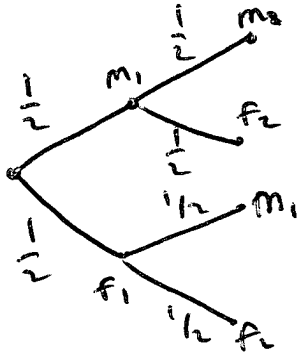
1) (2 points each) Write the sample space associated with each experiment:

a) The gender of a child born: $\{m, f\}$

b) The genders of an older child and a younger child: $\{mm, mf, fm, ff\}$

2) (5 points) When two children are born, what is the probability of having a two boys? Draw a tree diagram to support your answer:



$\frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{4}}$

3) (3 points each) Consider the data below showing students who recently graduated:

	Bachelor's Degree	Master's Degree	Doctoral Degree	Total
Male	29	10	8	**47**
Female	32	17	15	**64**
Total	**61**	**27**	**23**	**111**

Picking a student at random, what is the probability…

a) They are Male? $\boxed{\frac{47}{111}}$

b) They earned a Master's Degree? $\frac{27}{111} = \boxed{\frac{9}{37}}$

c) They are a Female and they earned a Doctoral Degree? $\frac{15}{111} = \boxed{\frac{5}{37}}$

4) (4 points each) The Annual Math Talent Show is coming up. This year's five finalists for the grand prize are Mr. Abacus, Sir Binomial, Lady Combination, Mrs. Derivative, and Lord E.

a) How different ways can the acts perform?

$5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

b) How many ways can Mr. Abacus perform first and Lady Combination second?

$1 \cdot 1 \cdot 3 \cdot 2 \cdot 1 = 6$

c) What is the probability that Mr. Abacus performs first and Lady Combination second?

$\frac{6}{120} = \frac{1}{20}$

d) What is the probability that Sir Binomial or Lord E perform first?

$\frac{2 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{120} = \frac{2}{5}$ or $\frac{1}{5} + \frac{1}{5}$

5) (4 points each) Consider picking a card from a standard deck of cards.

a) What is the probability of picking a Seven or a Queen?

$\frac{4+4}{52} = \frac{8}{52} = \frac{2}{13}$

b) What is the probability of picking a Club or a Face Card?

$\frac{13+12-3}{52} = \frac{22}{52} = \frac{11}{26}$

c) What is the probability of picking a Face Card and a Diamond?

$\frac{3}{52}$

3 cards are FC and Diamond

d) What is the probability of picking a King and a Seven?

0

no kings are also 7's.

e) What are the **odds** of picking a Spade?

13 to 39

1 to 3

f) What are the **odds** of picking a Face Card and a Diamond? (*Hint*: Use your answer in part *c*)

3 to 49

40

6) (4 points each) At an artsy film festival, 30 people are being surveyed on the movies they watched. It was found that 17 have seen the movie *Tacos: A Documentary*, 18 have seen the movie *Tom Hanks is Tom Hanks in Every Movie Starring Tom Hanks*, and 12 have seen both. Picking a person at random, what is the probability that…

a) They have seen *Tacos* or *Tom Hanks*?

$\frac{17+18-12}{30} = \boxed{\frac{23}{30}}$

b) They have seen *Tacos* given they have seen *Tom Hanks*?

$\frac{12}{18} = \boxed{\frac{2}{3}}$

c) They have seen *Tom Hanks* given they have seen *Tacos*?

$\boxed{\frac{12}{17}}$

d) They have seen *Tacos* given they did not see *Tom Hanks*?

$\frac{17-12}{30-18} = \boxed{\frac{5}{12}}$

7) (4 points each) At a crazy math party, Mike served some (non-alcoholic) beverages in two different flavors: Grape and Apple. He had 13 glasses of Grape and 7 glasses of Apple. If 3 people came by and each took a beverage, what is the probability that…

a) All of them took a glass of Apple?

$\frac{7}{20} \cdot \frac{6}{19} \cdot \frac{5}{18} = \boxed{\frac{7}{228}}$

or $\frac{C(7,3)}{C(20,3)}$

b) None of them took a glass of Apple?

$\frac{13}{20} \cdot \frac{12}{19} \cdot \frac{11}{18} = \boxed{\frac{143}{570}}$

or $\frac{C(13,3)}{C(20,3)}$

8) (4 points) The probability that people in Ohio will complain about the amount of snow in any given year is 79%. Suppose for 6 years, you researched if people in Ohio would complain about the amount of snow. Writing your answer as a percent rounded to three decimal places, what is the probability that people from Ohio will complained for…

a) Four years?

$C(6,4)(.79)^4(.21)^2$

$= \boxed{25.765\ \%}$

b) At least 4 years?

$C(6,4)(.79)^4(.21)^2 + C(6,5)(.79)^5(.21)^1 + C(6,6)(0.79)^6(0.21)^0$

$= \boxed{88.845\%}$

9) Extra credit: Explain why Problem #7 is not a binomial probability but #8 was:

I'd watch that Tacos movie.

$\frac{4}{32/34}$

10) At a local fair, a raffle is being held where 2,000 tickets were sold for $30 each. There is one first place prize of $2,500, two second place prizes of $1000, and five third place prizes of $500 each.

a) (6 points) Determine the expected **net** value of the game. Round answer to two decimal places.

1st 2nd 3rd Lose

$\frac{1}{2000} \cdot 2470 + \frac{2}{2000} \cdot 970 + \frac{5}{2000} \cdot 470 + \frac{1992}{2000}(-30)$

$= \boxed{-26.50}$

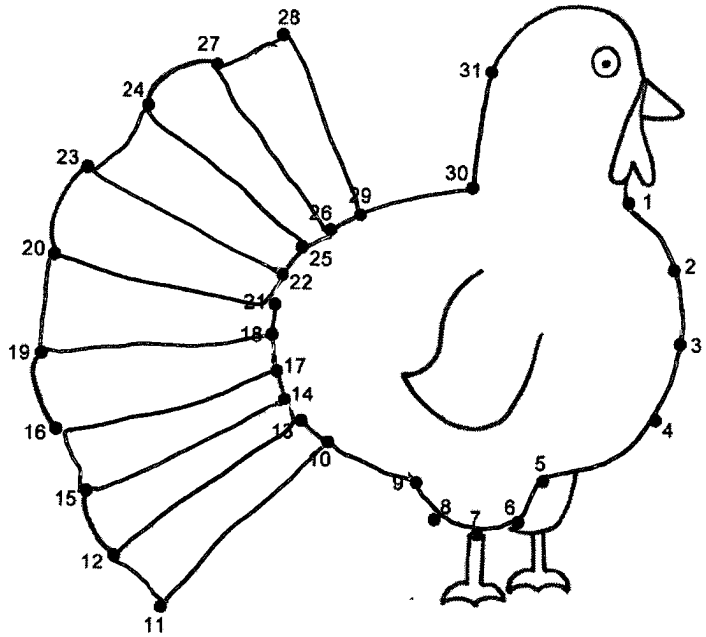
b) (2 points) Is this game fair to play? Why or why not?

Nope, EV is negative = expected to lose

11) (1 point each) What are the appropriate ways of writing...

a) Probability b) Odds

carefully



Hello, my name is probably Steve.

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