Mathematics Contest of New Jersey - 2018
Middle School Students

Non-Calculator Section.

1. Simplify the following expression. Your answer has to be written as a fraction in lowest terms.
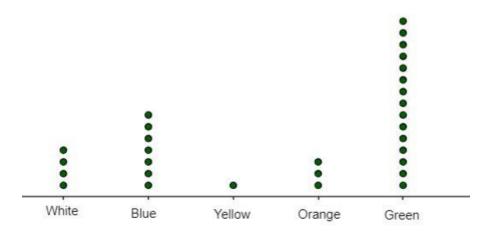
$$\frac{36 \div 3^2 + (7-2) + 4^0}{(14 - 3*4)^3}$$

2. A math test had 50 questions. The data set below shows how many questions were answered correctly in one class.

The number of Questions Answered Correctly
48 43 42 47 48 48 41 49 43 47 43 42

Find the interquartile range of the data set.

3. A school club surveyed 30 girls in middle school on their favorite T-shirts color to help them to decide on colors they should order for their fundraiser. The results of the survey are shown below.

The club is planning to order 150 t-shirts.

How many blue t-shirts they should order based on the results of the survey?

4. Circle the value of d that makes the equation $\frac{3}{4}d + \frac{2}{3} = \frac{1}{6}$ true?
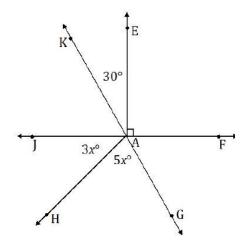
A. $\frac{2}{3}$

B. $-\frac{2}{3}$

C. $\frac{1}{3}$

D. $-\frac{1}{3}$

5. Solve for *x*. Do not round your answer

$2.5x + 6.1 = 10.25$

6. Determine the equation of the line connecting the points (0,1) and (2,3). Write your equation in the slope-intercept form.

7. An environmental club needs to enlarge a poster using a scale factor of 125%. The original poster dimensions are 18 inches by 24 inches. What are the dimensions of the new poster?

8. Use the diagram below to find
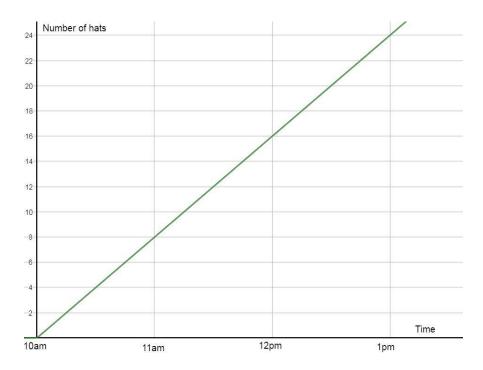
   a) m∠JAH

   b) m∠GAF

9. The *Robotic* club is selling t-shirts and the *Girls Who Code* club is selling hats at the fundraiser. Each club records the number of items sold at a certain time. The *Robotic* club uses a table to record their data, while the *Girls Who Code* club uses a graph.

The data collected is represented below:

The number of t-shirts sold:

Time	10:00am	12:00pm	1:00pm	3:00pm
T-shirts	0	12	18	30

The number of hats sold:

If both clubs continues to sell T-shirts and hats at the same rate,

   a) how many hours it will take the Robotic club to sell 48 t-shirt?

   b) how many hours it will take the Girls Who Code club to sell 48 hats?
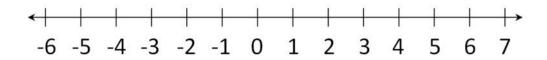
10. Evaluate the following expression when b=-2, c=4 and h=6. Your answer has to be written as a fraction in lowest terms.

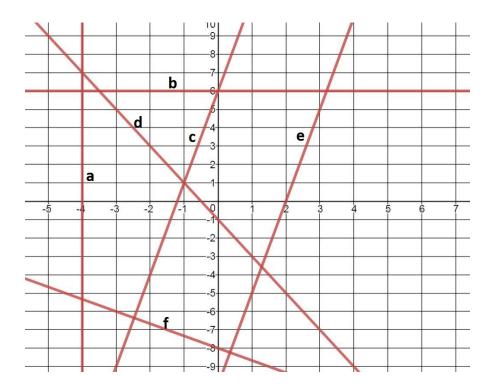$$\frac{(bc+h)^2 - bh}{bh}$$

11. Solve the inequality:

$$-2x + 7 \leq 15$$

Represent the solution set of the inequality on the number line below:

12. Monique is training for a marathon. The equation $y = \frac{1}{7}x$ represents the total distance y in miles she can run in x minutes.

a) Identify the slope of the equation.

b) Based on the given equation, how long will it take her to run 1 mile?
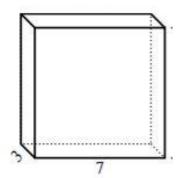
13. Use the graphs of linear equations below to answer the following questions. A line can be used more than once as long as it fits the specified characteristics.

A. Name at least one line with a negative slope? _____

B. Which line has an undefined slope? _____

C. Which line has a slope zero? _____

D. Name at least one line with the y intercept (0,6)? _____

E. Which line does not have any x-intercepts? _____

F. Which lines are perpendicular? _____

G. Which lines have the same slope? _____

H. Find the slope of the lines from the previous question _____

Calculator Section.

14. Eric paid $44.80 for an item after he received a 20% discount. What was the original price of the item?

15. Megan and her friends are baking different types of cookies for a party. Megan has $12\frac{1}{6}$ pounds of chocolate. After she gave each of her three friends the same amount of chocolate, she still had $2\frac{2}{3}$ pounds left. How much did she give to each of her friends?

16. The volume of the prism shown is 147 cm3. What is its height?

17. The water level in a swimming pool increased from 6.5 feet to 8 feet. What is the percent increase in the water level, rounded to the nearest percent?

18. Let *a* and *b* be two rational numbers. $a + b = -4$ and $|a - b| = 14$. Find the values of *a* and *b*.

19. A student brought a large jar of mixed M&M to share with his friends. The students randomly selected 50 pieces of candy from the jar and found the following counts for different colors of M&M.

M&M color	red	orange	blue	yellow	brown	green
Number Selected	12	4	5	10	14	5

a) Use the data above to estimate the probability of choosing a blue or yellow M&M.

b) According to the data collected, if 200 M&Ms are taken from the jar, how many of them can we expect to be orange? <u>Provide your reasoning.</u>

20. You decided to join an aquatic club and paid the initial fee $120. Once you are member, you can use a pool for $3 a day. For non-members, the cost of using a pool is $10 a day. What is the minimum amount of days you need to come to the pool, to make sure that becoming a member of the club was financially worth it.

21. You would like to purchase a new cellphone that costs $350. You have already saved $50 and just got a job at a local store making $8.50 an hour (after taxes) during holiday season. The manager offered you to work for a total of 8 hours every weekend for the next 4 weekends. If you save all the money you make, will you have enough money to purchase the cellphone? How much more or less money would you have?

22. Use each of the 10 digits 0-9 exactly once to create two 5-digit numbers such that their positive difference is as small is possible. Find the difference.