EXPECTED VALUE PROBLEMS

CROSSROADS ACADEMY MATHCOUNTS PREPARATION

(1) What is the expected value of rolling a standard 6 sided die?

(2) What is the expected value of the sum when two standard 6 sided die are rolled?

(3) If you win 3 dollars on a coin flip of heads and lose 4 dollars on a coin flip of tails what is the expected value of flipping the coin 8 times?

(4) If there are 10 people on a math team and each pair of people has probability of .25 of being friends what is the expected number of friendships on the team?

(5) What is the expected number of primes that divide a randomly chosen integer between 2 and 10?

(6) A bag contains some number of \$1 and \$5 dollar bills. If the expected value of a randomly drawn bill from the bag is \$2.20, what is the smallest number of bills that could be in the bag?

(7) A dartboard is formed of three concentric circles with radii of 1, 4, and 9. If the dart lands in the smallest circle you score 6 points, if it lands in the middle you score 4 points and if it lands in the outer circle you score 2 points. If your dart throwing hits a random point on the board, what is your expected score?

(8) A rectangular prism has edges of length 2, 3, and 4. If a point is picked randomly on the surface of the prism, what is the expected value of the area of the face it is on?

(9) A board of length 12 is going to be sawed into three pieces to make a 3–4–5 triangle. If we select a point at random on the board before it is cut, what is the expected value of the length of the piece that our point is on?

Date: April 10, 2018.

(10) What is the expected value of the product of a randomly chosen row or column on a telephone keypad?

(11) What is your expected individual score at a Mathcounts competition if your probability of answering any particular sprint problem correctly is $\frac{2}{3}$ and your probability of answering each target question correctly is $\frac{3}{4}$.

(12) You have two pennies, one nickle, three dimes, and four quarters in your pocket. If you take two coins at random from your pocket, what is the expected value of those coins?

(13) Joe picks a random two digit integer. What is the expected value of the sum of the digits of his number?

(14) If you roll two standard dice what is the expected value of the absolute value of the difference between the faces? What if we roll a blue die and a red die and always subtract the red value from the blue value (even if it is larger)?

(15) On a ten question multiple choice exam, each question has the same number of choices as the problem number (e.g. problem #7 has options a,b,c,d,e,f, and g) and a correct answer is worth the square of the problem number points (so answering number 4 correctly is worth 16 points). If you randomly guess on each problem how many points do you expect to score? What if wrong answers subtract the problem number from your score?

(16) What is the expected value of the number of intersections of a line that passes through the point $(0, 2)$ and $(x, 0$ and the circle of radius 1 centered at the origin if $-5 < x < 5$?