Practice Test
Unit 7
Determine which sets are finite or infinite.

**Finite**

\( A = \{2, 4, 6, 8\} \)  
You can count the number of elements.

\( B = \{2, 4, 6, 8, \ldots, 30\} \)  
The number of elements stops.

**Infinite**

\( C = \{2, 4, 6, 8, \ldots\} \)  
You **cannot** count the number of elements

The number of elements continues without stopping.
Given \( H = \{0, 3, 6, 9\} \) and \( J = \{0, 6, 12\} \).

Find the sets for \( H \cup J \) and \( H \cap J \).

Determine which venn diagrams represent union and intersection.

\[
H \cup J = \{0, 3, 6, 9, 12\} \quad H \cap J = \{0, 6\}
\]
Given $C = \{6, 7, 8\}$ and $D = \{9, 10, 11, 12\}$. Find the sets for $C \cup D$ and $C \cap D$. Determine which Venn diagrams represent union and intersection.

$C \cup D = \{6, 7, 8, 9, 10, 11, 12\}$  
$C \cap D = \{\} \text{ or } \emptyset$

Union  
Intersection
U = \{10, 20, 30, 40, 50, 60\}
A = \{10\}, B = \{10, 40, 60\}

A \cap B = \{10\}
A \cup B = \{10, 40, 60\}

(A \cap B)' = \{20, 30, 40, 50, 60\}
(A \cup B)' = \{20, 30, 50\}
If $P$ is the set of positive even integers and $M$ is the set of multiples of 10, find $P \cap M$

$P = \{2, 4, 6, 8, 10, 12, \ldots \}$

$Q = \{10, 20, 30, 40, 50, \ldots \}$

Intersection: Elements in common in both sets

Intersection = $\{10, 20, 30, 40, \ldots \}$
Draw a Venn diagram to illustrate the data.

U = \{all non-negative integers less than 12\}
N = \{all even natural numbers less than 11\}
P = \{all one-digit prime numbers\}

U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}
N = \{2, 4, 6, 8, 10\} \quad P = \{2, 3, 5, 7\}
Ms. Spann asked students to list the activities they participated in over the weekend. She organized the results in a Venn diagram below.
How many students did homework? 19
How many did homework, played sports, or saw a movie?
How many did all three activities?
How many did homework, played sports, and saw a movie?
How many students did none of the activities? 12
How many students are there in the class?  \textbf{Add all numbers} = 40
How many did homework and played sports?

8
How many students did homework or played sports?
How many students saw a movie and played no sports?
How many did homework and saw a movie, but did not play a sport? 2
How many did homework or saw a movie, but did not play a sport?  

15
Club $M$ has 11 members and Club $R$ has 18. If a total of 24 people belong to the two clubs, how many people belong to both clubs?

\[
\begin{align*}
M &= 11 \\
R &= 18
\end{align*}
\]

Club Participants
\[= M + R = 11 + 18 = 29\]

Both Clubs
\[= 29 - 24 = 5\]
A basket contains 14 different fruits. If there are 5 oranges, 6 apples and remaining are bananas, then find the probability of choosing a banana from a basket.

\[
P(\text{banana}) = \frac{\text{total bananas}}{\text{total number of fruit}} = \frac{3}{14}
\]
The table shows the numbers of brass instrument players in the New York Philharmonic. Suppose one brass instrument player is randomly selected to be a featured performer. Find the probability of each event.

\[ P(\text{trumpet}) = \frac{\# \text{ of trumpets}}{\text{total instruments}} = \frac{3}{14} \]

\[ P(\text{not tuba}) = \frac{\text{horns} + \text{trombones} + \text{trumpet}}{\text{total instruments}} = \frac{6 + 4 + 3}{14} = \frac{13}{14} \]
When one fair die is tossed, find the probability of rolling the number five and rolling an even number.

\[ P(\text{rolling #5 AND even}) \]

\[ P(\text{rolling #5}) \ AND \ P(\text{rolling even}) \]

\[ \frac{1}{6} \times \frac{3}{6} \]

\[ \frac{1}{6} \times \frac{1}{2} = \frac{1}{12} \]
Your drawer contains 8 red socks and 6 green socks. It is too dark to see which are which. What is the probability that you pick a green sock, then a red sock?

\[ P(\text{green AND red}) \]

\[ P(\text{green}) \times P(\text{red}) \]

\[ \frac{6}{14} \times \frac{8}{13} = \frac{24}{91} \]

DEPENDENT EVENTS
Without Replacement

# of socks left in drawer
Your drawer contains 8 red socks and 6 green socks. It is too dark to see which are which. The first sock picked from the drawer is green. What is the probability that the next sock picked is a red sock?

Statement 1  The drawer contains 14 socks.

Statement 2  After picking a green sock, there are 13 socks left.

Statement 3  There are 8 red socks remaining in the drawer.

Statement 4  The probability of picking a red sock is \( \frac{8}{13} \)
A face-down deck of cards contains four hearts, five diamonds, four clubs, and three spades. What is the probability that the first two cards drawn will be spades?

\[
\frac{3}{16} \times \frac{2}{15} \times \frac{1}{8} \times \frac{1}{5} = \frac{1}{40}
\]
A face-down deck of cards contains four hearts, five diamonds, four clubs, and three spades. Two cards are drawn without replacement. If the first card drawn is a spade, what is the probability that the next card drawn will be a spade?

Statement 1  There deck contains 16 cards.
Statement 2  After drawing a spade, there are 15 cards left.
Statement 3  There are 2 spades remaining in the deck.
Statement 4  The probability of picking a 2nd spade is $\frac{2}{15}$
At Stephenson High School 60% of all students have a car and an Ipod and 70% of all students have a car. What is the probability that a student with a car also has an Ipod?

At Stephenson High School 60% of all students have a car and an Ipod and 70% of all students have a car. What is the probability that a student has an Ipod, given they also own a car?

$$P(\text{Ipod } | \text{ car}) = \frac{P(\text{Ipod and Car})}{P(\text{Car})} = \frac{0.60}{0.70} = 0.86$$
45% of the children in a school have a dog, 30% have a cat, and 18% have a dog and a cat. What percent of those who have a dog also have a cat?

\[
P(\text{Cat} \mid \text{Dog}) = \frac{P(\text{Cat and Dog})}{P(\text{Dog})} = \frac{0.18}{0.45} = 0.4
\]
A group of students is donating blood during a blood drive. A student has a $\frac{2}{5}$ probability of having type $O$ blood and a $\frac{1}{5}$ probability of type $A$ blood.

a. What events are mutually exclusive?
   Type $O$ blood and Type $A$ blood

b. Why? A person has only one blood type.
A group of students is donating blood during a blood drive. A student has a \( \frac{2}{5} \) probability of having type \( O \) blood and a \( \frac{1}{5} \) probability of type \( A \) blood.

c. What is the probability that a student has type \( O \) or type \( A \) blood?

\[
P(\text{Type } O \text{ or Type } A) = P(\text{Type } O) + P(\text{Type } A)
\]

\[
\frac{1}{5} + \frac{2}{5} = \frac{3}{5}
\]
Michael has 4 red shirts, 3 green shirts, and 5 blue shirts in his closet. He has to select a shirt to wear to work.

a. What events are mutually exclusive?
   Picking red shirt, picking green shirt, and picking blue shirt

b. Why?
   A person has only one pick one shirt at a time.
Michael has 4 red shirts, 3 green shirts, and 5 blue shirts in his closet. He has to select a shirt to wear to work.

c. If he randomly selects a shirt, what is the probability that he chooses blue or red?

\[ P(\text{Blue or Red}) = P(\text{Blue}) + P(\text{Red}) \]

\[ \frac{5}{12} + \frac{4}{12} = \frac{9}{12} = \frac{3}{4} \]
In Hillcrest School, 36% of middle school students are in Grade 6, 31% are in grade 7, and 33% are in grade 8. If a middle school student is selected randomly, what is the probability that the student is either in grade 6 or in grade 7?

\[ P(\text{Grade 6 or Grade 7}) = P(\text{Grade 6}) + P(\text{Grade 7}) \]

\[ 36\% + 31\% = 67\% \]
Find the probability of a number cube rolling a 4 or an even number.

\[ P(4 \text{ or Even}) = P(4) + P(\text{Even}) - P(4 \text{ and Even}) \]

\[
= \frac{1}{6} + \frac{3}{6} - \frac{1}{6}
\]

\[
= \frac{3}{6} = \frac{1}{2}
\]
Find the probability on a number cube of rolling an odd number or a number greater than 2.

\[ P(\text{Odd or } >2) = P(\text{Odd}) + P(>2) - P(\text{Odd and } >2) \]

\[
= \frac{3}{6} + \frac{4}{6} - \frac{2}{6}
\]

\[= \frac{5}{6} \]
Determine which events are ‘mutually exclusive’ or ‘inclusive’. Then, explain why.

Events: ‘Choosing a black card from a deck’

‘Choosing a 10 from a deck’

Inclusive

Explain why.

A card can be both black and a 10.

(10 of clubs OR 10 of spades)
Determine which events are ‘mutually exclusive’ or ‘inclusive’. Then, explain why.

Events: ‘Sitting Down’
   ‘Standing Up’
   **Mutually exclusive**

Explain why.
   You can not do both at the same time.
Determine which events are ‘mutually exclusive’ or ‘inclusive’. Then, explain why.

Events: ‘Sitting Down’
‘Scratching your nose’

Inclusive

Explain why.

You can do both at the same time.
Sarah asked 40 randomly selected underclassmen at her high school whether they were planning to go to college and whether they were planning to move out of their parents’ or guardians’ homes right after high school. The results are summarized in the table.

<table>
<thead>
<tr>
<th>Planning to Move Out</th>
<th>Planning to Go to College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
</tr>
</tbody>
</table>

Make a table of the joint relative frequencies and marginal relative frequencies. Find the totals in each row and column.
Sarah asked 40 randomly selected underclassmen at her high school whether they were planning to go to college and whether they were planning to move out of their parents’ or guardians’ homes right after high school. The results are summarized in the table.

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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>12</td>
<td>40</td>
</tr>
</tbody>
</table>

Find the totals in each row and column.
Make a table of the joint relative frequencies and marginal relative frequencies.

<table>
<thead>
<tr>
<th>Planning to Move Out</th>
<th>Planning to Go to College</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16/40 = 0.4</td>
<td>8/40 = 0.2</td>
<td>24/40 = 0.6</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12/40 = 0.3</td>
<td>4/40 = 0.1</td>
<td>16/40 = 0.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>28/40 = 0.7</td>
<td>12/40 = 0.3</td>
<td>40/40 = 1</td>
<td></td>
</tr>
</tbody>
</table>
Make a table of the joint relative frequencies and marginal relative frequencies.

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<tr>
<td>Yes</td>
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<td>0.4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0.6</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0.1</td>
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<tr>
<td></td>
<td>Total</td>
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<tr>
<td>Total</td>
<td></td>
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<tr>
<td></td>
<td>Yes</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
</tr>
</tbody>
</table>

b. What is the probability that if a student plans to go to college, they do not plan to move out?

\[
\frac{0.3}{0.7} = 0.43
\]

c. What is the probability that if a student does not plan to go to college, they plan to move out?

\[
\frac{0.2}{0.3} = 0.67
\]