

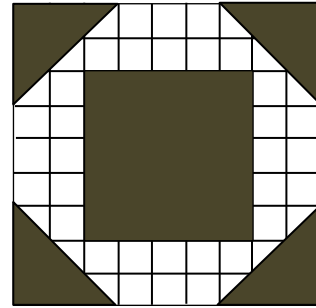
Seventh Grade - Excellence in Mathematics Contest - 2018

1. Marley can do 200 sit-ups at one time. If he averages 2 sit-ups every 5 seconds, how many minutes does it take him to complete 200 sit-ups?

A. $8\frac{1}{6}$ B. $8\frac{1}{4}$ C. $8\frac{1}{3}$ D. $8\frac{1}{2}$ E. $8\frac{2}{3}$

2. What per cent of this square quilt pattern is shaded?
Round to the nearest per cent.

A. 50% B. 51% C. 52%
D. 53% E. 54%

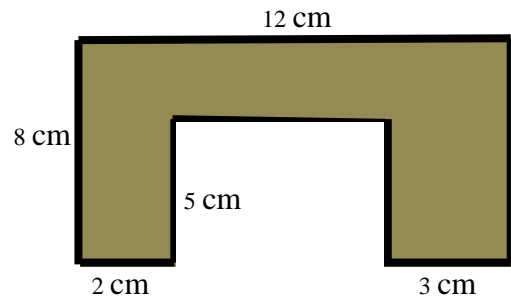


3. If $\frac{18}{42} = \frac{72}{X} = \frac{Y}{28}$, what does $X + Y$ equal?

A. 180 B. 184 C. 188 D. 192 E. 196

4. Using the given measurements, what is the area in square centimeters of the shaded region?
Assume that all angles are right angles.

A. 50 B. 61 C. 66
D. 71 E. Cannot be determined



5. A pair of jeans selling for \$36.80 was put on sale for 25% off. Then a 10% sales tax was applied to the sale price. When she bought this pair of jeans, how much change from a \$50 bill did the customer receive?

A. \$9.52 B. \$18.08 C. \$19.64 D. \$22.40 E. \$39.88

6. Among all the positive factors of 72, one is randomly selected.
What is the probability that it is a multiple of 3?

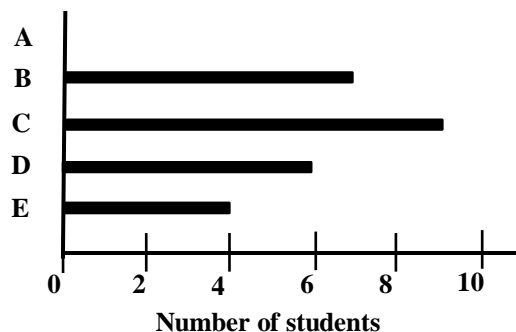
A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{2}{3}$ D. $\frac{7}{12}$ E. $\frac{3}{4}$

7. In his gold medal snowboarding halfpipe run in the 2018 Winter Olympics, Shaun White performed five tricks. On these five tricks, his degrees of rotation were 1440° , 1440° , 540° , 1260° , and 1260° .
What is the total number of rotations that he made?

A. 16 B. $16\frac{1}{2}$ C. 17 D. $17\frac{1}{2}$ E. 18

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8. When Ms. Drew drew the bar graph of her students' test grades, she forgot to draw a bar for the students who scored an A. Twice as many students scored C or better than students who scored less than C. What per cent of the students scored an A? Round to the nearest per cent.



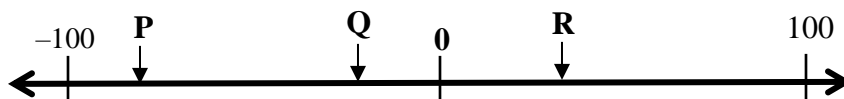
- A. 10% B. 12% C. 13%
D. 15% E. 17%

9. In the following sequence, how many sets of consecutive numbers sum to 12? For example, $6+1+5$
Note: It is possible that some of these sets overlap.

2, 5, 1, 4, 2, 3, 7, 6, 1, 5, 2, 4, 8, 4, 1, 5

- A. Fewer than 6 B. 6 C. 7 D. 8 E. More than 8

10. P, Q, and R represent numbers located on the number line as shown.



How many of the following five expressions represent a negative number?

$R - P$; $Q - P$; $P + Q + R$; $R \cdot Q + P$; $\frac{Q}{P} \cdot R$

- A. 1 B. 2 C. 3 D. 4 E. 5

11. How many 3-digit multiples of 9 can be formed by selecting three distinct digits from the set **{4, 5, 6, 7, 8}**?

- A. 1 B. 2 C. 6 D. 12 E. 18

12. M and N are positive integers such that $M^2 + N^2 = 2018$. What is $M + N$?

- A. 56 B. 58 C. 60 D. 62 E. 64

13. The average weight of the five offensive linemen of the New England Patriots was reported as 321 pounds. When that seemed too high, a coach realized that the weight of center David Andrews had been written down incorrectly. When Andrews' weight was corrected to 295 pounds, the average weight was correctly computed as 311 pounds.

What incorrect weight in pounds had been written for David Andrews?

- A. 325 B. 330 C. 335 D. 340 E. 345

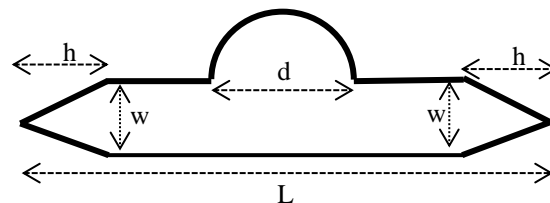
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14. How many ordered pairs (x, y) of positive integers satisfy: $\frac{x}{20} + \frac{y}{12} = 1$?

- A. 2 B. 3 C. 4 D. 5 E. 6

15. A *FoxTrot* cartoon reports this profile of a UFO flying saucer flying over Nevada. Its measurements in meters are:

$h = 4$ m; $w = 3$ m; $d = \sqrt{72/\pi}$ m; $L = 18$ m



In square meters, what is the area of this profile image?

- A. 45 B. 51 C. 60 D. 75 E. 78

16. The product of three integers is -45 . Their sum is 1. What is the least of these three integers?

- A. -15 B. -9 C. -5 D. -3 E. -1

17. Determine the sum of the two numbers which are twice as far from 20 as from 32.

- A. 36 B. 52 C. 68 D. 72 E. 84

18. When two digits of a 3-digit number are exchanged [for example, 971 and 791], the positive difference between the two 3-digit numbers could be:

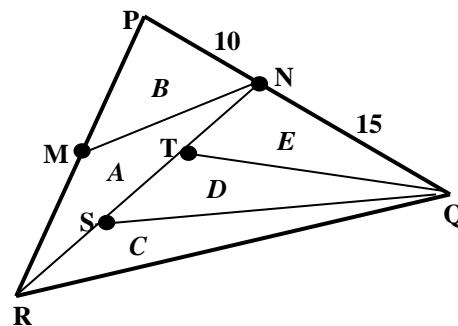
- A. 37 B. 83 C. 101 D. 393 E. 594

19. In 2018, Chris Mazdzer finished second to become the first American male to win an Olympic medal in luge. His total time in four races was only 0.026 seconds behind Austrian David Gleirscher. At a speed of 80 miles per hour, how many inches would Mazdzer travel in 0.026 seconds? Round to the nearest inch. There are 5280 feet in 1 mile.

- A. 20 B. 37 C. 44 D. 56 E. 64

20. On triangle PRQ , N is on PQ such that $PN = 10$ cm and $NQ = 15$ cm. M is the bisector of PR . Points S and T trisect RN . Which of the five triangles, A through E , has the largest area?

- A. B only B. E only C. A and B only
 D. $C, D,$ and E only E. All five have the same area



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21. $2^6 * 4^3 * 8^2 = 2^N$ What does N equal?
 A. 16 B. 17 C. 18 D. 19 E. 23

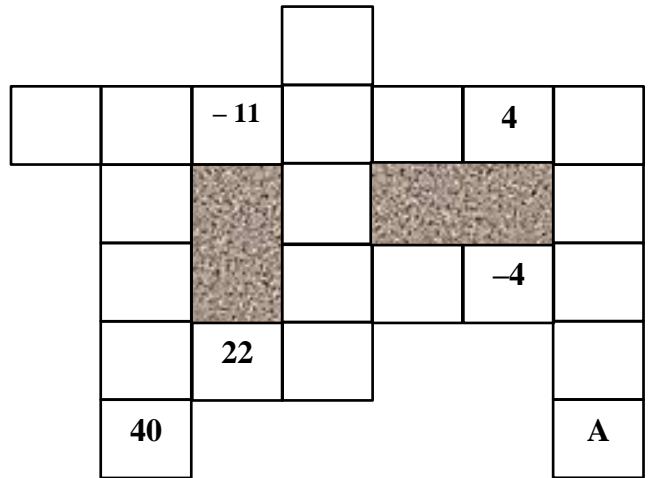
22. In January 2018, the US GDP per capita [a measure of American wealth] was \$59,000. Warren Buffet predicted that it would rise by 1.2% per year for each of the next 15 years. According to his prediction, what will the GDP per capita be in January 2033? Round to the nearest hundred dollars.
 A. \$69,600 B. \$70,600 C. \$165,200 D. \$253,300 E. \$322,900

23. The numbers in each row and in each column of white (unshaded) squares form an increasing arithmetic sequence or a decreasing arithmetic sequence.

For example: 3, 7, 10, 13,... OR 16, 6, -4, -14,...

What number is in the cell marked "A"?

- A. 49 B. 13 C. -33
 D. -39 E. -31



24. On rectangle ABCD, points P and Q are on AB such that AP = PQ = QB. M is the midpoint of BC. The area of triangle MPQ is what fraction of the area of rectangle ABCD?

- A. 1/12 B. 1/9 C. 1/8 D. 1/6 E. 1/4

25. How many more diagonals does a regular octagon have than a regular hexagon?
 Note: A *diagonal* is any segment that joins two vertices of a convex polygon but is not an edge of the polygon.

- A. 10 B. 11 C. 13 D. 20 E. 22

26. When Nance does not use his cell phone, a full charge lasts 36 hours. While using the phone, a full charge would last 4 hours. Nance's phone is fully charged at 6 AM. From 6 AM to 10 AM, Nance used his phone for 2.5 hours. Then his father took it away and set the phone aside. At what time will Nance's phone become fully discharged?

- A. 7:30 PM B. 8:00 PM C. 9:30 PM D. 10:00 PM E. 11:30 PM

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27. Use the clues below to place these seven numbers in the proper sequence: **2, 3, 7, 8, 9, 10, 13**

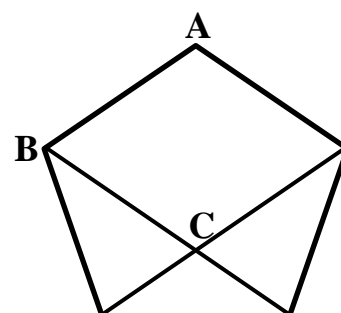
- The odd numbers and even numbers alternate
- 10 and 7 are adjacent [in either order]
- 3 is left of the 10 and the 7 but is not adjacent to either one
- The sum of the 5th and 7th numbers is 16
- No two consecutive numbers are adjacent to each other

_____ ; _____ ; _____ ; _____ ; _____ ; _____ ; _____

The sum of the 1st and 7th numbers in the sequence is:

- A. 10 B. 12 C. 16 D. 20 E. 22

28. Starting at one of the three given points (A or B or C), your goal is trace each segment exactly once. You are allowed to visit the same point more than once.



At which point could you start?

- A. A only B. B only C. C only
D. A or C only E. None of these

29. Like Sudoku, the numbers 1, 2, 3, and 4 occur in every row and in every column. In addition, the four greater than and less than symbols indicate which of the two adjacent numbers is larger or smaller.

			<
4			<
	v		
		^	

What is the sequence of numbers in the BOTTOM row?

- A. 3124 B. 1243 C. 2341
D. 1234 E. 3241

30. In the process of adding a 4-digit number to a 3-digit number, sometimes there are three carries. An example is given.

$$\begin{array}{r}
 \overset{1}{5} \ \overset{1}{5} \ \overset{1}{3} \ 7 \\
 + \ 8 \ 9 \ 5 \\
 \hline
 6 \ 4 \ 3 \ 2
 \end{array}$$

N is a 3-digit number. If the addition **2018 + N** results in three carries, how many values of N are possible?

- A. 7 B. 14 C. 16 D. 18 E. 32

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31. For how many ordered pairs (x, y) of positive integers does $5x + 7y = 2018$?

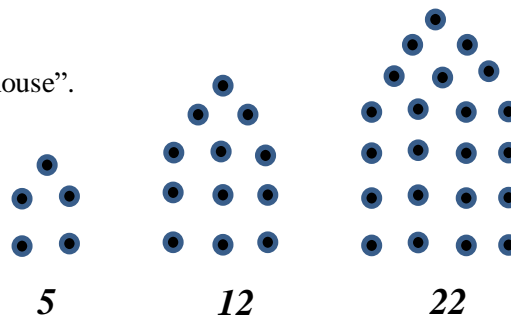
- A. 56 B. 57 C. 58 D. 40 E. 41

32. Aunt Mae's birthday was January 1. In the year that Aunt Mae died, her age (as an integer) was $\frac{1}{37}$ of the year of her birth. How old was she when she celebrated her birthday in 1966?

- A. 5 B. 8 C. 21 D. 22 E. 33

33. *House numbers* are associated with arrays of dots in the form of a "house".

The first three *House Numbers*, as illustrated, are 5; 12; and 22.



With 5 as the 1st *House Number*, what is the 20th *House Number*?

- A. 590 B. 610 C. 631 D. 641 E. 651

34. Alpha, Beta, Gamma, Delta, and Epsilon have their birthdays on consecutive days but not in that order. Alpha's birthday is as many days before Gamma's as Beta's birthday is after Epsilon's. Delta's birthday is two days before Epsilon's.

If Gamma's birthday is on a Wednesday, on what day is Epsilon's birthday?

- A. Monday B. Tuesday C. Thursday D. Friday E. Saturday

35. Tex agreed to work for one year for \$7100 and a horse. At the end of 7 months, he quit and received \$3475 and the horse. To the nearest dollar, how much was the horse worth?

- A. \$1510 B. \$1600 C. \$2115 D. \$2240 E. \$3625

36. Six points are equally spaced on a circle. How many sets of three points form an isosceles triangle?
Note: An equilateral triangle does count as one isosceles triangle.

- A. 6 B. 8 C. 9 D. 12 E. 20

37. In the Winter Olympics, the Biathlon combines cross-country skiing and shooting a rifle. If a competitor has a 75% probability of hitting each target, what is the probability that he will hit at least 4 of the 5 targets? Round to the nearest per cent.

- A. 55% B. 63% C. 65% D. 67% E. 71%

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38. On a certain day during the year, Bekah noticed that:

- Two days earlier, she was 13 years old.
- Sometime during next year, she will be 16.

What date is Bekah's birthday?

- A. Jan. 1 B. Jan. 2 C. Dec. 30 D. Dec. 31 E. Cannot be determined

39. These ten digits are written in *Gill Sans MT* font: **0 1 2 3 4 5 6 7 8 9**

Note that when the digit **0** or **1** or **8** is rotated 180° , the digit is identical to itself. When the digit **6** is rotated 180° , it becomes a **9** and of course when **9** is rotated 180° , it becomes a **6**.

How many 3-digit numbers written in this font would represent the same number when rotated 180° ?

Note: The hundreds digit of a 3-digit number cannot be 0.

- A. 10 B. 12 C. 18 D. 22 E. 24

40. Use these clues to place a digit 1 through 9 in each box.
In each row and column, digits may be repeated.

ACROSS:

1. Sum of digits is 13
3. The four digits form an increasing or decreasing arithmetic sequence
5. Each digit is even and their sum is 12
6. A perfect square

DOWN:

1. The sum of the digits is the same as the sum of the digits of 4 Down.
2. The sum of the first two digits is the same as the sum of the last two digits of 1 Down
3. A perfect cube
4. A perfect cube and a perfect square

	1	2	
	A		
3			4
5			
		6	

What number is in the square marked "A"?

- A. 4 B. 5 C. 7
D. 8 E. 9