

SPRING 2018 MCNABB GDCTM CONTEST  
PRE-ALGEBRA

NO Calculators Allowed/ 45 Minutes

1. Find the smallest integer  $n$  so that  $2^n$  is greater than 100.
2. Hezzy runs his first lap in 80 seconds, and, since he gets more and more tired as he runs, each following lap takes him six seconds longer than the previous one. If five laps of this track equals a mile, then Hezzy will take how many seconds to run a mile?
3. A certain triangle has an area of 200. If its height is doubled but its base kept the same, what is the area of the new triangle?
4. The positive integers are put in a rectangular grid in the following way

1	2	3	4	5	6	7	8	9
18	17	16	15	14	13	12	11	10
19	20	21	22	23	24	25	26	27
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$

What is the number at the top of the column which contains the number 70?

5. Bitcoin was created in 2004. By 2011 its value had increased 550% from its original value. By 2018 its value had increased 2100% from its value in 2011. If you had invested \$10,000 in Bitcoin in 2004, what would your investment be worth now in 2018?
6. The points  $A$ ,  $B$ , and  $C$  are collinear with  $AB = 18$  and  $BC = 32$ . Find the sum of all possible values of  $AC$ .
7. How many positive factors of 10,000 are greater than or equal to 100?
8. In how many ways can change be made for two dollars if you have an unlimited number of nickels, dimes, and quarters available?
9. Joe is  $\frac{5}{4}$  as tall as Susan. Bob is  $\frac{3}{4}$  as tall as Max. Susan is three inches shorter than Bob. If Bob is 51 inches tall, then how much taller is Max than Joe? Answer in inches.
10. When Billy starts his trip Sam has a seventy-five mile head start. If Billy drives at a rate of 70 miles per hour and catches up to Sam in two-and-a-half hours, find Sam's driving rate in miles per hour.
11. How many six-digit numbers of the form

$$456AB1$$

are multiples of seven? Note  $A$  and  $B$  are digits.

12. John has 43 blue socks, 71 red socks, and 61 green socks. If John were to select from his collection of socks at random, what is the fewest number of socks he would need to draw in order to guarantee fifteen matching pairs?

13. What is the area of a triangle with side lengths 6, 6, and 4?
14. Find the sum of the 100 smallest positive integers that are neither multiples of two nor multiples of three.
15. How many pairs of ordered integers  $(m, n)$  satisfy  $m \geq 0$ ,  $n \geq 0$ , and

$$\frac{m}{144} + \frac{n}{108} \leq 1$$

?