Spring 2010 McNabb GDCTM Contest
Level I

1. Three pomegranates and one pineapple weigh as much as sixteen plums. Four plums and one pomegranate weight as much as one pineapple. How many pomegranates weigh as much as 3 pineapples?

   (A) 5 **(B)** 6 **(C)** 7 **(D)** 9 **(E)** 11

2. What is the area of the quadrilateral in the coordinate plane with vertices whose coordinates are (in order): $(0, 0)$, $(7, 1)$, $(4, 4)$, and $(2, 11)$?

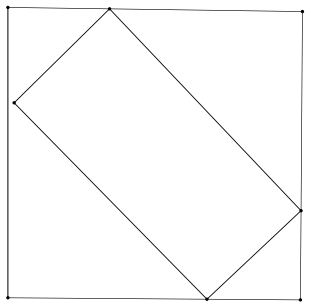
   (A) 30 **(B)** 31 **(C)** 31.5 **(D)** 32 **(E)** 33

3. Ronald has an unlimited number of 5 cent and 7 cent stamps. What is the largest amount of postage (in cents) that he cannot make with these stamps?

   (A) 16 **(B)** 22 **(C)** 23 **(D)** 79 **(E)** 99

4. A rectangle with unequal sides is placed in a square so that each vertex of the rectangle lies on a side of the square at a trisection point of that side as shown. What is the fraction of the area of the square that is covered by the rectangle?

   (A) 1/3 **(B)** 7/18 **(C)** 4/9 **(D)** 1/2 **(E)** 5/9



5. The area of a triangle with sides of length 13, 14, and 15 is closest to

   (A) 84 **(B)** 86 **(C)** 88 **(D)** 90 **(E)** 92

6. If $f(x)$ is a linear function for which $f(8) - f(1) = 11$, then $f(41) - f(6)$ is equal to

   (A) 61 **(B)** 55 **(C)** 49 **(D)** 43 **(E)** 37

7. The surface area of a large spherical balloon is doubled. By what factor is the volume of the balloon increased?

   (A) 8 **(B)** 4 **(C)** $2\sqrt{2}$ **(D)** $\sqrt[3]{4}$ **(E)** 2

8. Find the distance between the point with coordinates $(14, -2)$ and the line with equation $3x - 4y = 0$.

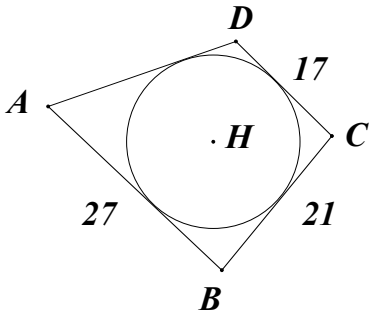
   (A) 4 **(B)** $4\sqrt{2}$ **(C)** $5\sqrt{2}$ **(D)** 8 **(E)** 10

9. Zeke cycles steadily for 36 miles. If he had managed to go 3 mph faster, he would have taken one hour less for the trip. What was Zeke's actual speed in mph during this trip?

(A) 9 **(B)** 12 **(C)** 15 **(D)** 18 **(E)** 21

10. A circle is inscribed in quadrilateral $ABCD$ as marked. Find the length of side $\overline{DA}$.

(A) 23 **(B)** 24 **(C)** 25 **(D)** 26 **(E)** 27



11. How many lines of symmetry does a cube have?

(A) 4 **(B)** 7 **(C)** 10 **(D)** 12 **(E)** 13

12. In $\triangle ABC$, let D be the intersection point of the bisector of $\angle ABC$ and the bisector of $\angle BCA$. If $\angle CAB$ is 70 degrees, what is the measure of $\angle CDB$ in degrees?

(A) 35 **(B)** 55 **(C)** 105 **(D)** 125 **(E)** 140

13. A set of seven distinct positive integers has a mean of 13. Find the difference between the greatest possible median of these integers and the least possible median of these integers.

(A) 12 **(B)** 13 **(C)** 14 **(D)** 15 **(E)** 16

14. A line L in the coordinate plane has slope -2. Suppose the triangle with vertices given by the origin, the x-intercept of L, and the y-intercept of L has area 9. Then an equation for L could be

(A) $2x + y = 0$ **(B)** $2x + y = 4$ **(C)** $-2x + y = 6$
(D) $2x + y = 3$ **(E)** $2x + y = -6$

15. Each vertex of a cube is randomly colored red or blue with each color being equally likely. What is the probability that every pair of adjacent vertices have different colors?

(A) 0 **(B)** 1/128 **(C)** 1/64 **(D)** 1/32 **(E)** 1/2

16. A semicircle lies in $\triangle EFG$ with diameter contained in $\overline{EG}$, and with $\overline{EF}$ and $\overline{GF}$ both tangent to it. If $EF = 12$, $FG = 15$, and $EG = 18$, what is the value of EC where C is the center of the semicircle?

(A) 6 **(B)** 6.5 **(C)** 7 **(D)** 7.5 **(E)** 8

17. A 4 inch by 4 inch square board is subdivided into sixteen 1 inch by 1 inch squares in the usual way. Four of the smaller squares are to be painted white, four black, four red, and four blue. In how many different ways can this be done if each row and each column of smaller squares must have one square of each color in it? (The board is nailed down: it can not be rotated or flipped).

(A) 576 **(B)** 864 **(C)** 1152 **(D)** 1200 **(E)** 1600

18. In acute $\triangle ABC$, the altitude from A meets side $\overline{BC}$ at point D, the altitude from B meets side $\overline{AC}$ at point E, and the altitude from C meets side $\overline{AB}$ at point F. All three altitudes are concurrent at point H lying inside $\triangle ABC$. If $\angle BAC$ measures 58 degrees, then find the measure of $\angle BHC$ in degrees.

(A) 90 **(B)** 98 **(C)** 104 **(D)** 116 **(E)** 122

19. In how many ways can five distinct books be arranged in a bookcase with 3 shelves, each shelf capable of holding all five books?

(A) 19 **(B)** 120 **(C)** 360 **(D)** 840 **(E)** 2520

20. Semicircles are drawn on two sides of square $ABCD$ as shown. Point E is the center of the square, and points Q, A, and P are collinear with $QA = 4$ and $AP = 16$. Find QE.

(A) 12 **(B)** $10\sqrt{2}$ **(C)** $10\sqrt{3}$
(D) 15 **(E)** 20