

2008 MathEdge+ Contest

Grades K-1 (JS) do problems 1-10. Grades 2-3 (B) do problems 1-15. Grades 4-5 (I) do problems 6-25. Grades 6-8 (A) do problems 6-30. Please box the answer. Only correct answer counts. No partial credit will be given. No Calculator. 40 mins. Additional problems from higher level could be used for tiebreak.

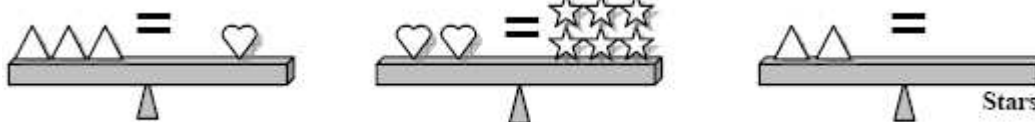
1) How many bicycles can you see in the picture below?



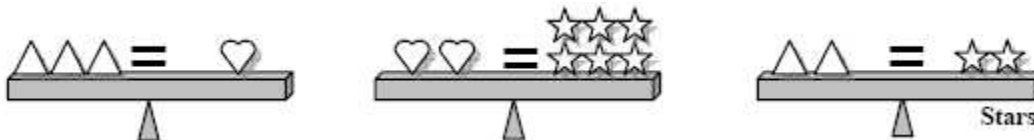
ANS: 6

SOL: Count up every 2 wheels for one bicycle. The number of wheels is 12. The number of bicycles is 6.

2) Balance the following scales by drawing in the missing stars in the 3rd diagram:



ANS:



3) In the addition problem, what digit does the apple represent?

ANS: 4

SOL: Apple is 1 less than 5. Thus apple is 4.

$$\begin{array}{r}
 + \quad 7 \\
 \quad \quad \text{apple} \\
 + \quad \text{apple} \quad 3 \\
 \hline
 \quad \quad 5 \quad \text{apple}
 \end{array}$$

4) Katie's birthday was yesterday. It is Thursday tomorrow. What day was Katie's birthday?

ANS: Tuesday

SOL: It is Thursday tomorrow, then today is Wednesday, then yesterday was Tuesday.

5) How many cubes have been removed from the first block to obtain the second one?



ANS: 7

SOL: Count the number of blocks that doesn't have a top block or $9 - 2 = 7$

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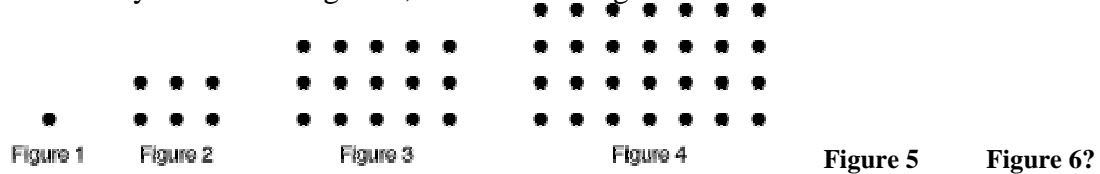
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- 6) For his good work at the math class, Johnny was given a bag of Gummi Bear candies as reward. It has 25 pieces in the bag in the colors of yellow, red, orange, green, and brown with equal amount for each color. Johnny likes to eat it in the order according to his favorite. He first ate all the yellow, red and orange ones. How many pieces of candy are now left in the bag?

ANS: 10

SOL: Divide 25 pieces into 5 colors which is 5 per color. Since he finished 3 colors, two colors of 5 each remains. The remaining number of candies totals $5 \times 2 = 10$.

- 7) How many dots are in Figure 6, the next next figure?



ANS: 66

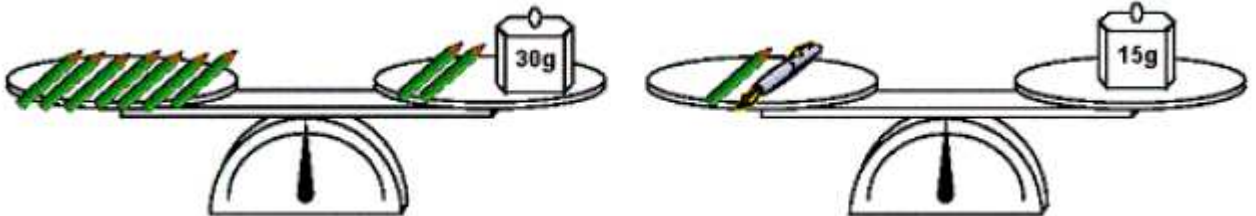
SOL: The rule is: $(X+2)(Y+1)$. Figure 5 will have $(7+2)(4+1) = 9 \times 5 = 45$. Figure will be $11 \times 6 = 66$

- 8) What number is 5 more than the number that is 10 less than 40?

ANS: 35

SOL: The number that is 10 less than 40 is $(40 - 10) = 30$. The number that is 5 more than 30 is $(30 + 5) = 35$.

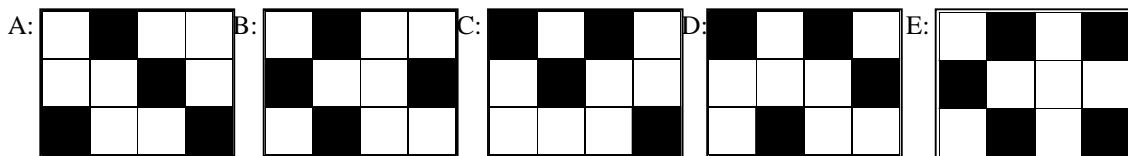
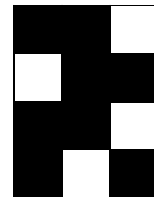
- 9) The scales in both pictures were balanced. Pencils and a pen are on the arms of the scales. What is the weight of the pen in grams?



ANS: 9 grams

SOL: From the left scale, we know that 5 (7-2) pencils weight 30g and thus a pencil weights $6g = 30g \div 5 = 6g$. Since a pencil and a pen weights 15g, a pen weights $9g = 15g - 6g$.

- 10) Five identical sheets of a plastic rectangles were divided into white and black squares. Which of the sheets from A to E has to be covered with the sheet to the right in order to get totally black rectangle?



ANS: D

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11) Place one digit in each box to make a correct subtraction problem. What is the sum of the digits in the five boxes?

ANS: 28

SOL: $4+7+5+6+6 = 28$

$$\begin{array}{r}
 6 \boxed{4} 4 \boxed{7} 3 \\
 - \boxed{5} 4 8 2 \boxed{6} \\
 \hline
 9 \boxed{6} 4 7
 \end{array}
 \qquad
 \begin{array}{r}
 6 \boxed{} 4 \boxed{} 3 \\
 - \boxed{} 4 8 2 \boxed{} \\
 \hline
 9 \boxed{} 4 7
 \end{array}$$

12) The sum of the two 5-digit numbers ABC10 and ABC12 is 123422. What is A + B + C?

ANS: 14

SOL: Since the last two digits of ABC10 and ABC12 sum to 22, we have $ABC + ABC = 2(ABC) = 1234$. Hence $ABC = 617$, so $A = 6$, $B = 1$, $C = 7$, and $A + B + C = 6 + 1 + 7 = 14$.

13) What is the result of the addition and subtraction shown below?

$$\begin{array}{r}
 111111111 \\
 - 111111111 \\
 + 111111111 \\
 - 111111111 \\
 + 111111111 \\
 - 111111111 \\
 + 111111111 \\
 - 111111111 \\
 + 111111111 \\
 - 111111111 \\
 + 111111111 \\
 - 111111111 \\
 \hline
 101010101
 \end{array}$$

ANS: 101010101

14) Eve was supposed to multiply a certain number by 10 but instead she divided that number by 10. With that she got 937 as a result. What would be the result if she hadn't made that mistake?

ANS: 93700

SOL: $937 \times 10 \times 10 = 93700$

15) In a time table practice worksheet on the right, every white section is the products of two numbers from the gray sections – one from above and one from the left (for example: $42 = 7 \cdot 6$). Some of these products are represented by letters. Which two letters represent the same number and what would be the number?

ANS: M = S = 12

SOL:

X	3	9	2	7
8				56
4		36	8	
3		27	6	
6	18			42

X	3	9	2	7
8	24	72	16	56
4	12	36	8	28
3	9	27	6	21
6	18	54	12	42

•				7
	J	K	L	56
	M	36	8	N
	T	27	6	P
6	18	R	S	42

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- 16) To paint all sides of a cube that was built out of little cubes (Figure 1) 9 pounds of paint was used. How many pounds of paint are needed to paint the white region of the solid shown in Figure 2?

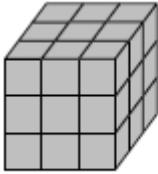


Figure 1

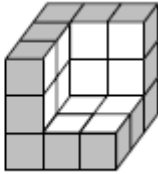


Figure 2

ANS: 2 lbs

SOL: Figure 1 with 9x6 faces took 9 lbs. The white region with 12 faces would take $(9 \times 12) / (9 \times 6) = 2$ lbs

- 17) What is the minimum number of times a pen must be lifted out of the page in order to draw the Kitty diagram?

ANS: 3

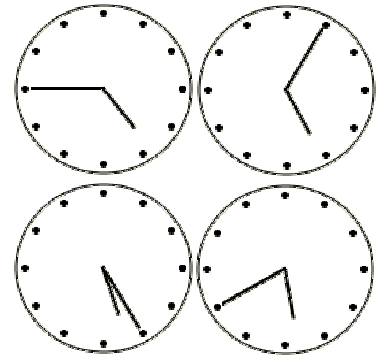
SOL: Because there is no mention of not being able to go over lines already drawn. The answer is, of course, 3: drawing the face first, then lifting to draw the eyes (2 times) and the nose (one more lift).



- 18) Four clocks are on the wall (see the picture) but only one of them shows correct time. One of them is 20 minutes ahead, another is 20 minutes late, and the other is stopped. What is the correct time at the moment?

ANS: 5:05

SOL: $5:05 + :20 = 5:25$; $5:05 - :20 = 4:45$. 5:40 is the clock that stopped.



- 19) The odd numbers from 1 through 17 are placed in the magic square so that the sum of the numbers in each row, column and diagonal are equal. What number goes in the square marked "X"?

ANS: 7

SOL: The sum of the numbers in each row ("the magic sum"), divide the sum of all the numbers by the number of rows. $1 + 3 + 5 + \dots + 15 + 17 = 81$, so the magic sum is $81 \div 3$, or 27. Since $5 + A + 13 = 27$, square A contains 9. Then $1 + 9 + B = 27$, so square B contains 17. Finally, $X + 17 + 3 = 27$, so 7 goes in the square marked "X".

	1	
5	A	13
X	B	3

- 20) Mary forgot her code to unlock her locker at school. She knows that she has created the code with 5 different even digits but forgot the order that it should be entered. What would be the maximum number of trials that she needs to make in order to open her locker?

ANS: 120

SOL: $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

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21) Each letter represents a different single digit. What would be the value of A, B, C, D, and E?

ANS: A = 7, B = 5, C = 3, D = 2, E = 6

SOL: $B \times B = ?B$, so B can be either 5 or 6.

If B = 6: then $A6 \times A = 6D6$, then A has to be either 1 or 6, neither works.

If B = 5; then $A5 \times A = 5D5$, then A has to be 7.

Work out the rest:

$$\begin{array}{r}
 75 \\
 \times 75 \\
 \hline
 375 \\
 525 \\
 \hline
 5625
 \end{array}$$

$$\begin{array}{r}
 AB \\
 \times AB \\
 \hline
 CAB \\
 BDB \\
 \hline
 BEDB
 \end{array}$$

22) The average of five numbers is 18. Let the first number be increased by 1, the second number by 2, the third number by 3, the fourth number by 4, and the fifth number by 5. What is the average of the set of increased numbers?

ANS: 21

SOL: Method 1: $(18 \times 5 + 1 + 2 + 3 + 4 + 5) \div 5 = (90+15) \div 5 = 105 \div 5 = 21$

Method 2: The new average = $18 + (1 + 2 + 3 + 4 + 5) \div 5 = 18 + 3 = 21$

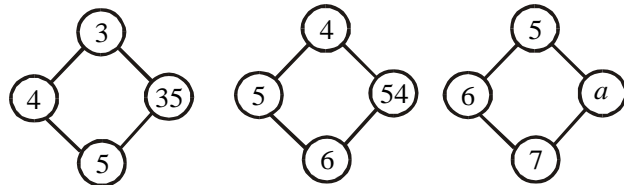
23) Find the next three numbers in the series and answer also what is the pattern?

5 10 40 240 _____

ANS: 1920; 19200; 230400

SOL: $(\times 2), (\times 4), (\times 6), (\times 8), (\times 10), (\times 12)$

24) Observe the pattern and find the value of a .



ANS: 77

SOL: The pattern is to add the first 2 numbers then multiply the third. $(5+6) \times 7 = 77$

25) In a rabbit race, the rabbit who came three places in front of the rabbit who finished last came two places ahead of the rabbit who came seventh. How many rabbits were in the race?

ANS: 8 rabbits

SOL: First, one can realize that 7 is a lower bound and begin guessing from 7 onwards. Alternatively, one can actually do the calculation, which is fairly trivial - two places ahead of 7th is 5th, 5th plus 3 places = 8 rabbits.

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26) What would be the value of the following express?

$$\frac{1}{2008} + \frac{2}{2008} + \frac{3}{2008} + \dots + \frac{2006}{2008} + \frac{2007}{2008}$$

ANS: 2007 / 2 or 1003.5

SOL: $(1+2+3+ \dots + 2007) / 2008 = (2007 \times 2008) / (2 \times 2008) = 2007 / 2$

27) Each of the angles of a triangle when expressed in degrees is a perfect square. What would be the value of the three angles?

ANS: 100, 64, 16

SOL: $a^2 + b^2 + c^2 = 180^\circ$; $10^2 + 8^2 + 4^2 = 180$

28) How many different 5-digit palindromes are there? (A palindrome is any number that reads the same forwards and backwards, such as 151, 729927 or 88388)

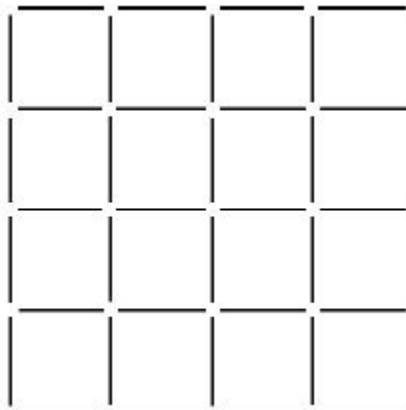
ANS: 900

SOL: The form of the palindrome is ABCBA. Since 0 is never a leading digit, A (on the left) can be any digit from 1 through 9, and B(on the left) can be any digit from 0 through 9. For each of the 9 possible values of A, there are 10 possible values of B, a total of $9 \times 10 = 90$ different two-digit numbers AB. Similarly, C can be any digit from 0 through 9. For each of the 90 possible values of AB, there are 10 possible values of C, a total of $90 \times 10 = 900$ different values of the three-digit ABC. Since B and A (on the right) each have only 1 possible value, there is a total of $9 \times 10 \times 10 \times 1 \times 1 = 900$ five-digit palindromes.

29) Given a 4×4 square grid made up of matchsticks (i.e. 40 matchsticks), what is the minimum number of matchsticks you can remove such that there are no squares left?

ANS: 9

SOL: First, considering a 1×1 square, only one matchstick need be removed to 'break' all the squares. Then go to a 2×2 square, by inspection one can easily see that three matchsticks must be removed. Now for a 3×3 square., we find that at least six matchsticks must be removed. At this point we could guess that the next number in the sequence is nine.



30) What is the value of the following expression?

$$\sqrt{\sqrt{\sqrt{1+2000\sqrt{1+2001\sqrt{1+2002\sqrt{1+2003 \times 2005}}}}}}$$

ANS: 2001

SOL: $(1+2003 \times 2005) = 2003^2 + 2 \times 2003 + 1 = (2003+1)^2 = 2004^2$. The inner square root resulted to 2004. The second square root results to 2003. The third square root results to 2002 and the first square root results to 2001.