2024 7th Grade Math Contest

1) Brand A tennis shoes are marked down from $\$100$ to $\$90$. Brand B tennis shoes are marked down from $\$90$ to $\$80$. Brand C tennis shoes are marked down from $\$99$ to $\$89$. Brand D tennis shoes are marked down from $\$49$ to $\$44$. Brand E tennis shoes are marked down from $\$20$ to $\$15$. On which of the five brands of tennis shoes is the percentage markdown the highest?

   A) Brand A
   B) Brand B
   C) Brand C
   D) Brand D
   E) Brand E

2) Sally can walk $\frac{1}{2}$ mile in $\frac{7}{6}$ minutes. How many miles can Sally walk in 1 minute assuming she can keep up the stated pace?

   A) $\frac{3}{7}$
   B) $\frac{7}{3}$
   C) $\frac{7}{12}$
   D) $\frac{5}{12}$
   E) $\frac{4}{3}$

3) Workers work independently to accomplish a job with each worker contributing equally. If 3 workers can complete a job in 24 hours, how long will it take for 4 workers to complete the job?
   A) 32
   B) 28
   C) 21
   D) 18
   E) 16

4) The graph of Fahrenheit temperature versus Celsius temperature is a line. 0 degrees Celsius equals 32 degrees Fahrenheit. 100 degrees Celsius equals 212 degrees Fahrenheit. When Fahrenheit temperature increases by 18 degrees, how many degrees Celsius does the temperature increase by?
   A) It depends on the starting Fahrenheit temperature.
   B) 8 degrees
   C) 9 degrees
   D) 10 degrees
   E) 12 degrees

5) At Handy Hardware, the proprietor set the price of a gizmo at \$10, but people did not buy gizmos at that price, so after a week he discounted the price by 8 percent. However, they still did not sell. So, the already-discounted price was discounted by 6%. People began buying gizmos then. The accountant for Handy Hardware is required to keep records of the total percentage discount when items are discounted more than once. What was the total percentage discount for the gizmos?

A) 13.52%
B) 14.00%
C) 14.48%
D) 14.52%
E) 15.48%

6) Of the five numbers in the following list of five numbers

$$17 + (-14), \quad 17 - 20, \quad -21 + 17, \quad -17, \quad -17 + 13$$

which is the greatest distance from 17 on the number line?

A) $17 + (-14)$
B) $17 - 20$
C) $-21 + 17$
D) -17
E) $-17 + 13$

7) $\frac{20\left(\frac{1}{2}+\frac{3}{4}\right)-4\left(\frac{1}{2}+\frac{3}{4}\right)}{8\left(\frac{1}{2}+\frac{3}{4}\right)-4\left(\frac{1}{2}+\frac{3}{4}\right)} =$

A) $\frac{25}{8}$
B) 4
C) 5
D) 18.5
E) 19.5

8) The perimeter of a rectangle is 24 cm. The area is 20 sq. cm. If the length of the rectangle is larger than the width, what is the width of the rectangle?

A) 2 cm
B) 3 cm
C) 4 cm
D) 5 cm
E) 8 cm

9) A candle 12 inches long burns at a constant rate of 1 inch per two hours. Another candle 10 inches long burns at a constant rate of 1 inch per three hours. If both candles were lit at 1:00 p.m. at what time will they be the same height?

A) 10 p.m.
B) 11 p.m.
C) 12 midnight
D) 1 a.m.
E) 2 a.m.

10) Two years from now, my sister will be twice as old as me. If my current age is M and my sister's current age is S, which equation expresses this fact?

A) $2M + 2 = S + 2$
B) $2(S - 2) = M - 2$
C) $2(M - 2) = S - 2$
D) $2(S + 2) = M + 2$
E) $2(M + 2) = S + 2$

11) The perimeter of a square is increased by 8%. By what percent is the area of the square increased? Round to the nearest hundredth of a percent.

A) 4.00%
B) 4.64%
C) 8.64%
D) 16.00%
E) 16.64%

12) What statement is true regarding the decimal representation of $\frac{1}{471}$?

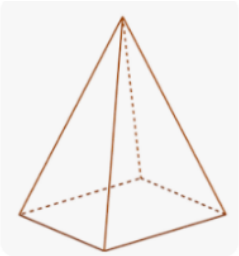
A) It terminates.
B) It repeats a sequence of digits.
C) It goes on forever without repeating a sequence of digits.
D) It is smaller than .00212
E) It is larger than .00213

13) $\left(\frac{3}{2}\right)a + \left(\frac{3}{4}\right)b$ is equivalent to

A) $\left(\frac{9}{4}\right)(a+b)$
B) $\left(\frac{4}{3}\right)\left(\left(\frac{9}{8}\right)a + \left(\frac{3}{4}\right)b\right)$
C) $\left(\frac{3}{2}\right)\left(a + \left(\frac{3}{2}\right)b\right)$
D) $\left(\frac{1}{2}\right)\left(3a + \left(\frac{1}{2}\right)b\right)$
E) $\left(\frac{3}{2}\right)\left(a + \left(\frac{1}{2}\right)b\right)$

14) Pictured below is a right rectangular pyramid. If a plane parallel to the base of the pyramid intersects (slices) the pyramid but does not pass through the apex, what 2-dimensional geometric figure will result?

A) Triangle
B) Square
C) Rectangle
D) Circle
E) Hexagon



15) Which of the following equations represents the relationship between the area, A, and the circumference, C, of a circle?

A) $A = \left(\frac{C}{2\pi}\right)^2$
B) $A = \left(\frac{C}{\pi}\right)^2$
C) $A = (2\pi C)^2$
D) $A = \frac{C^2}{\pi}$
E) $A = \frac{C^2}{4\pi}$

16) The ages of the players on a university basketball team are shown in the table below.

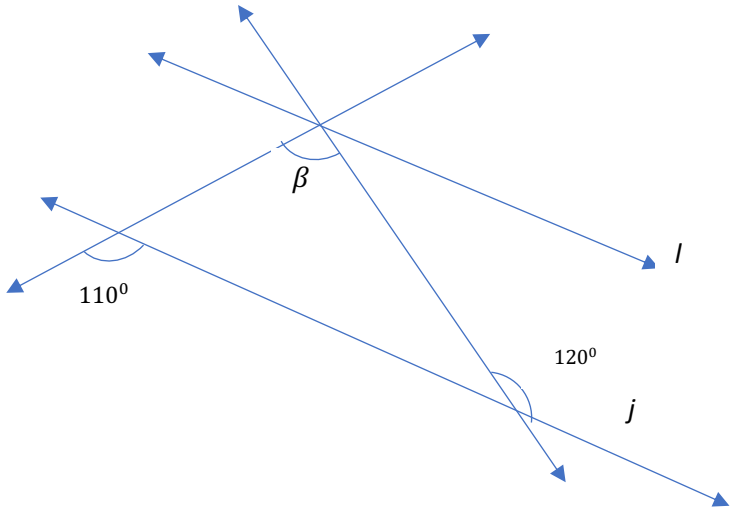
Frequency	Age in years
6	19
1	20
4	21
2	22
1	23

Which statement is correct about those ages?

A) The mean of the ages is less than the median.
B) The mode of the ages is greater than the mean.
C) The median of the ages is equal to the mode.
D) The median of the ages is 21.
E) The range of the ages is 14.

17) In the figure below, line l is parallel to line j. (The figure is not to scale.) What is the measure of angle β?

A) 110^0
B) 90^0
C) 60^0
D) 50^0
E) 40^0

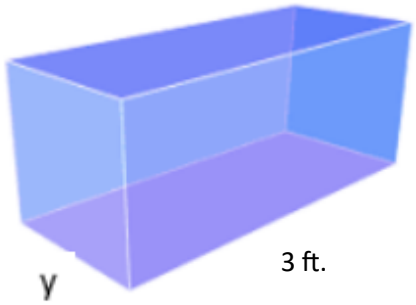


18) Mr. Syler's 7th grade homeroom at Beech Mountain Middle School has 12 blondes, 15 brunettes, and 3 red heads. If two students are randomly chosen from this homeroom to serve on the Homecoming Committee, what is the probability that they will both be blondes?

A) $\frac{2}{5}$
B) $\frac{4}{25}$
C) $\frac{22}{145}$
D) $\frac{22}{195}$
E) $\frac{13}{29}$

2024 7th Grade Math Contest

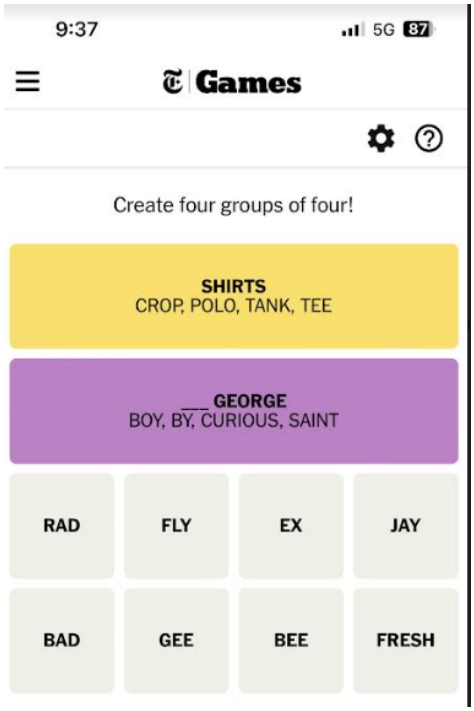
19) An aquarium in the shape of a rectangular prism has a volume of 9 cubic feet. The base of the aquarium is made from slate and the four slides are made of glass. The aquarium has no top. If slate costs five times as much (per unit area) as glass, and glass costs $80 per square foot, find the cost of the glass and slate needed to build aquarium.



A) $10,320
B) $ 7,920
C) $ 5,160
D) $ 4,860
E) $ 3,600

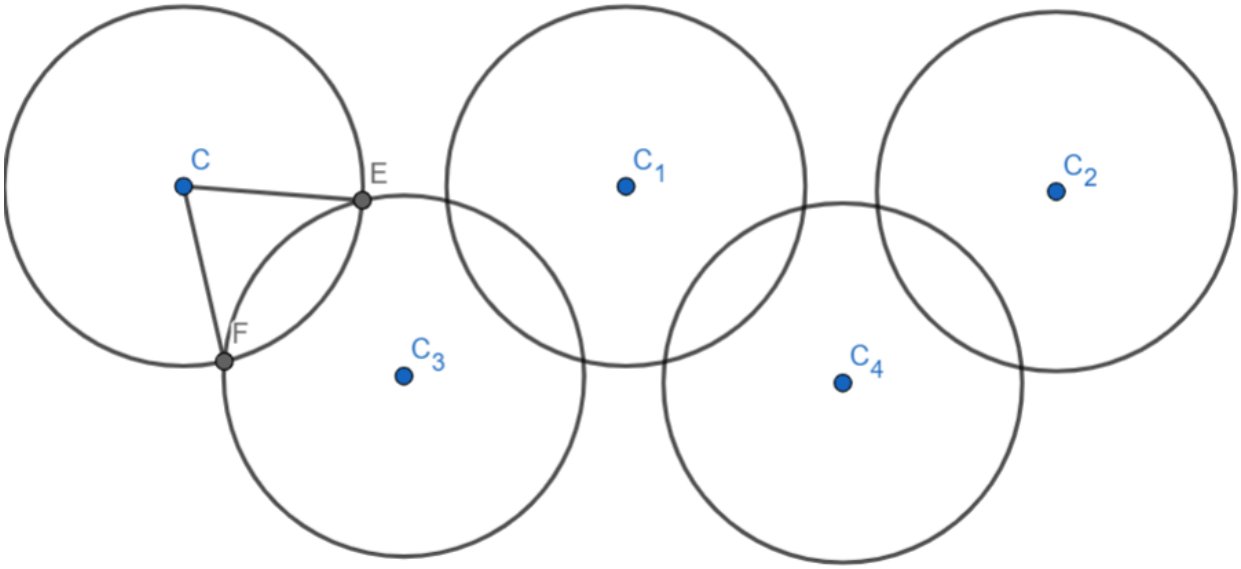
20) In the New York Times game called Connections, you are given 16 words, and you are to divide them into four groups of four words, with the words in each group sharing some common feature and thus being "connected." As shown below, on December 29,2023, Katie played the puzzle and got two groups of four words (crop, polo, tank, tee & boy, by, curious, saint) rather easily, thus leaving eight words (rad, fly, ex, jay, bad, gee, bee, fresh) to divide into two groups of four words. Katie was clueless as to the connections between the eight remaining words, and thus she reverted to purely guessing. How many guesses are possible? In other words, if you are given eight words, in how many ways can they be divided into two groups of four words?

A) 40,320
B) 1,680
C) 384
D) 105
E) 70



2024 7th Grade Math Contest

21) The Olympic Rings symbol consisting of five congruent circles is shown below. The centers of the circles are C, C_1, C_2, C_3, C_4. The points C, C_1, C_2 are collinear, and the line passing through the points C, C_1, C_2 is parallel to the line passing through the points C_3, C_4. Angle FCE measures 72.4 degrees. Suppose segments $\overline{C\,C_1}$, $\overline{C_1\,C_2}$, and $\overline{C_3\,C_4}$ each measure 5 cm, and segments $\overline{C\,C_3}$, $\overline{C_1\,C_3}$, $\overline{C_1\,C_4}$ and $\overline{C_2\,C_4}$ each measure 3.4 cm. What percentage of the total circumferences of all the circles combined is **not** in the interior of one of the five circles? (Give answer to the nearest one-hundredth of a percent.)



A) 66.67 %
B) 67.82 %
C) 69.32 %
D) 70.30 %
E) 79.99 %

22) How many $\frac{miles}{hour}$ is $10{,}000\ \frac{furlongs}{fortnight}$? A fortnight is 14 days and a furlong is $\frac{1}{8}$ mile.

A) $\frac{625}{168}$
B) $\frac{5000}{21}$
C) $\frac{4375}{6}$
D) $\frac{125}{14}$
E) $\frac{42}{250}$

23) The water cooler bottle pictured below is $2/3$ full. Using the dimensions of the bottle and the volume of a cylinder, $V = \pi r^2 h$, find how many gallons of water are in the bottle. Round your answer to the nearest tenth. ($1\ ft^3 \approx 7.5$ gal)

A) 6.7 gallons
B) 10.0 gallons
C) 3.3 gallons
D) 6.6 gallons
E) 4.25 gallons

24) A teacher's grade book was damaged due to water. The teacher could make out four of a student's five test scores. The four scores which the teacher could make out were 78, 84, 91 and 92. She knew that the remaining score was a whole number. The Mean Absolute Deviation (MAD) for the five test scores is known to be 4.4. What is the missing test score? (The Mean Absolute Deviation of a dataset is the average distance between each data point and the mean.)

A) 77
B) 85
C) 86
D) 88
E) 93

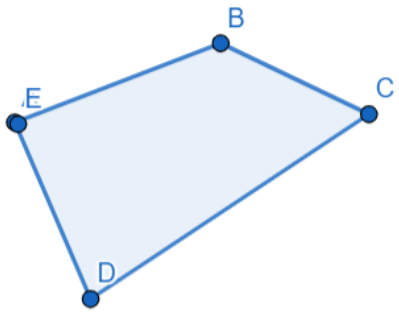
25) The Beta Club at Anywhere Middle School sells t-shirts as a fundraiser. The company Shirts Unlimited makes the t-shirts for the Beta Club. Shirts Unlimited charges $80 for a setup cost and $4 for each shirt made. The Beta Club sells shirts for $15 each. The Soccer Club at Anywhere Middle School also sells t-shirts as a fundraiser, but they use The Shirt Shack as their supplier of shirts. The Shirt Shack charges $60 for a setup fee and $5 for each shirt made. The Soccer Club also sells shirts for $15 each. In the 2022-2023 school year a surprising thing happened. The Beta Club made exactly the same amount of profit as the Soccer Club made. How much profit did each make from t-shirt sales?

A) $140
B) $160
C) $180
D) $200
E) $240

2024 7th Grade Math Contest

26) Polygon BCDE is enlarged using a scale factor of 1.5 to produce Polygon B'C'D'E'. Angle B measures 150 degrees, angle C measures 60 degrees, angle D measures 70 degrees. What is the measure of angle E'? (Polygon BCDE is not drawn to scale below.)

A) 70
B) 78
C) 80
D) 117
E) 120



27) If R is proportional to S, which of the following could not describe the relationship between R and S?

A) R = - S
B) S = 2R
C) S = 2(R-1) + 2
D) S = 2R + 2
E) S = R

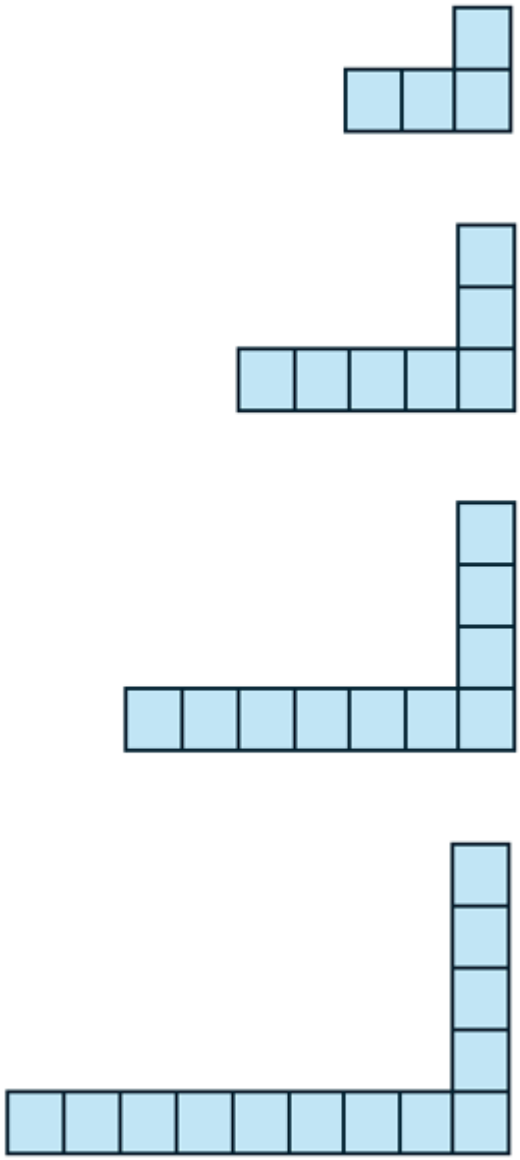
28) A right circular cylinder has a volume of 100 cubic centimeters. The height of the cylinder is tripled and the radius of the base is tripled. What is the volume of the enlarged cylinder?

A) 300 cubic centimeters
B) 600 cubic centimeters
C) 900 cubic centimeters
D) 1800 cubic centimeters
E) 2700 cubic centimeters

29) A large city of 1,000,000 people has a population in which 80 percent are over age 20. A medium size city of 250,000 people has a population in which 80 percent are over age 20. A small city of 2,500 people has a population in which 80 percent are over age 20. A person is randomly selected from one of the cities and they are under age 20. But we do not know from which city they were selected. Which of the following statements is true?

A) It is equally likely that the person came from the small city as from the medium size city as from the large city.
B) It is more likely that the person came from the large city.
C) It is more likely that the person came from the medium size city.
D) It is more likely that the person came from the small city.
E) It cannot be determined which is more likely.

30) Below are the first four pictures in a sequence of infinitely many pictures. Let k represent the number of squares in a picture.



Which of the following does <u>not</u> represent the number of squares in the nth picture?

A) k = $3n + 1$
B) k = $n + 3 + 2(n - 1)$
C) k = $1 + n + 2n$
D) k = $(3 + 2(n - 1)) + (1 + 1(n - 1))$
E) k = $(n + 1)^2 - 2n$