Math E-3: ASSIGNMENT 5

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TOTAL POSSIBLE POINTS: 50

Show work for full or partial credit.

For some of the following problems, it's quite helpful to draw diagrams. Use Pascal's Triangle when you are working with coins or with any event that can occur in only two ways. Use the dice table for dice.

Problems 1- 4

Hint: These are simple probability problems using the basic formula for probability.

An urn contains 4 blue balls, 6 red balls, and 3 green balls and 6 yellow balls. You stick your hand in and pull out a ball without looking. What is the probability of the following outcomes? **(Please give your answers as decimals rounded to TWO decimal places.)**

1) selecting a red ball? $\frac{6}{19} \approx .315789 = 31.58\%$ (2 pts)

2) selecting a blue ball? $\frac{4}{19} \approx .210526 = 21.05\%$ (2 pts)

3) selecting a yellow ball or a green ball? (2 pts)

$\frac{6}{19} + \frac{3}{19} = \frac{9}{19} \approx .473684 = 47.37\%$

4) Assume you chose a red ball. Do NOT put it back into the urn. You then pick another ball from the urn. Find the probability it will be another red ball. (2 pts)

$\frac{5}{18} \approx .277778 = 27.78\%$

Problems 5-6

Dice. These two questions involve one die.
(Please give your answers as decimals rounded to TWO decimal places.)

5) What is the probability of obtaining a 3 **or** a 5 on ONE roll of a single die? (2 pts)

$\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3} \approx .\overline{3} = 33.33\%$

6) What is the probability of obtaining an odd number on one roll of a die? (2 pts)

$\frac{3}{6} = \frac{1}{2} \approx .5 = 50.00\%$

Problems 7-13

Dice continued. For these problems, you must draw a dice table, and answer questions relating to two dice. (Please give your answers as decimals rounded to TWO decimal places.)

7) Draw Dice Table (4 pts)

Dice Table

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Now that you have drawn the dice table, find the probability. These problems use some abbreviations: P(4, 2 dice) means what is the probability of getting a 4 when you roll two dice. (Please give your answers as decimals rounded to TWO decimal places.)

If you roll a **PAIR** of dice, what is the probability that the total will be a:

8) P(7, 2 dice) (2 pts)

$\frac{6}{36} = \frac{1}{6} \approx .166667 = 16.67\%$

9) P(3, 2 dice) (2 pts)

$\frac{2}{36} = \frac{1}{18} \approx .055556 = 5.56\%$

10) P(10, 2 dice) (2 pts)

$\frac{3}{36} = \frac{1}{12} = .083333 = 8.33\%$

11) P(5, 2 dice) (2 pts)

$\frac{4}{36} = \frac{1}{9} \approx .\overline{1} = 11.11\%$

12) P(<6, 2 dice) (2 pts)

$\frac{10}{36} = \frac{5}{18} \approx .277778 = 27.78\%$

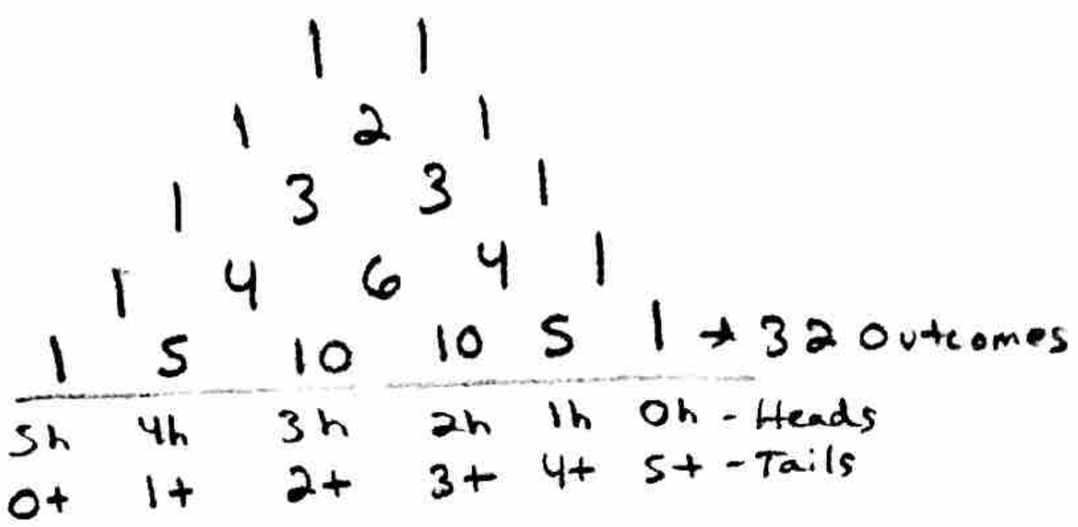
13) P(>5, 2 dice) (2 pts)

$\frac{26}{36} = \frac{13}{18} \approx .722222 = 72.22\%$

Problem 14 –18

Coins. Draw Pascal's Triangle and calculate the probability of the following coin flip problems. (Please give your answers as decimals rounded to TWO decimal places.)

14) Draw Pascal's Triangle (4 pts)



If you flip five coins what is the probability that you will get: (Please give your answers as decimals rounded to TWO decimal places.)

15) Two heads? (That means exactly 2 heads.) (2 pts)

$$\frac{10}{32} = \frac{5}{16} \approx .3125 = 31.25\%$$

16) Three tails? (2 pts)

$$\frac{10}{32} = \frac{5}{16} \approx .3125 = 31.25\%$$

17) At least three heads? (2 pts)

$$\frac{(10 + 5 + 1)}{32} = \frac{16}{32} = \frac{1}{2} = .5 = 50.00\%$$

(3h 4h 5h)

18) Fewer than two tails? (2 pts)

$$\frac{(5 + 1)}{32} = \frac{6}{32} = \frac{3}{16} \approx .1875 = 18.75\%$$

(1+ 0+)

Problem 19

In class we looked at the probability of winning a lottery such as Megabucks. To play, one has to pick six numbers between **1 and 48**, with no repeated numbers. The chance of your number being the winning number is

$$\frac{1}{12271512} \text{ or } \mathbf{0.0000000815.}$$

When the lottery first came out in Massachusetts, you only had to pick six different numbers between **1 and 36**. Do the following:

19) If you bought one ticket to this type of lottery, calculate your chance of having the winning number under these older conditions i.e. pick six numbers between 1 and 36. Please give your answer both as a fraction and as a decimal – this time don't round. Just write down all the numbers you see in the screen of your calculator, as above. (If you are using a computer, please don't write down more than 15 digits.) (4 pts)

t = tickets

↙ order doesn't matter (same count)

S1 $\frac{(36 \times 35 \times 34 \times 33 \times 32 \times 31)}{6!} = 1947792$ ← no repeats

↓

S2 $\frac{1}{1947792} \approx 5.13402 \times 10^{-7} = 0.000000513402$

Interesting thought questions but no need to answer:
Why do you think the rules were changed? Picking more number results in a lower chance of winning.
How do you think the gambling public perceived this change? The public wasn't too happy.

Problems 20-25

Calculate the following-you may use the factorial key on your calculator. Some of these are a bit tricky – you may need to do some simplifying *before* using your calculator.

20) 7! (1 pt)

$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$

21) $15! = 1.30767 \times 10^{12}$ (1 pt)

22) $\frac{15!}{6!} = \frac{1.30767 \times 10^{12}}{720} = 1.81621 \times 10^{9}$ (1 pt)

23) $\frac{25!}{(25-10)!} = \frac{25!}{15!} = \frac{1.55112 \times 10^{25}}{1.30767 \times 10^{12}}$ (1 pt)

$\frac{1.55112}{1.30767} = 1.8617$ $\quad \frac{10^{25}}{10^{12}} = 10^{(25-12)} = 13$

1.8617×10^{13}

24) $\frac{48!}{6! \times 42!} = \frac{1.24139 \times 10^{61}}{1.0116 \times 10^{54}}$ (1 pt)

$\frac{1.24139}{1.0116} = 1.22716$ $\quad \frac{10^{61}}{10^{54}} = 10^{(61-54)} = 7$

1.22716×10^{7}

25) 0! = 1 (1 pt)