below, a diameter of each of the two smaller circles is a radius of the larger circle. If the two smaller circles have a combined area of 1 square unit, then what is the area of the shaded region, in square units?
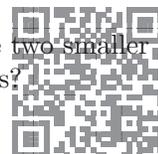
A) $\frac{1}{4}$ **B)** $\frac{1}{3}$ **C)** $\frac{1}{2}$ **D)** 1 **E)** $\frac{\pi}{2}$

Q16. Professor Chang has nine different language books lined up on a bookshelf: two Arabic, three German, and four Spanish. How many ways are there to arrange the nine books on the shelf keeping the Arabic books together and keeping the Spanish books together?

A) 1440 **B)** 2880 **C)** 5760 **D)** 182,440 **E)** 362,880

Q17. Bella begins to walk from her house toward her friend Ella's house. At the same time, Ella begins to ride her bicycle toward Bella's house. They each maintain a constant speed, and Ella rides 5 times as fast as Bella walks. The distance between their houses is 2 miles, which is 10,560 feet, and Bella covers $2\frac{1}{2}$ feet with each step. How many steps will Bella take by the time she meets Ella?

A) 704 **B)** 845 **C)** 1056 **D)** 1760 **E)** 3520

**Q18**. How many positive factors does 23,232 have?

A) 9 **B)** 12 **C)** 28 **D)** 36 **E)** 42

Q19. In a sign pyramid a cell gets a "+" if the two cells below it have the same sign, and it gets a "-" if the two cells below it have different signs. The diagram below illustrates a sign pyramid with four levels. How many possible ways are there to fill the four cells in the bottom row to produce a "+" at the top of the pyramid?
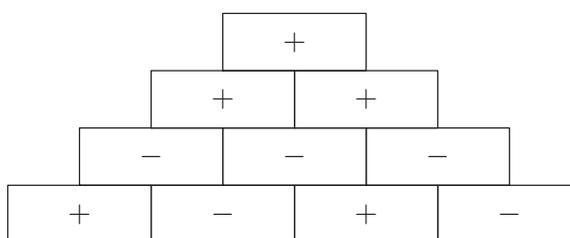
A) 2 **B)** 4 **C)** 8 **D)** 12 **E)** 16

Q20. In $\triangle ABC$, a point E is on $\overline{AB}$ with $AE = 1$ and $EB = 2$. Point D is on $\overline{AC}$ so that $\overline{DE} \parallel \overline{BC}$ and point F is on $\overline{BC}$ so that $\overline{EF} \parallel \overline{AC}$. What is the ratio of the area of $CDEF$ to the area of $\triangle ABC$?
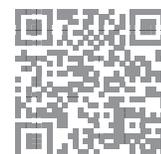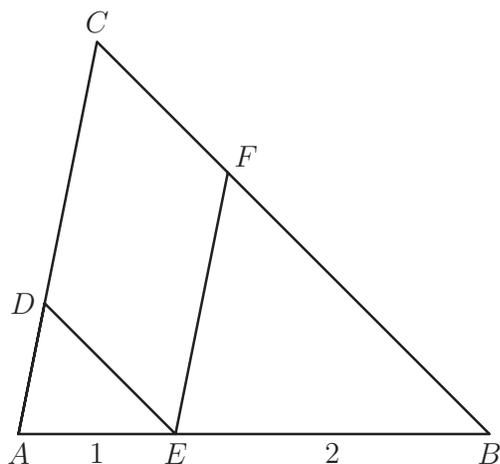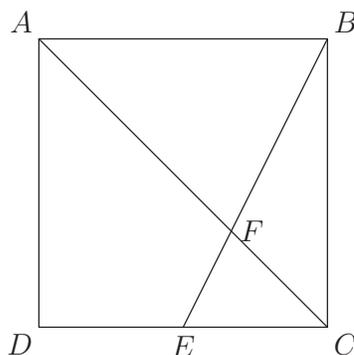
A) $\frac{4}{9}$ **B)** $\frac{1}{2}$ **C)** $\frac{5}{9}$ **D)** $\frac{3}{5}$ **E)** $\frac{2}{3}$

Q21. How many positive three-digit integers have a remainder of 2 when divided by 6, a remainder of 5 when divided by 9, and a remainder of 7 when divided by 11?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q22. Point E is the midpoint of side $\overline{CD}$ in square $ABCD$, and $\overline{BE}$ meets diagonal $\overline{AC}$ at F. The area of quadrilateral $AFED$ is 45. What is the area of $ABCD$?


**A)** 100   **B)** 108   **C)** 120   **D)** 135   **E)** 144

Q23. From a regular octagon, a triangle is formed by connecting three randomly chosen vertices of the octagon. What is the probability that at least one of the sides of the triangle is also a side of the octagon?
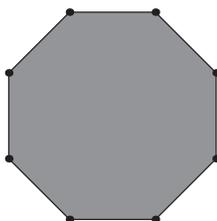
A) $\frac{2}{7}$ **B)** $\frac{5}{42}$ **C)** $\frac{11}{14}$ **D)** $\frac{5}{7}$ **E)** $\frac{6}{7}$

Q24. In the cube $ABCDEFGH$ with opposite vertices C and E, J and I are the midpoints of segments $\overline{FB}$ and $\overline{HD}$, respectively. Let R be the ratio of the area of the cross-section $EJCI$ to the area of one of the faces of the cube. What is R^2?
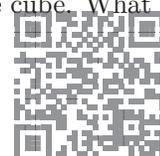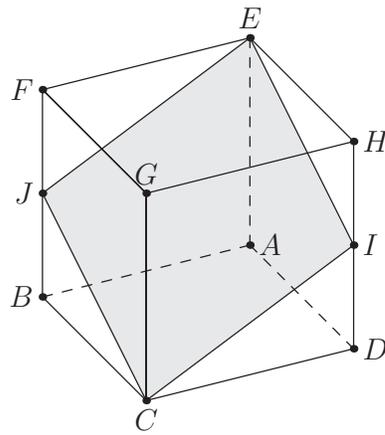
A) $\frac{5}{4}$ **B)** $\frac{4}{3}$ **C)** $\frac{3}{2}$ **D)** $\frac{25}{16}$ **E)** $\frac{9}{4}$

**Q25**. How many perfect cubes lie between $2^8 + 1$ and $2^{18} + 1$, inclusive?

A) 4   **B)** 9   **C)** 10   **D)** 57   **E)** 58

Q1. Which of the following values is largest?

A) $2 + 0 + 1 + 7$ **B)** $2 \times 0 + 1 + 7$ **C)** $2 + 0 \times 1 + 7$ **D)** $2 + 0 + 1 \times 7$ **E)** $2 \times 0 \times 1 \times 7$

Q2. Alicia, Brenda, and Colby were the candidates in a recent election for student president. The pie chart below shows how the votes were distributed among the three candidates. If Brenda received 36 votes, then how many votes were cast all together?
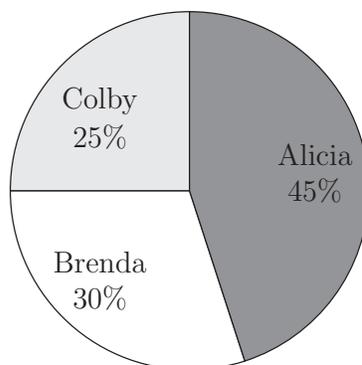
A) 70   **B)** 84   **C)** 100   **D)** 106   **E)** 120

Q3. What is the value of the expression $\sqrt{16\sqrt{8\sqrt{4}}}$?

A) 4   **B)** $4\sqrt{2}$ **C)** 8   **D)** $8\sqrt{2}$ **E)** 16

Q4. When 0.000315 is multiplied by $7,928,564$ the product is closest to which of the following?

A) 210   **B)** 240   **C)** 2100   **D)** 2400   **E)** 24000

Q5. What is the value of the expression

$$\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8}{1 + 2 + 3 + 4 + 5 + 6 + 7 + 8}?$$

A) 1020   **B)** 1120   **C)** 1220   **D)** 2240   **E)** 3360

Q6. If the degree measures of the angles of a triangle are in the ratio $3 : 3 : 4$, what is the degree measure of the largest angle of the triangle?

A) 18   **B)** 36   **C)** 60   **D)** 72   **E)** 90

Q7. Let Z be a 6-digit positive integer, such as 247247, whose first three digits are the same as its last three digits taken in the same order. Which of the following numbers must also be a factor of Z?

**A)** 11   **B)** 19   **C)** 101   **D)** 111   **E)** 1111

Q8. Malcolm wants to visit Isabella after school today and knows the street where she lives but doesn't know her house number. She tells him, "My house number has two digits, and exactly three of the following four statements about it are true."

(1) It is prime.

(2) It is even.

(3) It is divisible by 7.

(4) One of its digits is 9.

This information allows Malcolm to determine Isabella's house number. What is its units digit?
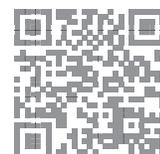
A) 4 **B)** 6 **C)** 7 **D)** 8 **E)** 9

Q9. All of Macy's marbles are blue, red, green, or yellow. One third of her marbles are blue, one fourth of them are red, and six of them are green. What is the smallest number of yellow marbles that Macy could have?

A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 5

Q10. A box contains five cards, numbered 1, 2, 3, 4, and 5. Three cards are selected randomly without replacement from the box. What is the probability that 4 is the largest value selected?

A) $\frac{1}{10}$ **B)** $\frac{1}{5}$ **C)** $\frac{3}{10}$ **D)** $\frac{2}{5}$ **E)** $\frac{1}{2}$

Q11. A square-shaped floor is covered with congruent square tiles. If the total number of tiles that lie on the two diagonals is 37, how many tiles cover the floor?

A) 148 **B)** 324 **C)** 361 **D)** 1296 **E)** 1369

Q12. The smallest positive integer greater than 1 that leaves a remainder of 1 when divided by 4, 5, and 6 lies between which of the following pairs of numbers?

A) 2 and 19 **B)** 20 and 39 **C)** 40 and 59 **D)** 60 and 79 **E)** 80 and 124

Q13. Peter, Emma, and Kyler played chess with each other. Peter won 4 games and lost 2 games. Emma won 3 games and lost 3 games. If Kyler lost 3 games, how many games did he win?

A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 4

Q14. Chloe and Zoe are both students in Ms. Demeanor's math class. Last night they each solved half of the problems in their homework assignment alone and then solved the other half together. Chloe had correct answers to only 80% of the problems she solved alone, but overall 88% of her answers were correct. Zoe had correct answers to 90% of the problems she solved alone. What was Zoe's overall percentage of correct answers?

A) 89 **B)** 92 **C)** 93 **D)** 96 **E)** 98

Q15. In the arrangement of letters and numerals below, by how many different paths can one spell AMC8? Beginning at the A in the middle, a path only allows moves from one letter to an adjacent (above, below, left, or right, but not diagonal) letter. One example of such a path is traced in the picture.

$$
\begin{array}{ccccc}
 & 8 & C & 8 & \\
8 & C & M & C & 8 \\
C & M & A & M & C \\
8 & C & M & C & 8 \\
 & 8 & C & 8 &
\end{array}
$$

A) 8 **B)** 9 **C)** 12 **D)** 24 **E)** 36

Q16. In the figure below, choose point D on $\overline{BC}$ so that $\triangle ACD$ and $\triangle ABD$ have equal perimeters. What is the area of $\triangle ABD$?
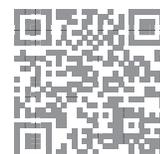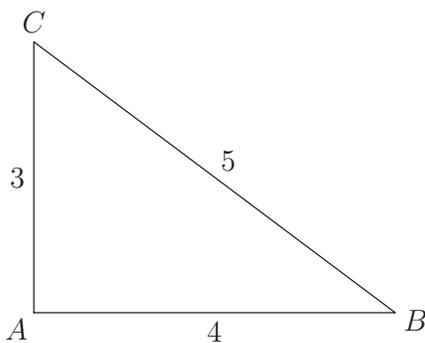
A) $\frac{3}{4}$ **B)** $\frac{3}{2}$ **C)** 2   **D)** $\frac{12}{5}$ **E)** $\frac{5}{2}$

Q17. Starting with some gold coins and some empty treasure chests, I tried to put 9 gold coins in each treasure chest, but that left 2 treasure chests empty. So instead I put 6 gold coins in each treasure chest, but then I had 3 gold coins left over. How many gold coins did I have?

A) 9   **B)** 27   **C)** 45   **D)** 63   **E)** 81

Q18. In the non-convex quadrilateral $ABCD$ shown below, $\angle BCD$ is a right angle, $AB = 12$, $BC = 4$, $CD = 3$, and $AD = 13$.
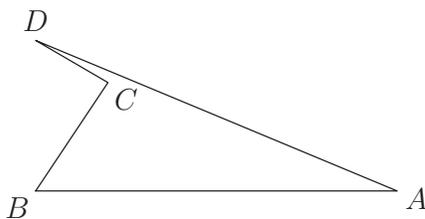
What is the area of quadrilateral $ABCD$?

A) 12   **B)** 24   **C)** 26   **D)** 30   **E)** 36

Q19. For any positive integer M, the notation $M!$ denotes the product of the integers 1 through M. What is the largest integer n for which 5^n is a factor of the sum $98! + 99! + 100!$?

**A)** 23   **B)** 24   **C)** 25   **D)** 26   **E)** 27

Q20. An integer between 1000 and 9999, inclusive, is chosen at random. What is the probability that it is an odd integer whose digits are all distinct?

A) $\frac{14}{75}$ **B)** $\frac{56}{225}$ **C)** $\frac{107}{400}$ **D)** $\frac{7}{25}$ **E)** $\frac{9}{25}$

Q21. Suppose a, b, and c are nonzero real numbers, and $a + b + c = 0$. What are the possible value(s) for $\frac{a}{|a|} + \frac{b}{|b|} + \frac{c}{|c|} + \frac{abc}{|abc|}$?

A) 0   **B)** 1 and -1 **C)** 2 and -2 **D)** $0, 2$ and -2 **E)** $0, 1$ and -1

Q22. In the right triangle ABC, $AC = 12$, $BC = 5$, and angle C is a right angle. A semicircle is inscribed in the triangle as shown. What is the radius of the semicircle?

    非淡泊无以明志，非宁静无以致远。
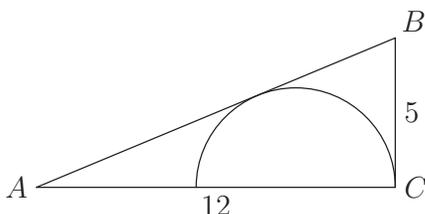
A) $\frac{7}{6}$ **B)** $\frac{13}{5}$ **C)** $\frac{59}{18}$ **D)** $\frac{10}{3}$ **E)** $\frac{60}{13}$

Q23. Each day for four days, Linda traveled for one hour at a speed that resulted in her traveling one mile in an integer number of minutes. Each day after the first, her speed decreased so that the number of minutes to travel one mile increased by 5 minutes over the preceding day. Each of the four days, her distance traveled was also an integer number of miles. What was the total number of miles for the four trips?

A) 10   **B)** 15   **C)** 25   **D)** 50   **E)** 82

Q24. Mrs. Sanders has three grandchildren, who call her regularly. One calls her every three days, one calls her every four days, and one calls her every five days. All three called her on December 31, 2016. On how many days during the next year did she not receive a phone call from any of her grandchildren?
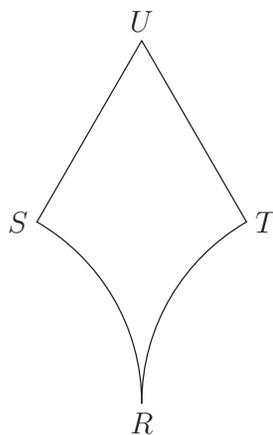
A) 78   **B)** 80   **C)** 144   **D)** 146   **E)** 152

Q25. In the figure shown, $\overline{US}$ and $\overline{UT}$ are line segments each of length 2, and $m\angle TUS = 60°$. Arcs $\overset{\frown}{TR}$ and $\overset{\frown}{SR}$ are each one-sixth of a circle with radius 2. What is the area of the region shown?

A) $3\sqrt{3} - \pi$ **B)** $4\sqrt{3} - \frac{4\pi}{3}$ **C)** $2\sqrt{3}$ **D)** $4\sqrt{3} - \frac{2\pi}{3}$ **E)** $4 + \frac{4\pi}{3}$
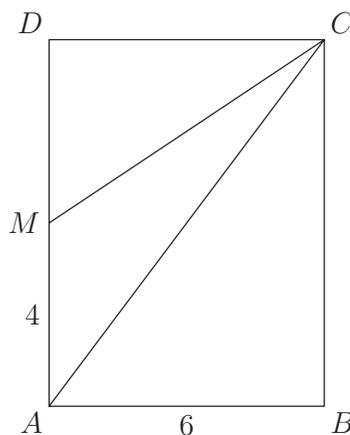
Q1. The longest professional tennis match lasted a total of 11 hours and 5 minutes. How many minutes is that?

  A) 605   **B)** 655   **C)** 665   **D)** 1005   **E)** 1105

Q2. In rectangle $ABCD$, $AB = 6$ and $AD = 8$. Point M is the midpoint of $\overline{AD}$. What is the area of $\triangle AMC$?

  A) 12   **B)** 15   **C)** 18   **D)** 20   **E)** 24

Q3. Four students take an exam. Three of their scores are $70, 80$, and 90. If the average of their four scores is 70, then what is the remaining score?

  A) 40   **B)** 50   **C)** 55   **D)** 60   **E)** 70

Q4. When Cheenu was a boy he could run 15 miles in 3 hours and 30 minutes. As an old man he can now walk 10 miles in 4 hours. How many minutes longer does it take for him to travel a mile now compared to when he was a boy?

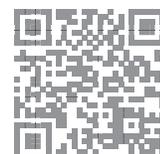 **A)** 6   **B)** 10   **C)** 15   **D)** 18   **E)** 30

Q5. When N is divided by 9, the remainder is 1.

When N is divided by 10, the remainder is 3.

What is the remainder when N is divided by 11?

  A) 0   **B)** 2   **C)** 4   **D)** 5   **E)** 7

Q6. The following bar graph represents the length (in letters) of the names of 19 people. What is the median length of these names?

frequency

name length
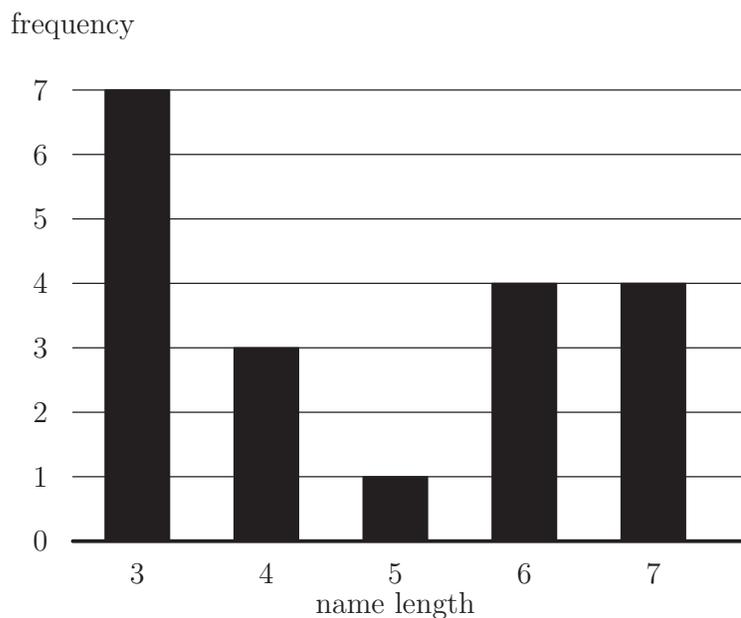
A) 3 **B)** 4 **C)** 5 **D)** 6 **E)** 7

Q7. Which of the following numbers is not a perfect square?

A) 1^{2016} **B)** 2^{2017} **C)** 3^{2018} **D)** 4^{2019} **E)** 5^{2020}

Q8. Find the value of the expression

$$100 - 98 + 96 - 94 + 92 - 90 + \cdots + 8 - 6 + 4 - 2.$$

A) 20 **B)** 40 **C)** 50 **D)** 80 **E)** 100

Q9. What is the sum of the distinct prime integer divisors of 2016?

A) 9 **B)** 12 **C)** 16 **D)** 49 **E)** 63

Q10. Suppose that $a * b$ means $3a - b$. What is the value of x if

$$2 * (5 * x) = 1$$

A) $\frac{1}{10}$ **B)** 2 **C)** $\frac{10}{3}$ **D)** 10 **E)** 14

Q11. Determine how many two-digit numbers satisfy the following property: when the number is added to the number obtained by reversing its digits, the sum is 132.

A) 5 **B)** 7 **C)** 9 **D)** 11 **E)** 12

Q12. Jefferson Middle School has the same number of boys and girls. $\frac{3}{4}$ of the girls and $\frac{2}{3}$ of the boys went on a field trip. What fraction of the students on the field trip were girls?

A) $\frac{1}{2}$ **B)** $\frac{9}{17}$ **C)** $\frac{7}{13}$ **D)** $\frac{2}{3}$ **E)** $\frac{14}{15}$

Q13. Two different numbers are randomly selected from the set $-2, -1, 0, 3, 4, 5$ and multiplied together. What is the probability that the product is 0?

A) $\frac{1}{6}$ **B)** $\frac{1}{5}$ **C)** $\frac{1}{4}$ **D)** $\frac{1}{3}$ **E)** $\frac{1}{2}$
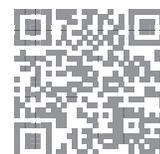
Q14. Karl's car uses a gallon of gas every 35 miles, and his gas tank holds 14 gallons when it is full. One day, Karl started with a full tank of gas, drove 350 miles, bought 8 gallons of gas, and continued driving to his destination. When he arrived, his gas tank was half full. How many miles did Karl drive that day?

     A) 525   **B)** 560   **C)** 595   **D)** 665   **E)** 735

Q15. What is the largest power of 2 that is a divisor of $13^4 - 11^4$?

     A) 8   **B)** 16   **C)** 32   **D)** 64   **E)** 128

Q16. Annie and Bonnie are running laps around a 400-meter oval track. They started together, but Annie has pulled ahead because she runs 25% faster than Bonnie. How many laps will Annie have run when she first passes Bonnie?

     A) $1\frac{1}{4}$ **B)** $3\frac{1}{3}$ **C)** 4   **D)** 5   **E)** 25

Q17. An ATM password at Fred's Bank is composed of four digits from 0 to 9, with repeated digits allowable. If no password may begin with the sequence $9, 1, 1$, then how many passwords are possible?

     A) 30   **B)** 7290   **C)** 9000   **D)** 9990   **E)** 9999

Q18. In an All-Area track meet, 216 sprinters enter a $100-$meter dash competition. The track has 6 lanes, so only 6 sprinters can compete at a time. At the end of each race, the five non-winners are eliminated, and the winner will compete again in a later race. How many races are needed to determine the champion sprinter?

     A) 36   **B)** 42   **C)** 43   **D)** 60   **E)** 72

Q19. The sum of 25 consecutive even integers is $10,000$. What is the largest of these 25 consecutive integers?

     A) 360   **B)** 388   **C)** 412   **D)** 416   **E)** 424

Q20. The least common multiple of a and b is 12, and the least common multiple of b and c is 15. What is the least possible value of the least common multiple of a and c?

     A) 20   **B)** 30   **C)** 60   **D)** 120   **E)** 180

Q21. A top hat contains 3 red chips and 2 green chips. Chips are drawn randomly, one at a time without replacement, until all 3 of the reds are drawn or until both green chips are drawn. What is the probability that the 3 reds are drawn?

     A) $\frac{3}{10}$ **B)** $\frac{2}{5}$ **C)** $\frac{1}{2}$ **D)** $\frac{3}{5}$ **E)** $\frac{7}{10}$

Q22. Rectangle $DEFA$ below is a 3×4 rectangle with $DC = CB = BA$. What is the area of the "bat wings" (shaded area)?
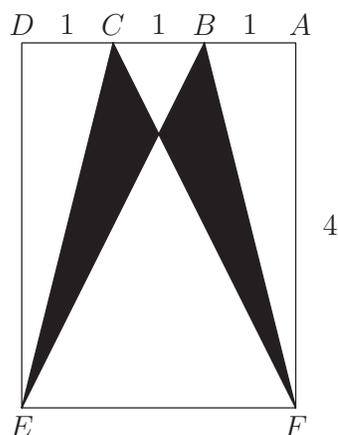
A) 2 　　　　　**B)** $2\frac{1}{2}$ 　　　　　**C)** 3 　　　　　**D)** $3\frac{1}{2}$ 　　　　　**E)** 5

Q23. Two congruent circles centered at points A and B each pass through the other circle's center. The line containing both A and B is extended to intersect the circles at points C and D. The circles intersect at two points, one of which is E. What is the degree measure of $\angle CED$?

A) 90 　　　　**B)** 105 　　　　**C)** 120 　　　　**D)** 135 　　　　**E)** 150

Q24. The digits 1, 2, 3, 4, and 5 are each used once to write a five-digit number $PQRST$. The three-digit number PQR is divisible by 4, the three-digit number QRS is divisible by 5, and the three-digit number RST is divisible by 3. What is P?

A) 1 　　　　**B)** 2 　　　　**C)** 3 　　　　**D)** 4 　　　　**E)** 5

Q25. A semicircle is inscribed in an isosceles triangle with base 16 and height 15 so that the diameter of the semicircle is contained in the base of the triangle as shown. What is the radius of the semicircle?
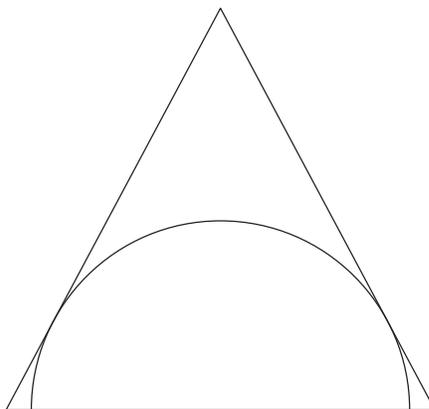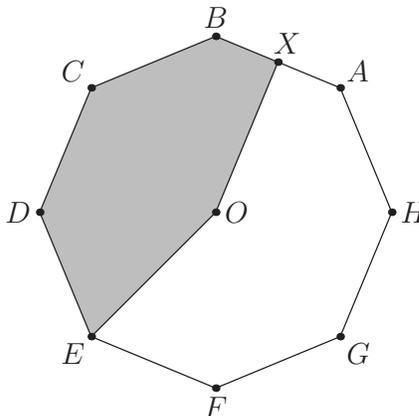

A) $4\sqrt{3}$ 　　　**B)** $\dfrac{120}{17}$ 　　　**C)** 10 　　　**D)** $\dfrac{17\sqrt{2}}{2}$ 　　　**E)** $\dfrac{17\sqrt{3}}{2}$

Q1. How many square yards of carpet are required to cover a rectangular floor that is 12 feet long and 9 feet wide? (There are 3 feet in a yard.)

   A) 12 **B)** 36 **C)** 108 **D)** 324 **E)** 972

Q2. Point O is the center of the regular octagon $ABCDEFGH$, and X is the midpoint of the side $\overline{AB}$. What fraction of the area of the octagon is shaded?

   A) $\frac{11}{32}$ **B)** $\frac{3}{8}$ **C)** $\frac{13}{32}$ **D)** $\frac{7}{16}$ **E)** $\frac{15}{32}$

Q3. Jack and Jill are going swimming at a pool that is one mile from their house. They leave home simultaneously. Jill rides her bicycle to the pool at a constant speed of 10 miles per hour. Jack walks to the pool at a constant speed of 4 miles per hour. How many minutes before Jack does Jill arrive?

   A) 5 **B)** 6 **C)** 8 **D)** 9 **E)** 10

Q4. The Dragonvale Middle School chess team consists of two boys and three girls. A photographer wants to take a picture of the team to appear in the local newspaper. She decides to have them sit in a row with a boy at each end and the three girls in the middle. How many such arrangements are possible?

   A) 2 **B)** 4 **C)** 5 **D)** 6 **E)** 12

Q5. Billy's basketball team scored the following points over the course of the first 11 games of the season:

$$42, 47, 53, 53, 58, 58, 58, 61, 64, 65, 73$$

If his team scores 40 in the 12th game, which of the following statistics will show an increase?

   A) range **B)** median **C)** mean **D)** mode **E)** mid-range

Q6. In $\triangle ABC$, $AB = BC = 29$, and $AC = 42$. What is the area of $\triangle ABC$?

   A) 100 **B)** 420 **C)** 500 **D)** 609 **E)** 701

Q7. Each of two boxes contains three chips numbered 1, 2, 3. A chip is drawn randomly from each box and the numbers on the two chips are multiplied. What is the probability that their product is even?

   A) $\frac{1}{9}$ **B)** $\frac{2}{9}$ **C)** $\frac{4}{9}$ **D)** $\frac{1}{2}$ **E)** $\frac{5}{9}$

Q8. What is the smallest whole number larger than the perimeter of any triangle with a side of length 5 and a side of length 19?

   A) 24 **B)** 29 **C)** 43 **D)** 48 **E)** 57

Q9. On her first day of work, Janabel sold one widget. On day two, she sold three widgets. On day three, she sold five widgets, and on each succeeding day, she sold two more widgets than she had sold on the previous day. How many widgets in total had Janabel sold after working 20 days?

A) 39 **B)** 40 **C)** 210 **D)** 400 **E)** 401

Q10. How many integers between 1000 and 9999 have four distinct digits?

A) 3024 **B)** 4536 **C)** 5040 **D)** 6480 **E)** 6561

Q11. In the small country of Icosahedrontopia, all automobile license plates have four symbols. The first must be a vowel ($A, E, I, O,$ or U), the second and third must be two different letters among the 21 non-vowels, and the fourth must be a digit (0 through 9). If the symbols are chosen at random subject to these conditions, what is the probability that the plate will read "$AMC8$"?

A) $\dfrac{1}{22,050}$ **B)** $\dfrac{1}{21,000}$ **C)** $\dfrac{1}{10,500}$ **D)** $\dfrac{1}{2,100}$ **E)** $\dfrac{1}{1,050}$

Q12. How many pairs of parallel edges, such as $\overline{AB}$ and $\overline{GH}$ or $\overline{EH}$ and $\overline{FG}$, does a cube have?
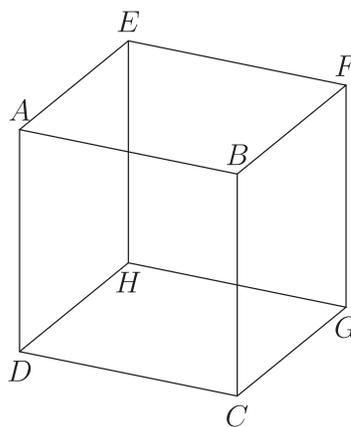
A) 6 **B)** 12 **C)** 18 **D)** 24 **E)** 36

Q13. How many subsets of two elements can be removed from the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$ so that the mean (average) of the remaining numbers is 6?

A) 1 **B)** 2 **C)** 3 **D)** 5 **E)** 6

Q14. Which of the following integers cannot be written as the sum of four consecutive odd integers?

A) 16 **B)** 40 **C)** 72 **D)** 100 **E)** 200

Q15. At Euler Middle School, 198 students voted on two issues in a school referendum with the following results: 149 voted in favor of the first issue and 119 voted in favor of the second issue. If there were exactly 29 students who voted against both issues, how many students voted in favor of both issues?

A) 49 **B)** 70 **C)** 79 **D)** 99 **E)** 149

Q16. In a middle-school mentoring program, a number of the sixth graders are paired with a ninth-grade student as a buddy. No ninth grader is assigned more than one sixth-grade buddy. If $\frac{1}{3}$ of all the ninth graders are paired with $\frac{2}{5}$ of all the sixth graders, what fraction of the total number of sixth and ninth graders have a buddy?

A) $\dfrac{2}{15}$ **B)** $\dfrac{4}{11}$ **C)** $\dfrac{11}{30}$ **D)** $\dfrac{3}{8}$ **E)** $\dfrac{11}{15}$

Q17. Jeremy's father drives him to school in rush hour traffic in 20 minutes. One day there is no traffic, so his father can drive him 18 miles per hour faster and gets him to school in 12 minutes. How far in miles is it to school?

A) 4   **B)** 6   **C)** 8   **D)** 9   **E)** 12

Q18. An arithmetic sequence is a sequence in which each term after the first is obtained by adding a constant to the previous term. For example, $2, 5, 8, 11, 14$ is an arithmetic sequence with five terms, in which the first term is 2 and the constant added is 3. Each row and each column in this 5×5 array is an arithmetic sequence with five terms. What is the value of X?

1				25
		X		
17				81

A) 21   **B)** 31   **C)** 36   **D)** 40   **E)** 42

Q19. A triangle with vertices as $A = (1, 3)$, $B = (5, 1)$, and $C = (4, 4)$ is plotted on a 6×5 grid. What fraction of the grid is covered by the triangle?
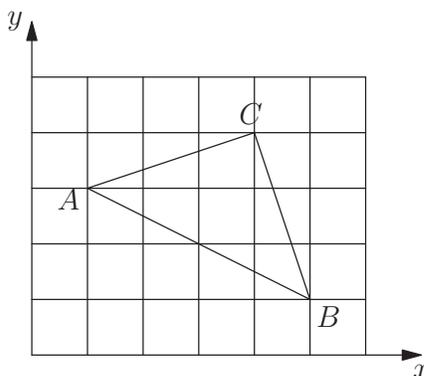

A) $\dfrac{1}{6}$ **B)** $\dfrac{1}{5}$ **C)** $\dfrac{1}{4}$ **D)** $\dfrac{1}{3}$ **E)** $\dfrac{1}{2}$

Q20. Ralph went to the store and bought 12 pairs of socks for a total of \$24. Some of the socks he bought cost \$1 a pair, some of the socks he bought cost \$3 a pair, and some of the socks he bought cost \$4 a pair. If he bought at least one pair of each type, how many pairs of \$1 socks did Ralph buy?

A) 4   **B)** 5   **C)** 6   **D)** 7   **E)** 8

Q21. In the given figure hexagon $ABCDEF$ is equiangular, $ABJI$ and $FEHG$ are squares with areas 18 and 32 respectively, $\triangle JBK$ is equilateral and $FE = BC$. What is the area of $\triangle KBC$?
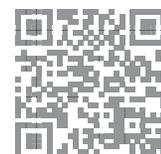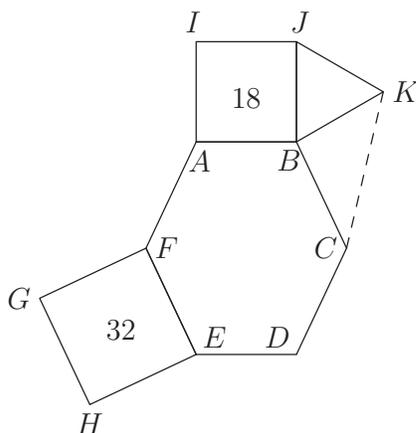
A) $6\sqrt{2}$ **B)** 9   **C)** 12   **D)** $9\sqrt{2}$ **E)** 32.

Q22. On June 1, a group of students are standing in rows, with 15 students in each row. On June 2, the same group is standing with all of the students in one long row. On June 3, the same group is standing with just one student in each row. On June 4, the same group is standing with 6 students in each row. This process continues through June 12 with a different number of students per row each day. However, on June 13, they cannot find a new way of organizing the students. What is the smallest possible number of students in the group?

**A)** 21   **B)** 30   **C)** 60   **D)** 90   **E)** 1080

Q23. Tom has twelve slips of paper which he wants to put into five cups labeled A, B, C, D, E. He wants the sum of the numbers on the slips in each cup to be an integer. Furthermore, he wants the five integers to be consecutive and increasing from A to E. The numbers on the papers are $2, 2, 2, 2.5, 2.5, 3, 3, 3, 3, 3.5, 4$, and 4.5. If a slip with 2 goes into cup E and a slip with 3 goes into cup B, then the slip with 3.5 must go into what cup?

A) A **B)** B **C)** C **D)** D **E)** E

Q24. A baseball league consists of two four-team divisions. Each team plays every other team in its division N games. Each team plays every team in the other division M games with $N > 2M$ and $M > 4$. Each team plays a 76-game schedule. How many games does a team play within its own division?

A) 36   **B)** 48   **C)** 54   **D)** 60   **E)** 72

Q25. One-inch squares are cut from the corners of this 5 inch square. What is the area in square inches of the largest square that can fit into the remaining space?
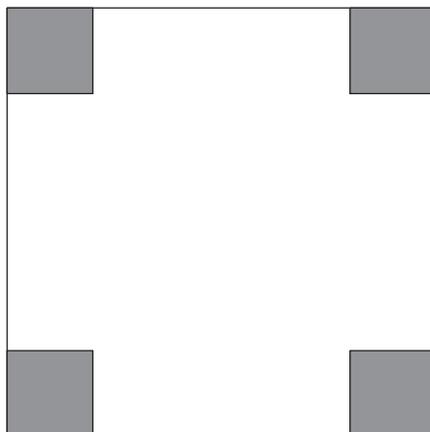
A) 9   **B)** $12\frac{1}{2}$ **C)** 15   **D)** $15\frac{1}{2}$ **E)** 17

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