Eighth Grade Test - Excellence in Mathematics Contest – 2012

1. Maggie read a book in five days, Monday through Friday. Each day, she read 12 more pages than the previous day. She read 47 pages on Thursday. How many pages were in the book?

   A. 59 B. 116 C. 140 D. 175 E. 235

2. A marathoner's heart beats a total of 24,900 times during a marathon that he runs in exactly 2 hours and 50 minutes. What is his average heart rate in beats per minute? Round to the nearest whole number.

   A. 134 B. 142 C. 143 D. 146 E. 147

3. **1 2 3 4 5 7 8 9**

   Using these <u>eight</u> digits (each once), write any two 3-digit numbers and one 2-digit number. Add those three numbers. What is the remainder when that sum is divided by 9?

   A. 0 B. 1 C. 2 D. 3 E. 6

4. Which one of these five numbers is a prime number?

   A. 51 B. 91 C. 101 D. 111 E. 121

5. In 2012, the world population is 6.8 billion and the population of the United States is 318 million. The population of the United States is what percent of the world's population?

   A. 0.047% B. 0.46% C. 0.47% D. 4.7% E. 47.7%

6. 2/5 of a class of 30 students were girls. Then two girls joined the class and eight boys left the class. What fraction of the class do girls now represent?

   A. 1/2 B. 2/3 C. 7/5 D. 7/15 E. 7/12

7. There are two pints in a quart and four quarts in a gallon. During one lunch period a cafeteria serves 700 half-pints of milk. How many gallons of milk is that?

   A. 43.3 B. 43.75 C. 44 D. 87.25 E. 87.5

8. Jan buys a toy that was discounted 20%. If this saved her $15, what was the original price of the toy?

   A. $3 B. $18 C. $60 D. $75 E. $90

9. The area of one face of a cube is 9 square centimeters. What is the volume of the cube?

   A. 27 cm^3 B. 36 cm^3 C. 54 cm^3 D. 81 cm^3 E. 729 cm^3

10. $\frac{-4+12 \div 4-16}{8-2}$ equals

    A. $-2\frac{5}{6}$ B. $-2\frac{1}{3}$ C. $-4\frac{1}{8}$ D. $-2\frac{1}{2}$ E. $2\frac{2}{3}$

11. Given: $\frac{2}{3} = \frac{x}{60} = \frac{216}{y}$. What is the product xy?

    A. 5760 B. 12,960 C. 14,440 D. 17,600 E. 29,160

12. For how many natural numbers N is $\frac{N}{60}$ greater than $\frac{1}{4}$ AND less than $\frac{2}{3}$?

A. 23 B. 24 C. 25 D. 26 E. 30

13. The average of five different positive odd numbers is 15.
What is the largest possible value of any one of these five numbers?

A. 19 B. 27 C. 39 D. 59 E. 71

14. Of these five numbers: **–8; –4; 9; 11; 15**; how many make the following compound inequality true?

$$-7 < 15 - 2x \leq 23$$

A. 0 B. 1 C. 2 D. 3 E. 4

15. If $x \neq 0$, $\frac{1}{x} + \frac{x}{3} + \frac{1}{3x}$ equals

A. $\frac{x^2+4}{3x}$ B. $\frac{x+2}{3x}$ C. $\frac{x+4}{3}$ D. $\frac{3x^2+4}{9x^2}$ E. $\frac{x+2}{3x^2}$

16. What is the length of the diagonal of a rectangle with width 8 cm and a perimeter of 46 cm?

A. 17 cm B. 23 cm C. 120 cm D. $\sqrt{145}$ cm E. $8\sqrt{2}$ cm

17. Jui Chin put \$10 into savings on January 1, \$20 on February 1, \$30 on March 1, and so on. Each month he saved \$10 more than the previous month.
Mui Tze put \$1 into savings on January 1, \$2 on February 1, \$4 on March 1, and so on. Each month she saved twice as much as the previous month.
At the end of one year, how much more had Mui Tze saved than Jui Chin?

A. \$1268 B. \$3315 C. \$3435 D. \$7410 E. \$7411

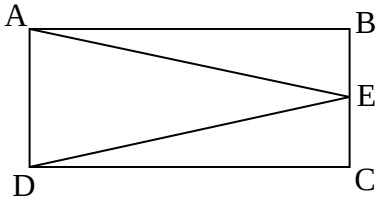
18. In basketball, a player can score by making 2-point shots, 3-point shots, or 1 point for each free throw made. In one game, Loni made four of seven 2-point shots, two of five 3-point shots, and attempted 16 free throws.
If she scored 24 points, what percent of her free throws did she make?

A. 37.5% B. 50% C. 60% D. 62.5% E. $66\frac{2}{3}\%$

19. Several rectangles with a perimeter of 50 inches have widths and lengths that are a whole number of inches.
How many different areas are possible for these rectangles?

A. 1 B. 12 C. 13 D. 24 E. 25

20. If the perimeter of rectangle ABCD is 160 inches and CD = 48 inches, what is the area of triangle AED?



A. 640 in^2 B. 704 in^2 C. 768 in^2

D. 840 in^2 E. 2688 in^2

21. A pizza is cut into N identical slices. Philippe eats the last four slices which was 2/5 of the pizza. What is N?

A. 10 B. 12 C. 15 D. 16 E. 20

22. What is the ratio of the number of degrees in the interior angle of a regular octagon to the number of degrees in the interior angle of a regular hexagon?

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

23. If **N+4** is an odd number, then how many of these four numbers must be odd?

$$\mathbf{3N;} \quad \mathbf{4N+1;} \quad \mathbf{N^2;} \quad \frac{\mathbf{N+1}}{\mathbf{2}}$$

A. 0 B. 1 C. 2 D. 3 E. 4

24. In a 6-year period from January 1, 2005 to January 1, 2011, the Pierce Auger Observatory in Argentina detected 1.6 million particle showers caused by cosmic rays. What rate is this in terms of *particle showers per hour*? Round to one decimal place.

A. 30.4 B. 182.6 C. 304.4 D. 1862.5 E. 1095.9

25. The average of 18 consecutive odd numbers is 50. What is the largest of these 18 numbers?

A. 59 B. 67 C. 69 D. 79 E. 85

26. To swim 800 m in her family's rectangular pool, Fran could swim the length 50 times or she could swim the perimeter of the pool 16 times. In square meters, what is the area of the pool?

A. 144 B. 196 C. 400 D. 544 E. 800

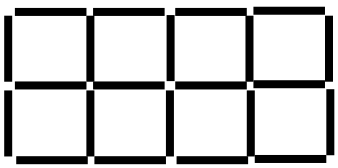
27. In the regular hexagon ABCDEF, what is the measure of angle ACF?

A. 15^o B. 30^o C. 45^o D. 60^o E. 90^o

28. In the following expression, the variables a, b, c, and d are replaced by the numbers 1, 2, 3, and 4, but not necessarily in that order. Each letter is for a different number. What is the minimum possible value of: $\mathbf{a * b^c - d}$?

A. –2 B. –1 C. 0 D. 1 E. 2

29. Twenty-two rods of equal length are needed to build this 2 by 4 array of 8 small squares. How many rods would be needed to construct a 2 by 1000 array of 2000 small squares?

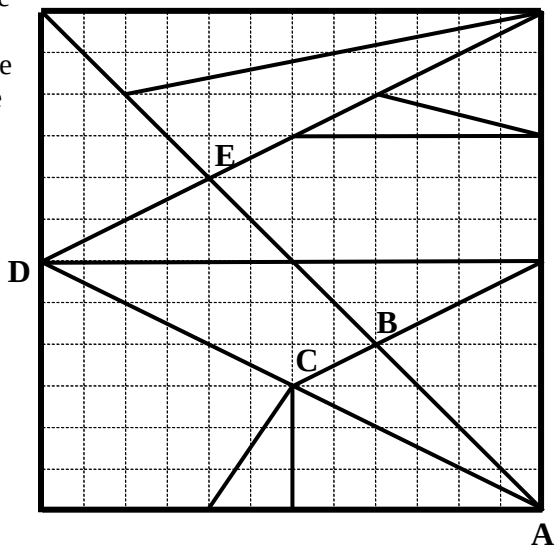


A. 5000 B. 5002 C. 5008 D. 7000 E. 7002

30. A standard six-sided die with faces labeled 1 through 6 is rolled. One face is face-down on a table. Let P equal the product of the other five numbers. What is the largest number that **must** be a factor of P?

A. 6 B. 8 C. 12 D. 24 E. 30

About 2500 years ago the Greek mathematician Archimedes studied the geometry of a game called Stomachion. The game consisted of 14 polygonal pieces that fit together to form a 12 by 12 square grid (see the diagram). The 14 pieces do not overlap and every vertex of each shape lies exactly on a lattice point of this grid.



31. What is the area of triangle ABC?

A. 5.25 square units B. 5.5 square units

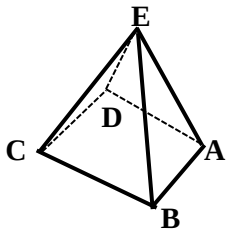
C. 5.75 square units D. 6 square units

E. 6.25 square units

32. In the diagram for Stomachion, what is the perimeter of quadrilateral BCDE? Round your answer to the nearest tenth of a unit.

A. 16.0 units B. 19.1 units C. 19.7 units D. 20.0 units E. 20.2 units

33. The base of this pyramid is a rectangle ABCD with AB = 10 cm and BC = 18 cm. The height of the pyramid is 12 cm. Also, AE = BE = CE = DE . What is the sum of the areas, in square centimeters, of the <u>five</u> faces of this pyramid?



A. 516 B. 524 C. 544 D. 564 E. 600

34. A 200 ml mixture is 80% water and 20% bleach. How much water must be added to dilute the mixture to 5% bleach?

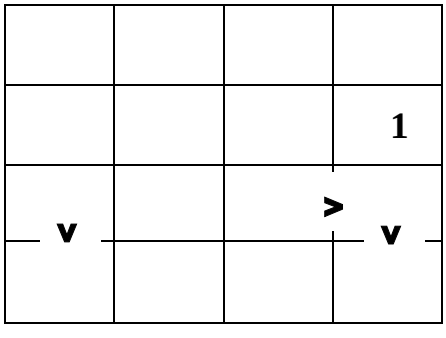
A. 160 ml B. 300 ml C. 320 ml D. 600 ml E. 640 ml

35. The product of the <u>digits</u> of many 4-digit numbers is 96. What is the <u>sum</u> of the greatest and the least such 4-digit numbers?

A. 9779 B. 9889 C. 9999 D. 10,550 E. 10,560

36. Complete this 4 by 4 grid so that the numbers 1, 2, 3, and 4 occur in every row and in every column. In addition the three greater than and less than symbols indicate which of the two adjacent numbers is larger or smaller.

What is the sequence of numbers in the SECOND row (from the top)?



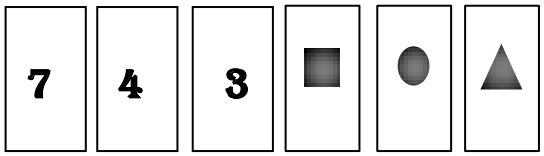
A. 2341 B. 3421 C. 3241

D. 4231 E. 4321

37. For Kara, a sandwich consists of 2 slices of bread and 2 slices of ham. For Tanya, a sandwich consists of 2 slices of bread and 3 slices of ham. When Tanya and Kara begin making sandwiches, each has an identical loaf of bread and an identical package of sliced ham. When Kara ran out of bread, she had 8 slices of ham leftover. When Tanya ran out of ham, she had 4 slices of bread left. What is the sum of the number of slices of ham in one package and the number of slices of bread in one loaf?

A. 48 B. 52 C. 56 D. 60 E. 64

38. Each of these six cards has a natural number on one side and a shape on its other side.



What is the minimum number of cards that must be turned over to determine whether the following statement is TRUE?

"If the number on one side of a card is odd, then the shape on the other side of that card is a square."

A. 2 B. 3 C. 4 D. 5 E. 6

39. A deck of consists of 16 cards, the
Ace, Two, Three, and Four* of each of the four suits: *spades, hearts, clubs, and diamonds.

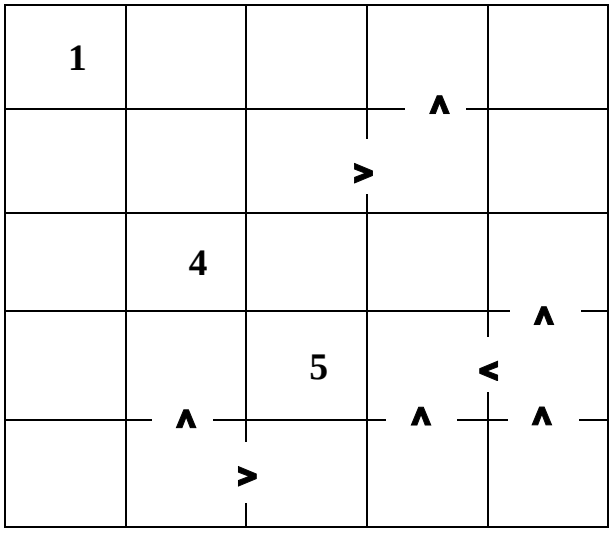
In how many different ways can **one row** of four cards from these 16 cards be dealt such that the row contains one card of each rank (ace, two, three, four) and also one card of each suit? For example, this row of four cards meets these conditions:

Two Of Clubs	*Four Of Spades*	*Ace Of Hearts*	*Three Of Diamonds*

(Note: The order of the four cards from left to right IS significant.)

A. 24 B. 256 C. 576 D. 6,144 E. 43,680

40. Complete this 5 by 5 grid so that the numbers 1, 2, 3, 4, and 5 occur in every row and in every column.
In addition the eight greater than and less than symbols indicate which of the two adjacent numbers is larger or smaller.



What is the sequence of numbers in the second row (from the top)?

A. 25431 B. 51432 C. 53421

D. 35421 E. 21435