

Name Key
Date

Illowsky – Chapt. 3 & 4
Larson – Chapt. 3 & 4

Please show all work neatly and orderly for credit. Unless stated otherwise, round final answers to 3 decimal places.
vide an appropriate response.

- 1) If one card is drawn from a standard deck of 52 playing cards, what is the probability of drawing a heart?

$$\frac{13}{52} = \frac{1}{4} \text{ or } .25$$

- 2) The distribution of Master's degrees conferred by a university is listed in the table.

Major	Frequency
Mathematics	216
English	207
Engineering	86
Business	176
Education	267

What is the probability that a randomly selected student graduating with a Master's degree has a major of Education?

$$P(\text{Educ}) = \frac{267}{952} = .280$$

Use the fundamental counting principle to solve the problem.

- 3) How many different codes of 4 digits are possible if the first digit must be 3, 4, or 5 and if the code may not end in 0?

$$3 \cdot 10 \cdot 10 \cdot 9 = 2700$$

Provide an appropriate response.

- 4) Which of the following cannot be a probability and why can it not be a probability?

A) $\frac{4}{3}$

B) 85%

C) 0.0002

D) 1

- 5) A group of students were asked if they carry a credit card. The responses are listed in the table.

Class	Credit Card	Not a Credit Card	Total
	Carrier	Carrier	
Freshman	49	11	60
Sophomore	12	28	40
Total	61	39	100

If a student is selected at random, find the probability that he or she is a freshman given that the student owns a credit card.

$$P(\text{Fr} | \text{cc}) = \frac{49}{61} = .803$$

- 6) The probability it will rain is 40% each day over a three-day period. What is the probability it will rain at least one of the three days?

$$p = .40 \Rightarrow P(\text{At least 1 day}) = 1 - P(\text{No rain all 3 days}) \\ q = .60 \qquad = 1 - (.60)^3 = .784$$

7) The table lists the smoking habits of a group of college students.

Sex	Non-smoker	Regular Smoker	Heavy Smoker	Total
Man	135	36	5	176
Woman	187	21	15	223
Total	322	57	20	399

$$P(R \text{ or } H) = \frac{57}{399} + \frac{20}{399} - \frac{0}{399} = \frac{77}{399} = \boxed{.193}$$

If a student is chosen at random, find the probability of getting someone who is a regular or heavy smoker.

8) The distribution of Master's degrees conferred by a university is listed in the table.

Assume that a student majors in only one subject.

Major	Frequency
Mathematics	224
English	200
Engineering	86
Business	176
Education	222

$$P(\text{Engl or Math}) = \frac{200}{908} + \frac{224}{908} - \frac{0}{908} = \boxed{.467}$$

What is the probability that a randomly selected student with a Master's degree majored in English or Mathematics?

Decide if the situation involves permutations, combinations, or neither. Explain your reasoning.

9) The number of ways you can choose 4 books from a selection of 8 to bring on vacation

Combination, order does NOT matter

Provide an appropriate response.

10) The access code to a house's security system consists of six digits. How many different codes are available if each digit can be repeated?

$$10^6 = \boxed{1,000,000}$$

11) How many ways can a jury of four men and three women be selected from twelve men and ten women?

$${}_{12}C_4 \cdot {}_{10}C_3 = 59,400$$

12) How many different permutations of the letters in the word ~~STATISTICS~~ are there?

$$\frac{10!}{3!3!2!} = 50,400$$

13) The random variable x represents the number of cars per household in a town of 1000 households. Find the probability of randomly selecting a household that has less than two cars.

Cars	Households
0	125
1	428
2	256
3	108
4	83

$$\frac{553}{1000} = \boxed{.553}$$

- 14) An insurance actuary asked a sample of senior citizens the cause of their automobile accidents over a two-year period. The random variable x represents the number of accidents caused by their failure to yield the right of way. Use the frequency distribution to construct a probability distribution.

Accidents	0	1	2	3	4	5
Senior Citizens	4	3	12	3	2	1

X	$P(X)$
0	.16
1	.12
2	.48
3	.12
4	.08
5	.04

- 15) Determine whether the distribution represents a probability distribution. If not, identify any requirements that are not satisfied.

x	$P(x)$
3	-0.3
6	0.5
9	0.1
12	0.3
15	0.4

$P(x)$ cannot be less than 0

- 16) The random variable x represents the number of credit cards that adults have along with the corresponding probabilities. Find the mean and standard deviation.

x	$P(x)$	$x P(x)$	$(x - \mu)^2 P(x)$
0	0.07	0	
1	0.68	.68	
2	0.21	.42	
3	0.03	.09	
4	0.01	.04	

$$\Sigma = 1.23 = \mu$$

$$SD = \sigma = \sqrt{\Sigma [(x - \mu)^2 P(x)]} = \sqrt{.4371} = .661$$

- 17) In a recent survey, 80% of the community favored building a police substation in their neighborhood. If 15 citizens are chosen, what is the mean number favoring the substation?

$$p = .80$$

$$q = .20$$

$$n = 15$$

$$\mu = np = (15)(.80) = 12$$

- 18) In a recent survey, 64% of the community favored building a police substation in their neighborhood. If 14 citizens are chosen, find the probability that exactly 8 of them favor the building of the police substation.

$$p = .64$$

$$q = .36$$

$$n = 14$$

$$x = 8$$

$${}_{14}C_8 (.64)^8 (.36)^6 = .184$$

19) Assume that male and female births are equally likely and that the birth of any child does not affect the probability of the gender of any other children. Find the probability of at most three boys in ten births.

($X=0$ or $X=1$ or $X=2$ or $X=3$)
 $P = .5 = \frac{1}{2}$
 ${}_{10}C_0 (.5)^0 (.5)^{10} + {}_{10}C_1 (.5)^1 (.5)^9 + {}_{10}C_2 (.5)^2 (.5)^8 + {}_{10}C_3 (.5)^3 (.5)^7$
 $= \boxed{.172}$

20) Fifty-seven percent of families say that their children have an influence on their vacation plans. Consider a sample of eight families who are asked if their children influence their vacation plans. Identify the values of n , p , and q , and list the possible values of the random variable x .

$n = 8$ $p = .57$ $q = .43$ $x = 0, 1, 2, 3, 4, 5, 6, 7, 8$

21) A company ships computer components in boxes that contain 90 items. Assume that the probability of a defective computer component is 0.21. Find the probability that the first defect is found in the seventh component tested.

$p = .21$
 $q = .79 \Rightarrow (.21)(.79)^7 = \boxed{.051}$

22) A sales firm receives an average of four calls per hour on its toll-free number. For any given hour, find the probability that it will receive exactly nine calls. Use the Poisson distribution.

$\mu = 4$
 $X = 9 \Rightarrow P(X) = \frac{4^9 e^{-4}}{9!} = \boxed{.013}$

For problems 23-25, decide which probability distribution - binomial, geometric, or Poisson - applies to the question. You do not need to answer the question.

23) Given: The probability that a federal income tax return is filled out incorrectly with an error in favor of the taxpayer is 20%. Question: What is the probability that of the ten tax returns randomly selected for an audit, three returns will contain only errors favoring the taxpayer?

Binomial

24) Given: The probability that a federal income tax return is filled out incorrectly with an error in favor of the taxpayer is 20%. Question: What is the probability that of the ten tax returns randomly selected for an audit in a given week, three returns will contain only errors favoring the taxpayer?

Poisson

25) Given: The probability that a federal income tax return is filled out incorrectly with an error in favor of the taxpayer is 20%. Question: What is the probability that when the ten tax returns are randomly selected for an audit, the sixth return will contain only errors favoring the taxpayer?

Geometric