Nassau County Interscholastic Mathematics League

Solutions
Contest # 3

2000-2001

13. The hour hand is 4/5 of the way from 7 to 8, so makes a 6° angle with 8 O'Clock. From 8 to 9 is another 30°. Then the minute hand is 3/5 of the way from 9 to 10, so it's 18° past the 9. So the total is 6+30+18=54°.

14. The number of such sets of rolls is ${}_6C_1 = 15$, since any combination has exactly one way to be in order. The number of all possible rolls is 6^6, so the probability is $\frac{15}{6^4} = \frac{5}{432}$

15. Let x = y = 1 and all that's left are the coefficients. So the sum is $2^6 = 64$

16. Since the bases are the same, all that matters is the altitude. Since the hypotenuse of a right triangle is larger than any leg, the lateral edge > slant height > altitude. So if slant ht = 10, alt < 10, so B has less volume than A. Similarly, lateral edge = 10, so slant ht less than 10, and alt even less so C has the least volume.

17. The denominator can't be zero, and neither radicand can be negative, so $9 - x^2 \geq 0$ and also $x^2 - 4 > 0$. So $x^2 \leq 9 \text{ and } x^2 > 4$. This occurs, between -3 and -2, also between 2 and 3, including 3, -3, but not 2, -2.

18. The third side is between the difference and sum of the other two sides, so x−6 < third side < 7x−4. The least x is when x = 5 and the most when x = 8, and 11 < third side < 60