Stats Review
Chapter 5

Mary Stangler Center for Academic Success

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Note:

This review is composed of questions similar to those found in the chapter review and/or chapter test. This review is meant to highlight basic concepts from the course. It does not cover all concepts presented by your instructor. Refer back to your notes, unit objectives, handouts, etc. to further prepare for your exam.

The questions are displayed on one slide followed by the answers are displayed in red on the next.

This review is available in alternate formats upon request.

Probability Models

Is the table a Probability Model?

x	P(x)
1	.2
2	-.3
3	.6
4	.1

x	P(x)
A	.3
B	.2
C	.5
D	0

x	P(x)
Red	.2
Green	.2
Blue	.3
Yellow	.2

Probability Models

Is the table a Probability Model?

x	P(x)
1	.2
2	-.3
3	.6
4	.1

No, cannot have negative probabilities

x	P(x)
A	.3
B	.2
C	.5
D	0

Yes

x	P(x)
Red	.2
Green	.2
Blue	.3
Yellow	.2

No, the sum of the probabilities doesn't equal 1

Probability Problem

A survey of 971 investors asked how often they tracked their portfolio. The table shows the investor responses. What is the probability that an investor tracks his or her portfolio daily?

Is it unusual?

How Frequently	**Response**
Daily	236
Weekly	261
Monthly	273
Couple times a year	141
Don't Track	60

Probability Problem

A survey of 971 investors asked how often they tracked their portfolio. The table shows the investor responses. What is the probability that an investor tracks his or her portfolio daily?

Is it unusual?

How Frequently	**Response**
Daily	236
Weekly	261
Monthly	273
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Step 1: Find the total of responses = 971

Step 2: Take the amount of daily responses and divide by the total

236/971=**0.243**

The event is not unusual because the probability is less than 5%.

Disjoint Events/Mutually Exclusive

- What are disjoint events?

- In the game of craps, two dice are tossed and the up faces are totaled. Is the event getting a total of 9 and one of the dice showing a 6 disjoint events? Explain.

Disjoint Events/Mutually Exclusive

- What are disjoint events?
  - AKA mutually exclusive
  - Events that have no outcomes in common
- In the game of craps, two dice are tossed and the up faces are totaled. Is the event getting a total of 9 and one of the dice showing a 6 disjoint events? Answer Yes or No.
  - No because you can get a sum of 9 when one of the dice is showing a 6 (the other would be a 3). Since the events have a common outcome, the events are not disjoint.

Addition Rules

Let the sample space be S={rock, rap, pop, country}. Suppose the outcomes are evenly likely. Compute the Probability of event:

E={rock}

F={pop or country}

A card is drawn from a standard deck of 52 playing cards. Find the probability that the card is a queen or a club. Express the probability as a simplified fraction.

Addition Rules

Let the sample space be S={rock, rap, pop, country}. Suppose the outcomes are evenly likely. Compute the Probability of event:

E={rock}

$$P(E) = \frac{Frequency\ of\ E}{number\ of\ trials} = \frac{\mathbf{1}}{\mathbf{4}}$$

F={pop or country}

$$P(E) = \frac{Frequency\ of\ f}{number\ of\ trials} = \frac{2}{4} = \frac{\mathbf{1}}{\mathbf{2}}$$

A card is drawn from a standard deck of 52 playing cards. Find the probability that the card is a queen or a club. Express the probability as a simplified fraction.

P(Queen or club)=P(Queen)+P(club)-P(Queen and a club)

P(Queen or club)= 4/52 + 13/52 – 1/52

P(Queen or club)= 16/52=4/13

Compliment Rule

What Is the probability of having less than 8 rooms?

What is the probability of having at least 3 rooms?

Rooms	**Probability**
1	.005
2	.011
3	.088
4	.183
5	.23
6	.204
7	.123
8 or More	.156

Compliment Rule

What Is the probability of having less than 8 rooms?

$$P(less\ than\ 8) = 1 - P(8\ or\ more) = 1 - .156 = .\mathbf{844}$$

What is the probability of having at least 3 rooms?

$$P(at\ least\ 3) = 1 - P(1\ room) - P(2\ rooms) = 1 - .005 - .011 = .\mathbf{984}$$

Rooms	Probability
1	.005
2	.011
3	.088
4	.183
5	.23
6	.204
7	.123
8 or More	.156

Independence and Multiplication Rule

When are 2 events independent?

Suppose P(A)=.8 P(B)=.6 and P(A and B)=.54. Are events A and B independent?

There are 30 chocolates in a box, all identically shaped. There are 11 filled with nuts, 10 filled with caramel, and 9 are solid chocolate. You randomly select one piece, eat it, and then select a second piece. Is this an example of independence? Answer Yes or No.

A single die is rolled twice. Find the probability of getting a 2 the first time and a 2 the second time. Express the probability as a simplified fraction.

Independence and Multiplication Rule

When are 2 events independent?

If the occurrence of event E in a probability experiment does not affect the probability of event F

Suppose P(A)=.8 P(B)=.6 and P(A and B)=.54. Are events A and B independent?

If A and B are independent, than

P(A and B)=P(A)·P(B).

$P(A) \cdot P(B) = .8 \cdot .6 = .48$

Since $P(A) \cdot P(B)$=.48 and not P(A and B)=.54, the events **are not independent.**

There are 30 chocolates in a box, all identically shaped. There are 11 filled with nuts, 10 filled with caramel, and 9 are solid chocolate. You randomly select one piece, eat it, and then select a second piece. Is this an example of independence? Answer Yes or No.

No, because the probability will change for the second piece (there are less to choose from).

A single die is rolled twice. Find the probability of getting a 2 the first time and a 2 the second time. Express the probability as a simplified fraction.

These events are independent

P(2 on the first and 2 on second)=P(2 on first roll)(2 on second roll)=(1/6)*(1/6)=**1/36**

Conditional Probability

Using the given table, given that the car selected was a domestic car, what is the probability that it was older than 2 years?

	Age of car (in years)				
Make	**0-2**	**3-5**	**6-10**	**Over 10**	**Total**
Foreign	40	30	10	20	100
Domestic	45	27	11	17	100
Total	85	57	21	37	200

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Foreign	40	30	10	20	100
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Total	85	57	21	37	200

$$\text{P(older than 2 } years|Domestic) = \frac{\text{N(older than 2 years and Domestic)}}{\text{N(Domestic)}}$$

$$= \frac{27 + 11 + 17}{100} = \mathbf{\frac{11}{20}}$$

General Multiplication Rule

There are 36 chocolates in a box, all identically shaped. There 10 are filled with nuts, 12 with caramel, and 14 are solid chocolate. You randomly select one piece, eat it, and then select a second piece. Find the probability of selecting solid chocolate then a nut. Is it unusual?

General Multiplication Rule

There are 36 chocolates in a box, all identically shaped. There 10 are filled with nuts, 12 with caramel, and 14 are solid chocolate. You randomly select one piece, eat it, and then select a second piece. Find the probability of selecting solid chocolate then a nut. Is it unusual?

P(solid and nut)=P(solid)*P(nut|solid)=

$$\frac{14}{36}*\frac{10}{35}=\mathbf{\frac{1}{9}}$$

$$\mathbf{\frac{1}{9}\approx .111}$$

This is greater than 5%, so the event is **not unusual**.

Using Probability Rules

49% of Americans say they watch too much TV. 49.2% of the country is male.

a) Are event “watch too much TV” and “male” mutually exclusive?

b) Assuming that watching TV and gender is independent, compute the probably that an person is selected at random is male and says they watch too much TV.

c) Using the results from part b, find the probability that a person selected is a male or watches too much TV.

d) If 89% of adults are male and watch too much TV. What does that indicate about the assumption made in part b?

Using Probability Rules

49% of Americans say they watch too much TV. 49.2% of the country is male.

a) Are event "watch too much TV" and "male" mutually exclusive?

No because its possible that a male says that they watch too much TV.

b) Assuming that watching TV and gender is independent. Compute the probably that an person is selected at random is male and says they watch too much TV.

$P(male\ and\ watch\ too\ much\ TV) = P(male) \cdot P(watch\ too\ much\ TV) = .49 \cdot .492$
$= .\mathbf{24108}$

c) Using the results from part b, find the probability of male or watches too much TV.

$P(male\ or\ watch\ too\ much\ TV)$
$= P(male) + P(watch\ too\ much\ TV) - P(\text{male and watch too much TV})$
$= .49 + .492 - .24108 = .\mathbf{74092}$

d) If 89% of adults are male and watch too much TV. What does that indicate about the assumption made in part b?

The assumption of independence was wrong because $P(male\ and\ watch\ too\ much\ TV) = .89$ and not the .24108 calculated in part b.

Counting Techniques

a) Outside a home there is a keypad that will open the garage if the correct 4-digit code is entered. How many codes are possible?

b) Suppose 40 cars start at the Indy 500. In how many ways can the top 3 cars finish?

c) A family has 6 children. If this family has exactly 2 boys, how many different birth/gender orders are possible?

d) A baseball team consists of 3 outfielders, 4 infielders, a pitcher, and a catcher. Assuming that the outfielders and infielders are indistinguishable, how many batting orders are possible?

a) Outside a home there is a keypad that will open the garage if the correct 4-digit code is entered. How many codes are possible?

Permutation of Distinct items with replacement; 10^4= **10,000**

b) Suppose 40 cars start at the Indy 500. In how many ways can the top 3 cars finish?

Permutation of Distinct items without replacement; ${}_{40}P_3$= **59280**

c) A family has 6 children. If this family has exactly 2 boys, how many different birth/gender orders are possible?

Combination; ${}_6C_2$= **15**

d) A baseball team consists of 3 outfielders, 4 infielders, a pitcher, and a catcher. Assuming that the outfielders and infielders are indistinguishable, how many batting orders are possible?

Permutation of no distinct items without replacement; $\frac{9!}{3!4!1!1!} = \mathbf{2520}$