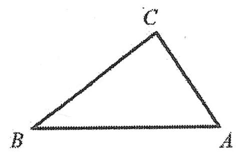
1. When a two-digit number and three times the sum of its digits are added, the resulting number is exactly the same as the number obtained by reversing the digits of the two-digit number. How many such two-digit numbers are there?

2. In triangle ABC, $\angle A = 57°$ and $AB > BC$. Determine the greatest possible integer value of $\angle B$.



3. What is the positive integer value of n such that the value of $\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+\ldots+\frac{1}{n\times(n+1)}$ is $\frac{2017}{2018}$?

4. If you subtract 100 from the square of an integer m, the result is 50 more than nineteen times the integer m. What is the greatest possible value of m?

5. A student was supposed to substitute a certain value for x into the expression $3x^3$. The student thought the expression was $(3x)^3$. If the student's answer was 3000 greater than the correct answer, what value of x did the student use?

6. The amount of time it takes to catch mice is inversely proportional to the number of cats at work. If 2 cats can catch 3 mice in 5 days, how many mice can 20 cats catch in 10 days?

7. The point (10, 4) lies on a line with slope equal to 3/7. What is the distance between (10, 4) and either one of the two closest points on the line with integer coordinates? Express your answer in simplest radical form.

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8. On his English test, Jack got 80% of the questions correct. He got 45 of the 50 multiple choice questions correct and $\frac{3}{5}$ of the true-false questions correct. If Jack's English test consisted of only multiple choice and true-false questions, how many total questions were on the test?

9. A pile of marbles has $5^{2017} + 5$ marbles. It is to be divided into 12 piles with the same number of marbles in each pile. If there are x marbles left over ($0 \le x < 12$), what is the value of x?

10. A three-digit subtractive black hole is a 3-digit positive integer that results from the following process:
(1) select a three-digit number, where all the digits are not the same,
(2) arrange the digits to get the greatest three-digit number possible, x,
(3) reverse the order of the digits of x to get the least three-digit number, y,
(4) subtract the lesser number from the greater one,
(5) repeat the steps 2 through 4 until a constant number (three-digit subtractive black hole) is obtained.
If the number you select is 492, what is the three-digit subtractive black hole?

11. At one of Abraham Lincoln's parties, each man shook hands with everyone except his spouse, and no handshakes took place between the women. If 165 handshakes are counted, what is the least number of married couples who attended the party?

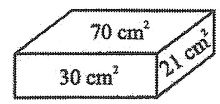
12. Elmo is selecting two numbers from 1 to 100 inclusive such that the positive difference between the pair is 6. How many pairs of numbers are there?

13. The function f is defined by $f(n) = f(m)$ with $n \neq m$. If $f(x) = x^2 - 2017x$, find $f(n + m)$.

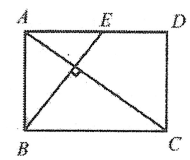
14. In the sequence 11, 4, 16,..., each term after the first term is the square of the sum of the digits of the preceding term. For example, $4 = (1 + 1)^2$ and $16 = (4)^2$. What is the 2017th term in a sequence with the first term is 11?

15. Twelve numbers form an arithmetic sequence. The sum of the first four numbers is twelve. The sum of the last four numbers is six. What is the sum of the first ten numbers? Express your answer as a common fraction.

16. The areas of three faces of a rectangular prism are 70 cm², 30 cm², and 21 cm² as shown. If the length, width and height of the prism each are increased by two centimeters, what is the volume of the resulting prism, in cubic centimeters?



17. In rectangle $ABCD$, $AB = 50\sqrt{6}$. Let E be the midpoint of AD. What is the length of AD if lines AC and BE are perpendicular? Express your answer in simplest radical form.



18. A list of integers has mean 12. If one of the list members were increased by 10, the mean of the new list would be increased by 2. How many integers are in the list?

19. There are 2017 points evenly marked on the circumference of a circle. If 4 distinct points are selected at random (denoted as A, B, C, and D), what is the probability that the chords AB and CD will intersect? Express your answer as a common fraction.

20. Let $\lfloor x \rfloor$ be the greatest integer less than or equal to x. For example, $\lfloor \sqrt{2} \rfloor = 1$ and $\lfloor -\sqrt{2} \rfloor = -2$. Find the sum of all real solutions to $\lfloor 4x+1 \rfloor = 3x - \frac{1}{3}$.

21. If a, b and c are three (not necessarily different) numbers chosen randomly and with replacement from the set $\{1, 2, 3, 4, 5\}$, what is the probability that $ab + c$ is odd?

22. The perimeter of a convex hexagon is 30 units. How many possible integral values are there for the longest side of the hexagon?

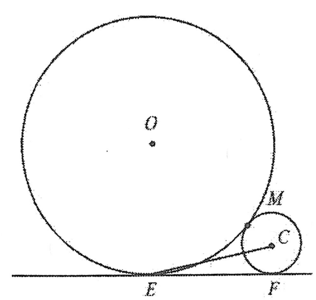
23. An unfair coin is flipped four times. The probability of it landing three tails up and one head up (in any order) is nine times the probability of it landing three heads up and one tail up (in any order). What is the probability of this coin landing tails up in one flip? Express your answer as a common fraction.

24. A grocer makes a display of cans in which the top row has one can and each lower row has two more cans than the row above it. Suppose the display contains 324 cans. How many rows does it contain?

25. Each number in the set $\{7, 12, 15, 17, 20, 21, 24, 25, 29, 34\}$ was formed by adding two of the numbers in the set $\{a, b, c, d, e\}$ where $a < b < c < d < e$. What is the value of c?

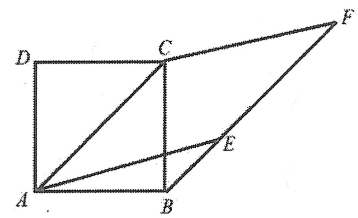
26. The length and width of a rectangle are all integers. What is the smallest possible area of the rectangle if its area and perimeter have the same numerical value?

27. Circle O has radius 16 units and circle C has radius 1 unit. The circles are externally tangent to each other at point M. Segment EF is tangent to both circle O and circle C at points E and F, respectively. What is the length of segment EC? Express your answer in simplest radical form.



28. Simplify $\frac{5}{\sqrt[3]{4}-\sqrt[3]{6}+\sqrt[3]{9}}$. Express your answer in simplest radical form.

29. *ABCD* is a square. *E* is a point on *BF* such that *AEFC* is a rhombus. Find the degree measure of $\angle AEB$.



30. The area of trapezoid *ABCD* is 68 square units. *AE* = *BF*. *CE* and *DF* meet at *O*. Find the shaded area if the area of triangle *OCD* is 22 square units.