

Nassau County Interscholastic Mathematics League

Contest # 6

Answers must be in simplest exact form, unless otherwise noted.

2004-2005

Calculators

Problems 25-26 Time limit: 10 minutes.

25) The half-life of a certain radioactive isotope is 15 days. A sample currently contains 180 grams of the isotope. In how many days, to the nearest tenth of a day, will there be exactly 5 grams left?

26) Find all ordered pairs of positive integers (x, y) such that $19x + 23y = 1937$

Problems 27-28 Time limit: 10 minutes.

27. The three digit number $54K$ is raised to successive powers to create the sequence $(54K)^1, (54K)^2, (54K)^3, \dots$. For which values of K will it be true that the sequence contains at least one number with a units digit of 6 and at least one number with a units digit not 6?

28. The coordinates of one pair of opposite vertices of a square are $(-1, 5)$ and $(7, 35)$. Find the other pair of opposite vertices.

Problems 29-30 Time limit: 10 minutes.

29. Four standard, six-sided dice are rolled. Given that the sum of the four numbers rolled is even, find the probability that the sum is 6. Write your answer as a simplified, common fraction.

30. The vertices of triangle ABC are $A(-4, 12)$, $B(6, 14)$ and $C(4, 0)$. Find the y -coordinate of the foot of the altitude from vertex B to side \overline{CA} . Write your answer as a simplified, common fraction.

Answers: 25) 77.5

26) $(85, 14), (62, 33), (39, 52), (16, 71)$

27) 2, 4, 8

28) $(-12, 24), (18, 16)$

29) $\frac{5}{324}$

30) $\frac{114}{13}$