

Part I

1. Give the negative of the statement below. Use conventional English, without phrases like "It is not the case that..." or "It is false that..."

All hot dogs need mustard to taste good.

5 pts

Some hot dogs don't need mustard to taste good.

2. Give the negative of the statement below. Use conventional English, without phrases like "It is not the case that..." or "It is false that..."

I will withdraw the money from the bank or borrow it from Henry.

5 pts

I won't withdraw the money from the bank and I won't borrow it from Henry.

3. Translate into symbolic form. Write in conventional English the converse, inverse, and contrapositive of the statement

I breath deeply if I exercise.

15 pts

P: I exercise
 Q: I breathe deeply

P: I breathe deeply
 Q: I exercise

(3) SYMBOLIC FORM: $P \rightarrow Q$

(3) CONVERSE: $Q \rightarrow P$ If I breathe deeply then I am exercising

(3) INVERSE: $\sim P \rightarrow \sim Q$ If I'm not exercising, then I'm not breathing

(3) CONTRAPOSITIVE: $\sim Q \rightarrow \sim P$ If I'm not breathing deeply then I'm not exercising.

Which pairs of these statements are logically equivalent to one another?

$P \rightarrow Q$
 $\sim Q \rightarrow \sim P$
 $\sim P \rightarrow \sim Q$

(3) Converse and Inverse, Contrapositive and original

Part 2

1. U is the set of letters in the words "I love math". $A = \{a, e, i, o, u\}$, $B = \{i, l, o, v, e\}$, $C = \{l, o, v, e, m, a, t, h\}$.
Find:

a) $B \cup A' = \{i, l, o, v, e, m, t, h\}$

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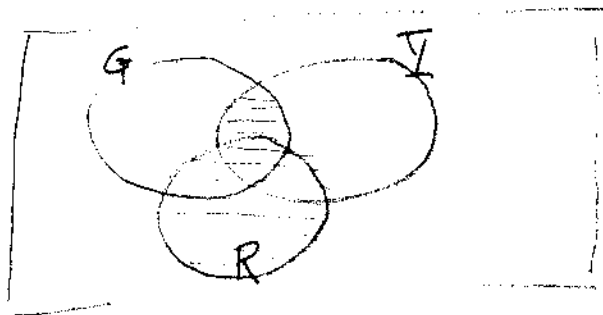
b) $(C \cap A) = \{o, e, a\}$
 $(C \cap A)' = \{I, l, v, m, t, h\}$

c) $B \cap (A \cup C) = \{i, o, e\}$ since $C' = \{I\}$

$B \cap (A \cup C) = \{i, o, e\}$

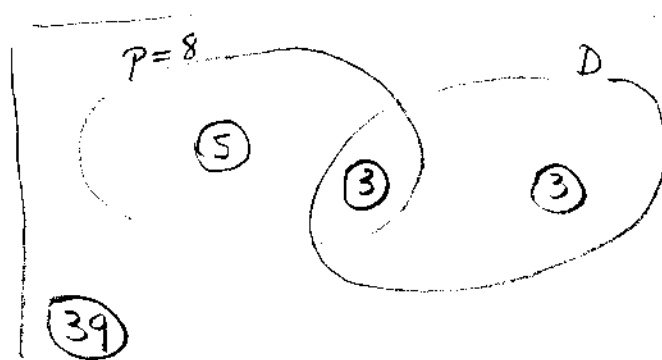
2. Students were asked if they liked green apples, if they liked yellow apples, and if they liked red apples. Draw a Venn diagram that could be used to represent the results of the survey, and shade the area that would represent the students who liked red apples or both green and yellow apples.

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3. 50 people in a jury pool were asked two questions: "Do you know any of the participants in the trial?" and "Have you been the defendant in a jury trial?". 8 said they did not know any of the participants, and 3 said they knew at least one of the participants and they were a defendant in a jury trial. 39 answered no to both questions. Use a Venn diagram to find how many of the jury pool that said they did not know any of the participants but they were defendant in a jury trial.

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$u = 50$

$n(P \cup D) = 50 - 39$
 $= 11$

$n(D \cap P') = 3$

4. a) In how many ways can a three card hand be dealt so that the first card is an ace, the second a face card and the third card is a 4, 5, or 6?

$$4 \times 12 \times 12 = 4 \times 144 = 576$$

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b) In how many ways can 5 cards be dealt so that the first three are jacks and the last two are not jacks?

$$4P_3 \times 48P_2 \\ = 4 \times 3 \times 2 \times 48 \times 47 = 54,144$$

5. a) From a pool of 10 people, in how many ways are there to select a president, vice president, and treasurer? Compute the answer completely, and show the work.

$$10P_3 = 10 \cdot 9 \cdot 8 = 720$$

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b) In how many ways can you select 3 council members from the pool above? Compute the answer completely, and show the work.

$$10C_3 = \frac{10 \cdot 9 \cdot 8}{3 \cdot 2 \cdot 1} = 10 \cdot 3 \cdot 4 = 120$$

c) If 6 are women and 4 are men, in how many ways can a committee of 5 be chosen from the pool if 3 must be women and 2 must be men? You needn't compute the answer.

$$6C_3 \cdot 4C_2$$

Part 3

1. Roll a die twice.
 a. Find the probability of the event E that both dice are even.

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$$n(E) = 3 \times 3 = 9$$

$$P(E) = \frac{9}{36} = \frac{1}{4}$$

- b. Describe the event E' , the complement of E . What is its probability?

$$E' = \text{at least one is odd}$$

$$P(E') = 1 - P(E) = 1 - \frac{1}{4} = \frac{3}{4}$$

2. a. A card is drawn from a deck with all spades removed and all 2-9s removed (ie, only 10, J, Q, K, A of clubs, hearts, and diamonds remain.) H is the event that it is a heart, and F is the event that it is a face card. Calculate

$$P(H) = \frac{1}{3} \quad P(F) = \frac{3}{5}$$

- b. Calculate $P(H \cap F)$ and $P(H \cup F)$.

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$$P(\text{heart and face card}) = \frac{3}{15} = \frac{1}{5}$$

$$P(H \cup F) = P(H) + P(F) - P(H \cap F) = \frac{1}{3} + \frac{3}{5} - \frac{1}{5} = .73 = \frac{11}{15}$$

3. a. With H and F as in problem 2, compute $P(H|F)$?

$$P(H|F) = \frac{P(H \cap F)}{P(F)} = \frac{\frac{1}{5}}{\frac{3}{5}} = \frac{1}{3}$$

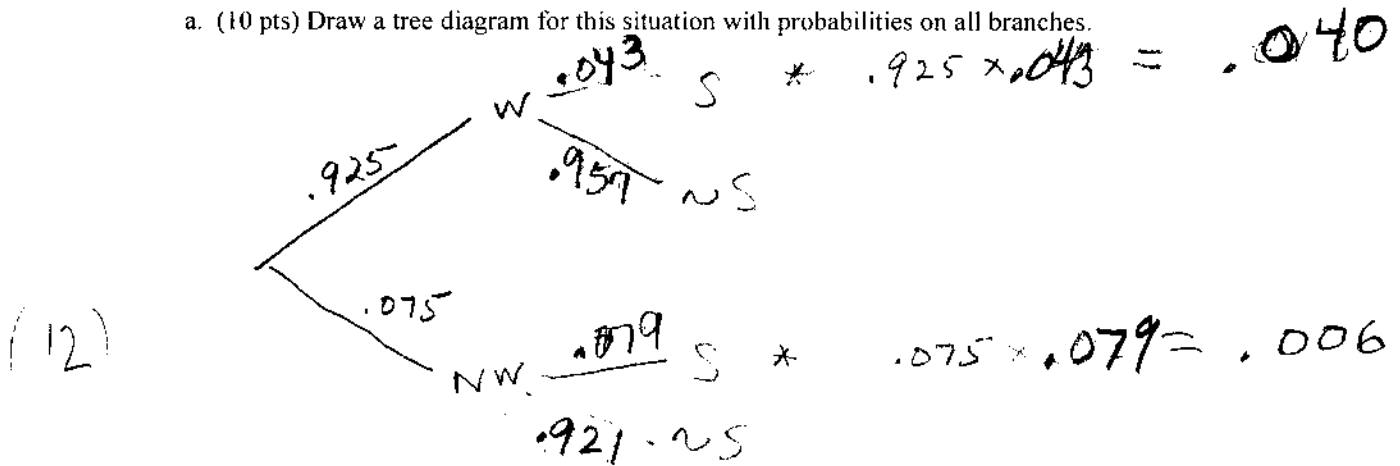
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- b. Are H and F independent events? Explain.

$$\left. \begin{array}{l} P(H|F) = \frac{1}{3} \\ P(H) = \frac{1}{3} \end{array} \right\} \text{Yes because these are equal.}$$

4. In the city of Westerly in 2001, 7.5% of all traffic stops made by police involved a non-white driver. (So 92.5% involved a white driver.) Of the non-whites who were stopped, 7.9% were searched. 4.3% of the whites who were stopped were searched.

a. (10 pts) Draw a tree diagram for this situation with probabilities on all branches.



b. Use the tree diagram to compute the probability that a car stopped by police in Westerly was searched.

$$.040 + .006 = .046$$

5. In a jar there are 20 marbles; 11 are white and 9 are black. Without looking you choose 10 marbles. What is the probability that exactly 4 are black? (You don't need to compute the answer.)

(8)

$$\frac{9^C_4 \times 11^C_6}{20^C_{10}}$$

PART 4: Formulas: $s^2 = \frac{1}{n-1} \left[\sum fx^2 - \frac{(\sum fx)^2}{n} \right]$

$MOE = \frac{z_{\alpha/2}}{2\sqrt{n}}$ $z = \frac{x - \bar{x}}{\sigma}$ $x = \bar{x} \pm z\sigma$

1. 1. a) In a frequency histogram using the data below, what is the height of the rectangle over the range $90 \leq x \leq 100$

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b) In a relative frequency histogram using the data below, what is the height of the rectangle over the range $90 \leq x \leq 100$?

2 $\frac{11}{30} = .37$

60, 62, 65, 70, 72, 73, 73, 73, 74, 76, 76, 78, 78, 79, 80, 84, 85, 86, 88, [90, 91, 91, 91, 93, 95, 95, 97, 99, 99, 100]

c) Jamie took several three-credit courses in her Freshman year. She got 3 A's, 3 B's, 2 C's, one D, and one F. An A counts 4 points, B= 3 points, C=2 points, D=1 point, and F=0 points. What is her grade point average for these courses?

2 $3 \times 4 + 3 \times 3 + 2 \times 2 + 1 + 0 = 26$ $\frac{26}{10} = 2.6$

2. Senior high school girls were asked how many times they had started a diet in the past 4 years. A frequency chart for $x =$ number of times is below.

a) Find the mean and standard deviation.

x	f	xf	x ²	x ² f
0	15	0	0	0
1	6	6	1	6
2	8	16	4	32
3	9	27	9	81
4	10	40	16	160
5	1	5	25	25
n = 49		94		304

$\bar{x} = \frac{94}{49} = 1.92$

$s^2 = \frac{1}{48} \left[304 - \frac{(94)^2}{49} \right]$

$306 - 180.33$

$s^2 = \frac{125.67}{48} = 2.58$

$s = \sqrt{2.58} = 1.61$

b) Find the proportion of the sample data that lies within one standard deviation from the mean.

4 $1.92 + 1.62 = 3.54$

$1.92 - 1.62 = .3$

} Range .3 \rightarrow 3.54

$x = 1, 2, \text{ or } 3$

$\frac{23}{49} = .47$