

The 37th Contest

*Mathematics Educators of Greater St. Louis
and St. Louis Community College
at Florissant Valley present*

Excellence In Mathematics

Seventh Grade Test

Thirty-Seventh Annual Mathematics Contest

March 21, 2015

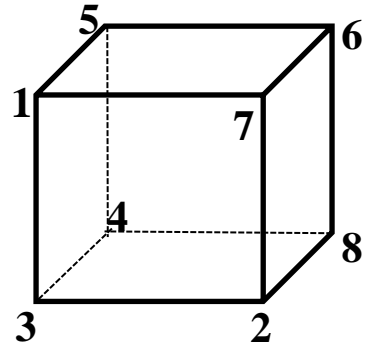
- I. Do not open the test booklet or begin work until instructed to do so by your proctor.**
- II. You have 75 minutes to take this test.**
- III. Listen carefully as the proctor explains where to write your name, the name of your school, your grade level, and how to mark your answers.
- IV. You may use a calculator. You only need a four-function calculator, but you may use any calculator approved for the SAT test, which includes most graphing calculators except the TI-92 and TI-Voyager. If you are unsure whether your calculator is allowed, check with your proctor.
- V. Your score will be the number of questions you answer correctly. In the event of ties, Problem #40 will be used as a tie-breaker. If ties still remain, Problem #39 will be used as a tie-breaker and so on until all ties are broken.

Seventh Grade Test - Excellence in Mathematics Contest – 2015

- Elisa counts backward from 200 by 7's to form the sequence: 200; 193; 186;....
What is the least positive number she will hit?
A. 1 B. 2 C. 3 D. 4 E. 5
- In circus class in San Francisco, Zan drops 20 feet from a trapeze bar onto a bouncy net and bounces several times. The first time she rebounds 15 feet; then she rebounds 10 feet; then she rebounds 5 feet; and then she stops on the net. Including up and down, what is the total distance that Zan traveled from the time she left the trapeze bar until the time she stopped bouncing?
A. 50 feet B. 65 feet C. 80 feet D. 90 feet E. 100 feet
- Emily lives 1.2 km west of school and Samantha lives 1.5 km east of school. After school each day Monday through Friday, Samantha walks from school to Emily's house and then walks to her own house.
In one week, how many kilometers does Samantha walk?
A. 13.5 km B. 15 km C. 18 km D. 19.5 km E. 27 km
- The value of 15 quarters and 23 nickels is equal to the value of how many dimes?
A. 38 B. 42 C. 43 D. 46 E. 49
- Geologists state that the Mesozoic Era lasted from about 65 to 245 million years ago. 40% of the Mesozoic Era is called the Jurassic Period. To the nearest 10 million, how many years long was the Jurassic Period?
A. 70 million B. 80 million C. 100 million D. 110 million E. 120 million
- Write these three numbers in increasing order; that is, from least to greatest: $\frac{15}{4}$; **3.6** ; $3\frac{2}{3}$
A. **3.6** ; $3\frac{2}{3}$; $\frac{15}{4}$ B. **3.6** ; $\frac{15}{4}$; $3\frac{2}{3}$ C. $\frac{15}{4}$; $3\frac{2}{3}$; **3.6**
D. $3\frac{2}{3}$; **3.6** ; $\frac{15}{4}$ E. $3\frac{2}{3}$; $\frac{15}{4}$; **3.6**
- The square of *100 thousand* equals
A. 1 trillion B. 1 billion C. 10 million D. 10 billion E. 10 trillion
- $48 \cdot \left(\frac{7}{4} \cdot \frac{6}{5} \cdot \frac{5}{6} \cdot \frac{4}{7} \cdot \frac{3}{8}\right)$ equals
A. 8 B. 12 C. 16 D. 18 E. 48
- Two rectangles each have perimeter 64 cm. In area, how much larger is the rectangle with length 18 cm than the rectangle with length 20 cm?
A. 0 cm^2 B. 4 cm^2 C. 8 cm^2 D. 12 cm^2 E. 16 cm^2

Seventh Grade Test - Excellence in Mathematics Contest – 2015

10. The vertices of this cube are labeled 1 through 8. For each edge, add the two numbers at the end-points of that edge. For the 12 edges, you should have 11 different sums. Which sum is repeated?



- A. 7 B. 8 C. 9
D. 10 E. 11
11. Referring to the cover of this test, *Big Bang Theory's* Sheldon Cooper often wears a T-shirt with the number 73 on it. 73 is his favorite number because 73 is the 21st prime number and 37 is the Nth prime number. What is N?
- A. 10 B. 11 C. 12 D. 13 E. 14
12. On November 11, 1911, Springfield Missouri set BOTH its record daily high temperature for November 11 and its record low temperature for November 11. The temperature dropped from 80°F at 3:45 PM to 13°F at midnight. In degrees per hour, what was the average rate of decrease of the temperature?
Round to the nearest tenth of a degree per hour.
- A. 6.9°F/hr B. 7.2°F/hr C. 7.3°F/hr D. 8.1°F/hr E. 8.2°F/hr
13. The number F is 6 less than -8 . The number U is 8 more than -3 . The number N is 18 less than 7. What is the sum $F+U+N$?
- A. 30 B. -2 C. -8 D. -20 E. -36
14. In 18 football games in the 2014 season, Marshawn Lynch of the Seattle Seahawks rushed for an average of 84.6 yards per game. In his best 4 games, he ran for 157 yards, 140 yards, 124 yards, and 110 yards. How many yards per game did he average in the other 14 games?
Round to the nearest tenth of a yard.
- A. 55.1 B. 70.8 C. 76.2 D. 79.5 E. 80.3
15. The numbers 2013 and 2015 each have exactly three prime factors. What is the sum of those six prime numbers?
- A. 124 B. 144 C. 486 D. 724 E. 1084
16. Ridi is $\frac{2}{3}$ as tall as his mother. If Ridi's height is 3 feet 6 inches, how tall is his mother?
- A. 2 feet 4 inches B. 4 feet 6 inches C. 4 feet 8 inches
D. 5 feet 3 inches E. 5 feet 9 inches

Seventh Grade Test - Excellence in Mathematics Contest – 2015

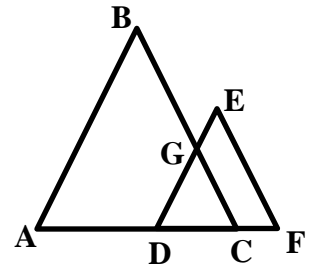
17. The three digits 1, 6, and 9 can be used to form three different 3-digit square numbers. What is the sum of these three square numbers? Note: Each of these 3-digit numbers contains one 1, one 6, and one 9.
A. 984 B. 1056 C. 1281 D. 1326 E. 1749
18. One marble is drawn randomly from a bag containing 6 red, 9 blue, and 5 green marbles. What is the probability that the marble that is drawn is not green? Round to the nearest per cent.
A. 20% B. 25% C. 67% D. 75% E. 80%
19. How many of the following five statements are TRUE?
1. One mile is longer than one kilometer.
2. One quart of water has greater volume than one liter of water.
3. One pound of beef weighs more than one kilogram of beef.
4. One inch is longer than one centimeter.
5. A temperature of 0°C is warmer than a temperature of 0°F.
A. 1 B. 2 C. 3 D. 4 E. 5
20. On this 40-item Excellence in Mathematics Contest, the 5-student Green Rock Park Middle School's goal as a team is to get 80% of the questions correct. If four students get 67.5%, 77.5%, 82.5%, and 85% correct, how many questions must their fifth student get correct to earn a team average of exactly 80%?
A. 32 B. 33 C. 34 D. 35 E. 36
21. In a triathlon competition, a 130-pound athlete burns calories at these rates:
• Swimming: 480 calories per hour
• Cycling: 420 calories per hour
• Running: 300 calories per hour
How many calories does Silky burn if she swims for 45 minutes, cycles for 1 hour and 40 minutes, and runs for 40 minutes? Round to the nearest hundred calories.
A. 900 B. 1000 C. 1100 D. 1200 E. 1300
22. A square with perimeter 36 cm has the same area as a circle. What is the circumference of the circle? Round to the nearest tenth of a centimeter.
A. 18.0 B. 21.3 C. 31.9 D. 37.7 E. 56.5
23. Each of the three letters in this sum represents a different non-zero digit.
What does $A+B+C$ equal?
A. 11 B. 12 C. 13 D. 14 E. 15

$$\begin{array}{r} AB \\ + BA \\ \hline CAC \end{array}$$

Seventh Grade Test - Excellence in Mathematics Contest – 2015

24. ABC and DEF are equilateral triangles. $AD = 2DC$ and $DC = 2CF$
 If the perimeter of ABC is 54 cm, what is the perimeter of the trapezoid EFCG?

A. 18 cm B. 21 cm C. 24 cm D. 27 cm E. 36 cm



25. $1+3+5+7+\dots+2009+2011+2013+2015 = N^2$. What is N?

A. 1006 B. 1007 C. 1008 D. 2014 E. None of these

26. After which of the following steps can you first conclude that point X is in region P?

Step A: X is not in region R

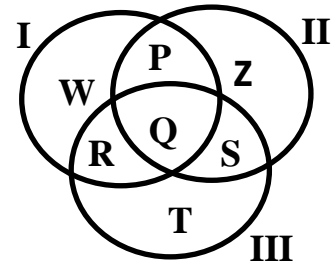
Step B: X is in circle I

Step C: X is not in circle III

Step D: X is not in region W

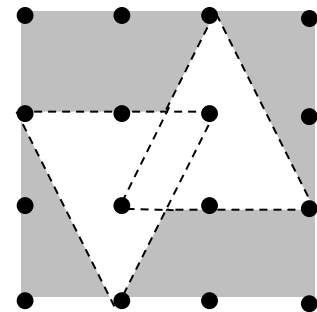
Step E: X is in circle II

A. A B. B C. C D. D E. E



27. On this grid of equally spaced lattice points, what fraction of the large square is white?

A. 7/18 B. 4/9 C. 3/8
 D. 1/2 E. 5/9



28. In Base Three, the way that one counts from “one” to “ten” is:
1; 2; 10; 11; 12; 20; 21; 22; 100; 101

How is the number *two hundred* written in Base Three?

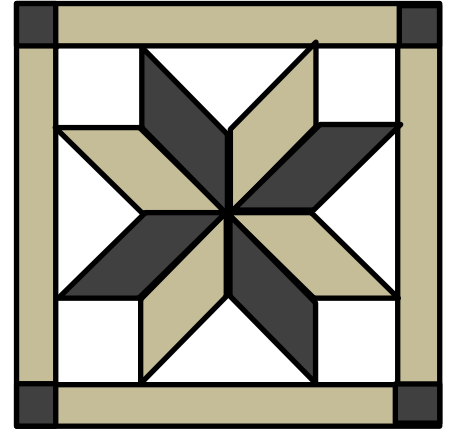
A. 1222 B. 2112 C. 12012 D. 21012 E. 21102

Seventh Grade Test - Excellence in Mathematics Contest – 2015

29. Jim is hiking at a pace of 5 km per hour and he takes 96 steps per minute.
To the nearest centimeter, what is the average length of each of Jim's steps?
- A. 87 cm B. 88 cm C. 89 cm D. 90 cm E. 91 cm

30. A, B, and C are three different integers from set S. $S = \{-8, -6, -2, 0, 1, 3, 5\}$
What is the least possible value of the expression $A \times B + C$?
- A. -38 B. -40 C. -43 D. -46 E. -50

31. In this quilt pattern, each dark gray square is 1 cm by 1 cm, each white square is 2 cm by 2 cm, each light gray rectangle is 1 cm by 8 cm, and the 8 parallelograms are congruent.
- What is the total area in square centimeters of the eight regions shaded light gray?
- A. 36 B. 44 C. 48
D. 56 E. 64



32. At the age of 22 in 1972 when Rick was teaching students in Malaysia, he was 30% older than the average age of his students. When he returns to see them in 2015, what per cent older will he be than the average 2015 age of his ex-students? Round to the nearest tenth of a per cent.
- A. 7.8% B. 8.5% C. 8.8% D. 10.2% E. 11.3%
33. In rectangle ABCD, M is the midpoint of AB and N is the midpoint of BC.
What is the ratio of the area of triangle BND to the area of triangle CMD?
- A. 1/4 B. 1/3 C. 1/2 D. 1 E. 2
34. Let M be the fifty-digit number $333\dots3333$; that is, all of M's fifty digits are 3's.
What is the sum of the digits of the product $72 \cdot M$?
- A. 432 B. 441 C. 445 D. 450 E. 454

Seventh Grade Test - Excellence in Mathematics Contest – 2015

35. The first three verses of the song *Twelve Days of Christmas* are:

On the first day of Christmas my true love sent to me:

A Partridge in a Pear Tree

On the second day of Christmas my true love sent to me:

2 Turtle Doves; and a Partridge in a Pear Tree

On the third day of Christmas my true love sent to me:

3 French Hens; 2 Turtle Doves; and a Partridge in a Pear Tree

This pattern continues until the 12th and final verse:

On the twelfth day of Christmas my true love sent to me:

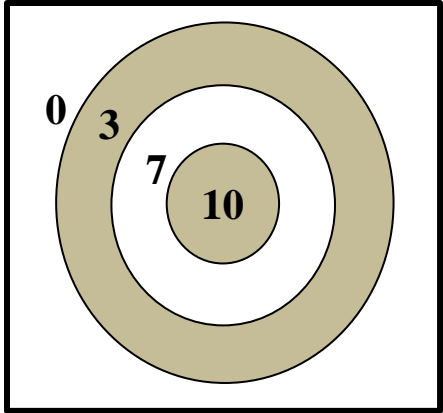
12 Drummers Drumming; 11 Pipers Piping; 10 Lords a Leaping

9 Ladies Dancing; 8 Maids a Milking; 7 Swans a Swimming

6 Geese a Laying; 5 Golden Rings; 4 Calling Birds

3 French Hens; 2 Turtle Doves; and a Partridge in a Pear Tree

What is the sum of the number of drummers, pipers, lords, ladies, maids, swans, geese, golden rings, calling birds, French hens, turtle doves, and partridges mentioned in the standard 12 verses of the song?

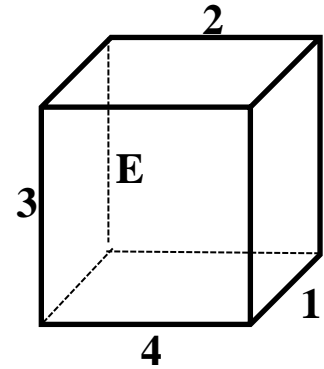
- A. 362 B. 363 C. 364 D. 365 E. 366
36. Each dart which hits this square dartboard scores 0, 3, 7, or 10 points. After Sasha throws three darts which all hit the dartboard, she adds her three scores. Including 0, how many different scores are possible?
- A. 14 B. 15 C. 16
D. 17 E. 18
- 
37. There are exactly 24 different 3-digit whole numbers with three different digits from this set: 4, 5, 6, 7. How many of those twenty-four 3-digit numbers are divisible by 6?
- A. 4 B. 6 C. 8 D. 9 E. 12

Seventh Grade Test - Excellence in Mathematics Contest – 2015

38. **A Magic Cube!** A cube has 12 edges and 6 faces. The numbers 1 through 12 (without repetition) are assigned to the edges of this cube so that the sum of the numbers on the 4 edges of each face is 26.

The numbers 1, 2, 3, and 4 are already assigned.

What number is on the edge marked E?

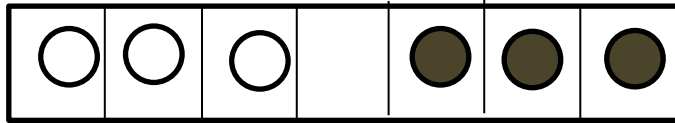


- A. 5 B. 6 C. 7
D. 8 E. 9

39. On a street with 32 houses: 7 have fewer than 6 rooms; 12 have more than 7 rooms; and 4 have more than 8 rooms. How many of these houses have 6, 7, or 8 rooms?

- A. 19 B. 20 C. 21
D. 25 E. Cannot be determined with this information

40.



The goal of this puzzle is to switch the positions of the 3 unshaded discs with the positions of the 3 shaded discs.

In this puzzle, only these two types of moves are allowed:

1. Slide one disc to an empty square next to it.
2. Jump over exactly one disc to an empty square (the jumped disc is not removed).

Note: Any move may be to the left or to the right.

What is the minimum number of *moves* needed to switch the positions of the three shaded discs with the three unshaded discs ?

- A. 15 B. 16 C. 17 D. 19
E. Using only these *moves*, it is not possible to switch the positions of these discs.