FALL 2010 McNABB GDCTM CONTEST
GEOMETRY

NO Calculators Allowed

1. An automobile goes $y/9$ yards in d seconds. How many feet does it travel in two minutes time?

   (A) $\dfrac{40y}{d}$ **(B)** $\dfrac{40d}{3y}$ **(C)** $\dfrac{3y}{40d}$ **(D)** $120yd$ **(E)** $\dfrac{120y}{d}$

2. The well-known formula $f = (9/5)c + 32$ relates the temperature f in Fahrenheit to the temperature c in Celcius. For how many values of f satisfying $32 \le f \le 212$, will the temperature be an integer in both of these scales?

   (A) 9   **(B)** 10   **(C)** 19   **(D)** 20   **(E)** 21

3. Suppose the *converse* of the following statement is true:

   > If Zerb is from Xanlor, then Zerb is blue.

   Which of the following statements **must** be true?
   > I. If Zerb is not from Xanlor, then Zerb is not blue.
   > II. If Zerb is from Xanlor, then Zerb is blue.
   > III. If Zerb is blue, then Zerb is not from Xanlor.

   (A) I only   **(B)** II only   **(C)** III only
   (D) I and II only   **(E)** I and III only

4. At Zeke's Zucchini Stand, 3 zucchini's and 2 squash cost \$4.75, while 2 zucchini's and 3 squash cost \$5.25. How much would 3 zucchini's and 3 squash cost?

   (A) \$5.50   **(B)** \$5.75   **(C)** \$6   **(D)** \$6.25   **(E)** \$6.50

5. A square is inscribed in a right triangle with sides of length 3, 4, and 5, so that one of the sides of the square is contained in the hypotenuse of the right triangle. What is the side length of the square?

   (A) $\dfrac{60}{37}$ **(B)** 2   **(C)** $\dfrac{12}{5}$ **(D)** 3   **(E)** cannot be determined

6. In how many ways can the the letters in the string $ABECEDA$ be arranged so that the consonants are in alphabetical order?

   (A) 90   **(B)** 105   **(C)** 120   **(D)** 180   **(E)** 210

7. Points A, B, C, and D are collinear and occur in the same order as given. If the ratio $AB : BC$ equals 3 and the ratio $BD : AB$ equals 8/3, then determine the ratio $CD : AC$.

   (A) $\dfrac{5}{3}$ **(B)** $\dfrac{3}{2}$ **(C)** 2   **(D)** $\dfrac{7}{4}$ **(E)** $\dfrac{8}{3}$

8. A baseball team has won 50 games out of 75 so far played. If there are 45 games yet to be played, how many of these must be won in order for the team to finish its season having won exactly 60% of its games?

   **(A)** 20   **(B)** 21   **(C)** 22   **(D)** 23   **(E)** 72

9. In $\triangle ABC$, $\angle A = 60°$, $\angle C = 40°$, $BD \perp AC$ and $\overrightarrow{BE}$ bisects $\angle ABC$. Find the measure of $\angle DBE$ in degrees.
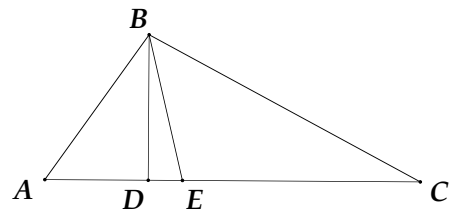
   (A) 8   **(B)** 10   **(C)** 12   **(D)** 14   **(E)** 20

10. A bag contains 4 quarters and 2 dimes. If 3 coins are randomly removed from the bag, what is the expected total value in cents of these three coins?

    (A) 50   **(B)** 55   **(C)** 60   **(D)** 65   **(E)** 75

11. The midpoints of the sides of a triangle are $(7,4)$, $(1,2)$, and $(1,6)$. What is the area of this triangle?

(A) 12   **(B)** 24   **(C)** 30   **(D)** 36   **(E)** 48

12. On co-planar lines l and m we choose points P_1, P_2, P_3, P_4, and P_5 on the former; and points Q_1, Q_2, Q_3, Q_4 on the latter. Draw all possible segments with one endpoint one of the P's and the other one of the Q's. What is the maximum total number of points that can be formed by intersection of pairs of these segments?

(A) 75   **(B)** 60   **(C)** 45   **(D)** 30   **(E)** 20

13. The set S contains seven numbers whose mean is 202. The mean of the four smallest numbers in S equals 100, while the mean of the four largest numbers in S equals 300. What is the median of all the numbers in S?

(A) 184   **(B)** 186   **(C)** 192   **(D)** 196   **(E)** 200

14. Quadrilaterals $ABCD$ and $BEGF$ are rhombi and are situated as in the diagram. If $\angle EBF = 20°$ and $\angle A = 50°$, what is $\angle DEG$?
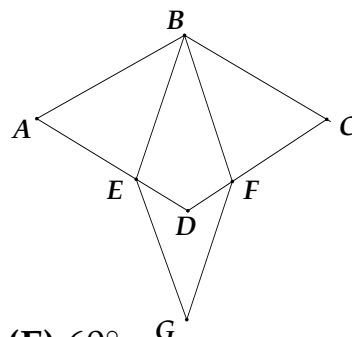
(A) 40°   **(B)** 45°   **(C)** 50°   **(D)** 55°   **(E)** 60°

15. While Xerxes marched on Greece his army streched out for 50 miles. A dispatch rider had to ride from the rear to the head of the army, then instantly turn about and return to the rear. While he did this, the army advanced 50 miles. How many miles did the rider ride?

(A) 100   **(B)** $50 + 50\sqrt{2}$ **(C)** $100\sqrt{2}$ **(D)** 150   **(E)** $50 + 100\sqrt{2}$

16. How many non-congruent scalene triangles with integer side lengths exist with two sides of lengths 13 and 7 respectively?

    (A) 10   **(B)** 11   **(C)** 12   **(D)** 13   **(E)** 14

17. An isosceles trapezoid has bases of 11 and 21 units and legs of 13 units. What is the area of the trapezoid?

    (A) 144   **(B)** 160   **(C)** 176   **(D)** 192   **(E)** 208

18. Hezy and Zeke were employed at different daily wages. At the end of a certain number of days Hezy received $300, while Zeke, who had been absent from work two of those days, received only $192. However, had it been the other way around, had Zeke worked all those days and Hezy been absent twice, then both would have received the same amount. What was Hezy's daily wage?

    (A) 30   **(B)** 40   **(C)** 50   **(D)** 60   **(E)** 70

19. Suppose that the two legs of a certain right triangle are in the ratio 3 : 4. What is the greatest possible area of such a right triangle, if one of its altitudes measures 24?

    (A) 216   **(B)** 384   **(C)** 486   **(D)** 600   **(E)** 726

20. A five-digit integer, with all distinct digits which in this problem must be 1,2,3,4, and 5 in some order, is called *alternating* if the digits alternate between increasing and decreasing in size as read from left to right. They may start on an increasing or decreasing foot. For instance, both 34152 and 53412 are alternating while 12354 is not, for example. How many of this kind of 5 digit integer are alternating?

    (A) 32   **(B)** 28   **(C)** 24   **(D)** 20   **(E)** 16