Contest # 3

Nassau County Interscholastic Mathematics League

Answers must be exact, unless otherwise noted

2000-2001

No Calculators

Problems 13-14. Time limit 10 minutes.

13. Find the angle formed by the minute and hour hands of a standard 12-hour clock when the time is 7:48.

14. Each of four people rolls the same die, one after the other. Find the probability that the numerical values of the four rolls (in the order rolled) are strictly increasing.

Problems 15-16. 10 minutes.

15. (a classic) Find the sum of all the coefficients in the expansion of $(5x-3y)^6$

16. Each of three square pyramids has a 10 by 10 square base. In Pyramid A, the altitude is 10. In pyramid B, each slant height is 10. In pyramid C, each lateral edge has length 10. Arrange the letters of the pyramids in the order of their volume from smallest to largest.

Problems 17-18. 10 minutes.

17. Find the real domain for x in the expression $\dfrac{\sqrt{9-x^2}}{\sqrt{x^3-4}}$

[i.e. find all real numbers which, when substituted for x, yield a real value for the expression]

18. One side of a triangle has length 3x - 1. Another side has length $4x + 5$. If $5 \le x \le 8$, find the range of possible numerical lengths for the third side of the triangle.

Answers

13. $54°$

14. $\dfrac{5}{432}$

15. 64

16. C, B, A

17. $-3 \le x < -2 \text{ or } 2 < x \le 3$
or equivalent disjunction/union

18. $11 <$ third side < 60
or equivalent inequality