Spring 2011 McNabb GDCTM Contest
Pre-Algebra

NO Calculators Allowed

1. Hezy leaves home for work at 6:45am. He drives to the Green Line train station 3 miles away at an average speed of 30 mph. After 8 minutes he boards the train for downtown. The train averages 45 mph for its 9 mile journey. After a 7 minute walk Hezy arrives at work. What time does Hezy arrive at work?

   (A) 7:11am **(B)** 7:18am **(C)** 7:21am **(D)** 7:27am **(E)** 7:29am

2. If today is a Saturday, what day of the week will it be 1001 days from today?

   (A) Thursday **(B)** Friday **(C)** Saturday
   (D) Sunday **(E)** Monday

3. The sum of all the factors of 1001 is equal to

   (A) 1002 **(B)** 1344 **(C)** 1440 **(D)** 1836 **(E)** 2002

4. How many arrangements of $REVERE$ are there in which the first R occurs before the first E?

   (A) 12 **(B)** 18 **(C)** 20 **(D)** 24 **(E)** 30

5. In a class, $2/3$ of the students have brown eyes and $4/5$ of the students have brown hair. If students with brown eyes are twice as likely to have brown hair as students who do not have brown eyes, what fraction of the class has neither brown eyes nor brown hair?

   (A) $1/30$ **(B)** $1/15$ **(C)** $1/10$ **(D)** $2/15$ **(E)** $1/5$

6. When three different numbers from the set $\{-7, -2, -1, 0, 4, 5\}$ are multiplied together the smallest possible product is

   (A) -343 **(B)** -175 **(C)** -140 **(D)** -14 **(E)** 0

7. Out of a sphere of clay with diameter 12, Marty fashions two spheres of radius 3 and 5 respectively. Using all of the remaining clay Jennifer fashions a sphere. What is the diameter of Jennifer's sphere?

   (A) 4 **(B)** 6 **(C)** 8 **(D)** 10 **(E)** 12

8. Let m and n be integers satisfying $m^2 + n^2 = 50$. The value of $m + n$ must be

   (A) -8 **(B)** -5 **(C)** 0
   (D) 10 **(E)** cannot be uniquely determined

9. Suppose that \$600 is divided into two parts in the ratio of 2 : 3. The larger of these parts is then further subdivided into two parts in the ratio of 3 : 2. The smallest of these now three parts is

   (A) \$96 **(B)** \$144 **(C)** \$192 **(D)** \$216 **(E)** \$240

10. Points A, B, and C all lie on the same straight line and occur in the order given. If $AB/BC = 2/5$ and $AC = 35$, what is AB?

    (A) 7 **(B)** 10 **(C)** 15 **(D)** 21 **(E)** 25

11. Suppose the integer n has prime factorization $2^6 \cdot 3^8$. How many perfect square factors does n have?

    (A) 12 **(B)** 18 **(C)** 20 **(D)** 24 **(E)** 48

12. The product $60 \times 60 \times 24 \times 7$ equals

    (A) the number of minutes in seven weeks
    (B) the number of hours in sixty days
    (C) the number of seconds in seven hours
    (D) the number of seconds in one week
    (E) the number of minutes in twenty-four weeks

13. The four digit integer $1A8B$ is divisible by 77. What is the value of $A + B$?

    (A) 9 **(B)** 10 **(C)** 11 **(D)** 12 **(E)** 13

14. The surface area of sphere A is 50. Its volume is $\frac{1}{27}$th of the volume of sphere B. What is the surface area of sphere B?

(A) 50/9 **(B)** 50/3 **(C)** 50 **(D)** 150 **(E)** 450

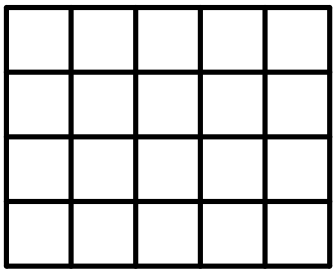
15. If n and m are positive integers and $480n = m^2$, what is the smallest possible value of m?

(A) 90 **(B)** 120 **(C)** 180 **(D)** 240 **(E)** 480

16. A fifth number n is added to the set $\{3, 6, 9, 10\}$ to form a new set $\{3, 6, 9, 10, n\}$. For how many values of n is the mean of this new set equal to its own median?

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** more than 3

17. How many rectangles are in this figure?



(A) 150 **(B)** 300 **(C)** 600 **(D)** 640 **(E)** 800

18. A regular 52 card deck is well shuffled. What is the probability that both the top and bottom cards are aces?

(A) 1/26 **(B)** 1/52 **(C)** 3/221 **(D)** 2/221 **(E)** 1/221

19. In two years a son will be one-third as old as his father was 2 years ago. In eighteen years this son will be the same age as his father was 18 years ago. How old is the son now?

(A) 10 **(B)** 12 **(C)** 14 **(D)** 16 **(E)** 18

20. How many different rectangular prisms can be made using exactly 48 unit cubes? Two prisms are the same if one can be rotated to coincide with the other. For example, a $3 \times 4 \times 4$ rectangular prism is the same as a $4 \times 3 \times 4$ rectangular prism.

(A) 8 **(B)** 9 **(C)** 10 **(D)** 11 **(E)** 12

21. Recall that a Pythagorean triple is a triple (a, b, c) of positive integers satisfying $a^2 + b^2 = c^2$. Which of the following must be true?

(I.) At least one of a, b, and c must be odd

(II.) At least one of a, b, and c must be even

(III.) For at least one Pythagorean triple, $a = b$.

(A) I only **(B)** II only **(C)** I and II only
(D) II and III only **(E)** none of them

22. The twelve edges of a cube are marked with the integers 1 through 12 in such a way that each edge receives a different number. Then each vertex of the cube is assigned the number equal to the sum of the numbers on the edges that meet at that vertex. Finally each face of the cube is assigned the sum of the numbers at each vertex of that face. What must be the sum of all the numbers that have been assigned to the faces of the cube?

(A) 156 **(B)** 234 **(C)** 390
(D) 468 **(E)** cannot be uniquely determined

23. Councilman Bob sits on a 12 member City Council. A committee of 4 councilpeople is to be selected at random. What is probability that Bob is selected to be on this committee?

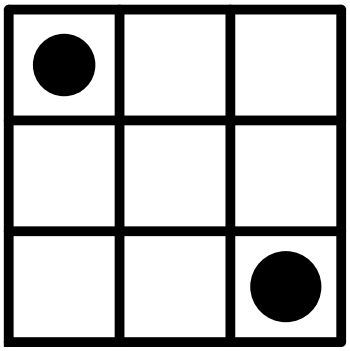
(A) 1/12 **(B)** 1/4 **(C)** 1/3 **(D)** 4/9 **(E)** 1/2

24. In a class of 28 students, 20 take Latin, 14 take Greek, and 10 take Hebrew. If no student takes all three languages and 6 take no language, how many students must be taking both Greek and Hebrew?

(A) 0 **(B)** 1 **(C)** 2
(D) 3 **(E)** cannot be uniquely determined

25. Molly's Motel is adopting a new room key system. The new keys will be square 3×3 cards each with two holes punched in them as in the figure. The two sides (what we would have called the front and back except we cannot tell which is which!) of such a card cannot be distinguished but there is a distinguished edge which is the edge to be inserted in the lock. What is the greatest number of rooms Molly's Motel can have?

insert this edge



(A) 18 **(B)** 21 **(C)** 24 **(D)** 30 **(E)** 36