BLUFFTON

EMBRACING SPIRIT, ENGAGING MINDS

Section A. Each correct answer is worth 1 point.

1. Find the <u>sum</u> of all the positive integral factors of 12, excluding the number 12 itself.

2. The sides of a triangle are all integers. If the 3 sides are $3, 4$, and x, list all possible values of x.

3. One stamp was randomly selected from an 8×8 sheet of 64 stamps. Find the probability that the stamp was one of this sheet's border stamps. Express as a fraction in simplest form.

4. Express in simplest form: $0x^1 + 2^0 + 4x^0 + (4x)^0 + 4x$

5. Find the length of a diagonal of a rectangle whose perimeter is 34 and whose width is 5.

6. Express in simplest form: $\sqrt{2} \cdot \sqrt{4} \cdot \sqrt{5} \cdot \sqrt{10} \cdot \sqrt{25}$

7. Solve for x: $3(x + 2) = x - 6 + 4$

Section B. Each correct answer is worth 2 points.

8. Two positive integers are chosen at random. What is the probability that their <u>product</u> is *even*? Express your answer as a *percent*.

9. The International Department of Climate Control decreed that there would no longer be any weather on even-numbered calendar dates. During one of the months following that decree, three Mondays had no weather. For that month, on what day of the week did the 18th occur?

10. Consider all of the two-digit numbers that can be made from the digits $2, 0, 1$, and 3. (Do not use any digit twice, like '22,' and do not begin with a zero, like '03.') Which of these numbers is closest to the mean (average) of these numbers?

11. Trapezoid *TRAP* has base $TR = y + 6$ and base $PA = 5y + 8$. If the length of the median (midsegment) is 28, find the length of the longer base.

12. The line $y = 3x + 6$ is parallel to the line $ax + 6y = 18$. Find the value of a.

Section C. Each correct answer is worth 3 points.

13. $\log_2 64 + \log_3 27 + \log_6 1 - \log_{12} 12 = 16^x$. Find x.

14. If $i = \sqrt{-1}$, simplify $2013i + 2014i^2 + 2015i^3 + i^{2013} + i^{2014} + i^{2015}$.

15. In the system of equations on the right, if $a = 1$, find the values of b, c, and d.

$$\begin{cases} 4a + 3b + 2c + d = 2 \\ 3a + 2b + c + 4d = -6 \\ 2a + b + 4c + 3d = 6 \end{cases}$$


Section A. Each correct answer is worth 1 point.

1. Find the <u>supplement</u> of the <u>complement</u> of an angle whose measure is $50°$.

2. Given that the 6-digit number $7a2013$ is divisible by 11, what is the value of a?

3. Roman math teacher Mathematicus assigned this problem: Multiply (XIV)·(XXVI). Do this multiplication, and express your answer using Roman numerals.

4. Give the name for an angle whose measure is between $90°$ and $180°$.

5. Give the <u>exact</u> value of $|3 - \pi|$.

6. In the stem-and-leaf plot (also called a stemplot) on the right, "0 | 8" represents the number 8. Find the difference between the <u>range</u> and the <u>median</u>.

0	8 9 9
1	2 2 5 6
2	3 7 8 9

7. Find the value of $\sqrt{6!}$ to the nearest tenth.

Section B. Each problem is worth 2 points.

8. Given a hexagon, let S be the number of sides, and let D be the number of diagonals. Find $20S - 13D$.

9. What is the remainder when 13^{20} is divided by 5?

10. If $M \# N = 2M + (5 - N)$, find x such that $3 \# x = 12$.

11. In the figure shown, $\overline{PA}$ and $\overline{PD}$ are tangent to $\odot O$ at A and D, respectively. $m\overset{\frown}{AB} = 90°$, $m\overset{\frown}{BC} = 20°$, and $m\overset{\frown}{CD} = 100°$. Find $m\angle P$ and $m\angle BFC$.

For #11

12. There are 200 fish in an aquarium. 99% of them are guppies. How many guppies must be removed to reduce the percentage of guppies to 98%?
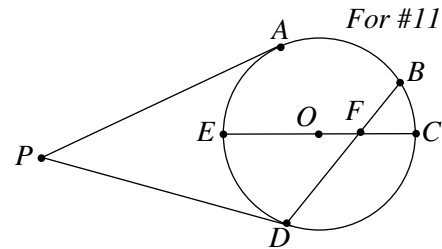
Section C. Each problem is worth 3 points.

13. Two adjacent sides of a parallelogram have lengths of 15 and 21. The smaller angle formed by the sides has a measure of $58°$. Find the length of the shorter diagonal; express your answer to the nearest tenth.

14. Given the ellipse $25x^2 + 9y^2 - 100x + 54y - 44 = 0$, find the coordinates (x, y) of the focus point lying in the first quadrant.

15. Several rectangles with integral sides each have an area of 2013 square feet. Of all such rectangles, find the one that has the smallest perimeter. How many feet are in that perimeter?