Bergen County Mathematics League

Good Luck To You

BCML

Good Luck To All

Contest #4 (Calculators Allowed)

2013-2014

Part I *Time Limit: 12 minutes*   Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-1.   In rectangle $ABCD$, $CD = 15$ and $AD = 36$. There is a point E on $\overline{BC}$ for which $AE = 25$. What is the area of trapezoid $ADCE$?

4-2.   What are all values of x which satisfy $\sqrt{x^2} > x$?

Part II *Time Limit: 12 minutes*   Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-3.   What is the least positive rational number k for which $2n^3 = 9k$ has a positive integral solution for n?

4-4.   A survey of 50 athletes, all of whom had lettered in at least one of the sports baseball, track, and volleyball, showed that only 3 lettered in all 3 sports. If 24 lettered in baseball, 27 lettered in track, and 26 lettered in volleyball, how many lettered in exactly 2 of these sports?

Part III *Time Limit: 12 minutes*   Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-5.   Writing your answer in base ten, what is the only positive integral value of x which satisfies the following equation, written in base one hundred:

$$x^2 + x^4 + x^6 + x^8 = 11110?$$

4-6.   In a single-knockout, elimination-type tournament, each match pits 2 contestants against each other. The winner of a match continues to play further matches, while the loser is eliminated from further competition. The matches continue until an overall winner is determined. If 100 players originally enter the tournament, and if every match has one winner, how many matches must be played in order for an overall winner to be determined? [Note that a bye round, in which a player does not actually compete, but is permitted to continue to play in further matches, does not count as a match.]

Reminder: **A question next meet will repeat the theme of question 4-1.**

Answers

4-1.   390

4-2.   all negatives, or $\{x \,|\, x < 0\}$ or $(-\infty, 0)$, or exact equivalent

4-3. $\frac{2}{9}$

4-4.   21

4-5.   10

4-6.   99