Happy Tuesday! Reflect & Turn in...

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 5 - 14 Topic: Counting Techniques	0 1 2	
Tuesday Date: 5 - 15 Topic: Permutations vs. Combinations	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Warm-up:

How many ways can you arrange the letters in the word MISSISSIPPI?

11 10 9 8 7 6 5 4 3 2 1

I: 4 4 3 2 1 $= 4!$ (# of ways to arrange I)

S: 4!

P: 2!

Warm-up:

How many ways can you arrange the letters in the word MISSISSIPPI?

(11 letters arranged) $11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

Divide out the repeated letters!

2 P's
4 I's
4 S's

$$\frac{11!}{2!4!4!} = 34{,}650$$

Class Plan

1) Warm-up

2) Youtube Example

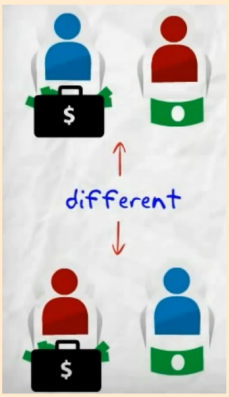
3) Review for Quiz 8.1

Youtube Example:

Three 9th graders are going to win a prize of either $50 or $5. How many ways can we arrange the two winners?

This video will answer this question...
https://www.youtube.com/watch?v=0NAASclUm4k

Three 9th graders are going to win a prize of either $50 or $5. How many ways can we arrange the two winners?



PERMUTATION

Order Matters

There are 6 different ways we could give out the prizes.

https://www.youtube.com/watch?v=0NAAScIUm4k

Ahhhh! Don't Memorize!!!

DontMemorise.com

Combinations

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Select

!

Permutations

$${}_nP_r = \frac{n!}{(n-r)!}$$

Arrange

Unit 8 Probability: Quiz 1

Do: Review Handouts

- Experimental vs. Theoretical
- Tree Diagram (with or without replacement)
- Analyze a Tree Diagram
- Counting Principle
- Permutation/Combination

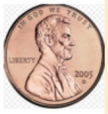
Done? Look over Chapter 14

Review Handout

1. Ms. Berg flipped a coin 20 times and it landed on heads 12 times.

a) What is the probability of landing on heads, based on this experiment?

b) If Ms. Berg flipped the coin 100 times, using this probability, how many times would the coin land on heads?



c) How many times should Ms. Berg land on heads in theory?

Review Handout

2. Ms. Paulson is rolling two dice with her son. He says that he gets a piece of candy every time a ~~6 is rolled.~~ Sum of 6 is rolled.

a) If they roll the dice 50 times, how many pieces of candy should he get?

b) Was this the best number to choose? Why?

Review Handout

3. The table shows data from a survey conducted at 5 schools on the rate of smoking amongst 15-year-old students.

School	*No. of 15 year olds*		*No. of smokers*	
	Male	*Female*	*Male*	*Female*
A	45	51	10	11
B	36	42	9	6
C	52	49	13	13
D	28	33	9	10
E	40	39	7	4
Total	201	214	48	44

a) Find the probability that a randomly chosen 15-year-old student at school **C** is a smoker.

b) Find the probability that a randomly chosen 15-year-old student at school **E** is *not* a smoker.

c) If a 15 year old is chosen at random from the 5 schools, what is the probability that he or she is a smoker?

Review Handout

4. A marble is randomly selected from a box containing 5 green, 3 red, and 7 blue marbles. Determine the probability that the marble is:

a) Red b) Green or Red c) not red d) Neither green nor blue

Review Handout

5. List all the possilbe outcomes (sample space).

a) A basketball player takes a shot that can result in a score or a miss.

b) Two rooms in a house need to be painted. Each room can be painted white, yellow, or green.

Review Handout

6. Malaya is playing a game that has a spinner with 4 equal sized sections labeled 1, 2, 3, and 4.
Model her first 2 spins using a tree diagram.
Label each branch and the end of each path with a probability.

What is the probability that her first spin is 2, and her second spin is also 2? **Show work!**

Review Handout

7. Ms. Paulson has an envelope of 2 winning tickets and 18 loser tickets. As she goes around the room students close their eyes and select one of the tickets. Each student gets their own ticket and keeps the ticket. **Model the probability of the first 2 student's choices using a tree diagram. Label each branch and the end of each path with a probability.**

According to your tree diagram what is the probability that the first person and second person choose a winning ticket? **Show work!**

Review Handout

8. Sureya has 4 hijabs, 5 skirts, 6 blouses, and 2 pairs of shoes. Calculate Sureya's total outfits.

9. A password needs 8 characters: Upper case letter, lower case letter, or digits. How many different passwords can be created?

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

1) You are setting the combination on a five-digit lock. You want to use the numbers 10962 but don't care what order they are in.

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

2) The batting order for nine players on a 12 person team.

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

3) The student body of 45 students wants to elect four representatives.

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

4) A team of 13 lacrosse players needs to choose a captain and co-captain.

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

5) A group of 45 people are going to run a race. The top 6 finishers advance to the finals.

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

6) There are 260 athletes at a meeting. They each shake hands with everyone else. How many handshakes were there?

Review Handout

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

7) How many passcods greater than 1000 can you create?

a) Using digits 0, 1, 2, 3, with repeats. b) Same as part a) , but without repeats.

c) Using digits 0, 1, 3, 5, 7, without repeats.

Review Handout Solutions

1. Ms. Berg flipped a coin 20 times and it landed on heads 12 times.

a) What is the probability of landing on heads, based on this experiment?

b) If Ms. Berg flipped the coin 100 times, using this probability, how many times would the coin land on heads?

a) $\frac{12}{20} = \boxed{\frac{3}{5}}$ b) $\left(\frac{3}{5}\right) \cdot 100 = \frac{300}{5} = \boxed{60}$

c) How many times should Ms. Berg land on heads in theory?

$\frac{1}{2}$ of the time, or 50 times for 100 flips.

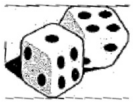
2. Ms. Paulson is rolling two dice with her son. He says that he gets a piece of candy every time a 6 is rolled.

a) If they roll the dice 50 times, how many pieces of candy should he get?

$\frac{1}{6}$ ← Probability of rolling a 6.

$\left(\frac{1}{6}\right) \cdot 50 = \frac{50}{6} = \frac{25}{3} = 8\frac{1}{3}$

He should get about 8 pieces.



b) Was this the best number to choose? Why?

Review Handout Solutions

Sum of

2. Ms. Paulson is rolling two dice with her son. He says that he gets a piece of candy every time a 6 is rolled.

a) If they roll the dice 50 times, how many pieces of candy should he get?

$P(\text{sum of } 6) = \frac{5}{36} = \frac{x}{50}$ $\quad \frac{250}{36} = \frac{36x}{36}$

b) Was this the best number to choose? Why?

He should have chose a sum of 7

6.94 ≈ x pieces of candy

Roll a sum of 6

1,5 5,1
2,4 4,2
3,3

All sums

$6 \times 6 = 36$

1st Dice, 2nd Dice

1,6 6,1
2,5 5,2
3,4 P(sum 7)
4,3 $\frac{6}{36}$

Review Handout Solutions

3. The table shows data from a survey conducted at 5 schools on the rate of smoking amongst 15-year-old students.

School	*No. of 15 year olds*		*No. of smokers*	
	Male	*Female*	*Male*	*Female*
A	45	51	10	11
B	36	42	9	6
C	52	49	13	13
D	28	33	9	10
E	40	39	7	4
Total	201	214	48	44

a) Find the probability that a randomly chosen 15-year-old student at school **C** is a smoker.

$\frac{13+13}{52+49} = \frac{26}{101}$

b) Find the probability that a randomly chosen 15-year-old student at school **E** is *not* a smoker.

$40+39 = 79$ students $\quad 79-(7+4) = 68$ $\quad \frac{68}{79}$

c) If a 15 year old is chosen at random from the 5 schools, what is the probability that he or she is a smoker?

$\frac{48+44}{201+214} = \frac{92}{415}$

Review Handout Solutions

4. A marble is randomly selected from a box containing 5 green, 3 red, and 7 blue marbles.
Determine the probability that the marble is:

15 marbles total.

a) Red $\frac{3}{15} = \boxed{\frac{1}{5}}$ b) Green or Red $\boxed{\frac{8}{15}}$ c) not red $\frac{12}{15} = \boxed{\frac{4}{5}}$ d) Neither green nor blue $\frac{3}{15} = \boxed{\frac{1}{5}}$

5. List all the possilbe outcomes (sample space).

a) A basketball player takes a shot that can result in a score or a miss.

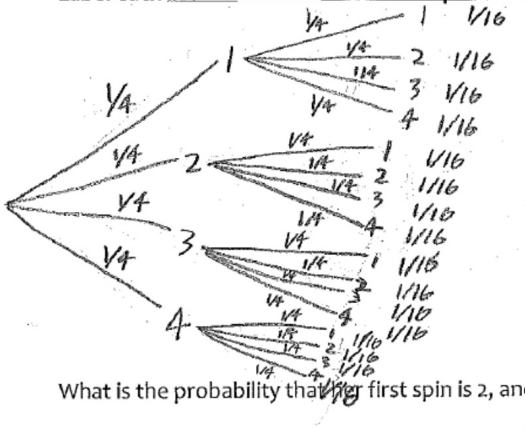
$S = \{Score, Miss\}$

b) Two rooms in a house need to be painted. Each room can be painted white, yellow, or green.

$S = \{WW, WY, WG, YW, YY, YG, GW, GY, GG\}$

Review Handout Solutions

6. Malaya is playing a game that has a spinner with 4 equal sized sections labeled 1, 2, 3, and 4.
Model her first 2 spins using a tree diagram.
Label each branch and the end of each path with a probability.

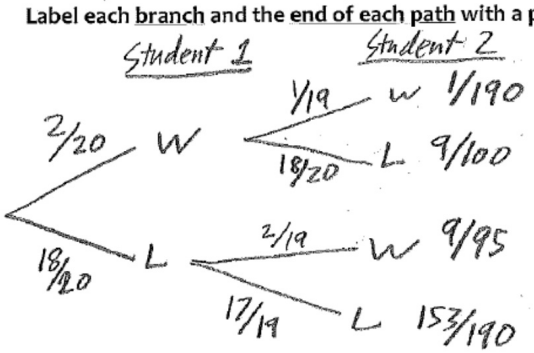


What is the probability that her first spin is 2, and her second spin is also 2? **Show work!**

$\frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{16}}$

Review Handout Solutions

7. Ms. Paulson has an envelope of 2 winning tickets and 18 loser tickets. As she goes around the room students close their eyes and select one of the tickets. Each student gets their own ticket and keeps the ticket. **Model the probability of the first 2 student's choices using a tree diagram. Label each branch and the end of each path with a probability.**



According to your tree diagram what is the probability that the first person and second person choose a winning ticket? **Show work!**

$$\frac{2}{20} \cdot \frac{1}{19} = \frac{2}{380} = \boxed{\frac{1}{190}}$$

Review Handout Solutions

8. Sureya has 4 hijabs, 5 skirts, 6 blouses, and 2 pairs of shoes. Calculate Sureya's total outfits.

$4 \cdot 5 \cdot 6 \cdot 2 = \boxed{240}$

9. A password needs 8 characters: Upper case letter, lower case letter, or digits. How many different passwords can be created?

26 26 10

$26 + 26 + 10 = 62$

$62 \cdot 62 \cdot 62 \cdot 62 \cdot 62 \cdot 62 \cdot 62 \cdot 62 = \boxed{(62)^8}$

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

1) You are setting the combination on a five-digit lock. You want to use the numbers 10962 but don't care what order they are in.

$\underset{1st}{5} \cdot \underset{2nd}{4} \cdot \underset{3rd}{3} \cdot \underset{4th}{2} \cdot \underset{5th}{1} = \frac{5!}{(5-5)!} = {}_5P_5 = 120$

Combos of locks

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

2) The batting order for nine players on a 12 person team.

12 11 10 9 8 7 6 5 4 3 2 1

1st 2nd

$$_{12}P_{12} = \frac{12!}{(12-12)!} = 79,833,600 \text{ batting orders!}$$

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

3) The student body of 45 students wants to elect four representatives.

ABCD BACD CABD DABC
ABDC BADC CADB DACB
ACBD BCAD CBAD DBAC
ACDB BCDA CBDA DBCA
ADBC BDAC CDAB DCAB
ADCB BDCA CDBA DCBA

24 ways to arrange the same 4 people!

$24 = 4 \cdot 3 \cdot 2 \cdot 1 = 4!$

$\frac{45}{\text{Rep.}} \quad \frac{44}{\text{Rep.}} \quad \frac{43}{\text{Rep.}} \quad \frac{42}{\text{Rep.}}$

24

$= {}_{45}C_4 = \frac{45!}{(45-4)!\,4!} = 148{,}995$ groups

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

4) A team of 13 lacrosse players needs to choose a captain and co-captain.

$\underset{\text{Cap.}}{13} \cdot \underset{\text{Co-Cap.}}{12} = \frac{13!}{(13-2)!} = \frac{13 \cdot 12 \cdot 11 \cdots 1}{11 \cdot 10 \cdot 9 \cdots 1} = 156$ pairs of Cap. & Co-Captain.

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

5) A group of 45 people are going to run a race. The top 6 finishers advance to the finals.

ABCDEF
ABCDFE
ABCFDE
ABFCDE
AFBCDE
FABCDE

Note: these are the same 6 finishers

$\frac{6}{1^{st}\text{ finisher}} \frac{5}{2^{nd}} \frac{4}{3^{rd}} \frac{3}{4^{th}} \frac{2}{5^{th}} \frac{1}{6^{th}} = 720$

720 arrangements of the SAME 6 finishers of race.

$\frac{45\ 44\ 43\ 42\ 41\ 40}{720} = 8,145,060$

$45C6 = \frac{45!}{(45-6)!6!} = \frac{45!}{39!6!}$

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

6) There are 260 athletes at a meeting. They each shake hands with everyone else. How many handshakes were there?

$$\frac{260 \cdot 259}{2} = \frac{67{,}340}{2} = 33{,}670 \text{ handshakes}$$

260 = # of people shaking hands

259 = # of handshakes (You don't shake YOUR hand!)

2 (A shaking hands with B is the same as B with A.)

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

7) How many passcodes greater than 1000 can you create?

a) Using digits 0, 1, 2, 3, with repeats.

Can't start with zero!

3 4 4 4 = 192

1110 2220
1111 2221
1112 2222
1113 2223

b) Same as part a), but without repeats.

3 3 2 1

18 arrangements

c) Using digits 0, 1, 3, 5, 7, without repeats.

Review Handout Solutions

State if each scenario involves a permutation or a combination. Then find total possibilities. SHOW ALL WORK!

7) How many passcods greater than 1000 can you create?

c) Using digits 0, 1, 3, 5, 7, without repeats.

4 digits > 1000

Can't ~~start~~ with zero!

4 · 4 · 3 · 2

96 passcodes > 1000

5 digits > 1000

5 4 3 2 1

120 passcodes > 1000

216 passcodes > 1000