

Pellissippi State

Middle School Mathematics Competition

Sponsored by: Oak Ridge Associated Universities

Seventh Grade

Scoring Formula: $4R - W + 30$

Directions:

For each problem there are 5 possible answers listed. You are to work the problems, determine the correct answer, and indicate your choice on the separate answer sheet provided.

Please use only capital letters on the answer sheet (A, B, C, D, E) and print neatly. This will more easily enable us to correctly grade your paper. If there is any question as to what letter an answer is, it will be marked wrong.

If you change your mind about your answer, be sure to erase completely. Avoid wild guessing, as wrong answers count against you. Do not mark more than one answer for any problem. Make no stray marks of any kind on your answer sheet. Additional room for you to work out problems is available on the back of each of the test booklet's pages.

When told to do so, open your test booklet and begin. When you have finished one page, go on to the next. There are 30 questions in all. The working time for the entire test is 60 minutes.

1. Which statement is *always* true?

- a. The greatest common factor of two prime numbers is 1.
- b. The greatest common factor of a prime and composite number is the prime number.
- c. The greatest common factor of two odd numbers is 1.
- d. The greatest common factor of two multiples of ten is 10.
- e. The greatest common factor of two even numbers is 2.

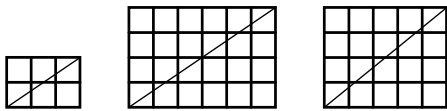
2. Which fractions are in order from least to greatest?

- a. $\frac{5}{12}$ $\frac{1}{2}$ $\frac{3}{5}$ $\frac{7}{12}$ b. $\frac{9}{16}$ $\frac{3}{4}$ $\frac{5}{6}$ $\frac{11}{12}$ c. $\frac{1}{6}$ $\frac{2}{7}$ $\frac{3}{14}$ $\frac{1}{3}$
- d. $\frac{7}{9}$ $\frac{13}{15}$ $\frac{2}{3}$ $\frac{4}{5}$ e. $\frac{4}{9}$ $\frac{2}{3}$ $\frac{1}{2}$ $\frac{1}{4}$

3. You found the same brand and same size box of tissue at five stores. Which store has the most economical price?

- a. Store A: 6 boxes for \$5.75 b. Store B: 5 boxes for \$5.10 c. Store C: 3 boxes for \$2.79
- d. Store D: 2 boxes for \$1.96 e. Store E: 1 box for \$ 0.97

4. Rectangles are made of small congruent squares. A diagonal drawn from the bottom left to the top right of a rectangle cuts through the interior of some of the squares. (Count only squares for which the diagonal goes through the interior of the square—not just the vertex.) For a 2 x 3, the diagonal goes through 4 squares. For a 4 x 6 it goes through 8. For a 4 x 5 it goes through 8. How many squares would a diagonal of a 28 x 35 rectangle go through?



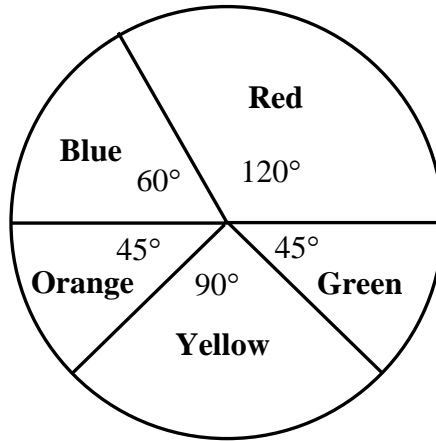
- a. 64 b. 49 c. 62 d. 56 e. 63

5. A drawer contains socks that are all identical except for color. The drawer contains 4 black, 12 blue, and 20 brown socks. In the dark, a person randomly selects 2 socks from the drawer. Find the probability that the two socks will match.

- a. $\frac{1}{3}$ b. $\frac{35}{81}$ c. $\frac{19}{63}$ d. $\frac{209}{694,575}$ e. $\frac{131}{315}$

6. A spinner has five sections with the following five colors and central angles: Blue, 60°; Red, 120°; Green, 45°, Yellow, 90°, and Orange, 45°. If the spinner is used twice, what is the probability that it will land on Red at least once?

- a. $\frac{1}{3}$
- b. $\frac{1}{9}$
- c. $\frac{4}{9}$
- d. $\frac{5}{9}$
- e. $\frac{8}{9}$



7. A penny is 1.55 mm thick. Its diameter is 19.05 mm. You have a cylinder whose (inside) diameter is 2 cm and whose height is 10 cm. You stack the most pennies possible in the cylinder so that the top penny is still below the top of the cylinder. How far is it from the top of the stack of pennies to the top of the cylinder? (Round to the nearest hundredth of a millimeter.)

- a. 0.80 mm b. 0.64 mm c. 0.51 mm d. 0.52 mm e. 0.48 mm

8. In modular arithmetic, $12 \equiv 5 \pmod{7}$ means that 12 and 5 both have the same remainder when divided by 7. Which of the following statements is true?

- a. $6 \equiv 3 \pmod{5}$
- b. $5 \equiv 0 \pmod{5}$
- c. $7 \equiv 4 \pmod{5}$
- d. $9 \equiv 1 \pmod{5}$
- e. $3 \equiv 7 \pmod{5}$

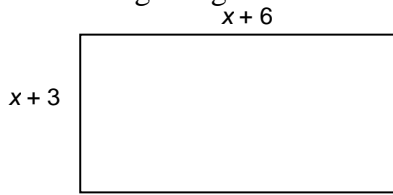
9. Mrs. Price made a stem and leaf plot to show the high temperature for the first 26 days in December. What was the median temperature for those days?

Daily High Temp (°F) December

<i>Stem</i>	<i>Leaf</i>
4	01247899
5	13345777788
6	024559
7	3

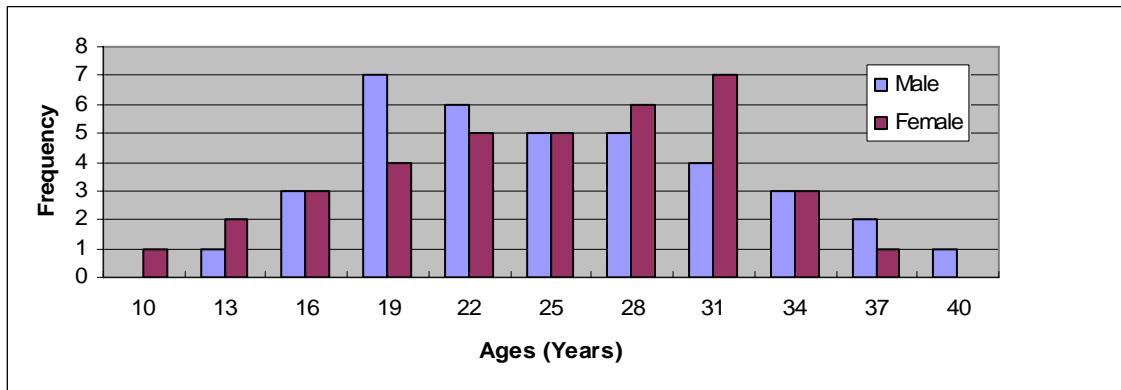
- a. 55 b. 56 c. 57 d. 58 e. 59

10. A rectangle has side lengths of $x + 3$ and $x + 6$ as shown. Suppose that the value of x is chosen at random from the following set of numbers: $\{1, 2, 3, 4, 5\}$. What is the probability that the area of the rectangle is greater than 65?



- a. 0 b. $\frac{1}{5}$ c. $\frac{2}{5}$ d. $\frac{3}{5}$ e. $\frac{4}{5}$

11. The following chart depicts the ages of a group of 37 males and 37 females. Which statement is true?



- a. The mode of the male ages is equal to the mode of the female ages.
 b. The mode of the male ages is greater than the mode of the female ages.
 c. The mean male age is equal to the mean female age.
 d. The median male age is equal to the median female age.
 e. The range of the male ages is greater than the range of the female ages.
12. When counting in base four, the first ten counting numbers are these: $1_{\text{four}}, 2_{\text{four}}, 3_{\text{four}}, 10_{\text{four}}, 11_{\text{four}}, 12_{\text{four}}, 13_{\text{four}}, 20_{\text{four}}, 21_{\text{four}}, 22_{\text{four}}$. What would be the twentieth counting number in base four?
- a. 20_{four} b. 30_{four} c. 100_{four} d. 110_{four} e. 200_{four}

13. Which choice below does NOT demonstrate a reasonable way to calculate $3\frac{3}{4} \div 1\frac{1}{2}$?
- a. $\frac{15}{4} \div \frac{3}{2} = \frac{15 \div 3}{4 \div 2} = \frac{5}{2}$ b. (Multiply both numbers by 4; then divide.) $3\frac{3}{4} \div 1\frac{1}{2} = 15 \div 6 = 2.5$
 c. (Double $1\frac{1}{2}$ to make it 3, divide, and then double that answer.) $\frac{15}{4} \div 3 = \frac{5}{4}$ $\frac{5}{4} \times 2 = \frac{5}{2}$
 d. (Think about money. It takes 15 quarters to make \$3.75. It takes 6 quarters to make \$1.50.) $15 \div 6 = 2\frac{3}{6} = 2\frac{1}{2}$ e. $\frac{15}{4} \div \frac{3}{2} = \frac{4}{15} \times \frac{2}{3} = 2\frac{1}{2}$

14. Movies-in-a-Flash has a deal for members who pay \$6 per month in dues. They can rent as many movies as they want for 75¢ per movie. Last month they charged a member \$18. How many movies did that member rent?

- a. 3 movies b. 24 movies c. 20 movies d. 30 movies e. 16 movies

15. The following table shows some inputs and outputs from Function Machine A. Any number greater than 0 can be an input for Machine A. What Machine A input would produce an output of 0.625?

Function Machine A	
INPUT	OUTPUT
1	1
2	0.5
3	$0.\overline{3}$
4	0.25
5	0.2

- a. 1.6 b. 6.25 c. 1.5 d. 0.58 e. 1.4

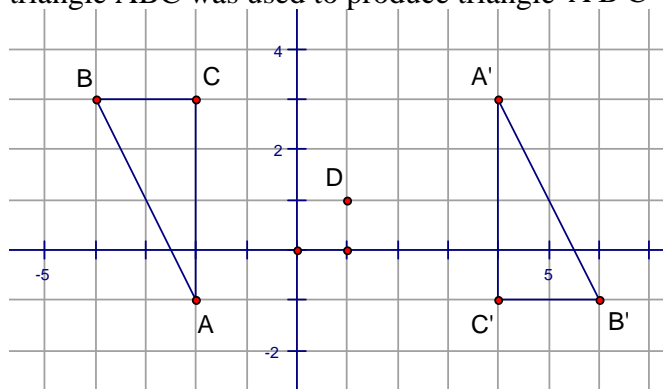
16. Let b represent the number of boys in a club and let g represent the number of girls. If there are 50% more boys in the club than girls, which equation is true?

- a. $0.5b = g$ b. $1.5b = g$ c. $b = 0.5g$ d. $b = 1.5g$ e. $b = 2.5g$

17. Six children were evenly spaced around a circle. The circumference of the circle was 30 meters. How far apart are the children who are directly opposite each other? (Round to the nearest tenth of a meter.)

- a. 9.6 meters b. 9.5 meters c. 9.4 meters d. 4.8 meters e. 4.7 meters

18. In the graph shown here, triangle $A'B'C'$ is the image of triangle ABC . Which transformation of triangle ABC was used to produce triangle $A'B'C'$?



- a. Triangle ABC was translated (slid) 6 units to the right.
 b. Triangle ABC was reflected (flipped) across the y -axis.
 c. Triangle ABC was first reflected (flipped) across the x -axis and then that image was reflected across the y -axis.
 d. Triangle ABC was rotated 180° about the origin $(0, 0)$.
 e. Triangle ABC was rotated 180° about point D .

19. Lee looked at the clock. The minute hand was pointing at the 6. Then the minute hand rotated 240° (clockwise). At that time, where was the minute hand pointing?

- a. 12 b. 2 c. 4 d. 6 e. 8

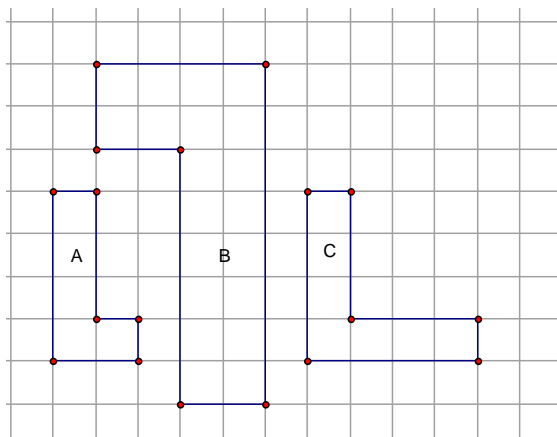
20. The students in one class were asked to circle ALL the flavors of ice cream they like from this list: chocolate, vanilla, and strawberry.

- Two students said they do not like ice cream.
- Nine liked vanilla or strawberry but not chocolate.
- Seventeen marked chocolate. (Six of them also chose one other flavor.)
- None of them marked ONLY vanilla and none marked ONLY strawberry.
- Five liked every kind of ice cream.

How many students were in the class?

- a. 28 b. 30 c. 34 d. 39 e. 41

21. Which statement is true for the figures shown below?



- a. Figure A is mathematically similar to Figure B, but not to Figure C.
 b. Figure A is mathematically similar to Figure C, but not to Figure B.
 c. Figure B is mathematically similar to Figure C, but not to Figure A.
 d. All three figures are mathematically similar to each other.
 e. Figure A is not mathematically similar to Figure B or to Figure C.

22. A candle is lit. Every 5 minutes the height of the candle is measured. The table shows the data gathered. Which statement below describes the rate of change of the candles height?

Time the candle has burned (minutes)	0	5	10	15
Height of the candle (centimeters)	30	28	26	24

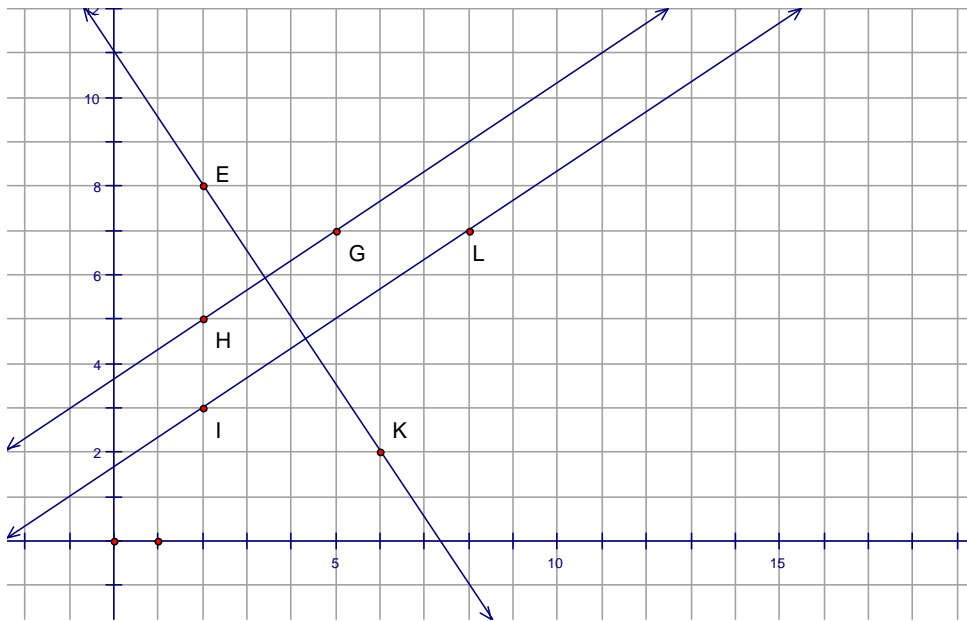
- a. The height is decreasing at the constant rate of 2 cm per minute.
 b. The height is increasing at the constant rate of 2 cm per minute.
 c. The height is decreasing at the constant rate of 5 cm per minute.
 d. The rate of decrease of the height is constantly changing.
 e. The height is decreasing at the constant rate of 0.4 cm per minute.

23. Lee is planning his garden. He decides to make the garden a rectangle with a perimeter 100 feet. After he goes outside to check, he decides that he wants 25% more area inside the fence. Lee decides to keep the width of the garden the same and just increase the length. By what percent will the length of the garden need to increase?
- $33\frac{1}{3}\%$
 - $16\frac{2}{3}\%$
 - 25%
 - 12.5%
 - 50%
24. Which statement is true about this inequality: $2 - x \geq 7$.
- Every solution is greater than 5.
 - 0 is not a solution.
 - Every number greater than 9 is a solution.
 - Negative three is a solution.
 - None of the solutions are negative.
25. I noticed that 100 kilometers per hour is about the same as 60 miles per hour on the speedometer of my sister's new car. About how many kilometers per hour is 35 miles per hour?
- 20 kilometers per hour
 - 40 kilometers per hour
 - 60 kilometers per hour
 - 70 kilometers per hour
 - 100 kilometers per hour
26. In scalene triangle ABC the measure of angle A is 60° . Which statement CANNOT be true about scalene triangle ABC?
- Triangle ABC is an equilateral triangle.
 - Triangle ABC is an obtuse triangle.
 - Triangle ABC is an acute triangle.
 - The measure of angle C is greater than the measure of angle A.
 - The measure of angle B is less than the measure of angle A.
27. Three decimeters is what percent of a kilometer?
- 0.03%
 - 0.3%
 - 0.003%
 - 0.0003%
 - 3%

28. How many faces are there on a pyramid whose base has 12 sides?

- 13 faces
- 14 faces
- 24 faces
- 25 faces
- 36 faces

29. There are three lines shown on the graph below. If (x_1, y_1) and (x_2, y_2) are two points on a line, the slope of the line is $\frac{y_1 - y_2}{x_1 - x_2}$. Which statement is true about the slopes of the give lines?



- The slope of \overrightarrow{GH} is equal to the slope of \overrightarrow{IL} .
- The slope of \overrightarrow{GH} is different from the slope of \overrightarrow{IL} .
- The slope of \overrightarrow{IL} is equal to the slope of \overrightarrow{EK} .
- The slopes of all three lines are equal.
- The slope of \overrightarrow{IL} is negative.

30. Which statement is false?

- The diagonals of any rhombus are perpendicular to each other.
- The diagonals of any parallelogram are perpendicular to each other.
- Opposite angles of any parallelogram are congruent.
- Adjacent angles of any parallelogram are supplementary.
- The acute angles of every right triangle are complementary.