Spring 2013 McNabb GDCTM Contest
Algebra One

NO Calculators Allowed

1. If 10 carpenters can build 10 cabinets in 10 days how many days does it take 20 carpenters to build 20 cabinets?

   (A) 5 **(B)** 10 **(C)** 15 **(D)** 20 **(E)** 25

2. The last 6 digits of 13^{426} are 000009. What is the sum of the last 6 digits of 13^{1704}?

   (A) 18 **(B)** 19 **(C)** 20 **(D)** 21 **(E)** 22

3. How many seconds are there in exactly six weeks?

   (A) 7! **(B)** 8! **(C)** 9! **(D)** 10! **(E)** 12!

4. If the integer $\underline{4400b074}$ is divisible by 101, what must the digit b equal?

   (A) 0 **(B)** 2 **(C)** 3 **(D)** 5 **(E)** 8

5. A rectangle with area 125 has its sides in the ratio of 4 : 5. What is the perimeter of this rectangle?

   (A) 18 **(B)** 22.5 **(C)** 36 **(D)** 45 **(E)** 54

6. For how many positive integers n does $n!$ end in exactly eleven zeros?

   (A) 0 **(B)** 3 **(C)** 5 **(D)** 8 **(E)** 11

7. Which of the following equations has exactly two solutions over the real numbers?

   (A) $x^2 - 6x + 9 = 0$ **(B)** $5x = 2(5 - 7x)$ **(C)** $|x + 8| = -5$
   (D) $|x| = 12$ **(E)** $x^2 + 1 = 0$

8. When a cyclist gets a puncture she has just completed three-fourths of her route. She finishes her route by walking. If she spent twice as much time walking as biking, how many times faster does she bike than walk?

   (A) 4 **(B)** 4.5 **(C)** 5 **(D)** 5.5 **(E)** 6

9. Given the three points $(2013, -1863)$, $(1776, -1812)$, and $(1181, -1492)$ in the coordinate plane, a fourth point (a, b) is called a *complementing* point if it along with the given three points form the vertices of a parallelogram. Find the sum of all the coordinates of all the complementing points of the given three points.

(A) -197 **(B)** 0 **(C)** 216 **(D)** 631 **(E)** 783

10. The sum of a set of numbers is the sum of all the numbers in that set. How many subsets of the set $\{1, 2, 3, 4, 5, 6, 7\}$ have a sum of 12?

(A) 4 **(B)** 5 **(C)** 6 **(D)** 7 **(E)** 8

11. An amount of \$10000 dollars is deposited in an account for one year at an interest rate of x percent per year compounded twice a year. If, at the end of the year, \$10404 is in the account, then x is

(A) 3.9 **(B)** 4 **(C)** 4.1 **(D)** 7.8 **(E)** 8

12. Which transformation never changes the median of a list of a dozen distinct positive integers?

(A) adding 6 to each number in the list
(B) adding 3 to each of the three smallest numbers in the list
(C) subtracting 4 from each of the four largest numbers in the list
(D) doubling each number in the list
(E) taking the reciprocal of each number in the list

13. One factor of $14x^2 + 37x + 24$ is

(A) $2x + 1$ **(B)** $14x + 3$ **(C)** $2x + 7$ **(D)** $7x + 8$ **(E)** $7x + 3$

14. A purse may only contain pennies, nickels, dimes, and quarters but does not have to contain any particular type of coin, except as demanded in meeting the following conditions: the average value of the coins in the purse is 16 cents; if one more quarter were added to it the average value would rise to 17 cents. How many quarters are actually in the purse?

(A) 0 **(B)** 3 **(C)** 5 **(D)** 7 **(E)** cannot be uniquely determined

15. For what value of the constant a do the three lines

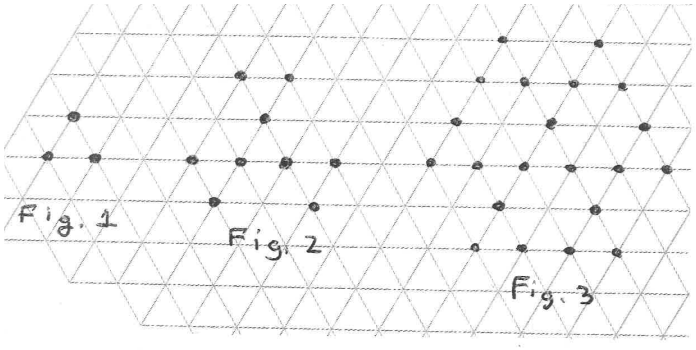
$$2x + 5y = -7 \qquad 3x - 2y = 18 \qquad ax + 6y = 2$$

all intersect at the same point?

(A) 5 **(B)** 6 **(C)** 7 **(D)** 8 **(E)** 9

16. The first three figures of a certain sequence of figures are shown below on an equilateral triangle grid. Each successor figure is obtained recursively from its predeccesor by this rule: any two or more consecutive dots on a grid line generate new neighboring dots on that grid line, on either side, where no dot was before. All previous dots remain. How many dots does the 5th figure in this sequence have?

(A) 34 **(B)** 36 **(C)** 57 **(D)** 59 **(E)** 64



17. If the equations $x^2 + ax + 21 = 0$ and $2x^2 + 19x + 35 = 0$ have a solution in common, what could be the value of the constant a?

(A) -10 **(B)** -4 **(C)** -2 **(D)** 4 **(E)** 10

18. Amanda and Blake together can paint a house in 749 hours. Blake and Cathy together paint it in 535 hours. Cathy and Amanda together paint it in 642 hours. How long would it take in hours to paint the house if all three work together?

(A) 400 **(B)** 420 **(C)** 430 **(D)** 440 **(E)** 460