

***Eighth Grade Test - Excellence in Mathematics Contest – 2013***

1. How many of these five fractions are between 1.5 and 2?

$$\frac{7}{8} \quad \frac{7}{4} \quad \frac{7}{5} \quad \frac{4}{3} \quad \frac{23}{15}$$

- A. 1            B. 2            C. 3            D. 4            E. 5
2. Of 162 Eighth graders, 80% of the 90 girls and 75% of the boys are taking Algebra I. How many of these Eighth graders are taking Algebra I?
- A. 121            B. 126            C. 130            D. 132            E. 135
3. Shaun starts to list the powers of 3: **3; 9; 27;** .... He stops once all ten digits { 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 } have appeared somewhere in his list. Of those ten digits, which is the last to appear in his list?
- A. 0            B. 1            C. 4            D. 5            E. 6
4. The perimeter of a rectangle is 40 cm. If its width is 6 cm, what is the area of the rectangle?
- A. 84 cm<sup>2</sup>            B. 100 cm<sup>2</sup>            C. 102 cm<sup>2</sup>            D. 168 cm<sup>2</sup>            E. 204 cm<sup>2</sup>
5. On this calendar for March, 2013, what is the sum of all of the shaded dates?

MARCH, 2013						
SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

- A. 240            B. 255            C. 270            D. 285            E. 300
6. The first three numbers in an arithmetic sequence are: **97; 82; 67;**..... What is the tenth number in this sequence?
- A. -53            B. -52            C. -38            D. -37            E. -32
7. One new oil well in North Dakota required 10,560 feet of steel pipe. Each segment of the pipe was 32 feet long and weighed  $\frac{1}{4}$  of a ton. (1 ton = 2000 pounds) How many pounds of steel were used for this one oil well?
- A. 84,480            B. 124,000            C. 165,000            D. 660,000            E. 2,640,000
8. What is the sum of the least and the greatest of these five numbers?
- 0 ; 0.2 ; -0.3 ; -0.04 ; 0.08**
- A. 0.16            B. 0.08            C. 0.04            D. 0.2            E. -0.1

***Eighth Grade Test - Excellence in Mathematics Contest – 2013***

9. Follow this set of directions:
1. Select any three different natural numbers between 0 and 10 to use as digits.
  2. Write all six 3-digit numbers that can be written with your three digits.
  3. Add those six numbers.
  4. Divide the sum in Part 3 by the sum of the three digits you originally chose in Part 1.

What is your result?

- A. 111      B. 222      C. 333      D. 444      E. 555
10. Given 5 nickels and 3 pennies, how many different amounts of money can be formed using one or more of these 8 coins?
- A. 16      B. 18      C. 20      D. 23      E. 24
11. If  $x + y = 20$  and  $x - y = -6$ , what does  $x^2 - y^2$  equal?
- A. -120      B. -36      C. 36      D. 64      E. 120
12. Entomologists estimate that there are about  $10^{16}$  ants on the Earth and that 1.5 million ants weigh about one pound. The world human population is about 7.1 billion people. Which one of the following five numbers is closest to the ratio of “total weight in pounds of humans” to “total weight in pounds of ants”? (Hint: You must estimate one ‘missing’ piece of data.)
- A. 2      B. 40      C. 100      D. 400      E. 1200
13. On this calendar for March, 2013, 16 numbers have been shaded. Circle any four of those 16 numbers so that exactly one number from each row and exactly one number from each column have been circled.

<b>MARCH, 2013</b>						
<b>SUN</b>	<b>MON</b>	<b>TUE</b>	<b>WED</b>	<b>THUR</b>	<b>FRI</b>	<b>SAT</b>
					<b>1</b>	<b>2</b>
<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>
<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>
<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>31</b>						

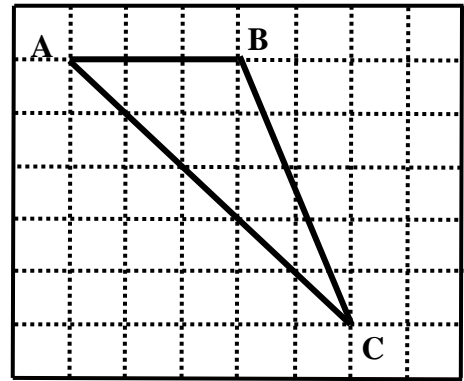
What is the largest possible sum of any four numbers you could circle?

- A. 72      B. 76      C. 80      D. 104      E. 114
14. In Fairbanks Alaska, the number of hours of daylight increases rapidly each February. On February 1, sunrise was at 9:37 AM and sunset was at 4:33 pm. On February 28, sunrise was at 8:02 AM and sunset was at 6:08 pm. How many more minutes of daylight were there on February 28 than on February 1?
- A. 166      B. 172      C. 178      D. 184      E. 190
15. If 12 woodchucks could chuck 6 cords of wood in 4 hours, in one hour *how much wood could a woodchuck chuck if a woodchuck could chuck wood?*
- A. 1/8 cord      B. 1/4 cord      C. 1/2 cord      D. 3/4 cord      E. 1 cord



***Eighth Grade Test - Excellence in Mathematics Contest – 2013***

16. This grid is divided into 1 cm by 1 cm squares. In square centimeters, what is the area of triangle ABC?



- A. 7                      B. 7.25                      C. 7.5  
D. 7.75                      E. 8

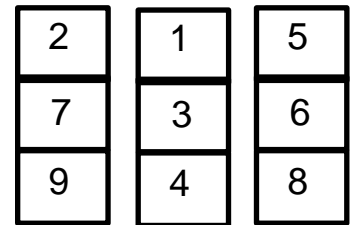
17. After their first five games, the Arizona Wildcats men’s basketball team was averaging 85.2 points per game. After their sixth game, their average dropped to 81.5 points per game. How many points did they score in their sixth game?

- A. 63                      B. 66                      C. 74                      D. 77                      E. 78

18.  $N$  is a positive integer. What is the average of all of the integers from  $-N$  to  $N+5$ , inclusive?

- A. 2.5                      B.  $\frac{15}{2(N+3)}$                       C.  $\frac{5(N+3)}{2N+5}$                       D. 3                      E.  $\frac{15}{2N+5}$

19. Form a 3-digit whole number by selecting one digit from each column, in the order given. For example, you can form 718 or 215.



How many different 3-digit multiples of 3 are possible?

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

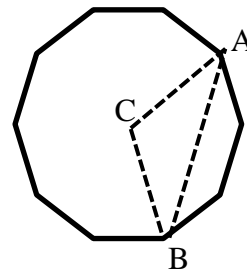
20. The stronger Goldbach conjecture states that any even number greater than 7 can be written as the sum of two different prime numbers. In how many ways can 60 be written as the sum of two different prime numbers?

- A. 3                      B. 4                      C. 5                      D. 6                      E. 7

21. *Nine billion* can be factored in the form:  $2^a * 3^b * 5^c$ . What is  $a+b+c$  ?

- A. 11                      B. 14                      C. 17                      D. 18                      E. 20

22. Point C is the center of this regular decagon, What is the measure of angle ABC?



- A.  $30^\circ$                       B.  $36^\circ$                       C.  $40^\circ$   
D.  $45^\circ$                       E.  $54^\circ$

23. The sum of 40 consecutive odd numbers is 240. What is the largest of those 40 numbers?

- A. 25                      B. 27                      C. 45                      D. 47                      E. The sum of 240 is not possible

***Eighth Grade Test - Excellence in Mathematics Contest – 2013***

24. The length and the width of a rectangle are each a whole number of centimeters. If the area of the rectangle is 2013 square centimeters, how many different rectangles are possible?
- A. 2                      B. 4                      C. 5                      D. 6                      E. 8
25. Along the Mississippi River, the distance from Hannibal, Missouri, to the Gulf of Mexico is about 1500 miles. To estimate the speed of his raft, Tom Sawyer measures that it drifts 65 feet in 20 seconds. If this rate stays constant and Tom drifts 12 hours each day, which is the best estimate of the number of days it would take Tom to drift from Hannibal to the Gulf of Mexico? (1 mile = 5280 feet)
- A. 28                      B. 56                      C. 96                      D. 112                      E. 192
26. On this calendar for March, 2013, nine numbers have been shaded. Circle any three of those nine numbers so that exactly one number from each row and exactly one number from each column have been circled. What is the largest possible product of any three numbers you could circle?

MARCH, 2013						
SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2
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10	11	12	13	14	15	16
17	18	19	20	21	22	23
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- A. 5643                      B. 5832                      C. 6000                      D. 6084                      E. 6175
27. In square ABCD, P is the midpoint of AB and Q is the midpoint of BC. If the length of PQ is 8 cm, what is the area of ABCD?
- A.  $64 \text{ cm}^2$                       B.  $128 \text{ cm}^2$                       C.  $256 \text{ cm}^2$                       D.  $64\sqrt{2} \text{ cm}^2$                       E.  $128\sqrt{2} \text{ cm}^2$
28. If  $y = 4x$  and  $z = 6y$ , then what does  $12x + 4y + 12z$  equal?
- A.  $9y$                       B.  $19y$                       C.  $54y$                       D.  $79y$                       E.  $124y$
29. In January, Rick and Fran drove 680 miles on I-55 from St. Louis to New Orleans. Along the way, in order, they passed Cape Girardeau MO, Memphis TN, and Jackson MS. It is 115 miles from St. Louis to Cape Girardeau; 380 miles from Cape Girardeau to Jackson; and 395 miles from Memphis to New Orleans. How far is it from Cape Girardeau to Memphis?
- A. 165 miles                      B. 170 miles                      C. 180 miles                      D. 185 miles                      E. 210 miles
30. What is the positive difference between the area of a square with perimeter 120 m and the area of a rectangle with perimeter 120 m if the length of the rectangle is three times its width?
- A.  $0 \text{ m}^2$                       B.  $100 \text{ m}^2$                       C.  $225 \text{ m}^2$                       D.  $400 \text{ m}^2$                       E.  $900 \text{ m}^2$
31. How many zeroes are at the end of the product of 25 billion times 80 trillion?
- A. 17                      B. 18                      C. 22                      D. 23                      E. 24

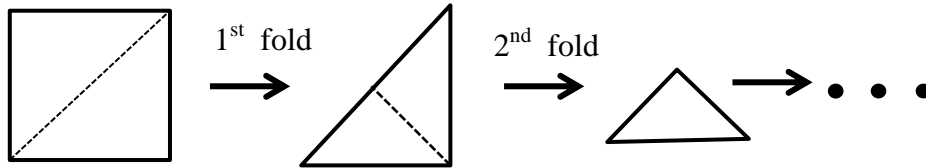
***Eighth Grade Test - Excellence in Mathematics Contest – 2013***

32. A, B, and C are negative integers such that:  $A < B < C < 0$   
How many of the following five expressions MUST represent a positive number?

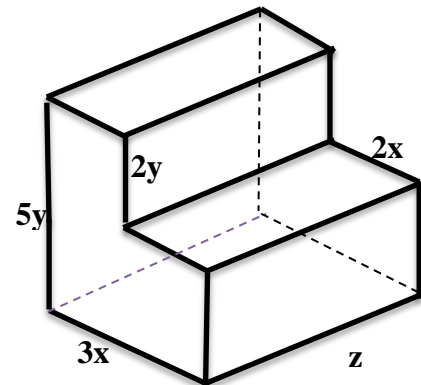
$A - B$ ;       $A + B * C$ ;       $A * B * C$ ;       $B(A + C)$ ;       $B - C - A$

- A. 0      B. 1      C. 2      D. 3      E. 4
33. In November, 2013, Rick’s daughter Zan will be one billion seconds old. In what year was she born?  
A. 1976      B. 1979      C. 1982      D. 1985      E. 1987
34. On a 20 km run-and-walk, Sean averages 12 km/hr running and 7 km/hr walking. If he spends twice the amount of time running as he does walking, how long did it take Sean to complete the 20 km race? Round to the nearest minute.  
A. 77      B. 104      C. 116      D. 129      E. 155

35. A 40 cm by 40 cm square piece of paper is first folded in half along a diagonal. Then that right triangle is folded in half three times to form smaller and smaller right triangles. After these four folds, what is the perimeter of the final triangle? Round your answer to the nearest tenth of a centimeter.



- A. 30.0 cm      B. 34.1 cm      C. 48.3 cm      D. 60.0 cm      E. 68.3 cm
36. How many 4-digit numbers are there with four different digits and with a thousand’s digit two larger than its unit’s digit? (For example, 7405 is one such number.)  
A. 336      B. 448      C. 504      D. 648      E. 2688
37. Given:  $x, y,$  and  $z$  are natural numbers such that  $1 < x \leq y \leq z$ .  
The volume of the solid is 693 cubic centimeters.  
All angles are right angles. The sketch is NOT to scale.



In square centimeters, what is the surface area of the solid?  
(Include all 8 faces.)

- A. 512      B. 534      C. 580  
D. 588      E. 606
38. Assume that the wheel on the TV game show *The Price is Right* has 20 slots labeled  $5; 10; 15; \dots 90; 95; 100$ . When the wheel is spun, its arrow is equally likely to stop in each of these 20 slots.

The first person, Bo, spins a “70” and stops. The second person, Pesky, can win either

- by spinning more than 70 on his first spin and stopping OR
- by spinning a sum of more than 70 and less than or equal to 100 on his first two spins.

What is the probability that Pesky wins by beating Bo?

- A. 45%      B. 48%      C. 50%      D. 51%      E. 60%

*Eighth Grade Test - Excellence in Mathematics Contest – 2013*

**In Problems #39 and #40,** you need to complete two *Ken-Ken* Puzzles.

**RULES:** In any correctly completed 4x4 *Ken-Ken* Puzzle:

- Use only the numbers 1, 2, 3, 4
- Each row must contain 1, 2, 3, 4
- Each column must contain 1, 2, 3, 4
- Also, the numbers in each region with a **heavy border** must make the calculation true. For example:
  - **2 ÷** means that the quotient of the two numbers must be 2
  - **1 -** means that the difference of the two numbers must be 1
  - **12x** means that the product of the two or more numbers must be 12
  - **9+** means that the sum of the two or more numbers must be 9

**SAMPLE** →

<b>4+</b> 1	<b>1 -</b> 4	3	<b>16x</b> 2
3	<b>2 ÷</b> 1	2	4
<b>9+</b> 4	2	1	<b>12x</b> 3
2	3	4	1

A correctly completed puzzle is to the right.

39. Using only *1, 2, 3,* and *4,* complete this 4x4 *Ken-Ken* Puzzle.

What is the sum of the four numbers in the boxes labeled A, B, C, and D?

- A. 8                      B. 9                      C. 10  
D. 11                     E. 12

<b>24x</b> A	<b>8+</b> B		
C	<b>3+</b> D	<b>6x</b>	
		<b>5+</b>	<b>2 ÷</b>
<b>2 -</b>			

40. Using only *1, 2, 3, 4, 5, 6,* and *7,* complete this 7x7 *Ken-Ken* Puzzle.

What is the sum of the four numbers in the four boxes labeled A, B, C, and D?

- A. 14                      B. 15  
C. 16                      D. 17  
E. 18

<b>13 +</b>		<b>12 +</b>		<b>3 -</b>	<b>12x</b>	
<b>14 +</b>	<b>5 +</b>		A	B	<b>2 -</b>	
			<b>36x</b> C	<b>13 +</b> D		<b>12x</b>
<b>20x</b>		<b>2 -</b>				
	<b>6 -</b>			<b>120x</b>		
<b>9 +</b>		<b>2 -</b>	<b>6 -</b>	<b>3 ÷</b>		
				<b>105x</b>		