



**MATH 140: WEEK-IN-REVIEW 6**  
(4.2, 4.3, 4.4 & REVIEW QUESTIONS OVER CH 3 & CH 4)

**Problem 1** *A chick is randomly chosen from a new box of multi-colored Peeps containing 3 yellow, 4 purple, 2 green, 1 red, and 6 pink chicks, and its color is noted.*

(a) *Write the probability distribution for this experiment.*

(b) *Does this experiment have a uniform sample space? Why or why not?*

(c) *What is the probability that a green or red chick is chosen?*

(d) *What is the probability that a traditional yellow chick is not chosen?*



**Problem 2** *A pair of fair six-sided dice are rolled and the outcomes on each die are recorded.*

(a) *Write an appropriate sample space for this experiment.*

(b) *Is this a uniform sample space? Why or why not?*

(c) *Write the event,  $E$ , that a sum of less than 6 is rolled.*

(d) *Determine  $P(E)$ .*

(e) *Determine the probability that a sum of 2 and at least one 3 is rolled.*



(f) Determine the probability that a product of 8 is rolled or a 5 is rolled on at least one of the dice.

(g) Determine the probability that a sum of 8 is rolled or a double is rolled.

(h) Determine the probability that a 3 is not rolled on either die.

(i) Draw the probability distribution associated with the random variable  $X$  which denotes the sum of the numbers rolled.

(j) What sum do you expect to roll?



**Problem 3** *The students in a statistics class were surveyed concerning their eye color. The findings were gathered in the table below.*

	<i>Blue Eyes (B)</i>	<i>Green Eyes (G)</i>	<i>Brown Eyes (W)</i>	<i>Other (O)</i>	<i>Totals</i>
<i>Freshman (F)</i>	15	8	25	3	51
<i>Sophomore (H)</i>	10	5	12	7	34
<i>Totals</i>	25	13	37	10	85

*For each question below, write the corresponding probability notation for the question being asked, and then determine the numerical answer.*

*What is the probability that a randomly selected surveyed statistics student*

*(a) Is a freshman?*

*(b) Has blue eyes?*

*(c) Is a freshman and has blue eyes?*

*(d) Is a freshman or has blue eyes?*

*(e) Does not have green eyes?*

*(f) Is a sophomore or does not have brown eyes?*



**Problem 4** Let  $S = \{s_1, s_2, s_3, s_4, s_5, s_6\}$  be the sample space for an experiment with the following distribution.

<i>Outcome</i>	$s_1$	$s_2$	$s_3$	$s_4$	$s_5$	$s_6$
<i>Probability</i>	$\frac{1}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{1}{16}$	$\frac{2}{16}$

(a) Is the probability distribution uniform? Why or why not?

(b) Let  $A = \{s_1, s_3, s_4\}$ ,  $B = \{s_1, s_5, s_6\}$ , and  $C = \{s_2, s_3, s_4\}$ . Compute the following.

(i)  $P(A)$

(ii)  $P(B)$

(iii)  $P(A \cap B)$

(iv)  $P(B \cap C)$



<i>Outcome</i>	$s_1$	$s_2$	$s_3$	$s_4$	$s_5$	$s_6$
<i>Probability</i>	$\frac{1}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{1}{16}$	$\frac{2}{16}$

$$A = \{s_1, s_3, s_4\}, B = \{s_1, s_5, s_6\}, \text{ and } C = \{s_2, s_3, s_4\}$$

(v)  $P(B \cup C)$

(vi)  $P(C^C)$

(vii)  $P(A^C \cup B)$



**Problem 5** Suppose  $P(E) = 0.4$ ,  $P(F) = 0.5$ , and  $P(E \cup F) = 0.6$ . Calculate the following.

(a)  $P(E \cap F)$

(b)  $P(F^C)$

(c)  $P(E^C \cup F^C)$

(d)  $P(E \cap F^C)$



**Problem 6** *200 students were surveyed about their regular vending machine purchases. 150 regularly purchase drinks, 75 regularly purchase snacks, and 30 don't make regular vending machine purchases. What is the probability that a randomly selected surveyed student regularly*

*(a) Purchases both drinks and snacks?*

*(b) Purchases only drinks?*

*(c) Does not purchase drinks?*





**Problem 7** Let  $P(A^C) = 0.55$  and  $P(B) = 0.5$ .

(a) If  $P(A \cap B) = 0.4$ , then

(i)  $P(A \cup B) =$

(ii)  $P(A^C \cup B) =$

(b) If  $A$  and  $B$  are mutually exclusive, then

(i)  $A \cap B =$  \_\_\_\_\_

(ii)  $P(A \cap B) =$  \_\_\_\_\_

(iii)  $P(A \cup B) =$

(iv)  $P(A^C \cap B^C) =$



**Problem 8** Use the given distribution to answer the questions that follow.

$X$	-2	-1	0	1	2	3
$Probability$	0.1	0.15	0.05	0.20	0.30	

(a) Fill in the missing probability in the given probability distribution.

(b) Draw a histogram representing the probability data for  $X$ .

(c) Calculate:

(i)  $P(X \geq 1)$

(ii)  $P(-2 < X < 5)$

(iii)  $P(X = 2.5)$

(d) What is the expected value of  $X$ ?



**Problem 9** *A diamond bracelet is insured for \$6000 in the case it is lost or stolen and \$3000 in case the bracelet is broken, over the next year. There is a 0.2% chance that the bracelet is lost or stolen, but a 5% chance that the bracelet is broken, during the next year. The annual premium for this policy is \$p.*

(a) *Write the probability distribution for the insurance company's profit on this policy.*

(b) *Determine the minimum premium the insurance company will charge for this policy.*



**Problem 10** You pay \$2.00 to play in a game where you roll a fair six-sided die and toss a fair coin. If the coin comes up heads, you win twice the amount shown on the die in dollars. If the coin comes up tails and you roll an odd number, you win the amount shown on the die in dollars. Otherwise, you win nothing.

(a) Draw a probability distribution describing your NET winnings.

(b) What are your expected net winnings?

(c) Is this a fair game? Why or why not?



**Problem 11** The following system of linear inequalities are constraints in a linear programming problem. Graph the feasible region of the linear programming problem, and determine all corner points. Is the region bounded or unbounded?

$$x + y \leq 10$$

$$10x + 9y \geq 45$$

$$x - y \geq 0$$

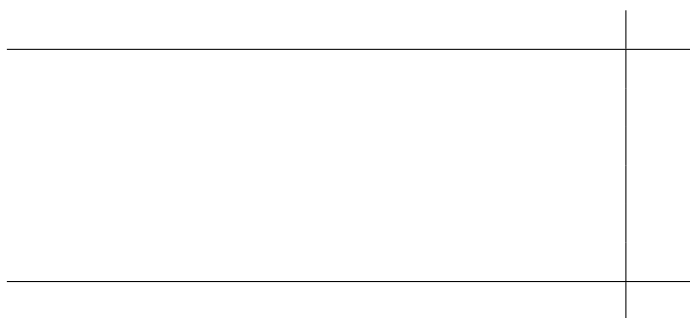
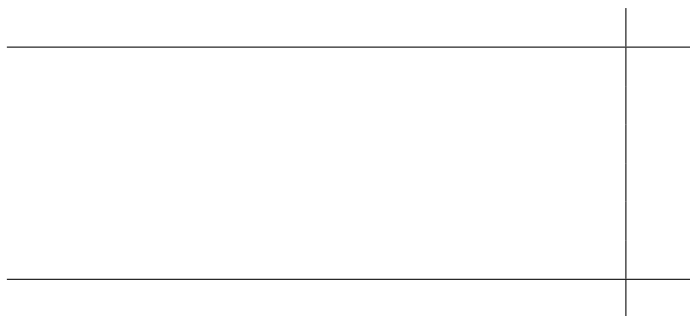
$$x \geq 0, y \geq 0$$

- (a) At what point(s) is the objective function  $f = 5x + 4.5y$  maximized on this region and what is the maximum value? (If not possible, explain why not.)
- (b) At what point(s) is the objective function  $f = 5x + 4.5y$  minimized on this region and what is the minimum value? (If not possible, explain why not.)



**Problem 12** A company is selling two perfumes, A and B, for \$20 and \$17 per ounce, respectively. It takes the company 3 hours and \$12 to produce each ounce of perfume A and 1 hour and \$15 for each ounce of perfume B. If the company has a total of 90 hours and \$600 for production, and the company is not allowed to make more than 20 ounces of perfume A, how many ounces of each perfume should the company produce and sell in order to maximize its revenue? What is its maximum revenue? Is anything leftover at the optimal production level?

(a) Formulate and then solve the given linear programming problem using the Simplex Method.







*(b) Solve the same problem using the Method of Corners and compare your answers.*





(c) *If it was stated in the problem that the company was required to produce at least twice as many ounces of perfume B as perfume A, what additional constraint would have been required in the set-up of the problem?*

**Problem 13** *Given  $S = \{k, l, b\}$  in the sample space of an experiment, answer the following.*

(a) *How many total possible events are associated with this experiment?*

(b) *List all the events associated with this experiment.*

(c) *How many of these events are simple events?*

(d) *Give an example of two events that are mutually exclusive.*



**Problem 14** Suppose there is an experiment with sample space,  $S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e\}$ , and events

$A =$  the event an odd number is drawn,

$B = \{1, 2, 4, 7, 8\}$ ,

$C = \{2, 4, 6, 8\}$ , and

$D =$  the event a letter from the phrase “spring break” is drawn.

Answer each of the following.

(a)  $(A \cap B) \cup C =$

(b)  $A^C \cap B =$

(c)  $A \cap (B \cup C)^C =$

(d) Write the outcomes of event  $D$ .

(e) Verbally describe  $A^C$ .



**Problem 15** *A box contains snack bags of potato chips, and each bag is carefully weighed. It is found that 12 bags weigh no more than 0.85 ounces, 27 bags weigh more than 0.85 ounces, but less than 1 ounce, and 11 bags weigh at least 1 ounce. Organize this information as a probability distribution.*