Name:	Date:

Topic:	Class:

Main Ideas/Questions	Notes/Examples
EXPERIMENT	An investigation or procedure with varying results **Example:** rolling a die
OUTCOME	A possible result from the experiment **Example:** 4
SAMPLE SPACE	The set of all possible outcomes **Example:** {1,2,3,4,5,6}
EVENT	A certain desired outcome **Example:** rolling an odd number
FAVORABLE OUTCOMES	All possible outcomes of an event **Example:** {1,3,5}

Identifying Outcomes

1. A letter from the word **BASKETBALL** is chosen at random. List the possible outcomes.

B, A, S, K, E, T, B, A, L, L

List the favorable outcomes for:

a) choosing K

K

b) not choosing B

A, S, K, E, T, B, A, L, L

c) choosing a T or an L

T, L, L

d) choosing a vowel

A, E, A

2. The spinner to the left is spun once. List the possible outcomes.

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

List the favorable outcomes for:

a) spinning an even number

2, 4, 6, 8, 10, 12

b) spinning a number greater than 10

11, 12

c) spinning a number that is at most 5

1, 2, 3, 4, 5

d) spinning a prime number

2, 3, 5, 7, 11

	3. A month of the year is chosen at random. List the possible outcomes. Jan, Feb, Mar, Apr, May, June, July, Aug, Sept, Oct, Nov, Dec	**List the favorable outcomes for:**
		a) choosing a month that starts with the letter A April, August
		b) choosing a month that starts with the letter J or S January, June, July, September
		c) choosing month with no more than 30 days Feb, Apr, June, Sept, Nov
Counting Outcomes	**4.** The spinner below is spun once. How many possible outcomes are there? 8 Green, Blue, Yellow, Yellow, Red, Blue, Blue, Green	**Give the number of favorable outcomes for each event:**
		a) spinning green 2
		b) not spinning red 7
		c) spinning yellow or blue 5
		d) spinning green and red 0
	5. A bag contains 50 lottery balls, numbered 1-50. A ball is chosen at random. How many possible outcomes are there? 50	**Give the number of favorable outcomes for each event:**
		a) choosing a number less than 14 13
		b) choosing a number divisible by 3 16
		c) choosing a perfect square 7
		d) choosing a number that is odd and at least 21 15
	6. Jon's piggy bank contains 12 pennies, 9 nickels, 23 dimes, and 16 quarters. If Jon chooses one coin at random, how many possible outcomes are there? 60	**Give the number of favorable outcomes for each event:**
		a) choosing a dime 23
		b) choosing a nickel or a penny 21
		c) choosing a silver coin 48
		d) choosing a coin worth at most 10¢ 44

Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 1:** Outcomes & Events

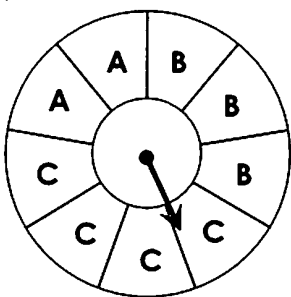| **Directions:** List the possible outcomes.	
1. Cara is playing a number game where she has two tiles for each number 0 – 9. A tile is chosen at random. List the possible outcomes. 0,0, 1, 1, 2, 2, 3,3, 4, 4, 5, 5, 6,6, 7,7, 8,8, 9,9	**List the favorable outcomes for:**
	a) choosing a 2 2,2
	b) not choosing an even number 1,1, 3,3, 5,5, 7,7, 9, 9
	c) choosing a number less than 4 0,0, 1,1, 2,2, 3, 3
	d) choosing a multiple of 3 3, 3, 6, 6, 9, 9
2. A jar contains 3 red marbles, 2 orange marbles, 3 green marbles and 4 blue marbles. One marble is chosen at random. List the possible outcomes. R, R, R, O, O, G, G, G, B, B, B, B	**List the favorable outcomes for:**
	a) choosing a red marble R, R, R
	b) not choosing a green marble R,R,R, O, O, B, B,B, B
	c) choosing a blue or orange marble O, O, B, B, B, B
	d) choosing a primary color R, R, R, B, B, B, B
3. The spinner below is spun once. How many possible outcomes are there? 9 	**Give the number of favorable outcomes for each event.**
	a) spinning B 3
	b) spinning A or C 6
	c) not spinning C 5
	d) spinning B and C 0
4. Blair has a box of candy to sell. She has 4 chocolate bars, 4 fruit chews, 1 pack of bubble gum and 3 sour candies. If she chooses a piece of candy at random, how many possible outcome are there? 12	**Give the number of favorable outcomes for each event.**
	a) choosing a pack of gum 1
	b) not choosing a sour candy 9
	c) choosing a chocolate bar or pack of gum 5
	d) choosing anything other than fruit chews 8
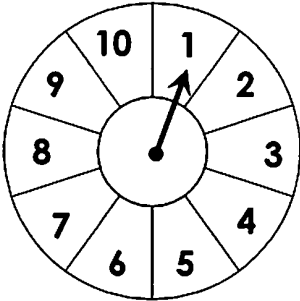
Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
PROBABILITY	• Probability is a measure of the __likelihood__ that a specific __event__ will occur. • Probabilities have values between __0__ and __1__. • An event that is impossible has a probability of __0__. • An event that is certain to occur has a probability of __1__.
FINDING PROBABILITY	When all outcomes are equally likely, the probability of an event, P(event), is the ratio of the number of favorable outcomes to the total number of outcomes. $$P\textbf{(event)} = \frac{\#\ of\ favorable\ outcomes}{\#\ of\ total\ outcomes}$$ **Probabilities can be written as fractions, decimals, or percents!**

EXAMPLES	**Directions:** Find each probability as a fraction (in simplest form), decimal, and percent.

1. The spinner below is spun once.	a) P(odd) $\frac{5}{10} = \frac{1}{2}$; 0.5 ; 50%
	b) P(multiple of 4) $\frac{2}{10} = \frac{1}{5}$; 0.2 ; 20%
(spinner with numbers 1–10)	c) P(prime number) $\frac{4}{10} = \frac{2}{5}$; 0.4 ; 40%
	d) P(even or greater than 5) $\frac{7}{10}$; 0.7 ; 70%
2. A letter from the word **ACCELERATION** is chosen at random.	a) P(R) $\frac{1}{12}$; $0.08\overline{3}$; $8.\overline{3}\%$
	b) P(C) $\frac{2}{12} = \frac{1}{6}$; $0.1\overline{6}$; $16.\overline{6}\%$
	c) P(not a vowel) $\frac{6}{12} = \frac{1}{2}$; 0.5 ; 50%
	d) P(L, R, or A) $\frac{4}{12} = \frac{1}{3}$; $0.\overline{3}$; $33.\overline{3}\%$

3. Ryan randomly chooses a card from below.
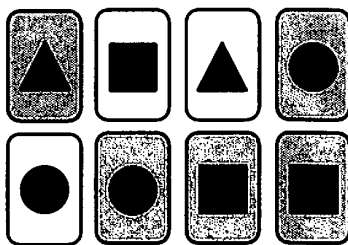
a) P(shaded card)

$\frac{5}{8}$; 0.625 ; 62.5%

b) P(a circle)

$\frac{3}{8}$; 0.375 ; 37.5%

c) P(not a triangle)

$\frac{6}{8} = \frac{3}{4}$; 0.75 ; 75%

d) P(an unshaded square)

$\frac{1}{8}$; 0.125 ; 12.5%

4. A date in the month of September shown below is chosen at random.

SEPTEMBER 2019						
SUN	MON	TUES	WEDS	THURS	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

a) P(a multiple of 5)

$\frac{6}{30} = \frac{1}{5}$; 0.2 ; 20%

b) P(the 3rd)

$\frac{1}{30}$; $0.0\overline{3}$; $3.\overline{3}$%

c) P(after the 14th)

$\frac{16}{30} = \frac{8}{15}$; $0.5\overline{3}$; $53.\overline{3}$%

d) P(a Friday)

$\frac{4}{30} = \frac{2}{15}$; $0.1\overline{3}$; $13.\overline{3}$%

5. A card is chosen at random from a standard deck of cards.

↓

52 cards

a) P(a black card)

$\frac{26}{52} = \frac{1}{2}$; 0.5 ; 50%

b) P(a 4)

$\frac{4}{52} = \frac{1}{13}$; ≈0.0769 ; 7.69%

c) P(a diamond)

$\frac{13}{52} = \frac{1}{4}$; 0.25 ; 25%

d) P(a queen or a 2)

$\frac{8}{52} = \frac{2}{13}$; ≈0.1538 ; 15.38%

6. Christina is making a necklace using beads. She has 20 red, 14 blue, 10 purple, 28 green, and 8 yellow beads. She randomly chooses a bead to start the necklace. ↓

80 beads

a) P(blue)

$\frac{14}{80} = \frac{7}{40}$; 0.175 ; 17.5%

b) P(not green)

$\frac{52}{80} = \frac{13}{20}$; 0.65 ; 65%

c) P(yellow or red)
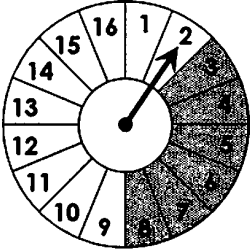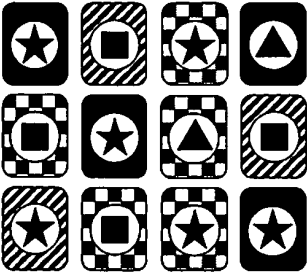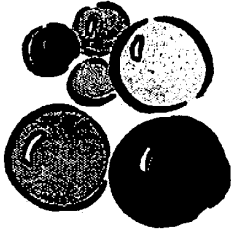
$\frac{28}{80} = \frac{7}{20}$; 0.35 ; 35%

d) P(pink)

$\frac{0}{80}$; 0.0 ; 0%

Why Did the Teacher Jump in the Pool?

Directions: Find each probability. After completing each set, find matching answers between Column 1 and Column 2. One will have a letter and the other a number. Write the letter in the matching numbered box at the bottom of the page.

		COLUMN 1			COLUMN 2	
SET 1	The spinner below is spun once.	**T**	P(even) $\frac{1}{2}$	**9**	P(unshaded) $\frac{5}{8}$	
		E	P(at least 7) $\frac{5}{8}$	**7**	P(10 or a multiple of 3) $\frac{3}{8}$	
		T	P(prime) $\frac{3}{8}$	**2**	P(shaded and at most 4) $\frac{1}{8}$	
		O	P(multiple of 5 and odd) $\frac{1}{8}$	**12**	P(less than 9) $\frac{1}{2}$	
SET 2	The set of cards below has 3 background styles (solid, stripes, and checkered) and 3 shapes (stars, squares, and triangles). One card is chosen at random.	**W**	P(stripes) $\frac{1}{4}$	**6**	P(a triangle) $\frac{1}{6}$	
		T	P(a star) $\frac{1}{2}$	**10**	P(solid and a star) $\frac{1}{4}$	
		R	P(solid or checkered) $\frac{3}{4}$	**1**	P(a square or a triangle) $\frac{1}{2}$	
		T	P(checkered and a square) $\frac{1}{6}$	**4**	P(stripes and a star) $\frac{1}{12}$	
		E	P(solid and a triangle) $\frac{1}{12}$	**14**	P(checkered or a star) $\frac{3}{4}$	
SET 3	There are 2 blue, 6 yellow, 10 red, 3 green, 5 orange, and 4 purple marbles in a jar. One marble is chosen at random.	**S**	P(red) $\frac{1}{3}$	**11**	P(orange) $\frac{1}{6}$	
		E	P(red, yellow, or purple) $\frac{2}{3}$	**3**	P(yellow) $\frac{1}{5}$	
		A	P(green or blue) $\frac{1}{6}$	**13**	P(not red) $\frac{2}{3}$	
		H	P(orange, purple, or yellow) $\frac{1}{2}$	**5**	P(purple or yellow) $\frac{1}{3}$	
		T	P(blue or purple) $\frac{1}{5}$	**8**	P(blue, red, or green) $\frac{1}{2}$	

ANSWER:

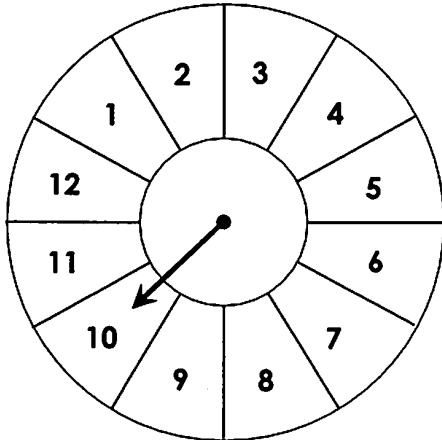| 1.	2.		3.	4.	5.	6.		7.	8.	9.		10.	11.	12.	13.	14.	
T	O		T	E	S	T		T	H	E		W	A	T	E	R	!

Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 2:** Simple Probability

** This is a 2-page document! **

Directions: Find each probability as a fraction (in simplest form), decimal, and percent.

1. The spinner below is spun once.

a) P(even)

$\frac{6}{12} = \frac{1}{2}$; 0.5 ; 50%

b) P(no more than 10)

$\frac{10}{12} = \frac{5}{6}$; $0.8\overline{3}$; $83.\overline{3}\%$

c) P(even or a multiple of 3)

$\frac{8}{12} = \frac{2}{3}$; $0.\overline{6}$; $66.\overline{6}\%$

d) P(less than 10 and odd)

$\frac{5}{12}$; $0.41\overline{6}$; $41.\overline{6}\%$

2. A ball is thrown into one of the jars.
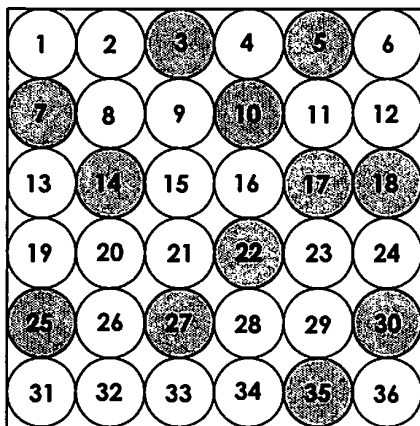
a) P(odd and unshaded)

$\frac{11}{36}$; $0.30\overline{5}$; $30.\overline{5}\%$

b) P(shaded and at least 18)

$\frac{6}{36} = \frac{1}{6}$; $0.1\overline{6}$; $16.\overline{6}\%$

c) P(multiple of 6)

$\frac{6}{36} = \frac{1}{6}$; $0.1\overline{6}$; $16.\overline{6}\%$

d) P(less than 25 and shaded)

$\frac{8}{36} = \frac{2}{9}$; $0.\overline{2}$; $22.\overline{2}\%$

3. A jar contains 3 chocolate chip cookies, 4 mint cookies, 3 double chocolate cookies, 5 oatmeal cookies and 1 peanut butter cookie. One cookie is chosen at random.

↓

16 cookies

a) P(double chocolate)

$\frac{3}{16}$; 0.1875 ; 18.75%
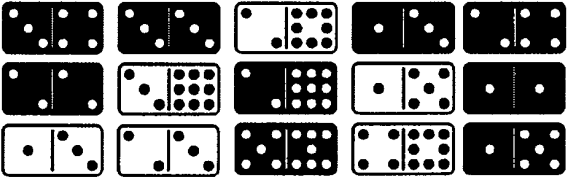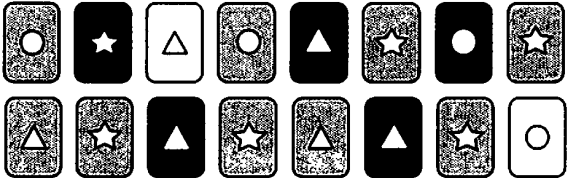
b) P(chocolate chip or peanut butter)

$\frac{4}{16} = \frac{1}{4}$; 0.25 ; 25%

c) P(oatmeal or peanut butter)

$\frac{6}{16} = \frac{3}{8}$; 0.375 ; 37.5%

d) P(not mint)

$\frac{12}{16} = \frac{3}{4}$; 0.75 ; 75%

4. A letter is chosen from the word **APPLICATIONS.** ↓ 12 letters	a) $P(A)$ $\frac{2}{12} = \frac{1}{6}$; $0.1\overline{6}$; $16.\overline{6}\%$
	b) $P(\text{vowel})$ $\frac{5}{12}$; $0.41\overline{6}$; $41.\overline{6}\%$
	c) $P(\text{not a P})$ $\frac{10}{12} = \frac{5}{6}$; $0.8\overline{3}$; $83.\overline{3}\%$
	d) $P(\text{T or I})$ $\frac{3}{12} = \frac{1}{4}$; 0.25 ; 25%
5. A domino is chosen. Find each probability related to the total number of dots on the domino.	a) $P(\text{6 and black})$ $\frac{3}{15} = \frac{1}{5}$; 0.2 ; 20%
	b) $P(\text{odd})$ $\frac{3}{15} = \frac{1}{5}$; 0.2 ; 20%
	c) $P(\text{white})$ $\frac{6}{15} = \frac{2}{5}$; 0.4 ; 40%
	d) $P(\text{even and white})$ $\frac{5}{15} = \frac{1}{3}$; $0.\overline{3}$; $33.\overline{3}\%$
6. One card is selected.	a) $P(\text{triangle on black})$ $\frac{3}{16}$; 0.1875 ; 18.75%
	b) $P(\text{gray or black})$ $\frac{14}{16} = \frac{7}{8}$; 0.875 ; 87.5%
	c) $P(\text{not a star})$ $\frac{10}{16} = \frac{5}{8}$; 0.625 ; 62.5%
	d) $P(\text{circle on gray})$ $\frac{2}{16} = \frac{1}{8}$; 0.125 ; 12.5%
7. A basket is filled with cards, one for each letter of the alphabet and one for each digit 0 – 9. One card is chosen.	a) $P(\text{number})$ $\frac{10}{36} = \frac{5}{18}$; $0.2\overline{7}$; $27.\overline{7}\%$
	b) $P(\text{vowel or even number})$ $\frac{10}{36} = \frac{5}{18}$; $0.2\overline{7}$; $27.\overline{7}\%$
	c) $P(\text{letter after N or number})$ $\frac{22}{36} = \frac{11}{18}$; $0.6\overline{1}$; $61.\overline{1}\%$
	d) $P(\text{letter or odd number})$ $\frac{31}{36}$; $0.86\overline{1}$; $86.\overline{1}\%$

Name:	Date:
Topic:	Class:

| Main Ideas/Questions	Notes/Examples
THEORETICAL PrOBaBILILY	<u>What should happen in an experiment.</u> **Example:** If tossing a coin, the probability of it landing on heads is $\frac{1}{2}$.
EXPERIMENTAL PrOBaBILILY	<u>What actually happens after an experiment.</u> **Example:** A coin was tossed 100 times. Heads appeared 60 times. Therefore, the probability of the coin landing on heads on the next toss is $\frac{60}{100} = \frac{3}{5}$.

THEORETICAL VS. **EXPERIMENTAL** PrOBaBILILY
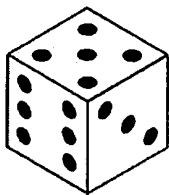
Roll a standard die 60 times and record the results in the table below:

Result	1	2	3	4	5	6
Frequency	卌 卌 II	卌 IIII	卌 I	卌 卌 III	卌	卌 卌 卌

Answer each question based on theoretical probability and experimental probability using your results.

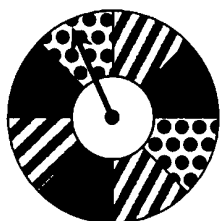|	Theoretical Probability	Experimental Probability
1. What is the probability that the next roll is an odd number?	$\frac{3}{6} = \boxed{\frac{1}{2}}$	$\boxed{\frac{23}{60}}$
2. What is the probability that the next roll is a 1 or a 4?	$\frac{2}{6} = \boxed{\frac{1}{3}}$	$\frac{25}{60} = \boxed{\frac{5}{12}}$
3. What is the probability that the next roll is at least 2?	$\boxed{\frac{5}{6}}$	$\frac{48}{60} = \boxed{\frac{4}{5}}$
4. Out of 100 rolls, about how many times would you expect to roll a 3?	$\frac{1}{6} \cdot 100$ $\approx \boxed{17}$	$\frac{6}{60} = \frac{1}{10}$ $\frac{1}{10} \cdot 100 = \boxed{10}$

5. Do the theoretical results match the experimental results?

No; Some were lower and others higher than expected.

6. How could the experimental results get closer to the theoretical results?

More trials should bring the experimental results closer to the theoretical results.

<table>
<tr><td rowspan="2">**MORE EXAMPLES**
</td><td>**7.** A letter in the word **ACCEL** is chosen 50 times. Results are shown in the table below.

Result	Frequency
A	14
C	5
C	7
E	15
L	9
</td><td>**a)** What is the theoretical probability of choosing a C?

$\dfrac{2}{5}$

b) What is the experimental probability of choosing a C? Compare this to the theoretical probability.

$\dfrac{12}{50} = \dfrac{6}{25}$; lower than expected</td></tr>
<tr><td>**8.** The spinner to the left is spun 80 times. Results are shown in the table below.

Result	Frequency
Stripes	27
Polka Dots	18
Solid	35
</td><td>**a)** What is the theoretical probability of the spinner not landing on polka dots?

$\dfrac{6}{8} = \dfrac{3}{4}$

b) What is the experimental probability of the spinner not landing on polka dots? Compare this to the theoretical probability.

$\dfrac{62}{80} = \dfrac{31}{40}$; higher than expected</td></tr>
<tr><td rowspan="2">**USING SAMPLES TO PREDICT**</td><td>**9.** A day of the week is chosen at random 40 times. Results are shown in the table below.

Result	Frequency
Sunday	3
Monday	12
Tuesday	2
Wednesday	10
Thursday	8
Friday	1
Saturday	4
</td><td>**a)** Theoretically, if a day of the week is chosen 150 times, how many times would you expect a day that starts with the letter T?

$\dfrac{2}{7} \cdot 150 \approx \boxed{43}$

b) Based on the experiment, if a day of the week is chosen 150 times, how many times would you expect a day that starts with the letter T?

$\dfrac{10}{40} = \dfrac{1}{4}$; $\dfrac{1}{4} \cdot 150 \approx \boxed{38}$</td></tr>
<tr><td>**10.** A small deck of cards has 4 kings, 3 queens, 2 jacks, and 1 ace. Eli chooses one card at random 75 times and records his results in the table below.

Result	Frequency
King	27
Queen	20
Jack	16
Ace	12
</td><td>**a)** Theoretically, how many times would you expect to draw an ace out of 200 draws?

$\dfrac{1}{10} \cdot 200 = \boxed{20}$

b) Based on Eli's experiment, how many times would you expect to draw an ace out of 200 draws?

$\dfrac{12}{75} = \dfrac{4}{25}$; $\dfrac{4}{25} \cdot 200 = \boxed{32}$</td></tr>
</table>

Name: _____   Unit 8: Probability & Statistics

Date: _____ **Per:** _____   Homework 3: Theoretical vs. Experimental
Probability

** This is a 2-page document! **

Give each probability as a simplified fraction, decimal, and percent.

1. A number between 1 and 3 is chosen 30 times. Results are shown in the table below.
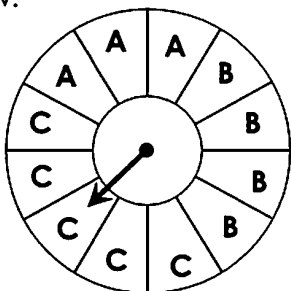
Result	Frequency
1	8
2	12
3	10

a) Find and compare the theoretical probability and experimental probability of choosing a 2.

$$\frac{12}{30} = \frac{2}{5};$$

Theoretical: $\frac{1}{3}$; $0.\overline{3}$; 33.3% **Experimental:** 0.4 ; 40%

Compare: Experimental was higher than expected.

2. The spinner below is spun 60 times. Results are shown in the table below.

Result	Frequency
A	18
B	20
C	22

a) Find and compare the theoretical probability and experimental probability of spinning an A.

$$\frac{3}{12} = \frac{1}{4}; \qquad\qquad \frac{18}{60} = \frac{3}{10};$$

Theoretical: 0.25 ; 25% **Experimental:** 0.3 ; 30%

Compare: Experimental was higher than expected.

b) Find and compare the theoretical probability and experimental probability of not spinning an A.

$$\frac{9}{12} = \frac{3}{4}; \qquad\qquad \frac{42}{60} = \frac{7}{10};$$

Theoretical: 0.75 ; 75% **Experimental:** 0.7 ; 70%

Compare: Experimental was lower than expected.

3. A member of a soccer team is chosen at random 40 times. Results are shown in the table below.

Result	Frequency
Ellie	3
Gavin	4
Jacob	6
Logan	5
Natalie	4
Emma	6
Reese	2
Joseph	3
David	5
Kevin	2

a) Find and compare the theoretical probability and experimental probability of Reese being chosen.

$$\frac{2}{40} = \frac{1}{20};$$

Theoretical: $\frac{1}{10}$; 0.1 ; 10% **Experimental:** 0.05 ; 5%

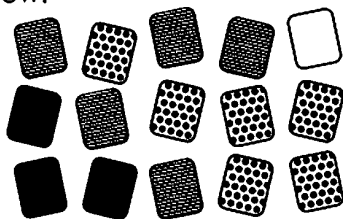**Compare:** Experimental was lower than expected

b) Find and compare the theoretical probability and experimental probability of a boy being chosen.

$$\frac{6}{10} = \frac{3}{5};$$

Theoretical: 0.6 ; 60% **Experimental:** $\frac{27}{40}$; 0.675 ; 67.5%

Compare: Experimental was higher than expected.

4. A card from the following set is chosen at random 120 times. Results are shown in the table below.

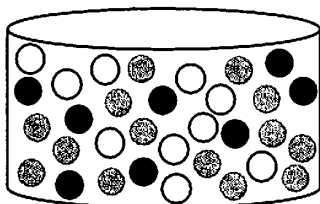| Result	Frequency
Solid	18
Stripes	42
Dots	50
White	10

a) Theoretically, if a card is chosen 200 times, how many times would you expect to pick a card without stripes?

$$\frac{10}{15} = \frac{2}{3} \quad ; \quad \frac{2}{3} \cdot 200 \approx \boxed{133}$$

b) Based on the experiment, if a card is chosen 200 times, how many times would you expect to pick a card without stripes?

$$\frac{78}{120} = \frac{13}{20} \quad ; \quad \frac{13}{20} \cdot 200 = \boxed{130}$$

5. A marble is picked from the jar 60 times. Results are shown in the table below.

Result	Frequency
White	20
Gray	28
Black	12

a) Theoretically, if a marble is chosen 150 times, how many times would you expect a gray marble?

$$\frac{14}{32} = \frac{7}{16} \quad ; \quad \frac{7}{16} \cdot 150 \approx \boxed{66}$$

b) Based on the experiment, if a marble is chosen 150 times, how many times would you expect a gray marble to be chosen?

$$\frac{28}{60} = \frac{7}{15} \quad ; \quad \frac{7}{15} \cdot 150 = \boxed{70}$$

6. A piece of fruit was selected from a basket 40 times. The results are shown in the table below.

Result	Frequency
Orange	15
Apple	8
Banana	4
Grape	5
Cherry	8

a) Theoretically, if a piece of fruit is chosen 300 times, how many times would you expect to pick an apple or a banana?

$$\frac{7}{20} \cdot 300 = \boxed{70}$$

b) Based on the experiment, if a piece of fruit is chosen 300 times, how many times would you expect an apple or a banana?

$$\frac{12}{40} = \frac{3}{10} \quad ; \quad \frac{3}{10} \cdot 300 = \boxed{90}$$

Name: _____ **Math 7**

Date: _____ **Per:** _____ **Unit 8:** Probability & Statistics

Quiz 8-1: Theoretical & Experimental Probability

For questions 1-3: Nora must create a 4-character password to login to a website. The password must have three letters followed by a single digit, 0 to 9. She decided to use her initials as the three letters, then randomly select the digit.

1. List all outcomes for choosing the digit. $\underline{0,1,2,3,4,5,6,7,8,9}$

List the number of ways each event can occur:

2. choosing a number that is greater than 4

3. choosing a number that is at most 7

2. $\underline{5,6,7,8,9}$

3. $\underline{0,1,2,3,4,5,6,7}$

For questions 4-6: A bucket contains the letter tiles shown below. Each letter also has a point-value. If one is chosen at random, give the number of favorable outcomes for each event.

A_1 D_2 Q_{10}

Y_4 R_1 F_4

E_1 V_4 M_3

4. choosing a vowel

5. choosing a tile worth at least 3 points

6. choosing a letter in the word **FORGIVE**

4. $\underline{2}$

5. $\underline{5}$

6. $\underline{4}$

For questions 7-12: A square on the board below is chosen at random. Find each probability as a fraction in simplest form.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

7. $P(\text{odd})$ $\dfrac{10}{20} = \dfrac{1}{2}$

8. $P(\text{unshaded})$ $\dfrac{12}{20} = \dfrac{3}{5}$

9. $P(\text{less than 7})$ $\dfrac{6}{20} = \dfrac{3}{10}$

10. $P(9)$ $\dfrac{1}{20}$

11. $P(\text{even or shaded})$ $\dfrac{15}{20} = \dfrac{3}{4}$

12. $P(\text{multiple of 3 and no less than 10})$ $\dfrac{3}{20}$

7. $\dfrac{1}{2}$

8. $\dfrac{3}{5}$

9. $\dfrac{3}{10}$

10. $\dfrac{1}{20}$

11. $\dfrac{3}{4}$

12. $\dfrac{3}{20}$

For questions 13-16: A jar contains 12 pink, 8 yellow, 6 blue, and 10 green jelly beans. If a jelly bean is chosen at random, find each probability as a fraction in simplest form.

13. P(yellow)

$$\frac{8}{36} = \frac{2}{9}$$

14. P(pink or blue)

$$\frac{18}{36} = \frac{1}{2}$$

15. P(not green)

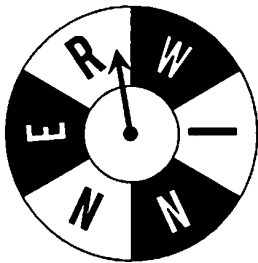$$\frac{26}{36} = \frac{13}{18}$$

16. P(yellow and pink)

$$0$$

13. $\frac{2}{9}$

14. $\frac{1}{2}$

15. $\frac{13}{18}$

16. 0

For questions 17-20: The spinner to the left is spun 100 times. Results are shown in the table.

Result	W	I	N	N	E	R
Frequency	12	21	15	9	18	25

17. Theoretically, what is the probability of the spinner landing on an N?

$$\frac{2}{6} = \frac{1}{3}$$

18. Based on this experiment, what is the probability of the spinner landing on an N?
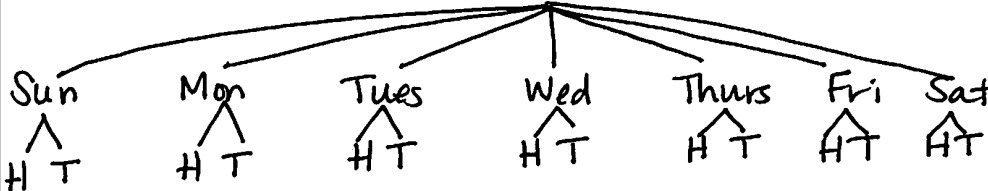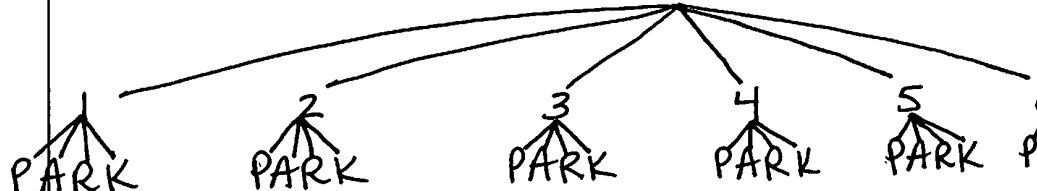
$$\frac{24}{100} = \frac{6}{25}$$
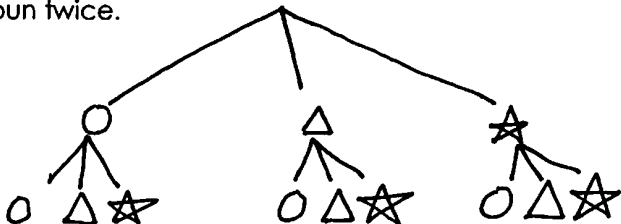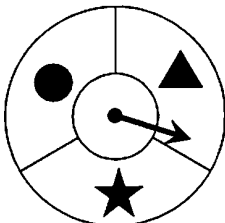
19. Theoretically, if the spinner is spun 250 times, how many times would you expect it to not land on W?

$$\frac{5}{6} \cdot 250 \approx 208$$

20. Based on this experiment, if the spinner is spun 250 times, how many times would you expect it to not land on W?

$$\frac{88}{100} = \frac{22}{25} \quad ; \quad \frac{22}{25} \cdot 250 = 220$$

17. $\frac{1}{3}$

18. $\frac{6}{25}$

19. 208

20. 220

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

TREE DIAGRAMS

In many cases, there is more than one event, which results in several outcomes. Tree diagrams are a useful tool in organizing and listing all possible outcomes.

Draw a tree diagram, then list the sample space and determine the number of outcomes.

1. The spinner below is spun twice.

Sample Space:	# of Outcomes
○○, ○△, ○☆, △○, △△, △☆, ☆○, ☆△, ☆☆	9

2. A day of the week is chosen, then a coin is tossed.

Sun Mon Tues Wed Thurs Fri Sat

H T H T H T H T H T H T H T

Sample Space: Sun H, Sun T, Mon H, Mon T, Tues H, Tues T, Wed H, Wed T, Thurs H, Thurs T, Fri H, Fri T, Sat H, Sat T	# of Outcomes: 14

3. A standard die is rolled, then a letter from the word PARK is chosen at random.

1 PARK 2 PARK 3 PARK 4 PARK 5 PARK 6 PARK

Sample Space: 1P, 1A, 1R, 1K, 2P, 2A, 2R, 2K, 3P, 3A, 3R, 3K, 4P, 4A, 4R, 4K, 5P, 5A, 5R, 5K, 6P, 6A, 6R, 6K	# of Outcomes: 24

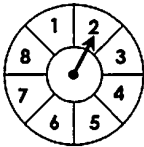**4.** A smoothie shop has smoothies in two sizes (regular and large), and five flavors (strawberry, watermelon, banana, orange, and pineapple).

Reg — S W B O P

Large — S W B O P

Sample Space: Reg S, Reg W, Reg B, Reg O, Reg B, Lg S, Lg W, Lg B, Lg O, Lg P	# of Outcomes 10

Fundamental Counting Principle

You can use the counting principle to find the total number of outcomes:

If one activity can occur in __m__ ways and another activity can occur in __n__ ways, then both activities can occur in __m · n__ ways.

Example	# of Outcomes
5. A standard die is rolled twice. Find the total number of outcomes.	6 · 6 = 36
6. The spinner to the left is spun once, then a day of the week is chosen at random. Find the total number of outcomes.	8 · 7 = 56
7. How many ways can someone order cotton candy if it comes in three sizes (small, medium, and large) and four flavors (bubble gum, raspberry, cherry, and strawberry).	3 · 4 = 12
8. A month of the year and a letter from the word **BINGO** is chosen at random. How many outcomes are possible?	12 · 5 = 60
9. A letter of the alphabet and a digit from 0-9 are chosen at random. How many outcomes are possible?	26 · 10 = 260
10. Kayla is shopping on the second floor of the mall. If there are 4 escalators to the first floor and 8 exits, how many ways can she leave the mall?	4 · 8 = 32
11. How many ways can Hillary guess on the last three multiple choice questions on her science test if they each have four options?	3 · 4 = 12
12. Braden has three pairs of jeans. He has five times as many t-shirts as jeans. How many outfits can he make consisting of one pair of jeans and one t-shirt?	3 · 15 = 45

Name: _____   **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____   **Homework 4:** Tree Diagrams &
                                                   The Counting Principle

**** This is a 2-page document! ****

Draw a tree diagram, then list the sample space and determine the number of outcomes.

1. A t-shirt company sells shirts in 4 different sizes (S, M, L and XL) that are available in blue, red, white, black or gray. A shirt is selected at random.
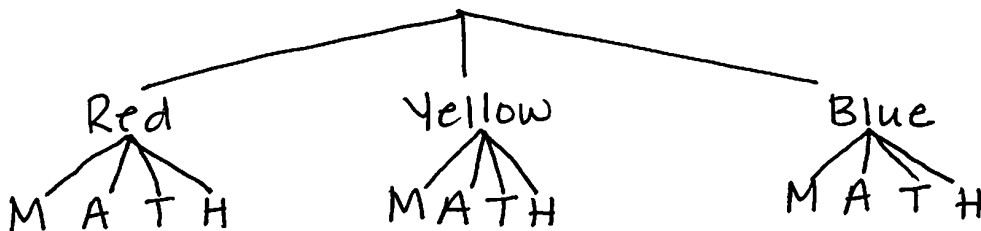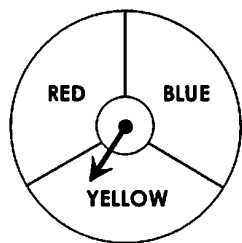

S
Blu R W Bla G

M
Blu R W Bla G

L
Blu R W Bla G

XL
Blu R W Bla G

Sample Space: S Blu, SR, SW, S Bla, SG, M Blu, MR, MW, M Bla, MG, LBlu, LR, LW, LBla, LG, XLBlu, XLR, XLW, XLBla, XLG	# of Outcomes 20

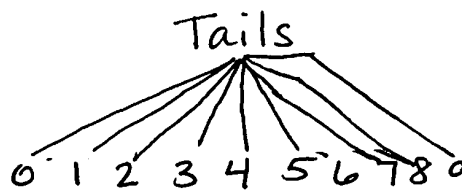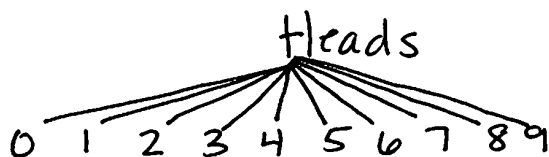**2.** The spinner below is spun and a letter from the word **MATH** is chosen.

RED   BLUE
YELLOW

Red
M A T H

Yellow
M A T H

Blue
M A T H

Sample Space: RM, RA, RT, RH, YM, YA, YT, YH, BM, BA, BT, BH	# of Outcomes 12

3. A coin is flipped and a digit from 1 – 9 is chosen at random.

Heads
0 1 2 3 4 5 6 7 8 9
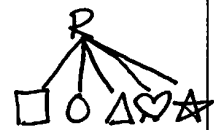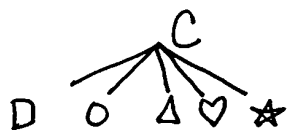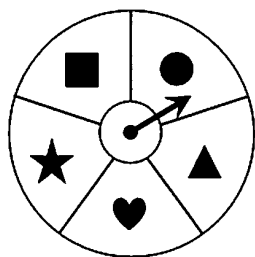
Tails
0 1 2 3 4 5 6 7 8 9

Sample Space: H0, H1, H2, H3, H4, H5, H6, H7, H8, H9, T0, T1, T2, T3, T4, T5, T6, T7, T8, T9	# of Outcomes 18

4. A letter is chosen at random from the word **CAR** and the spinner below is spun.

Sample Space:	# of Outcomes
C◻, CO, C△, C♡, C✭, A◻, AO, A△, A♡, A✭, R◻, RO, R△, R♡, R✭	15

Use the counting principle to find the total number of outcomes.

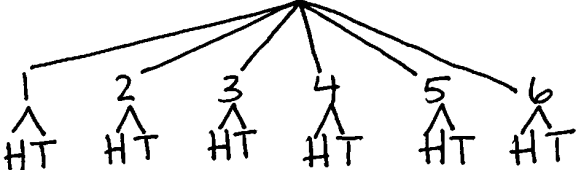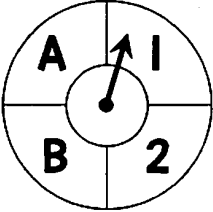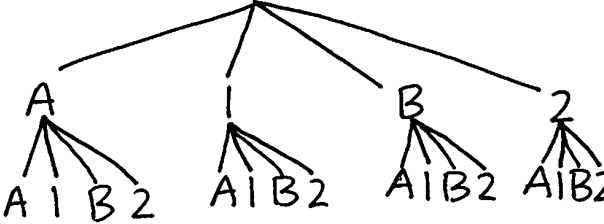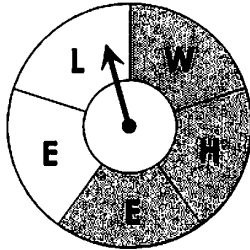|	
5. How many options does Ana have if she can choose from 4 different types of lettuce and 9 different dressings?	4·9 = 36
6. A twelve sectioned spinner is spun once, then a standard die is rolled. Find the total number of outcomes.	12·6 = 72
7. How many different kitchen islands can be made from 7 cabinet choices and 6 different countertops?	7·6 = 42
8. Heather is ordering invitations and can choose from 5 different types of paper and 9 different fonts. Find the total number of invitations she could make.	5·9 = 45
9. Nick is designing a toy car. He is picking between 8 different car models and 10 colors. Find the total number of cars he could design.	8·10 = 80
10. Six different people each brought four dishes to a gathering. Find the total number of dishes.	6·4 = 24
11. Marissa is pouring drinks at a birthday party. She has three different sizes of cups and seven different flavors of juice. How many different cups of juice can she pour?	3·7 = 21
12. A coin is flipped and a letter from the word **COMPUTER** is chosen. How many outcomes are there?	2·8 = 16
13. A child from a class of 28 students is chosen to pick one of five prizes. How many outcomes are there?	28·5 = 140

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
COMPOUND EVENTS	The probability of 2 or more simple events **Example:** rolling a die and drawing a card.
COMPOUND PROBABILITY	**Compound probability is the probability of a compound event.** As with a single event, the probability of a compound event is the ratio of the number of favorable outcomes to the total number of outcomes.

METHOD 1:

Using Tree Diagrams

Draw a tree diagram and list the sample space to find each probability.

1. A standard die is rolled then a coin is tossed.

Sample Space:

1 H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T

a) P(heads)

$$\frac{6}{12} = \boxed{\frac{1}{2}}$$

b) P(even number)

$$\frac{6}{12} = \boxed{\frac{1}{2}}$$

c) P(odd number then tails)

$$\frac{3}{12} = \boxed{\frac{1}{4}}$$

d) P(at least 5 then heads)

$$\frac{2}{12} = \boxed{\frac{1}{6}}$$

e) P(5 or tails)

$$\boxed{\frac{7}{12}}$$

2. The spinner to the left is spun twice.

Spinner: A | 1 / B | 2

Sample Space:

AA, A1, AB, A2, 1A, 11, 1B, 12, BA, B1, BB, B2, 2A, 21, 2B, 22

a) P(letter both times)

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

b) P(at least one B)

$$\boxed{\frac{7}{16}}$$

c) P(A then 2)

$$\boxed{\frac{1}{16}}$$

d) P(not spinning A)

$$\boxed{\frac{9}{16}}$$

e) P(2 both times)

$$\boxed{\frac{1}{16}}$$

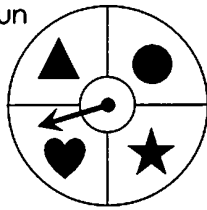| **METHOD 2:** Multiplying Probabilities	The probability of two independent events can be found by **multiplying** the probability of the first event by the probability of the second event.	
	3. The spinner below is spun twice. Find each probability. 	**a)** P(W both times) $\dfrac{1}{5} \cdot \dfrac{1}{5} = \boxed{\dfrac{1}{25}}$
		b) P(E, then a shaded region) $\dfrac{2}{5} \cdot \dfrac{3}{5} = \boxed{\dfrac{6}{25}}$
		c) P(unshaded region both times) $\dfrac{2}{5} \cdot \dfrac{2}{5} = \boxed{\dfrac{4}{25}}$
	4. There are 4 red, 8 blue, 2 green, and 6 yellow paperclips in a jar. A paperclip is drawn, replaced, then another paperclip is drawn. Find each probability.	**a)** P(green, then blue) $\dfrac{2}{20} \cdot \dfrac{8}{20} = \dfrac{1}{10} \cdot \dfrac{2}{5} = \dfrac{2}{50} = \boxed{\dfrac{1}{25}}$
		b) P(neither is red) $\dfrac{16}{20} \cdot \dfrac{16}{20} = \dfrac{4}{5} \cdot \dfrac{4}{5} = \boxed{\dfrac{16}{25}}$
		c) P(both yellow) $\dfrac{6}{20} \cdot \dfrac{6}{20} = \dfrac{3}{10} \cdot \dfrac{3}{10} = \boxed{\dfrac{9}{100}}$
	5. A number from 1-12 then a letter in the word **KANGAROO** is chosen at random.	**a)** P(even, then R) $\dfrac{6}{12} \cdot \dfrac{1}{8} = \dfrac{1}{2} \cdot \dfrac{1}{8} = \boxed{\dfrac{1}{16}}$
		b) P(less than 9, then a vowel) $\dfrac{8}{12} \cdot \dfrac{4}{8} = \dfrac{2}{3} \cdot \dfrac{1}{2} = \dfrac{2}{6} = \boxed{\dfrac{1}{3}}$
		c) P(prime number, then not K) $\dfrac{5}{12} \cdot \dfrac{7}{8} = \boxed{\dfrac{35}{96}}$
	6. A piggy bank contains 15 pennies, 5 nickels, 18 dimes, and 12 quarters. A coin is chosen at random, replaced, then another is chosen. Find each probability.	**a)** P(both dimes) $\dfrac{18}{50} \cdot \dfrac{18}{50} = \dfrac{9}{25} \cdot \dfrac{9}{25} = \boxed{\dfrac{81}{625}}$
		b) P(a penny, then a quarter) $\dfrac{15}{50} \cdot \dfrac{12}{50} = \dfrac{3}{10} \cdot \dfrac{6}{25} = \dfrac{18}{250} = \boxed{\dfrac{9}{125}}$
		c) P(both coins worth at least 5¢) $\dfrac{35}{50} \cdot \dfrac{35}{50} = \dfrac{7}{10} \cdot \dfrac{7}{10} = \boxed{\dfrac{49}{100}}$

Compound Probability
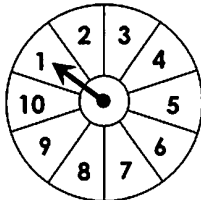
Directions: Find each probability. Identify your answer on the picture below and color accordingly.

For questions 1-3: The spinner is spun once and a standard die is rolled.				For questions 4-6: A marble is chosen, replaced, and then another marble is chosen.		
1. P(circle, then 4)	$\frac{1}{24}$	BLUE		**4.** P(black, then another black)	$\frac{1}{16}$	YELLOW
2. P(not a star, then even)	$\frac{3}{8}$	RED		**5.** P(not white, then stripes)	$\frac{21}{100}$	ORANGE
3. P(heart, then at least 2)	$\frac{5}{24}$	GREEN		**6.** P(stripes, then white)	$\frac{7}{50}$	PINK

For questions 7-9: A letter is chosen from the word **OCEAN** and a coin is flipped.				For questions 10-12: The spinner is spun twice.		
7. P(C, then heads)	$\frac{1}{10}$	PURPLE		**10.** P(4, then even)	$\frac{1}{20}$	YELLOW
8. P(vowel, then tails)	$\frac{3}{10}$	PINK		**11.** P(odd, then at least 4)	$\frac{7}{20}$	BLUE
9. P(consonant, then heads)	$\frac{1}{5}$	GREEN		**12.** P(less than 7, then 9)	$\frac{3}{50}$	PURPLE
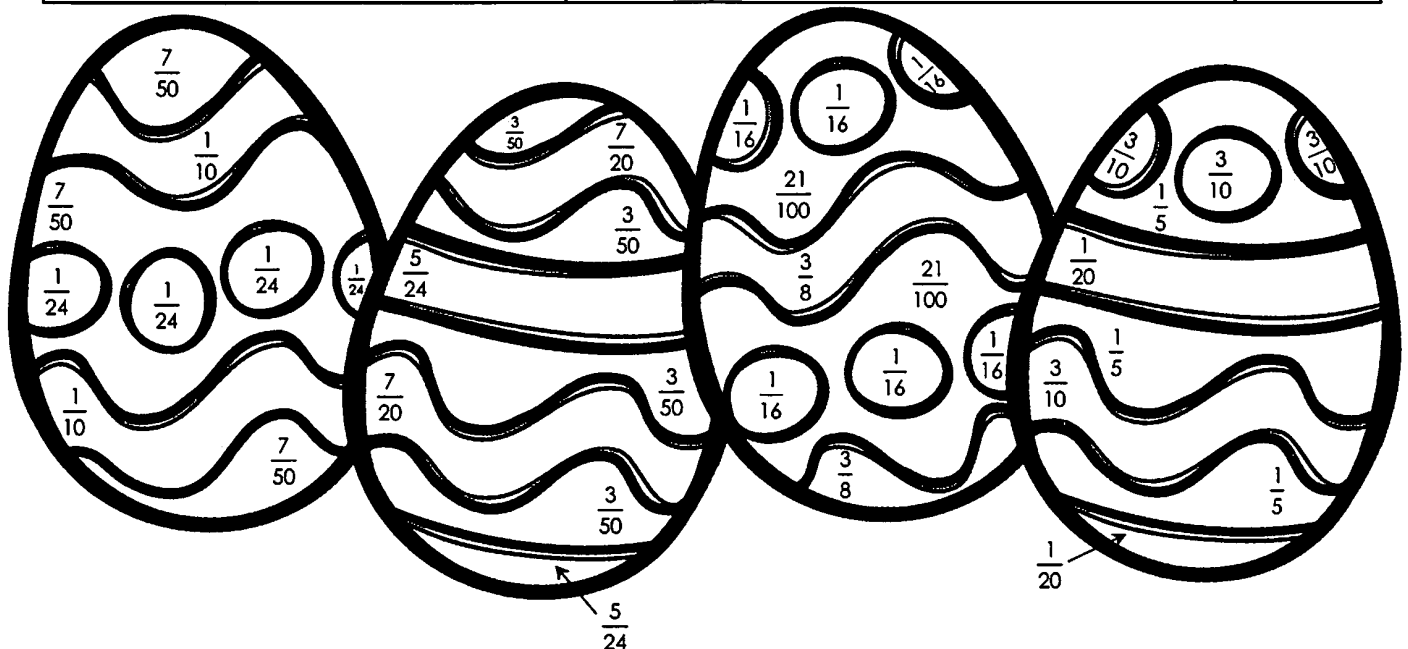
Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 5:** Compound Probability

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Draw a tree diagram and list the sample space to find each probability.	

1. The spinner below is spun once, then a coin is flipped.
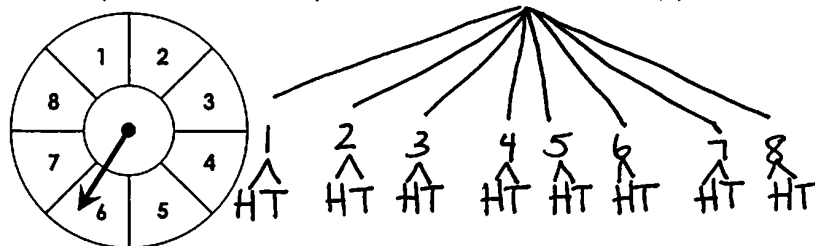
Sample Space:

1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T,
6H, 6T, 7H, 7T, 8H, 8T

a) P(tails)

$\frac{8}{16} = \boxed{\frac{1}{2}}$

b) P(odd number)

$\frac{8}{16} = \boxed{\frac{1}{2}}$

c) P(at least 3 then heads)

$\frac{6}{16} = \boxed{\frac{3}{8}}$

d) P(even number then tails)

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

e) P(odd number or heads)

$\frac{12}{16} = \boxed{\frac{3}{4}}$

2. A letter is chosen from the word **ROCK** and a standard die is rolled.

Sample Space:

R1, R2, R3, R4, R5, R6, O1, O2, O3, O4, O5,
O6, C1, C2, C3, C4, C5, C6, K1, K2, K3, K4,
K5, K6

a) P(at most 4)

$\frac{16}{24} = \boxed{\frac{2}{3}}$

b) P(C)

$\frac{6}{24} = \boxed{\frac{1}{4}}$

c) P(a vowel then an even number) $\frac{3}{24} = \boxed{\frac{1}{8}}$

d) P(R or K then 6)

$\frac{2}{24} = \boxed{\frac{1}{12}}$

e) P(a consonant or an odd number) $\frac{21}{24} = \boxed{\frac{7}{8}}$

3. A marble is picked and a letter is chosen at random from the word **MAT**.
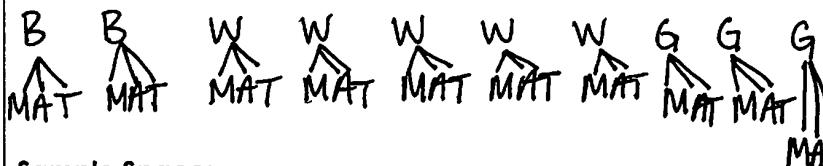
Sample Space:

BM, BA, BT, BM, BA, BT, WM, WA, WT, WM, WA,
WT, WM, WA, WT, WM, WA, WT, WM, WA, WT,
GM, GA, GT, GM, GA, GT, GM, GA, GT

a) P(black marble)

$\frac{6}{30} = \boxed{\frac{1}{5}}$

b) P(A)

$\frac{10}{30} = \boxed{\frac{1}{3}}$

c) P(gray marble then T)

$\frac{3}{30} = \boxed{\frac{1}{10}}$

d) P(white marble then consonant) $\frac{10}{30} = \boxed{\frac{1}{3}}$

e) P(black marble or vowel)

$\frac{14}{30} = \boxed{\frac{7}{15}}$

Find each probability using multiplication	
4. There are 8 green, 10 purple, 6 red and 16 blue markers in a box. A marker is chosen, replaced and then another marker is chosen. Find each probability.	**a)** P(neither is red) $\dfrac{34}{40} \cdot \dfrac{34}{40} = \dfrac{17}{20} \cdot \dfrac{17}{20} = \boxed{\dfrac{289}{400}}$
	b) P(green, then purple) $\dfrac{8}{40} \cdot \dfrac{10}{40} = \dfrac{1}{5} \cdot \dfrac{1}{4} = \boxed{\dfrac{1}{20}}$
	c) P(both blue) $\dfrac{16}{40} \cdot \dfrac{16}{40} = \dfrac{2}{5} \cdot \dfrac{2}{5} = \boxed{\dfrac{4}{25}}$
5. The spinner is spun twice. Find each probability. 	**a)** P(square both times) $\dfrac{8}{12} \cdot \dfrac{8}{12} = \dfrac{2}{3} \cdot \dfrac{2}{3} = \boxed{\dfrac{4}{9}}$
	b) P(12, then circle) $\dfrac{1}{12} \cdot \dfrac{4}{12} = \dfrac{1}{12} \cdot \dfrac{1}{3} = \boxed{\dfrac{1}{36}}$
	c) P(square, then even number) $\dfrac{8}{12} \cdot \dfrac{6}{12} = \dfrac{2}{3} \cdot \dfrac{1}{2} = \dfrac{2}{6} = \boxed{\dfrac{1}{3}}$
6. Two standard die are rolled. Find each probability.	**a)** P(5, then a number greater than 2) $\dfrac{1}{6} \cdot \dfrac{4}{6} = \dfrac{1}{6} \cdot \dfrac{2}{3} = \dfrac{2}{18} = \boxed{\dfrac{1}{9}}$
	b) P(both numbers at most 5) $\dfrac{5}{6} \cdot \dfrac{5}{6} = \boxed{\dfrac{25}{36}}$
	c) P(3, then an even number) $\dfrac{1}{6} \cdot \dfrac{3}{6} = \dfrac{1}{6} \cdot \dfrac{1}{2} = \boxed{\dfrac{1}{12}}$
7. A bag contains 4 cherry, 8 orange, 6 strawberry and 10 lemon gummy bears. A gummy bear is chosen at random, replaced, then another is chosen. Find each probability.	**a)** P(both lemon) $\dfrac{10}{28} \cdot \dfrac{10}{28} = \dfrac{5}{14} \cdot \dfrac{5}{14} = \boxed{\dfrac{25}{196}}$
	b) P(cherry, then orange) $\dfrac{4}{28} \cdot \dfrac{8}{28} = \dfrac{1}{7} \cdot \dfrac{2}{7} = \boxed{\dfrac{2}{49}}$
	c) P(strawberry, then lemon) $\dfrac{6}{28} \cdot \dfrac{10}{28} = \dfrac{3}{14} \cdot \dfrac{5}{14} = \boxed{\dfrac{15}{196}}$
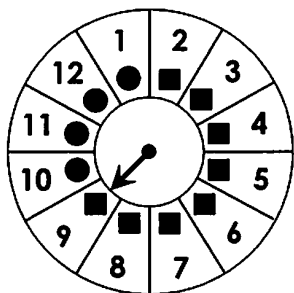
Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
POPULATION	An entire group of people or objects **Example:** the 6th grade class at Roberts Middle School.
SAMPLE	Part of the population **Example:** 6th graders in orchestra
UNBIASED Sample	An unbiased sample is: • Representative of the larger population • Selected at random • Large enough to provide accurate data
BIASED Sample	A sample that is not representative of the larger population and usually favors certain parts of the population.
EXAMPLES	**Determine whether each sample is biased or unbiased. Explain.** 1. Casey surveyed the members of his soccer team to ask them what their favorite sport is. Biased - they will likely say soccer 2. An airline is conducting a survey to determine whether people prefer to check their luggage or carry it on. They ask every 10th person that walks into an airport. Unbiased - large and random selection 3. Imani would like to approximate the number of students in her school with part-time jobs. She surveys the 28 students in her math class. Biased - Small sample and not random 4. A school district would like to know what type of communcation (email, text, or phone) parents prefer. They survey the parents of the seventh grade students enrolled in the district. Biased - only parents of one grade

PREDICTING *Outcomes*	The results of an **unbiased sample** are **proportional** to the results of a population. You can use unbiased sample results to **make predictions** about the population. Biased sample results should not be used to make predictions about the population.

Minutes	Number
0-30	4
31-60	64
61-90	25
91+	32

5. Green Valley Middle School conducted a survey of 125 random students asking them how much time they spend each night on homework. Results are shown in the table to the left.

a) What percent of the students spend no more than 30 minutes on homework each night?

$\dfrac{4}{125}$; 3.2%

b) What percent of the students spend at least 31 minutes on homework each night?

$\dfrac{121}{125}$; 96.8%

c) If there are 1,200 students in the school, approximately how many would you expect to spend more than one hour on homework each night?

$\dfrac{57}{125} = 45.6\%$

.456 · 1200

≈ 547 students

Pasta	Number
Spaghetti	72
Linguine	21
Macaroni	18
Rigatoni	39

6. An Italian restaurant asked 150 random customers what type of pasta they preferred. Results are shown in the table to the left.

a) What percent of the people surveyed said spaghetti or macaroni?

$\dfrac{90}{150}$; 60%

b) What percent of the people surveyed did not say spaghetti?

$\dfrac{78}{150}$; 52%

c) If the restaurant is ordering 500 boxes of pasta, approximately how many should be linguine?

$\dfrac{21}{150} = 14\%$

.14 · 500 = 70 boxes

7. A landscaper offers three colors of mulch: red, black, and brown. They randomly survey their customers to see which they prefer. Of these customers, 62% prefer brown, 22% prefer black, and the rest prefer red.

a) If they are ordering 800 bags of mulch, how many should be brown?

.62 · 800 = 496 bags

b) If they are ordering 800 bags of mulch, how many should be red?

.16 · 800

= 128 bags

Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 6:** Using Samples to Predict

** This is a 2-page document! **

Identify the population and the sample.

1.	2.	3.
←population —sample	population —sample	population —sample
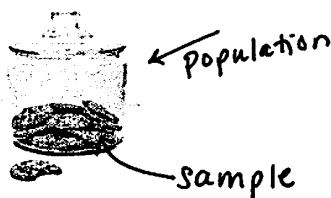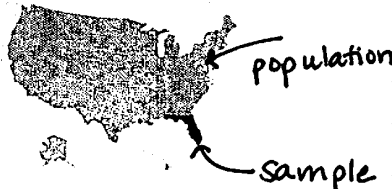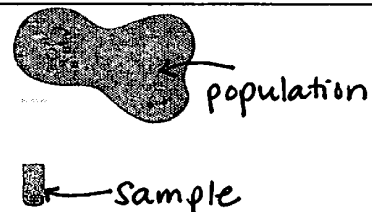
Determine whether each sample is biased or unbiased. Explain.

4. A nation-wide company wants to know which product consumers prefer. They randomly select 1,000 people who have purchased their products over the last 10 years.

Biased ; Selection only consists of those who've purchased the product.

5. Jason wants to find out if students prefer football or basketball. He surveys the entire football team.

Biased ; Sample only contains football players

6. A dog food company is making a new line of treats. To find out which flavors are preferred, they ask 25 people who have purchased their brand of dog food.

Biased ; Small sample and consists of those who've purchased the product.

7. A principal wants to know how his teachers feel about certain issues at school. He emails a survey to 10 randomly selected teachers from each grade level.

Unbiased ; random selection

8. A pizza store manager wants to know which pizza topping most people prefer. He surveys everyone who places an order over the phone on one given night.

Unbiased ; large, random sample

9. An apartment complex manager wants to survey residents about the apartment maintenance service. A survey is sent to 100 randomly selected apartment numbers.

Unbiased ; large, random sample

10. Darren wants to find out whether 7th grade students prefer music, art or sports. He generates 150 random 7th grade names from the school enrollment list and surveys those students.

Unbiased ; large, random sample

Use the given samples to make predictions about the population.

Flavor	Number
Chocolate Strawberry	70
Orange Cream	36
Peanut Butter Pop	46
Very Berry Mix	40
Green Machine	8

11. An ice cream shop surveyed 200 random customers to find out which new ice cream flavor they enjoy the most. Results are shown in the table to the left.

a) What percent of the customers prefer orange cream?

$\frac{36}{200}$ = $\boxed{18\%}$

b) What percent of the customers prefer either peanut butter pop or green machine?

$\frac{54}{200}$ = $\boxed{27\%}$

c) If there are 1,400 customers in a given week, how many would you expect to prefer chocolate strawberry or very berry mix?

$\frac{110}{200}$ = 55%

$.55 \cdot 1400$

$\boxed{= 770 \, customers}$

Minutes	Number
0-45	4
46-90	19
91-135	25
136+	32

12. A fitness center asked 80 random patrons how long they exercise on average each day. Results are shown in the table to the left.

a) What percent of people surveyed exercise for at most 45 minutes?

$\frac{4}{80}$ = $\boxed{5\%}$

b) What percent of people surveyed exercise for more than an hour and a half?

$\frac{57}{80}$ = $\boxed{71.25\%}$

c) If 300 people come to the gym on a given day, approximately how may would you expect to exercise for more than 135 minutes?

$\frac{32}{80}$ = 40%

$.4 \cdot 300$

$\boxed{= 120 \, people}$

Seafood	Percent
shrimp	24%
crab	30%
fish	36%
neither	10%

13. A seafood restaurant surveys their customers to find out whether they prefer shrimp, crab, or fish. Their results are shown in the table to the left.

a) If 140 people were surveyed, how many preferred crab?

$.3 \cdot 140 =$ $\boxed{42}$

b) If 140 people were surveyed, how many preferred none of the given options?

$.10 \cdot 140$ $= \boxed{14}$

c) They are ordering 120 pounds of seafood for the week. How many should be fish?

$.36 \cdot 120 =$ $\boxed{43.2 \, lb \, of \, fish}$

Name: _____ **Math 7**

Date: _____ **Per:** _____ **Unit 8:** Probability & Statistics

Quiz 8-2: Compound Events & Random Sampling

1. A jar contains 5 popsicle sticks, numbered 1-5. A stick is drawn, then a letter in the word **SPRING** is chosen at random. Draw a tree diagram, list the sample space, and give the number of outcomes.

Tree Diagram:	Sample Space:
	1S, 1P, 1R, 1I, 1N, 1G, 2S, 2P, 2R, 2I, 2N, 2G, 3S, 3P, 3R, 3I, 3N, 3G, 4S, 4P, 4R, 4I, 4N, 4G, 5S, 5P, 5R, 5I, 5N, 5G
	# of Outcomes: 30

For questions 2-4: Use the tree diagram and sample space from #1 to find each probability. Give each answer as a fraction in simplest form.

2. P(greater than 2, then P) $\quad \dfrac{3}{30} = \dfrac{1}{10}$

3. P(4, then R or G) $\quad \dfrac{2}{30} = \dfrac{1}{15}$

4. P(at most 3, then not a vowel) $\quad \dfrac{15}{30} = \dfrac{1}{2}$

2. $\dfrac{1}{10}$

3. $\dfrac{1}{15}$

4. $\dfrac{1}{2}$

For questions 5-7: Use the counting principle to determine the total number of outcomes.

5. A card is chosen at random from a standard deck, then a coin is tossed.

$52 \cdot 2$

6. Nick is deciding on a ring to buy his wife for Valentine's Day. He can choose gold or silver for the ring. For the stone, he can choose a diamond, ruby, sapphire, emerald, or amethyst.
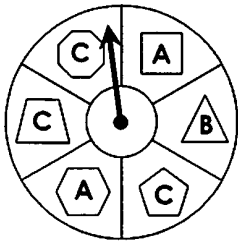
$2 \cdot 5$

7. Mrs. Roslin has 32 students in her class. Of these students, 14 are girls. She chooses one boy and one girl at random to help pass out papers.

$18 \cdot 14$

5. 104

6. 10

7. 252

For questions 8-9: The spinner below is spun twice. Find each probability as a fraction in simplest form.

8. P(a hexagon, then A)   **9.** P(not a quadrilateral, then C)

$$\frac{1}{6} \cdot \frac{2}{6}$$

$$= \frac{1}{6} \cdot \frac{1}{3} = \frac{1}{18}$$

$$\frac{4}{6} \cdot \frac{3}{6}$$

$$= \frac{2}{3} \cdot \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$$

8. $\dfrac{1}{18}$

9. $\dfrac{1}{3}$

For questions 10-11: A cup contains 8 black, 4 blue, 2 red, and 6 green markers. A marker is selected at random, returned to the cup, then another marker is selected. Find each probability as a fraction in simplest form.
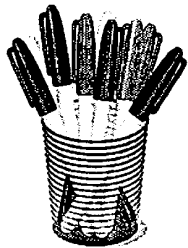
10. P(black, then red)   **11.** P(both green)

$$\frac{8}{20} \cdot \frac{2}{20} =$$

$$\frac{2}{5} \cdot \frac{1}{10} = \frac{2}{50} = \frac{1}{25}$$

$$\frac{6}{20} \cdot \frac{6}{20} =$$

$$\frac{3}{10} \cdot \frac{3}{10} = \frac{9}{100}$$

10. $\dfrac{1}{25}$

11. $\dfrac{9}{100}$

---

12. To determine the approval rating of the governor of New York, 100,000 random <u>residents of New York City</u> were surveyed. Determine whether this sample is biased or unbiased. Explain. If the sample is biased, give an example of a sample that would contain less bias.

Biased - large sample but limited to only residents of NYC.

* Answers May Vary * Survey should include residents from throughout the state of New York

---

For questions 13-15: A Boy Scout troop plans to sell bags of popcorn to raise money for a camping trip. To determine the number of bags they should order, they randomly survey 60 people and asked which flavor of popcorn they prefer.

Flavor	Number
Plain	9
Butter	24
Cheese	12
Caramel	15

13. What percent of those surveyed said caramel? $\dfrac{15}{60}$

14. What percent of those surveyed said butter or cheese? $\dfrac{36}{60}$

13. 25%

14. 60%

15. 75 bags

15. If the troop is ordering 500 bags of popcorn, how many should be plain based on this survey?

$$\frac{9}{60} = 15\%$$

$$.15 \cdot 500 = 75$$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
Measures of **CENTRAL TENDENCY**	A value that describes the center or middle of a data set. **Mean:** average of the values (mean = $\frac{sum}{total\#}$) **Median:** middle value (values must be small → large) **Mode(s):** most occurring value(s)
RANGE	The difference between the largest + smallest values.
EXAMPLES	**Directions:** Find the mean, median, mode(s), and range of each data set. Round to the nearest tenth when necessary.

1. The weight of each person on a wrestling team:
{150, 177, 205, 163, 172, 190, 186, 168, 155}

mean: $\frac{1566}{9}$

median: 150, 155, 163, 168, 172, 177, 186, 190, 205

Mean: 174
Median: 172
Mode(s): None
Range: 55

2. The age of each person in an aerobics class:
{26, 45, 21, 35, 38, 50, 52, 28, 34, 26, 40, 42, 48, 25, 30}

mean: $\frac{540}{15}$

median: 21, 25, 26, 26, 28, 30, 34, 35, 38, 40, 42, 45, 48, 50, 52

Mean: 36
Median: 35
Mode(s): 26
Range: 31

3. The grades Katya earned on her last 10 math quizzes:
{92, 80, 88, 100, 94, 98, 72, 80, 94, 86}

mean: $\frac{884}{10}$

median: 72, 80, 80, 86, 88, 92, 94, 94, 98, 100

Mean: 88.4
Median: 90
Mode(s): 80
Range: 28

4. The average high temperature each month for a certain city last year:
{31, 35, 42, 55, 70, 75, 80, 78, 71, 59, 48, 46}

mean: $\frac{690}{12}$

median: 31, 35, 42, 46, 48, 55, 59, 70, 71, 75, 78, 80

Mean: 57.5
Median: 57
Mode(s): None
Range: 49
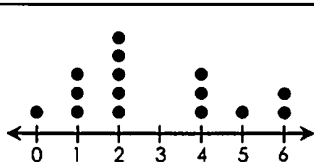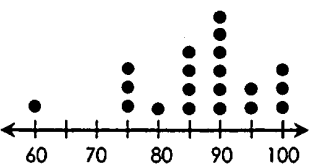
Points Scored (dot plot: 0–6)

5. The dot plot to the left shows the number of points scored by a hockey team in the first 15 games of their season.

mean: $\dfrac{42}{15}$

median: 0, 1, 1, 1, 2, 2, 2, 2, 2, 4, 4, 4, 5, 6, 6

Mean: __2.8__

Median: __2__

Mode(s): __2__

Range: __6__

Science Grades (dot plot: 60–100)

6. The dot plot to the left shows Rylan's science grade this quarter. If he can drop his two lowest grades, which measure is affected the most, mean or median? Explain.

mean: 86.75 | mean: 88.89
median: 90 | median: 90

The mean is most affected. It increased by more than 2 pts.

OUTLIER

A value that is much larger or much smaller than the others

Choosing the BEST CENTER

Circumstances within the data set determine which measure of central tendency would be the most appropriate.

Measure	Most Useful When...
Mean	• No outliers.
Median	• Outliers present.
	• Data is without large gaps.
Mode	• Many repeated values

EXAMPLES

Directions: Determine which measure of center best represents the data. Justify your selection, then find the measure of center.

7. The golf scores in a tournament: {68, 72, 72, 72, 70, 72, 76, 72, 72, 72, 80, 72, 72, 72, 76, 72}

Mode = [72]

☐ Mean
☐ Median
☑ Mode — Multiple repeated values

8. Number of hours that Cedric worked each week at his summer job: {38, 30, 35, 32, 28, 9, 25, 40, 32, 34, 29, 36}

9, 25, 28, 29, 30, 32, 32, 34, 35, 36, 38, 40

☐ Mean
☑ Median — 9 is an outlier   Median = [32]
☐ Mode

9. The ball speed, in miles per hour, of a pitcher's last 8 pitches: {90, 85, 92, 95, 82, 92, 89, 87}

☑ Mean — no outliers   Mean = $\dfrac{712}{8}$ = [89]
☐ Median
☐ Mode

Mean, Median, Mode and Range Maze!

Directions: Read and solve each problem.
Use your solutions to navigate through the maze. Staple all work to this paper!

Start!

Find the mode:
{5, 3, 6, 2, 4, 7, 8, 5, 6, 5, 19}

Find the range:
{12, 10, 13, 8, 8, 3, 2, 19, 6}

Find the difference between the mean and the mode:
{2, 12, 13, 12, 3, 12, 7, 0, 5, 15, 7}

Find the mean:
{5, 9, 7, 12, 9, 12, 5, 5, 9, 5}

Find the difference between the range and the mean:
{15, 13, 22, 18, 13, 12, 18, 16, 14, 18, 14}

Find the mean:
{17, 13, 14, 15, 16, 13, 12, 15, 23}

Find the mode:
{3, 5, 5, 7, 5, 9, 7, 3, 7}

Find the median:
{21, 16, 14, 18, 22, 18, 16, 14, 18, 22, 12}

End! ☺

Find the mean:
{10, 7, 6, 9, 7, 7, 10, 9, 7, 9}

Find the difference between the median and the mean:
{4.25, 6.25, 8, 8, 8, 4.25, 6, 9, 6, 8.25, 9.25}

Find the mean:
{14, 14, 12, 13, 16, 13, 16, 12, 15, 15, 13}

Find the mean:
{8.5, 7.5, 7.5, 7.5, 4, 6, 10, 7.5, 6, 7.5}

Find the difference between the range and the median:
{12, 5, 10, 8, 6, 23, 23, 13, 5}

Find the median:
{4, 6, 15, 4, 0, 12, 15, 6, 6, 5}

Find the range:
{4, 18, 6, 0, 12, 7, 8, 2, 4, 6, 3}

Path values: 5, 4, 7.8, 2.27, 8, 17, 9, 12, 8, 18, 15.33, 5 and 7, 5.73, 5, 13 and 15, 7, 0.98, 13, 14, 4, 7, 13.91, 6, 7.5, 8, 8.1, 15, 7.3, 18, 7.2, 18, 6

** This is a 2-page document! **

Find the mean, median, mode(s), and range of each data set. Round to the nearest tenth if necessary.

1. Points scored in the last 8 football games: {42, 35, 12, 20, 30, 18, 21, 30}

Mean: $\frac{208}{8}$ = 26

Median: 12, 18, 20, 21, 30, 30, 35, 42

↑

$\frac{21+30}{2}$ = 25.5

Mean	Median	Mode(s)	Range
26	25.5	30	30

2. The average low temperature in Denver, Colorado from October through April.

Month	°F
Oct	38
Nov	21
Dec	18
Jan	15
Feb	19
Mar	26
Apr	38

Mean: $\frac{175}{7}$ = 25

Median: 15, 18, 19, 21, 26, 38, 38

Mean	Median	Mode(s)	Range
25	21	38	23

3. The rounded total spent by the last 12 people checking out at the grocery store: {14, 26, 98, 74, 55, 35, 104, 9, 46, 55, 26, 76}

Mean: $\frac{618}{12}$ = 51.5

Median: 9, 14, 26, 26, 35, 46, 55, 55, 74, 76, 98, 104   ↑

$\frac{46+55}{2}$

Mean	Median	Mode(s)	Range
51.5	50.5	26, 55	95

4. The dot plot shows the number of children on 15 different youth soccer teams.

Soccer Players

Mean: $\frac{161}{15}$ = 10.7

Median: 8, 8, 9, 10, 10, 10, 11, 11, 11, 11, 11, 11, 13, 13, 14

Mean	Median	Mode(s)	Range
10.7	11	11	6

5. The age of the past 14 winners of a national singing competition: {20, 25, 19, 21, 29, 17, 25, 23, 23, 17, 21, 23, 23, 29}

Mean: $\frac{315}{14}$ = 22.5

Median: 17, 17, 19, 20, 21, 21, 23, 23, 23, 23, 25, 25, 29, 29

Mean	Median	Mode(s)	Range
22.5	23	23	12

6. The number of named storms in the Atlantic from 2006 to 2014.

Year	Storms
2006	10
2007	15
2008	16
2009	25
2010	19
2011	19
2012	19
2013	14
2014	8

Mean: $\frac{145}{9}$ = 16.1

Median: 8, 10, 14, 15, 16, 19, 19, 19, 25

Mean	Median	Mode(s)	Range
16.1	16	19	17

7. Over the last 8 nights, Elyse earned the following in tips: {105, 120, 84, 95, 100, 150, 132, 140}. If she earns $140 a night for the next four nights, which measure of center would increase more, the mean or median?
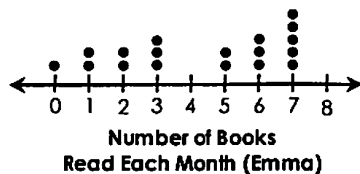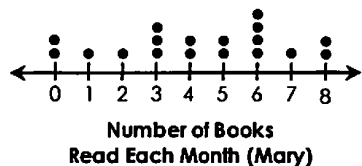
Original: Mean = $\frac{926}{8}$ = 115.75

Median = 112.5

New: Mean = $\frac{1486}{12}$ = 123.83

Median = 136

Median increased more.

8. The dot plots below show the number of books that Emma and Mary read each month in the last 18 months. On average, which girl read the most number of books each month?

Mary: $\frac{77}{18}$ = 4.2$\overline{7}$

Emma: $\frac{78}{18}$ = 4.$\overline{3}$

Emma

0 1 2 3 4 5 6 7 8
**Number of Books
Read Each Month (Mary)**

0 1 2 3 4 5 6 7 8
**Number of Books
Read Each Month (Emma)**

9. The average 40-yard dash times for NFL players based on position are listed in the table to the right. If a time of 5.06 is added to the table, which measure would change the most, the range or the mean?

Position	Time (sec)
WR	4.48
CB	4.48
FS	4.42
TE	4.50
DE	4.80
QB	4.92

Original:
Range = 0.5

Mean = $\frac{27.6}{6}$ = 4.6

New:
Range = 0.64

Mean = $\frac{32.66}{7}$ = 4.67

Range

Directions: Determine which measure of center best represents the data. Justify your selection, then find that measure of center.

10. The speed in miles per hour of the last 12 cars to pass by a police officer running radar:
{68, 65, 55, 74, 60, 62, 72, 50, 62, 66, 68, 70}

☑ Mean – No outliers
☐ Median
☐ Mode

Mean = $\frac{772}{12}$ = 64.3

11. The cost of a cheeseburger at 9 different restaurants: {9, 7.5, 10, 10, 14.75, 10, 8.5, 7.75, 10}

Mode = 10

☐ Mean
☐ Median
☑ Mode – 10 repeats

12. The ages of the counselors at a camp: {18, 19, 20, 28, 28, 22, 19, 39, 18, 21}

☐ Mean
☑ Median – 39 is an outlier
☐ Mode

Median = 18, 18, 19, 19, 20, 21, 22, 28, 28, 39 ↑

$\frac{20+21}{2}$ = 20.5

Main Ideas/Questions	Notes/Examples

STEM-AND-LEAF PLOTS

- A **stem-and-leaf plot** is a way of organizing and displaying data using the digits of the data values.
- The last digit of a data value is the **leaf**.
- The remaining digit(s) are the **stem**.
- The key will explain what the stem and leaves represent.
- Stem-and-leaf plots are useful in showing how data values are distributed.

Football Scores

Stem	Leaf
0	3 6
1	2 3 4
2	1 1 4 4 8
3	0 5 5 5 8
4	5

Key: 1|2 = 12 points

QUESTIONS

1. The stem-and-leaf plot above shows the scores of a football team in each of their games last season. Use this plot to answer the questions below.

a) Find the mean, median, mode(s) and range.

mean: $\dfrac{384}{16}$

median: 3, 6, 12, 13, 14, 21, 21, 24, 24, 28, 30, 35, 35, 35, 38, 45

Mean: 24
Median: 24
Mode(s): 35
Range: 42

b) In how many games did the team score less than 14 points?

4

c) In how many games did the team score at least 35 points?

5

Running Time (min)

Stem	Leaf
9	4 4
10	1 5 9
11	4 6 8
12	7
13	0 6
14	2 8

Key: 14|1 = 141 minutes

2. The stem-and-leaf plot to the left shows the running time (in minutes) of the movies currently showing at a theater. Use this plot to answer the questions below.

a) Find the mean, median, mode(s) and range.

mean: $\dfrac{1534}{13}$

median: 94, 94, 101, 105, 109, 114, 116, 118, 127, 130, 136, 142, 148

Mean: 118
Median: 116
Mode(s): 94
Range: 54

b) How many movies have a running time greater than 130 minutes?

3

c) How many movies are at most two hours?

8

Drawing STEM-AND-LEAF PLOTS

Helpful Hint:
Order the data values before making the stem-and-leaf plot!

Make a stem-and-leaf plot, then describe the distribution for each data set.

3. Test scores for a group of students: {88, 81, 93, 90, 74, 52, 100, 68, 85, 96, 72, 80}

Key: 5|2 = 52

Stem	Leaf
5	2
6	8
7	2 4
8	0 1 5 8
9	0 3 6
10	0

Majority of data lies in the 70s, 80s, 90s

4. The weight, in pounds, of fifteen dogs: {9, 25, 52, 19, 34, 40, 45, 30, 16, 38, 42, 48, 56, 42, 34}

Key: 1|6 = 16

Stem	Leaf
0	9
1	6 9
2	5
3	0 4 4 8
4	0 2 2 5 8
5	2 6

Most of the dogs are 30 lb or more.

5. Bowling scores in a tournament: {175, 196, 226, 148, 128, 167, 204, 215, 185, 192, 171, 160, 183, 198}

Key: 17|1 = 171

Stem	Leaf
12	8
13	
14	8
15	
16	0 7
17	1 5
18	3 5
19	2 6 8
20	4
21	5
22	6

wide range of scores

6. The GPA's of a group of students: {2.8, 4.0, 3.3, 1.8, 3.6, 3.2, 3.1, 3.7, 2.5, 3.0, 3.2, 2.7}

Key: 1|8 = 1.8

Stem	Leaf
1	8
2	5 7 8
3	0 1 2 2 3 6 7
4	0

The majority have a 3.0 - 3.9 GPA.

BACK-TO-BACK Stem-and-Leaf

7. The back-to-back stem and leaf plot below shows Jack and Lily's math grades. Use the plot to answer the following questions.

Jack		Lily
8 3 0	5	4
1	6	2 4 5
0	7	0 6 8 8
9 7	8	2 5 5 7
4 3 1 0	9	
0	10	

Key: 0|7|2 = 70 and 72

a) How does Jack's mean score compare to Lily's mean score?

J: $\frac{936}{12} = 78$

L: $\frac{886}{12} = 73.8$

Lily has a lower average.

b) How does Jack's median score compare to Lily's median score?

J: 88
L: 77

Jack has a higher median.

** This is a 2-page document! **

---

1. The stem and leaf plot shows the ages of people in one car on the subway.

Age (years)

Stem	Leaf
0	4 5 9
1	0 9
2	
3	3 5 8 9
4	2
5	6 7

Key: 0|4 = 4 years old

a) Find the mean, median, mode and range.

mean: $\frac{347}{12}$

median: 4, 5, 9, 10, 19, 33, 35, 38, 39, 42, 56, 57

Mean: __28.9__

Median: __34__

Mode(s): __None__

Range: __53__

b) How many people in the subway car were at least 30 years old? 7

c) How many people in the subway car were no older than 25 years old? 5

---

2. The stem and leaf plot shows the average fastball velocity from top professional baseball players.

Speed (mph)

Stem	Leaf
96	8 8 8 8 9
97	0 2 2 2 3 4 5 7
98	1
99	
100	1

Key: 96|8 = 96.8 mph

a) Find the mean, median, mode and range.

mean: $\frac{1460.8}{15}$

median: 96.8, 96.8, 96.8, 96.8, 96.9, 97, 97.2, 97.2, 97.2, 97.3, 97.4, 97.5, 97.7, 98.1, 100.1

Mean: __97.4__

Median: __97.2__

Mode(s): __96.8__

Range: __3.3__

b) How many players throw under 98 mph? 13

b) How many players throw a minimum of 97.2 mph? 9

---

3. The stem and leaf plot shows the number of calories per serving, for different vegetables.

Total Calories

Stem	Leaf
1	0 0 0 5 5
2	0 0 2 4 5
3	0
4	0 5
5	0

Key: 1|0 = 10 calories

a) Find the mean, median, mode and range.

mean: $\frac{336}{14}$

median: 10, 10, 10, 15, 15, 20, 20, 22, 24, 25, 30, 40, 45, 50

Mean: __24__

Median: __21__

Mode(s): __10__

Range: __40__

b) How many vegetables have at least 15 calories? 11
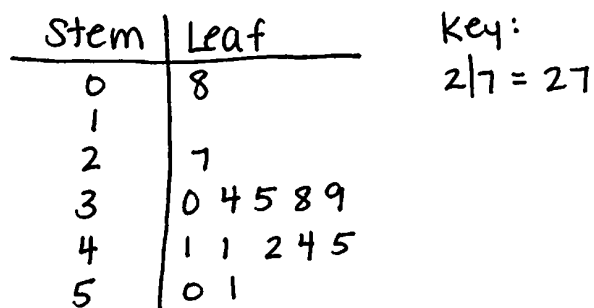
**c)** How many vegetables have at most 24 calories? 9

Make a stem-and-leaf plot, then describe the distribution for each data set.

4. The number of minutes it took a group of students to complete their math test: {8, 27, 41, 38, 50, 41, 39, 35, 44, 45, 51, 30, 34, 42}

Stem	Leaf	Key:
0	8	2|7 = 27
1		
2	7	
3	0 4 5 8 9	
4	1 1 2 4 5	
5	0 1	

8 is an outlier from the remaining data.

5. The average high temperature in Orlando during each month: {72, 74, 79, 83, 88, 91, 92, 92, 90, 85, 79, 73}

Stem	Leaf	Key: 7|2
7	2 3 4 9 9	=72
8	3 5 8	
9	0 1 2 2	
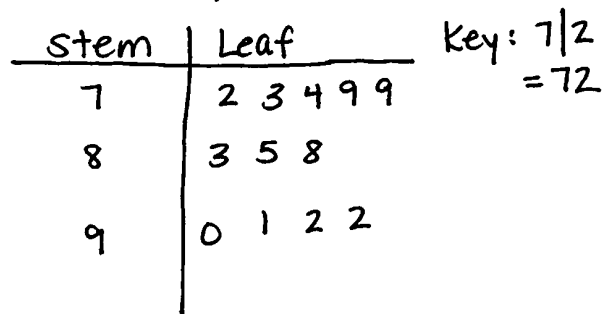
The data is evenly distributed.

6. The average player age on different professional football teams: {25.2, 27.1, 26.3, 25.9, 25.4, 26.1, 26.3, 24.9, 26.8, 26}

Stem	Leaf	Key:
24	9	25|2 = 25.2
25	2 4 9	
26	0 1 3 3 8	
27	1	
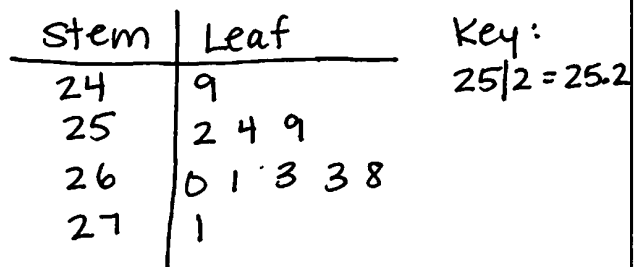
The data is evenly distributed.

7. The height, in inches, of members of a basketball team: {83, 83, 83, 79, 80, 77, 82, 79, 80, 82}

Stem	Leaf
7	7 9 9
8	0 0 2 2 3 3 3
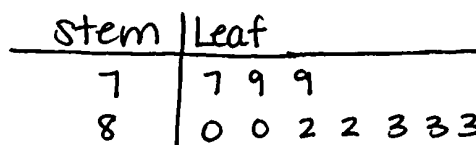
Key: 7\|7 = 77

There are many more heights in the 80s than the 70s.

8. The back-to-back stem and leaf plot shows the number of miles logged by two cab drivers during the same time period. Use the plot to answer the following questions.

Driver A		Driver B
7 3 2 1 0	17	4
2 1	18	7 9
8 2	19	0 2 2 8
3 1 0	20	1 1 5
2	21	1 8
9	22	2 4

Key: 0 | 17 | 4 = 170 and 174

a) How does the median number of miles driven for Driver A compare to the median number of miles driven Driver B?

A: 187
B: 199.5

Driver A has a lower median than Driver B, showing they drive less.

b) How does the mean number of miles driven for Driver A compare to the mean number of miles driven Driver B?

A: 190.1
B: 200.3

Driver B averages 10.2 more miles than Driver A.

| Name:	Date:

Topic:	Class:

| Main Ideas/Questions	Notes/Examples
HISTOGRAMS	**A histogram is a bar graph that shows the frequency of data values in intervals of the same size.** • The height of the bar represents the frequency of the data. Frequency means how many data values fall in this interval. • A histogram does not give individual data values. Therefore it is not possible to find measures of center or range.

Employees

Frequency (y-axis): 4, 8, 12, 16, 20
Age (years) (x-axis): 21-30, 31-40, 41-50, 51-60, 61-70, 71-80
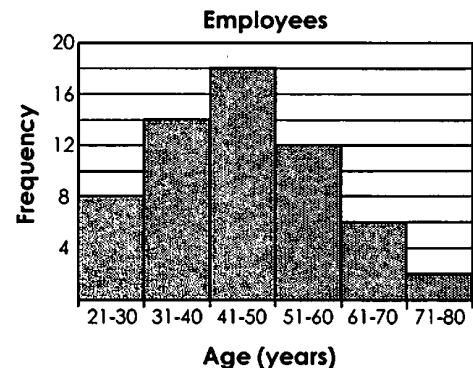
QUESTIONS	**1.** The histogram above shows the ages of the employees at a certain company. Use the histogram to answer the questions below. **a)** How many employees are there? __60__ **b)** How many employees are at most 40 years old? __22__ **c)** Which interval contains the most employees? __41-50__ **d)** What percent of the employees are over 60 years old? __13.3%__ $\frac{8}{60} = 0.1\overline{3}$

2. The histogram below shows the history test scores for a class. Use the histogram to answer the questions.

History Test Scores

Frequency (y-axis): 2, 4, 6, 8, 10
Score (x-axis): 51-60, 61-70, 71-80, 81-90, 91-100
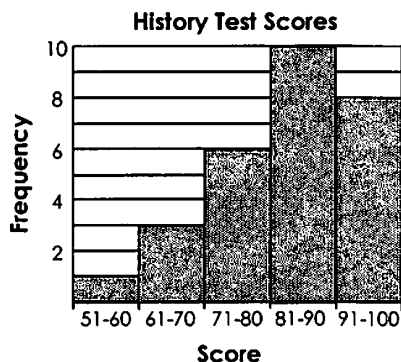
$\frac{24}{28} = .857$

| |
|---|
| **a)** How many students scored between between 61 and 70?
3 |
| **b)** How many students scored scored below 81?
10 |
| **c)** Which interval contained the fewest scores?
51-60 |
| **d)** What percent of the students scored between 71 and 100?
85.7% |
| **e)** What was the highest score on the test? We cannot see the score but know it was in the 91-100 range. |

Creating a HISTOGRAM

Some rules when making a histogram:
- Intervals must be of the same size and can not overlap.
- There should be no space between the bars.

3. The data below represents the number of touchdowns scored by each team in the NFL in the 2017 football season. Create a frequency table, then use the table to draw a histogram.

{53, 51, 51, 49, 49, 47, 46, 43, 43, 42, 42, 42, 41, 40, 40, 40, 39, 38, 36, 36, 34, 33, 32, 31, 31, 31, 31, 31, 29, 28, 27, 25}

Interval	Frequency
20-29	IIII
30-39	HHt HHt II
40-49	HHt HHt III
50-59	III

Touchdowns
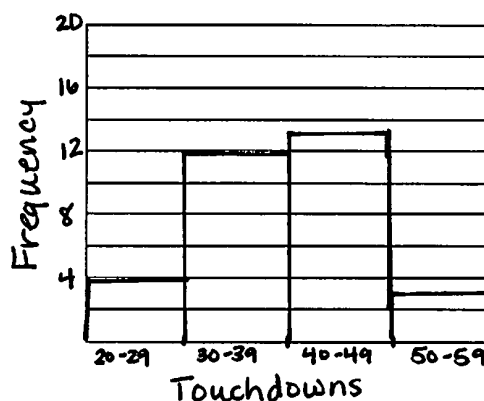
Fuel Efficiency
(miles per gallon, mpg)

Stem	Leaf
1	2 9
2	0 3 5 6 8
3	1 1 4 5 5 7 9
4	2 6 8
5	0 2 4

Key: 5|0 = 50 mpg

4. The stem-and-leaf plot to the left shows the fuel efficiency, in miles per gallon, of a group of vehicles. Create a frequency table, then use the table to draw a histogram.

Interval	Frequency
10-19	II
20-29	HHt
30-39	HHt II
40-49	III
50-59	III

Fuel Efficiency

3.2% (90-99 bpm)
7.2% (80-89 bpm)
12% (50-59 bpm)
20% (70-79 bpm)
57.6% (60-69 bpm)
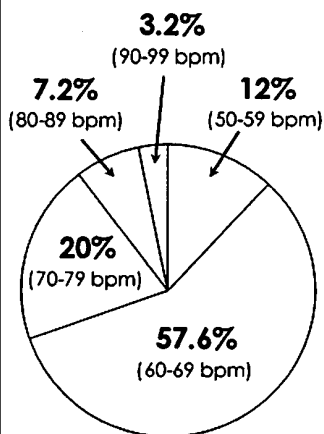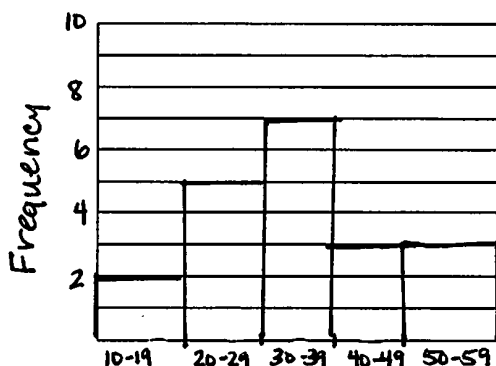
5. The circle graph to the left shows the resting heart rates for 200 people at the gym. Create a frequency table, then use the table to draw a histogram.

Interval	Frequency
50-59	24
60-69	115.2
70-79	40
80-89	14.4
90-99	6.4

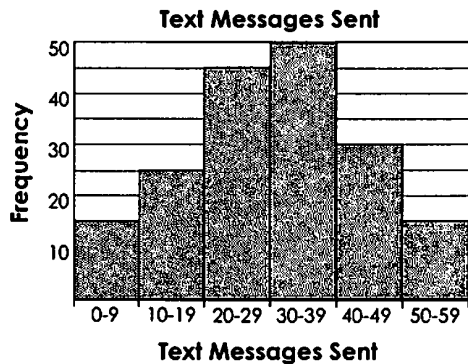Resting Heart Rate
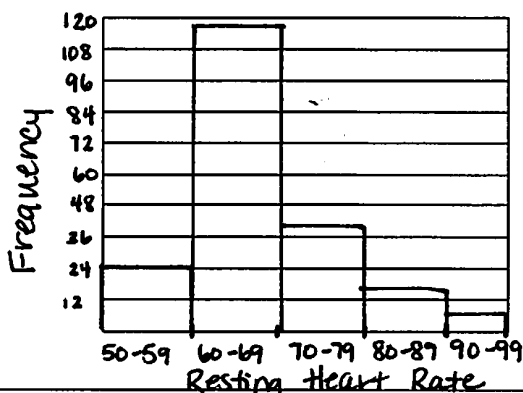
Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 9:** Histograms

** This is a 2-page document! **

1. The histogram shows the number of text messages sent each day by a group of students. Use the histogram to answer the questions.

Text Messages Sent

(Histogram with y-axis "Frequency" from 10 to 50, x-axis "Text Messages Sent" with intervals 0-9, 10-19, 20-29, 30-39, 40-49, 50-59)

a) How many students sent between 10 and 19 text messages?

25

b) How many students sent more than 29 text messages?

95

c) Which interval contained the fewest text messages?

0-9 and 50-59

d) What percent of the students sent between 40 and 59 text messages? $\frac{45}{180} = .25$ 25%

2. The histogram shows the scores from a recent math test. Use the histogram to answer the questions.

Test Scores

(Histogram with y-axis "Frequency" from 4 to 20, x-axis "Math Test Score" with intervals 1-20, 21-40, 41-60, 61-80, 81-100)
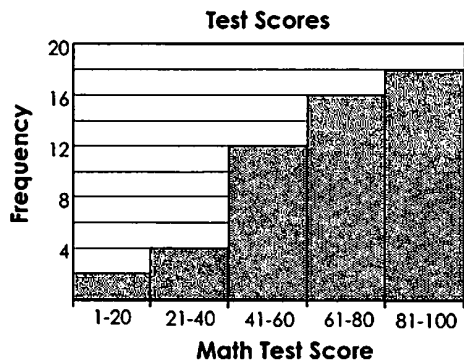
a) How many students scored below an 81%?

34

b) Which interval contained the most scores?

81-100

c) What percent of the students scored no higher than 60%?

$\frac{18}{52} = .3462$ 34.62%

d) What percent of the students scored at least an 81%?

$\frac{18}{52} = .3462$ 34.62%

3. The histogram shows the fuel efficiency of different vehicles. Use the histogram to answer the questions.

Highway Fuel Efficiency

(Histogram with y-axis "Frequency" from 4 to 20, x-axis "Miles Per Gallon" with intervals 1-8, 9-16, 17-24, 25-32, 33-40)
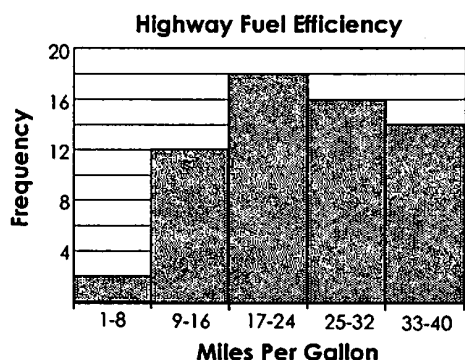
a) How many vehicles get less than 17 miles per gallon?

14

b) How many vehicles get no more than 32 miles per gallon?

48

c) What percent of the vehicles get no more than 24 miles per gallon? $\frac{32}{62} = .5161$ 51.61%

d) What is the highest recorded mpg in the histogram?

You cannot tell the exact mpg but it is in the 33-40 range.

4. The data below represents the number of points scored in each game during the season by the Jacksonville Jaguars. Create a frequency table, then use the table to draw a histogram.

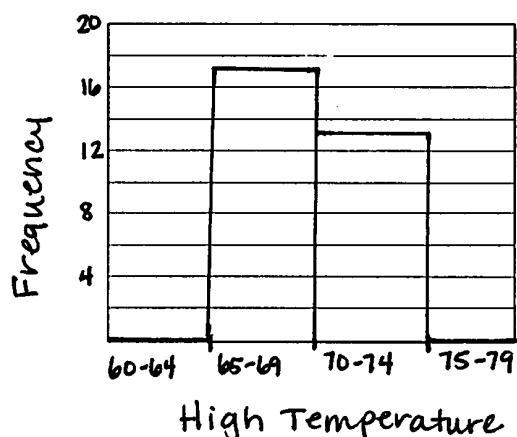{31, 8, 23, 13, 44, 20, 30, 17, 27, 23, 20, 19, 24, 30, 30, 45, 33, 10, 10}

Interval	Frequency
0 - 9	I
10 - 19	＋＋＋＋
20 - 29	＋＋＋＋ I
30 - 39	＋＋＋＋
40 - 49	II

Points Scored
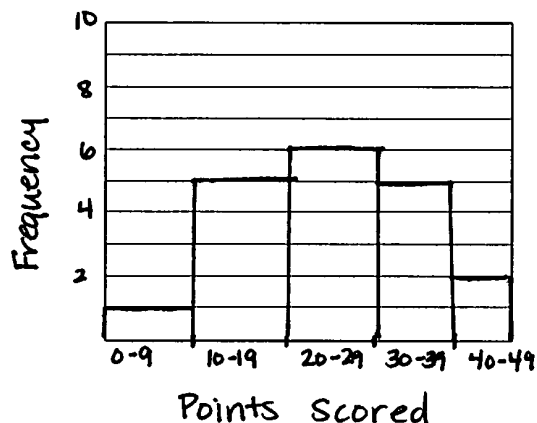
5. The dot plot shows the daily high temperature in San Diego, California in January. Create a frequency table, then use the table to draw a histogram.

Daily High Temperature
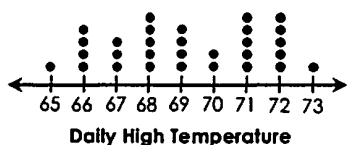
Interval	Frequency
60-64	0
65-69	17
70-74	13
75-79	0

High Temperature

6. The stem-and-leaf plot shows the number of movies seen by a group of adults over a one year period. Create a frequency table, then use the table to draw a histogram.

Age (years)

Stem	Leaf
0	2 2 3 5 6 8 8
1	0 0 2 4 6
2	0 0 0 1 3
3	3 5
4	1
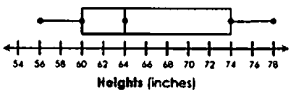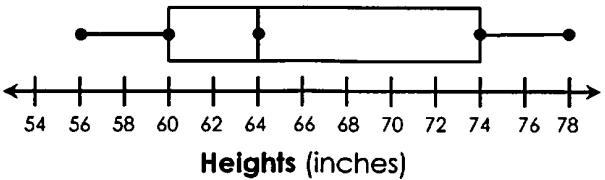
Key: 0|2 = 2 movies

Interval	Frequency
0 - 9	＋＋＋＋ II
10 - 19	＋＋＋＋
20 - 29	＋＋＋＋
30 - 39	II
40 - 49	I

Movies

Name:	Date:

Topic:	Class:

Main Ideas/Questions	Notes/Examples
BOX-AND-WHISKER PLOT	A way to display data on a number line by organizing it into 4 sections.
FIVE-NUMBER SUMMARY	The values used to create the box-and-whisker plot: • Minimum Value: Smallest value • Lower Quartile: median of the lower half • Median: Middle value (order small → large) • Upper Quartile: median of the upper half • Maximum Value: largest value
QUARTILES	The 4 sections that make up the box plot. Each quartile represents 25% of the data.
INTERQUARTILE RANGE	The range between the upper and lower quartiles; the length of the box
EXAMPLE	1. The box-and-whisker plot below represents the heights of a group of students. Give the five number summary, then answer the questions below. **Heights (inches)** Minimum: 56 Lower Quartile: 60 Median: 64 Upper Quartile: 74 Maximum: 78

a) What is the range? 78 - 56 = 22	b) What is the interquartile range? 74 - 60 = 14
c) What percent of the students are between 56 and 60 inches tall? 25%	d) What percent of the students are at most 74 inches tall? 75%

e) Does the data vary more above or below the median?

The data varies more above the median.

<table>
<tr>
<td rowspan="4">

Drawing
**BOX-AND-WHISKER
PLOTS**

</td>
<td colspan="2">

Directions: Draw the box-and-whisker plot and give the five-number summary for each data set.

</td>
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<td>

2. Number of grams of fat in 9 sandwiches on a menu at a restaurant:

{35, 16, 19, 25, 12, 22, 39, 28, 14}

12, 14, 16, 19, 22, 25, 28, 35, 39

↑ LQ (15)   ↑ Med   ↑ UQ (31.5)

</td>
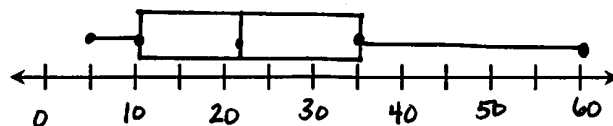<td>

Minimum: 12

Lower Quartile: 15

Median: 22

Upper Quartile: 31.5

Maximum: 39

</td>
</tr>
<tr>
<td>

3. Wait time, in minutes, at 15 amusement park rides:

{45, 16, 24, 60, 35, 30, 10, 8, 21, 12, 7, 40, 25, 18, 5}

5, 7, 8, 10, 12, 16, 18, 21, 24, 25, 30, 35, 40, 45, 60

↑ LQ   ↑ Med   ↑ UQ

</td>
<td>

Minimum: 5

Lower Quartile: 10

Median: 21

Upper Quartile: 35

Maximum: 60

</td>
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4. The heights, in feet, of 10 lighthouses:

{136, 107, 110, 60, 146, 95, 82, 101, 115, 85}

60, 82, 85, 95, 101, 107, 110, 115, 136, 146

↑ LQ   ↑ Med (104)   ↑ UQ
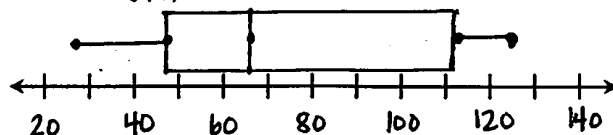
</td>
<td>

Minimum: 60

Lower Quartile: 85

Median: 104

Upper Quartile: 115

Maximum: 146

</td>
</tr>
</table>
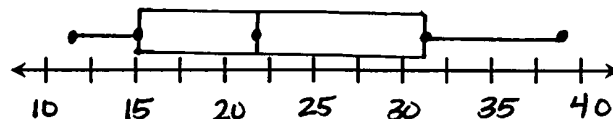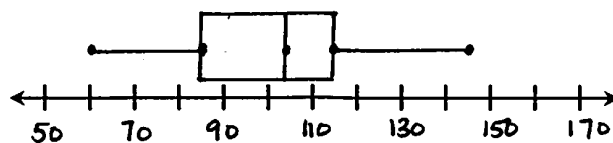
5. Vera's heating bill each month, in dollars, for the past year:

{120, 115, 95, 70, 58, 30, 27, 42, 52, 65, 109, 124}

27, 30, 42, 52, 58, 65, 70, 95, 109, 115, 120, 124

↑ LQ (47)   ↑ Med (67.5)   ↑ UQ (112)
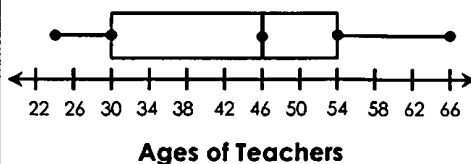
Minimum: 27

Lower Quartile: 47

Median: 67.5

Upper Quartile: 112

Maximum: 124

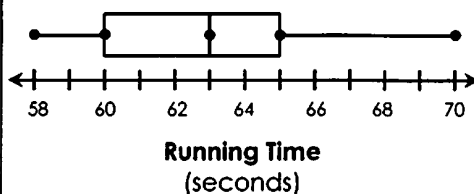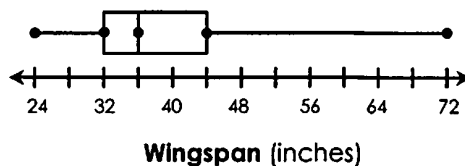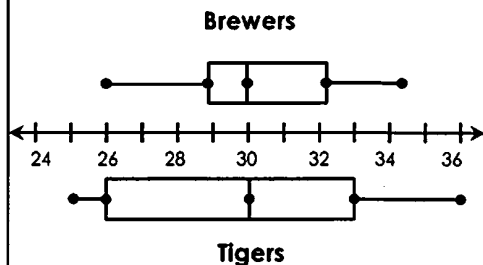| MORE PRACTICE | **6.** The ages of the teachers at Carter Middle School is shown below. | **a)** What is the median age? 46 |
		b) What is the interquartile range? $54 - 30 = \boxed{24}$
	Ages of Teachers	**c)** What percent of the teachers are at least 30 years old? 75%
	7. The 400-meter run times in a girls track meet are shown below.	**a)** Identify the minimum and maximum run times. Min = 58 Max = 70
		b) What percent of the runners had a time between 63 and 70 seconds? 50%
	Running Time (seconds)	**c)** What percent of the runners had a time of at most 60 seconds? 25%
	8. The wingspan of the birds at the zoo's birds of prey exhibit are shown below.	**a)** Identify the lower and upper quartiles. LQ = 32 UQ = 44
		b) What percent of the birds have a wingspan of no more than three feet? 50%
	Wingspan (inches)	**c)** In which quartile do the data values vary the least? 2nd quartile
Comparing **BOX-AND-WHISKER** Plots	**9.** The Tigers and Brewers are rival baseball teams. The box-and-whisker plot below shows the number of runs scored by the players on each of these teams last season. **Brewers** **Tigers**	**a)** Which team has the greater range of runs scored by the players? Tigers
		b) Based on runs, which team has a stronger group of players? Explain your reasoning. *Answers may vary* Brewers since their data is more consistent.

Name: _____ **Unit 8:** Probability & Statistics

Date: _____ **Per:** _____ **Homework 10:** Box-and-Whisker Plots

** This is a 2-page document! **

1. The box and whisker plot represents the time spent on homework by a group of college students. Give the number summary, then answer the questions below.

Minutes Spent on Homework
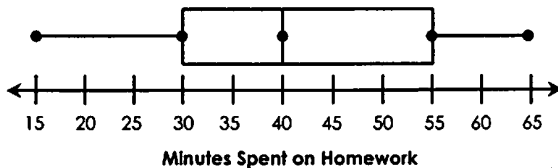
Minimum: __15__

Lower Quartile: __30__

Median: __40__

Upper Quartile: __55__

Maximum: __65__

a) What is the range?

$65 - 15 =$ __50__

b) What is the interquartile range?

$55 - 30 =$ __25__

c) What percent of college students spent more than 40 minutes on homework?

50%

**d)** What percent of the students spent between 30 and 65 minutes on homework?

75%

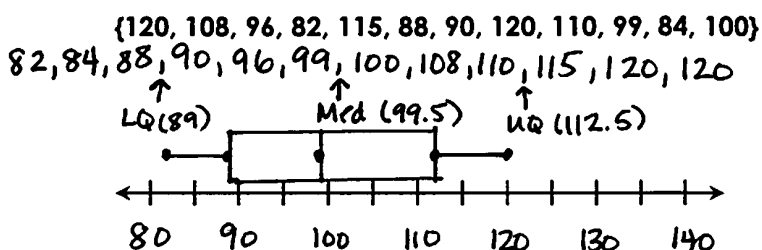**e)** Does the data vary more above or below the median?

The data is similar above and below the medians; the lower half has a range of 25 and the upper half is also 25.

**Directions:** Draw the box-and-whisker pot and give the five-number summary for each data set.

2. Number of dance tickets sold each day over a ten-day period.

{45, 30, 22, 15, 18, 62, 19, 31, 50, 44}

15, 18, 19, 22, 30, 31, 44, 45, 50, 62

↑ LQ   ↑ Med (30.5)   ↑ UQ
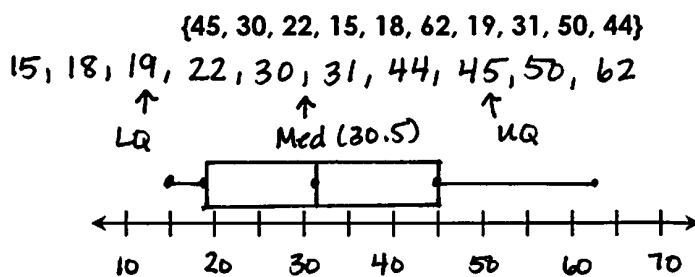
Minimum: __15__

Lower Quartile: __19__

Median: __30.5__

Upper Quartile: __45__

Maximum: __62__

3. Number of students who bought lunch over a twelve-day period.

{120, 108, 96, 82, 115, 88, 90, 120, 110, 99, 84, 100}

82, 84, 88, 90, 96, 99, 100, 108, 110, 115, 120, 120

↑ LQ(89)   ↑ Med (99.5)   ↑ UQ (112.5)

Minimum: __82__

Lower Quartile: __89__

Median: __99.5__

Upper Quartile: __112.5__

Maximum: __120__

4. The number of lattes made at a coffee shop between 7:00 am and 8:00 am over a one month period.

Lattes Made
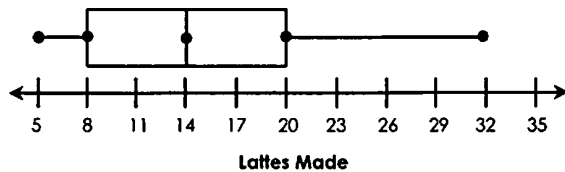
a) Identify the lower and upper quartiles.

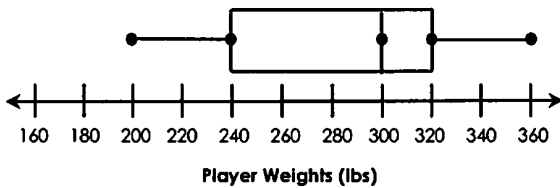LQ = 8   UQ = 20

b) What is the interquartile range?

20 - 8 = 12

c) In which quartile do the data values vary the most?

4th quartile

---

5. The weight of players on a football team.

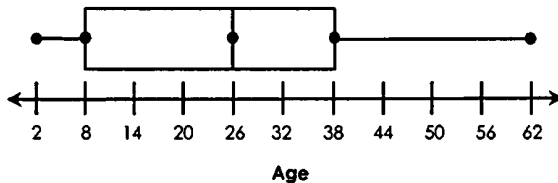**Player Weights (lbs)**

a) What is the median weight?

300

b) What percent of the players weigh between 240 and 300 pounds?

25%

c) What percent of the players weighed no more than 320 pounds?

75%

---

6. Ages of people in a movie theater.

Age

a) Identify the minimum and maximum ages.
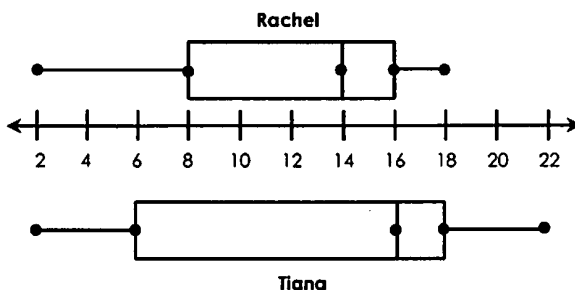
Min = 2   Max = 62

b) What percent of the people are no more than 8 years old?

25%

c) What percent of the people are between 8 and 38 years old?

50%

---

7. Rachel and Tiana are both dancers preparing for an audition. The box-and-whisker plot below shows the number of hours each girl practiced each week over the last few months.

Rachel

Tiana

a) Which girl has the greatest range of practice hours?

Tiana

b) Based on the number of hours practiced, which dancer do you feel is most prepared for the audition? Explain your reasoning. Tiana

[*Answers may vary*]
The upper 25% of Tiana's data is higher than any of Rachel's data.

Name: _____   Math 7

Date: _____   **Per:** _____   **Unit 8:** Probability & Statistics

Quiz 8-3: Statistics

Use the following data for questions 1-4: {55, 52, 60, 76, 52, 41, 62, 65, 57, 52, 76, 48}
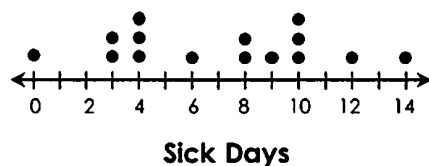
1. Find the mean. $\frac{696}{12} = 58$

2. Find the median. 41, 48, 52, 52, 52, 55, 57, 60, 62, 65, 76, 76
                          ↑

3. Find the mode(s).

4. Find the range. 76 - 41 = 35

1.	58
2.	56
3.	52
4.	35

The dot plot below shows the number of sick days taken by each employee at a certain company in one year. Use the diagram for questions 5-8.

0 2 4 6 8 10 12 14
Sick Days

5. Find the mean. $\frac{132}{15} = 8.8$

6. Find the median.

7. Find the mode(s).

8. Find the range. 14 - 0 = 14

5.	8.8
6.	8
7.	4 and 10
8.	14

9. Kate's math grades are shown below. Determine whether the mean, median, or mode would be the best measure of center. Explain your reasoning.

{78, 100, 96, 84, 80, ⑯ 90, 88, 76, 100, 92, 86, 84, 96, 70, 96}

Median; 36 is an outlier so the median is the best center.

The stem-and-leaf plot below shows the number of minutes that twenty people spent on a treadmill at the gym. Use the plot to answer questions 10 and 11.

Stem	Leaf
0	8
1	2 5
2	4 5 6 7 8
3	0 0 0 5 9
4	2 5 8
5	4 7
6	0 5

Key: 2|4 = 24 minutes

10. What is the difference between the mean and median?
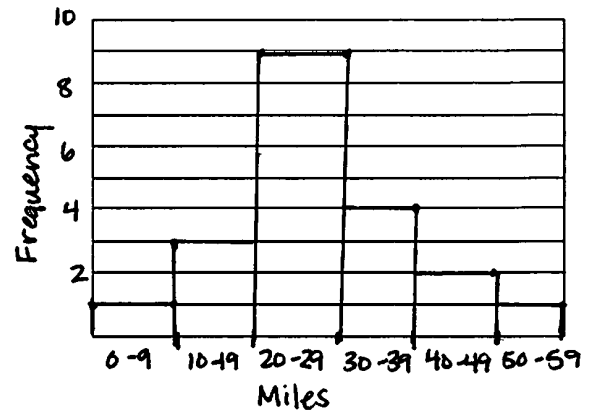   Mean: $\frac{700}{20} = 35$
    Median: 30

11. How many people were on the treadmill for at most 45 minutes?

10.	5
11.	15

12. The number of miles Juan has driven each day in the last 20 days is given below. Make a frequency table and histogram for this data.

{25, 14, 36, 24, 48, 9, 50, 27, 24, 28, 18, 30, 41, 12, 27, 38, 22, 26, 35, 20}

Interval	Frequency
6-9	I
10-19	III
20-29	₩H IIII
30-39	IIII
40-49	II
50-59	I

Miles

The histogram below gives the number of days that a group of homes were on the market last year before they sold. Use the histogram to answer questions 13 and 14.
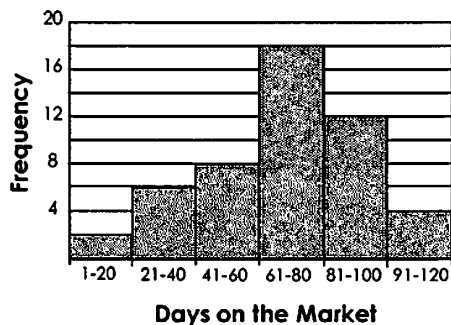
Days on the Market

13. How many homes were on the market for at least 81 days?

**14.** What percent of the homes were on the market for no more than 60 days?

$$\frac{16}{50} = .32$$

13. __16__

14. __32%__

15. The data below represents the speeds of cars picked up by radar on the highway. Give the five-number summary and draw the box-and-whisker plot.

{68, 75, 54, 71, 68, 62, 75, 80, 62, 65, 60, 70}

54, 60, 62, 62, 65, 68, 68, 70, 71, 75, 75, 80

LQ = 62   Med = 68   UQ = 73
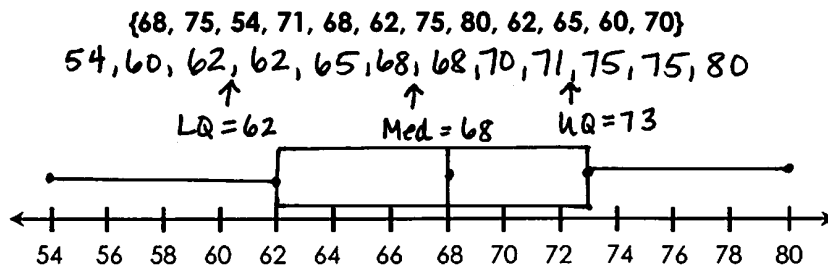
Minimum Value = __54__

Lower Quartile = __62__

Median = __68__

Upper Quartile = __73__

Maximum Value = __80__

The box-and-whisker below shows the number of years that employees have worked at a certain company. Use the diagram to answer questions 16-18.

Years with a Company
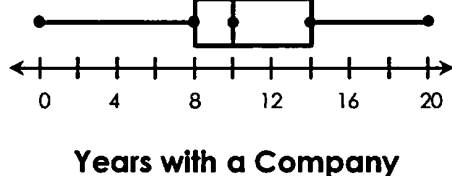
16. What is the interquartile range?

14 - 8 = 6

17. What percent of the employees have been with the company for at least 8 years?

18. In which quartile is the data most varied?
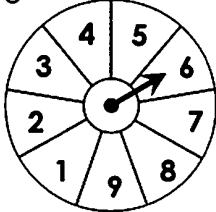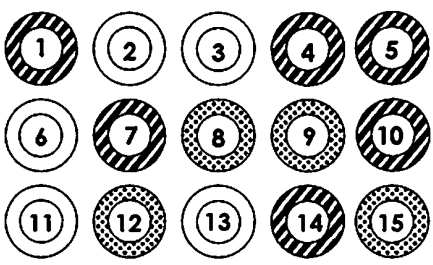
16. __6__

17. __75%__

18. __1st quartile__

Unit 8 Test Study Guide
(Probability & Statistics)

Name: _____

Date: _____ Per: _____

Topic 1: Simple Probability

Give each probability as a fraction in simplest form.

1. The spinner to the right is spun once.	**a)** $P(5)$ $\frac{1}{9}$	**b)** $P(\text{less than 4})$ $\frac{3}{9} = \frac{1}{3}$
	c) $P(\text{not 8})$ $\frac{8}{9}$	**d)** $P(\text{odd or 2})$ $\frac{6}{9} = \frac{2}{3}$

2. A ball from the set below is chosen at random.	**a)** $P(\text{stripes})$ $\frac{6}{15} = \frac{2}{5}$	**b)** $P(3)$ $\frac{1}{15}$
	c) $P(\text{white or 2})$ $\frac{5}{15} = \frac{1}{3}$	**d)** $P(\text{polka dots or odd})$ $\frac{10}{15} = \frac{2}{3}$

3. A letter is chosen randomly from the word **OFFICIAL**.	**a)** $P(C)$ $\frac{1}{8}$	**a)** $P(\text{vowel})$ $\frac{4}{8} = \frac{1}{2}$
	c) $P(A \text{ or } F)$ $\frac{3}{8}$	**c)** $P(\text{consonant or I})$ $\frac{6}{8} = \frac{3}{4}$

### Topic 2: Theoretical vs. Experimental Probability

4. A month of the year is chosen at random 60 times. The results are shown in the table.

Result	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Frequency	3	8	5	7	4	4	5	6	7	3	5	3

a) What is the theoretical probability of February being chosen? $\frac{1}{12}$	**b)** Based on this experiment, what is the probability of February being chosen? $\frac{8}{60} = \frac{2}{15}$
c) Theoretically, if a month is chosen 300 times, how many times would you expect a month that starts with the letter J? $\frac{3}{12} = \frac{1}{4}$; $\frac{1}{4}(300) = \boxed{75}$	**d)** Based on this experiment, if a month is chosen 300 times, how many times would you expect a month that starts with the letter J? Compare this to the previous answer. $\frac{12}{60} = \frac{1}{5}$; $\frac{1}{5}(300) = \boxed{60}$ The theoretical is higher.

Topic 3: Tree Diagrams & The Counting Principle

5. Each of the spinners below is spun once. Draw a tree diagram to show all possible outcomes.
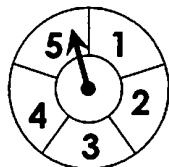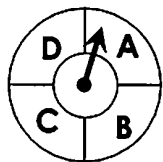
6. List the sample space.	**7.** What are the total number of outcomes?
A1, A2, A3, A4, A5, B1, B2, B3, B4, B5, C1, C2, C3, C4, C5, D1, D2, D3, D4, D5	$4 \cdot 5 = 20$

Use the fundamental counting principle for questions 8-9.

| **8.** A day of the week and a number from 0-9 are chosen at random. How many outcomes are possible? $7 \cdot 10 = 70$	**9.** Micha is getting a fountain drink. He can pick from four cup sizes, eight different drink flavors and two different straw colors. How many drink outcomes are possible? $4 \cdot 8 \cdot 2 = 64$

Topic 4: Compound Probability

10. There are four shirts (red, white, green and blue) and three pair of shorts (black, brown and orange) in a drawer. One shirt and one pair of shorts are picked at random. Draw a tree diagram to show all the possible outcomes. Then find each probability.
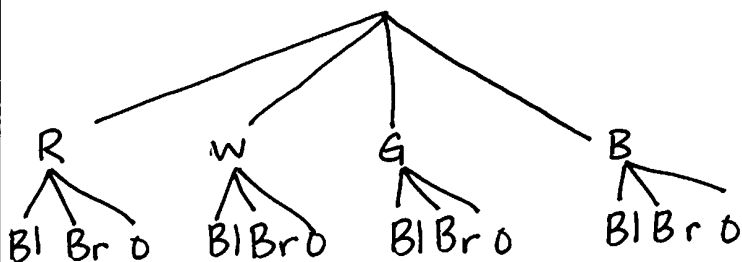
a) P(red, then brown)

$$\frac{1}{12}$$

b) P(white or green, then black)

$$\frac{2}{12} = \frac{1}{6}$$

c) P(not blue, then brown or orange)

$$\frac{6}{12} = \frac{1}{2}$$

11. Carol's pocket contains 2 pennies, 4 nickels, 9 dimes and a quarter. A coin is chosen at random, replaced, then another is chosen. Use multiplication to find each probability.

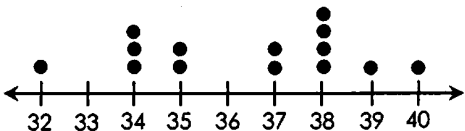| **a)** P(a penny, then a dime)	**b)** P(both nickels)	**c)** P(a coin worth at least 10¢, then a quarter)
$\frac{2}{16} \cdot \frac{9}{16}$ $= \frac{1}{8} \cdot \frac{9}{16} = \boxed{\frac{9}{128}}$	$\frac{4}{16} \cdot \frac{4}{16}$ $= \frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{16}}$	$\frac{10}{16} \cdot \frac{1}{16}$ $= \frac{5}{8} \cdot \frac{1}{16} = \boxed{\frac{5}{128}}$

Topic 5: Using Samples to Predict

12. A car dealership is conducting a survey to see what color vehicle is preferred. Determine whether the samples are biased or unbiased. Explain.

a) four random people who visit the dealership on Friday	b) mail surveys to 150 random past customers	c) fifteen students in a driver's education class
Biased - Sample is Small	Unbiased - Random	Biased - Sample is Small

13. A pizza shop surveyed a random group of customers to determine their favorite pizza topping. Results are shown below.

Result	Frequency
Pepperoni	35
Mushroom	8
Cheese	15
Veggie	12
Sausage	10

a) What percent reported pepperoni as their favorite?

$$\frac{35}{80} = .4375 \qquad \boxed{43.75\%}$$

b) What percent reported cheese or veggie as their favorite?

$$\frac{27}{80} = .3375 \qquad \boxed{33.75\%}$$

c) Out of 400 people, how many would you expect to say their favorite topping is sausage?

$$\frac{10}{80} = .125 ; \qquad .125(400) = \boxed{50}$$

Topic 6: Measures of Center

Find the mean, median, mode(s), and range for each of the following data sets. Round to the nearest tenth if necessary.

14. The dot plot shows the length of time, in minutes, it took each member of the track team to run 5 miles.

5 Mile Time (minutes)

$$mean = \frac{509}{14} = 36.4$$

$$Range = 40 - 32 = 8$$

15. The number of boxes of each type of cookie sold by Melissa this year is shown in the table.

Type	Boxes Sold
Mint	200
Chocolate	180
Peanut Butter	88
Coconut	42
Lemon	68
Shortbread	96
Raspberry	150
Vanilla Cream	102

$$mean = \frac{926}{8} = 115.8$$

$$Range = 200 - 42 = 158$$

Mean	Median	Mode(s)	Range	Mean	Median	Mode(s)	Range
36.4	37	38	8	115.8	99	None	158

Topic 7: Stem-and-Leaf Plots

16. The stem-and-leaf plot below shows the number of tickets sold to different movies at 2 pm.

Tickets Sold

Stem	Leaf
0	3 6 8
1	2 2 6 9
2	3 3
3	1 1 5 9
4	0 7 8
5	1 4 6 6

Key: 0|3 = 3 tickets sold

a) Find the mean, median, mode and range.

$$Mean = \frac{610}{20} = 30.5$$

$$range = 56-3 = 53$$

Mean: **30.5**

Median: **31**

Mode(s): **12, 23, 31, 56**

Range: **53**

b) How many movies sold more than 20 tickets?

13

c) How many movies sold more than 35 tickets?

8

d) How many movies sold between 30 and 50 tickets?

7

Topic 8: Histograms

17. The histogram shows the winning team's score in the last 20 football games. Use the histogram to answer the questions.

Winning Scores — Frequency vs Points Scored (1-10, 11-20, 21-30, 31-40, 41-50)
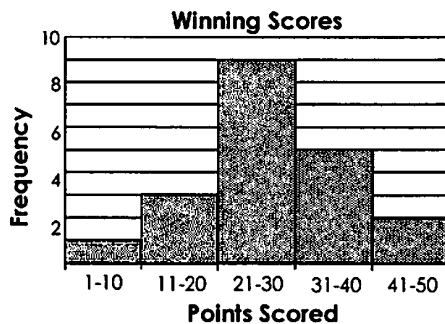
a) How many games ended with a winning score between 21 and 30 points?

9

b) How many games ended with a winning score of no more than 20 points?

4

c) What percent of the games ended with a winning score between 31 and 50 points?

35%

18. The data below represents the number of children enrolled in various sports programs at the YMCA. Create a frequency table, then use the table to draw a histogram.

{22, 8, 34, 19, 42, 30, 25, 28, 9, 10, 11, 20, 46, 14, 18, 22, 34, 38, 20, 10}

Interval	Frequency
0 - 9	II
10 - 19	HHT I
20 - 29	HHT I
30 - 39	IIII
40 - 49	II

Frequency vs Enrollment (0-9, 10-19, 20-29, 30-39, 40-49)
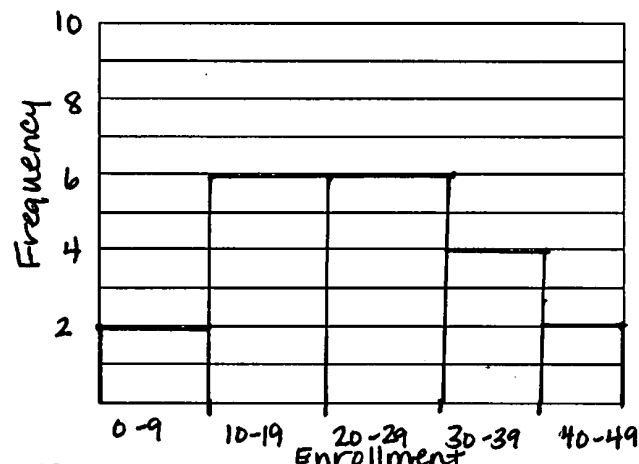
Topic 9: Box-and-Whisker Plots

Find the five-number summary and construct the box-and-whisker plot for each data set.

19. The number of teachers at twelve different middle schools:
{60, 53, 45, 60, 55, 59, 48, 47, 51, 53, 55, 45}

45, 45, 47, 48, 51, 53, 53, 55, 55, 59, 60, 60

LQ = 47.5   Med = 53   UQ = 57

Minimum: **45**

Lower Quartile: **47.5**

Median: **53**

Upper Quartile: **57**

Maximum: **60**

45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

20. The amount of candy bars sold in a fundraiser by each child in a class: {18, 22, 23, 33, 28, 20, 19, 30, 28, 26, 25, 28, 23, 33, 30, 30, 20}

18, 19, 20, 20, 22, 23, 23, 25, 26, 28, 28, 28, 30, 30, 30, 33, 33

LQ = 21   Med   UQ = 30
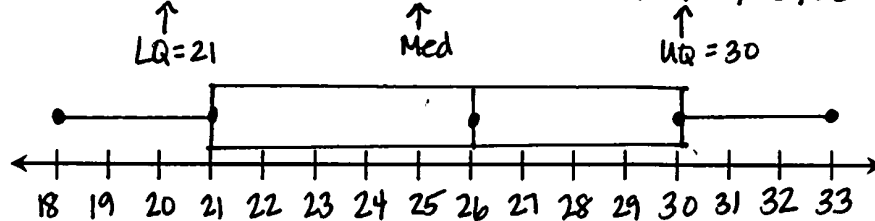
Minimum: **18**
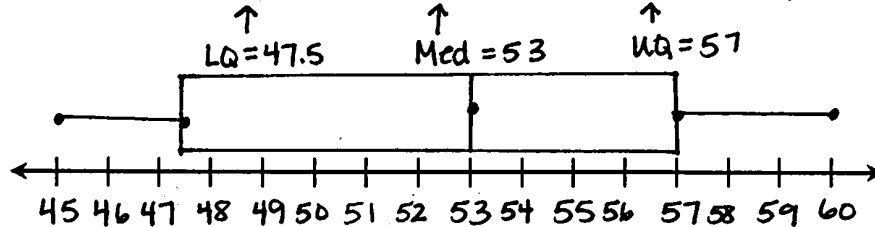
Lower Quartile: **21**

Median: **26**

Upper Quartile: **30**

Maximum: **33**

18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

21. The cost of 30 movie downloads is shown on the box-and-whisker plot to the right.

10 11 12 13 14 15 16 17 18 19 20
Cost of a Movie Download ($)
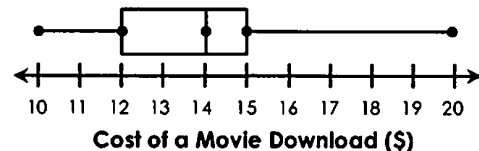
a) What is the interquartile range? **3**

b) What percent of movies cost at least $12? **75%**

c) What percent of the movies cost between $10 and $15? **75%**

d) What percent of movies cost no more than $14? **50%**

22. The ages of the participants in a summer art camp are shown below.

Male Participants

3 4 5 6 7 8 9 10 11 12 13

Female Participants
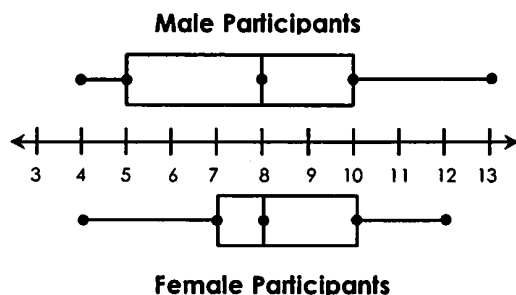
a) Which group had a greater range?

Male; 13 - 4 = 9

b) What is the difference in the maximum age?

13 - 12 = 1 ; 1 year

c) What is the difference in the median age?

None

d) Which group is oldest overall? Explain.

* Answers may vary *

Females because their 2nd quartile is higher.

Unit 8 Test
Probability & Statistics

Use for questions 1-4: A card from the set below is chosen at random. Give each probability as a fraction in simplest form.

1. $P(\text{stripes})$

$\dfrac{4}{12}$ $\boxed{\dfrac{1}{3}}$

2. $P(\text{less than 9})$

$\dfrac{8}{12}$ $\boxed{\dfrac{2}{3}}$

3. $P(\text{polka dots and odd})$

$\boxed{\dfrac{1}{12}}$

4. $P(\text{black or at least 5})$

$\dfrac{10}{12}$ $\boxed{\dfrac{5}{6}}$

5. If the spinner below is spun once, which event is least likely to happen?

A. the spinner lands on a prime number $\;^6/_{16}$

B. the spinner lands on a shaded number $\;^7/_{16}$

C. the spinner lands on a multiple of 3 $\;^5/_{16}$

D. the spinner lands on a number that is at least 9 $\;^8/_{16}$

$\boxed{C}$

For questions 6-8: A letter from the word **SAPPHIRE** is selected at random 75 times. The results from the experiment are shown in the table below.

Result	S	A	P	P	H	I	R	E
Frequency	8	15	7	5	11	9	8	12

6. What is the theoretical probability of choosing a vowel? Give your answer as a fraction in simplest form.

$\boxed{\dfrac{3}{8}}$

7. Based on the experiment, what is the probability of choosing a vowel? Give your answer as a fraction in simplest form. Check whether this is lower or higher than expected compared to the theoretical probability.

$\dfrac{36}{75}$

☐ lower than expected
☒ higher than expected

$\boxed{\dfrac{12}{25}}$

8. Based on the experiment, if a letter is chosen 500 times, which statement is true regarding the number of times you would expect a P?

A. 80 times; 45 times less than theoretically expected

B. 80 times; 45 times more than theoretically expected

C. 90 times; 30 times less than theoretically expected

D. 90 times; 30 times more than theoretically expected

$\boxed{A}$

Use for questions 9-13: A bag contains one penny, one nickel, one dime, and one quarter. A standard die is rolled, then one coin is picked at random from the bag.

9. Draw a tree diagram to show all the possible outcomes.

P
1 2 3 4 5 6

N
1 2 3 4 5 6

D
1 2 3 4 5 6

Q
1 2 3 4 5 6
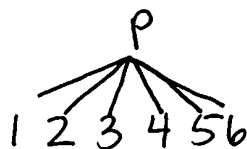
10. List the sample space.

P1, P2, P3, P4, P5, P6, N1, N2, N3, N4, N5, N6, D1, D2, D3, D4, D5, D6, Q1, Q2, Q3, Q4, Q5, Q6

11. What are the total number of outcomes?

$4 \cdot 6$

24

Using your sample space above, give each probability as a fraction in simplest form.

12. P(a silver coin and a number greater than 1)

$\frac{15}{24}$

$\boxed{\frac{5}{8}}$

13. P(a quarter and number that is at least 5)

$\frac{2}{24}$

$\boxed{\frac{1}{12}}$

Use the fundamental counting principle for questions 14-15.

14. A date in the month of October and a letter of the alphabet are chosen at random. How many outcomes are possible?
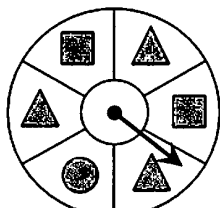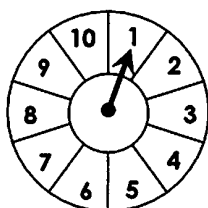
$31 \cdot 26$

$\boxed{806}$

15. The school cafeteria has four entrée options, seven side options, and three drink options. How many lunch combinations of one entrée, one side, and one drink are possible?

$4 \cdot 7 \cdot 3$

$\boxed{84}$

16. Each spinner below is spun once. Find the probability of spinning a number that is no less than 3, then a square. Give your answer as a fraction in simplest form.

$\frac{8}{10} \cdot \frac{2}{6}$

$= \frac{4}{5} \cdot \frac{1}{3}$

$\boxed{\frac{4}{15}}$

Use for questions 17-18: A box contains 8 apple, 10 fruit punch, 10 grape, and 12 berry juice boxes. A juice box is chosen at random, replaced, then another juice box is chosen at random. Find each probability as a fraction in simplest form.

17. P(berry, then not fruit punch)

$$\frac{12}{40} \cdot \frac{30}{40}$$

$$= \frac{3}{10} \cdot \frac{3}{4}$$

$\boxed{\dfrac{9}{40}}$

18. P(both apple juice)

$$\frac{8}{40} \cdot \frac{8}{40}$$

$$= \frac{1}{5} \cdot \frac{1}{5}$$

$\boxed{\dfrac{1}{25}}$

19. Which survey collection method would contain the least amount of bias?

A. ask 25 randomly chosen students in band how they get to school each day

B. ask every 3rd person that walks into a football game which team they predict will win

C. ask 100 randomly chosen eighth grade students if they plan on attending the school play

D. ask every 10th person that enters an amusement park if they plan to ride a certain rollercoaster that day

$\boxed{D}$

Use for questions 20-21: The grocery store bakery randomly surveyed customers and asked which type of pie they prefer. The results are shown in the table below.

Pie	Apple	Pumpkin	Key Lime	Cherry	Pecan
Number	24	15	10	18	13

20. What percent of those surveyed said they prefer apple or key lime pie?

$$\frac{34}{80} = .425$$

$\boxed{42.5\%}$

21. If the bakery is making 400 pies for Thanksgiving, how many cherry pies do you recommend they make?

$$\frac{18}{80} = .225 ;$$

$$.225 (400) = 90$$

$\boxed{90 \text{ pies}}$

22. The data below represents the scores of a basketball team in their first nine games of the season. Which measure is the greatest?

$$\{111, 107, 103, 90, 114, 103, 109, 106, 93\}$$

$$90, 93, 103, 103, 106, 107, 109, 111, 114$$

A. mean

B. median

C. mode

D. range

$$\text{Mean} = \frac{936}{9} = 104$$

$$\text{Med}$$

$$\text{range} = 114 - 90 = 24$$

$\boxed{B}$

23. The dot plots below show the scores of 16 students on two tests. Which statement is true?
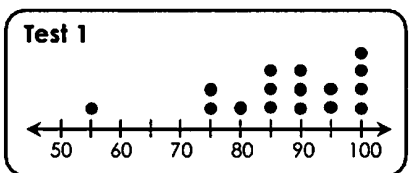
Test 1

Test 2

Mean: $\dfrac{1400}{16} = 87.5$

Med: 90
Mode: 100
Range: 45

Mean: $\dfrac{1420}{16} = 88.75$

Med: 87.5
Mode: 95
Range: 25
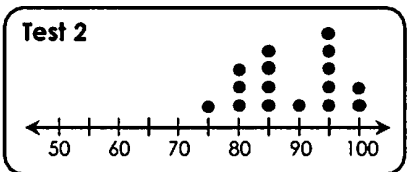
A. the mean of Test 1 < the mean of Test 2

B. the range of Test 1 < the range of Test 2

C. the median of Test 1 = the median of Test 2

D. the mode of Test 1 < the mode of Test 2

$\boxed{A}$

For questions 24-25: The stem-and-leaf plot below shows the salary, in thousands of dollars, of the employees at a company.

Stem	Leaf
3	0 2 4
4	1 4 5 7
5	2 4 8
6	0 0 0 3 5 8
7	1 4
8	0 2

Key: 3|5 = $35,000

24. Find the difference between the mean and median salary.

Mean = 56,000

Med = 59,000

A. $1,000

B. $2,000

C. $3,000

D. $4,000

$\boxed{C}$

**25.** What percent of the employees have a salary that is greater than $60,000?

$\dfrac{7}{20} = .35$

$\boxed{35\%}$

---

26. The calendar below shows daily low temperatures of a city each day in January. Make a frequency table, then use the table to create a histogram. Label all parts of the histogram.

JANUARY 2018

SUN	MON	TUES	WEDS	THURS	FRI	SAT
		2°	11°	8°	3°	5°
9	4°	29°	21°	18°	48°	17°
8	1°	3°	16°	11°	14°	27°
32	30°	37°	42°	19°	16°	24°
36	30°	22°	5°	17°		

Interval	Frequency
0 – 9	⊪⊪ ⊪⊪
10 – 19	⊪⊪ IIII
20 – 29	⊪⊪
30 – 39	⊪
40 – 49	II
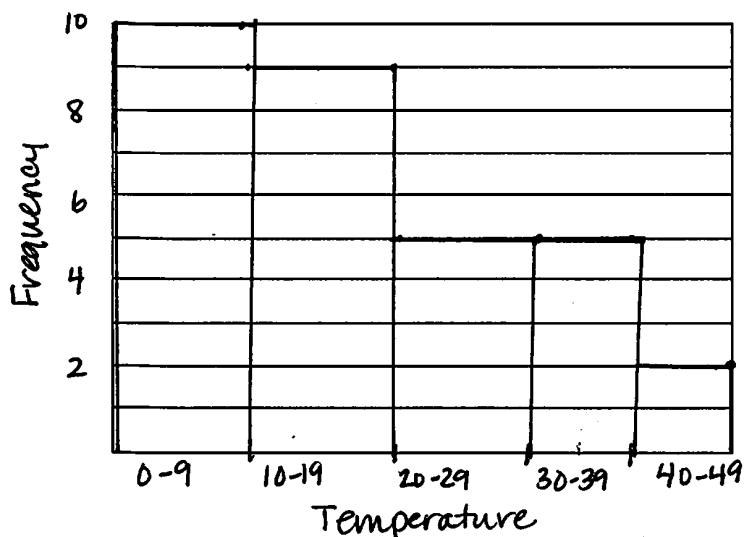
For questions 27-28: The histogram below represents the number of questions answered incorrectly on a science exam by a group of students.
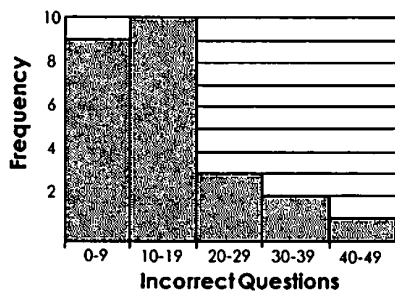
27. How many students incorrectly answered at least 30 questions?

3

28. What percent of the students incorrectly answered less than 20 questions?

$\frac{19}{25}$ = .36

36%

---

29. The data set below represents the amount of weight lost by each person in a weight loss challenge. Find the five-number summary then draw a box-and-whisker plot.
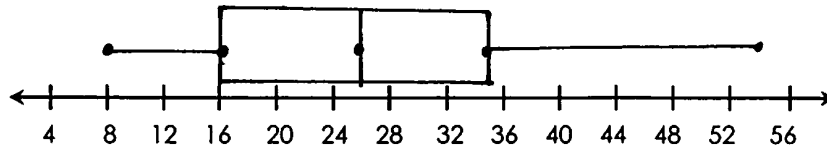
{16, 28, 8, 32, 12, 54, 28, 21, 26, 40, 18, 35, 24, 11, 45}

8, 11, 12, 16, 18, 21, 24, 26, 28, 28, 32, 35, 40, 45, 54
          ↑   ↑   ↑
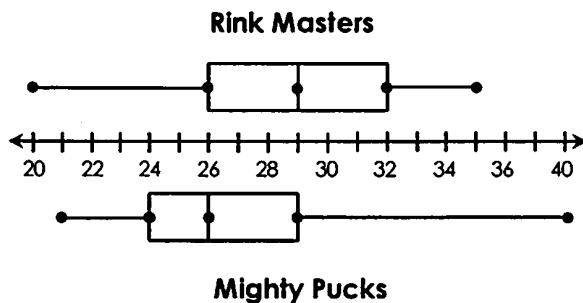   LQ   Med   UQ

Minimum Value = 8
Lower Quartile = 16
Median = 26
Upper Quartile = 35
Maximum Value = 54

For questions 30-32: The Rink Masters and Mighty Pucks are two hockey teams in the same league. The box-and-whisker plot below shows the ages of the players on each team.

Rink Masters

Mighty Pucks

30. What is the interquartile range of ages for the Rink Masters?

6

31. What is the median age of the Mighty Pucks players?

26

---

32. Which statements are true? Check all that apply.

☑ The Rink Masters have a lesser range of ages than the Mighty Pucks.

☐ Of the players on the Mighty Pucks, 25% are at most 27 years old.

☑ Of the players on the Rink Masters, 75% are at least 26 years old.

☐ The median age of players on both teams is 29 years.

☑ The lower quartile age of the Mighty Pucks is less than the lower quartile age of the Rink Masters.

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