NAME: _____ DATE: _____

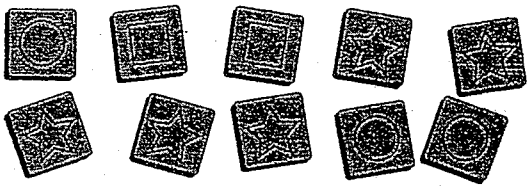
STATISTICS & PROBABILITY PERIOD: _____

Understanding Experimental Probability Versus Theoretical Probability

DO NOW:

Jada has a bag with tiles. She pulls a tile from the bag, records the shape, and then puts the tile back in the bag. She gets a star 5 times, a circle 3 times, and a square 2 times. Suppose Jada does the same experiment 100 times. What is a reasonable prediction for the number of times she will pull a tile with a star? a circle? a square?

Show your work in the space below.



1. A spinner is divided into 5 sections, lettered A to E. Kyle spins the pointer on the spinner 25 times. He records his results in the table shown at the right.

Letter	Tally	Number of Spins
A	𝍸 I	6
B	𝍸	5
C	𝍸 II	7
D	IIII	4
E	III	3

   A) Based on these results, what is the probability the pointer lands on the letter D?

   B) Based on these results, what is the probability the pointer lands on a vowel?

   C) What is the theoretical probability the pointer lands on a vowel?

2. Joan used a standard deck of 52 cards and selected a card at random. She recorded the suit of the card she picked, and then replaced the card. The results are shown in the table at the right.

Diamonds	𝍸 ||
Hearts	𝍸 ||||
Spades	𝍸 𝍸 |
Clubs	|||

A) Based on her results, what is the experimental probability of selecting a heart?

B) What is the theoretical probability of selecting a heart?

C) Based on her results, what is the experimental probability of selecting a diamond or a spade?

D) What is the theoretical probability of selecting a diamond or a spade?

3. Chip conducted a survey of the students in his classes to observe the distribution of eye color. The table below shows the results of his survey.

Eye Color	Blue	Brown	Green	Hazel
Number	12	58	2	8

A) Find the experimental probability of the distribution for each eye color.

P(blue) = _____ P(brown) = _____ P(green) = _____ P(hazel) = _____

B) Based on the survey, what is the experimental probability that a student in Chip's class has blue or green eyes?

C) If the distribution of eye color in Chip's grade is similar to the distribution in his classes, about how many of the 360 students in his grade would expect to have brown eyes?

NAME: _____ DATE: _____

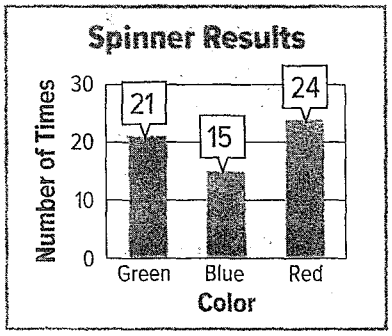
PROBABILITY PERIOD: _____

Theoretical Probability
Vs
Experimental Probability

Theoretical probability is based on what should happen. ***Experimental probability*** is what actually occurs during an experiment.

The theoretical probability and the experimental probability of an event may or may not be the same. As the number of attempts increases, the theoretical probability and the experimental probability should become closer in value.

1. The graph shows the results of an experiment in which a spinner with 3 equal sections is spun sixty times. Find the experimental probability of spinning red for this experiment.



2. Compare the experimental probability you found in Question #1 to its theoretical probability.

3. Refer to Question #1. If the spinner was spun 3 more times and landed on green each time, find the experimental probability of spinning a green for this experiment.

4. Compare the experimental probability you found in Question #3 to its theoretical probability.

5. Two number cubes are rolled together 20 times. A sum of 9 is rolled 8 times. What is the experimental probability of rolling a sum of 9?

6. Compare the experimental probability you found in Question #5 to its theoretical probability. If the probabilities are not close, explain a possible reason for the discrepancy.

7. In Question #5, what is the experimental probability of rolling a sum that is *not* 9?

8. Two coins are tossed 10 times. Both coins landed on heads 6 times. Compare the experimental probability to the theoretical probability. If the probabilities are not close, explain a possible reason for the discrepancy.

9. Last year, a DVD store sold 670 action DVDs, 580 comedy DVDs, 450 drama DVDs, and 300 horror DVDs. A media buyer expects to sell 5,000 DVDs this year. Based on these results, how many comedy DVDs should she buy? Explain.

10. A survey of Mrs. Meyer's students showed that 30 students will have pizza for lunch, 17 will have macaroni and cheese, 12 will have a hamburger, and 5 will have chicken fingers. Suppose Mrs. Meyer surveys all 1,200 students in the school. How many students can she expect to choose hamburgers for lunch?

NAME: _____ DATE: _____

PROBABILITY PERIOD: _____

Experimental Probability

1 Geoff rolled a number cube 50 times. He rolled a 1 five times. What is exp $P(1)$?

A $\frac{1}{5}$

B $\frac{1}{10}$

C $\frac{1}{25}$

D $\frac{1}{50}$

2 Peter flipped a two-sided coin 45 times and flipped heads 9 times. What is exp $P(H)$?

A $\frac{1}{45}$

B $\frac{1}{9}$

C $\frac{1}{5}$

D $\frac{1}{2}$

3 Jessica rolled a number cube 10 times. She rolled a 5 nine times. Based on this data, what is the best prediction?

A The next roll will be a 4.

B The next roll will be a 5.

C The next roll will be a 2.

D The next roll will be a 1.

4 Torri randomly selected a marble from a bowl, recorded the color as orange (O) or black (B), and replaced the marble. The list shows the results of the experiment.

O, B, B, O, O, O, B, O, B

Based on Torri's results, which statement is correct?

A exp $P(B) = \frac{1}{4}$

B exp $P(O) = \frac{5}{9}$

C It is very likely that the next marble will be black.

D exp $P(B)$ = exp $P(O)$

5 Luke flipped a two-sided coin 19 times and flipped heads 0 times. What is exp $P(T)$?

A 0

B $\frac{1}{19}$

C $\frac{1}{2}$

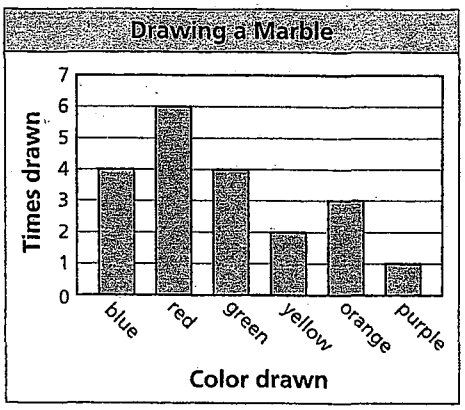
D 1

NAME: _____ DATE: _____

PROBABILITY PERIOD: _____

Finding Experimental Probability & Theoretical Probability

Use the bar graph to find the experimental probability of the event.



1. Drawing red

2. Drawing orange

3. Drawing *not* yellow

4. Drawing a color with more than 4 letters in its name

5. There are 25 students' names in a hat. You choose 5 names. Three are boys' names and two are girls' names. How many of the 25 names would you expect to be boys' names?

Use a number cube to determine the theoretical probability of the event.

6. Rolling a 2

7. Rolling a 5

8. Rolling an even number

9. Rolling a number greater than 1

NAME: KEY DATE:

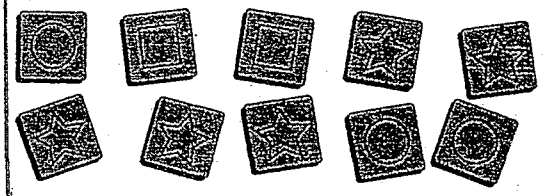
STATISTICS & PROBABILITY PERIOD:

Understanding Experimental Probability Versus Theoretical Probability

DO NOW:

Jada has a bag with tiles. She pulls a tile from the bag, records the shape, and then puts the tile back in the bag. She gets a star 5 times, a circle 3 times, and a square 2 times. Suppose Jada does the same experiment 100 times. What is a reasonable prediction for the number of times she will pull a tile with a star? a circle? a square?

Show your work in the space below.



$\left(\frac{\text{star}}{\text{total}}\right)$ $\frac{5}{10} = \frac{x}{100}$

$10x = 5(100)$

$\frac{10x}{10} = \frac{500}{10}$

$x = 50$

$\left(\frac{\text{square}}{\text{total}}\right)$ $\frac{2}{10} = \frac{x}{100}$

$10x = 2(100)$

$\frac{10x}{10} = \frac{200}{10}$

$x = 20$

$\left(\frac{\text{circle}}{\text{total}}\right)$ $\frac{3}{10} = \frac{x}{100}$

$10x = 3(100)$

$\frac{10x}{10} = \frac{300}{10}$

$x = 30$

1. A spinner is divided into 5 sections, lettered A to E. Kyle spins the pointer on the spinner 25 times. He records his results in the table shown at the right.

Letter	Tally	Number of Spins
A	𝍸 I	6
B	𝍸	5
C	𝍸 II	7
D	IIII	4
E	III	3

25 = total

A) Based on these results, what is the probability the pointer lands on the letter D?

$\text{exp } P(D) = \frac{4}{25}$

B) Based on these results, what is the probability the pointer lands on a vowel?

$\text{exp } P(\text{vowel}) = \frac{9}{25}$

C) What is the theoretical probability the pointer lands on a vowel?

$P(\text{vowel}) = \frac{2}{5}$

2. Joan used a standard deck of 52 cards and selected a card at random. She recorded the suit of the card she picked, and then replaced the card. The results are shown in the table at the right.

Diamonds	𝍸 ||	7
Hearts	𝍸 ||||	9
Spades	𝍸 𝍸 |	11
Clubs	|||	3

TOTAL = 30

A) Based on her results, what is the experimental probability of selecting a heart?

$$\text{exp } P(\text{Heart}) = \frac{9}{30} = \frac{3}{10}$$

B) What is the theoretical probability of selecting a heart?

$$P(\text{Heart}) = \frac{1}{4}$$

C) Based on her results, what is the experimental probability of selecting a diamond or a spade?

diamond + spade
7 + 11
18

$$\text{exp } P(\text{Diamond or Spade}) = \frac{18}{30} = \frac{3}{5}$$

D) What is the theoretical probability of selecting a diamond or a spade?

$$P(\text{Diamond or Spade}) = \frac{2}{4} = \frac{1}{2}$$

3. Chip conducted a survey of the students in his classes to observe the distribution of eye color. The table below shows the results of his survey.

Eye Color	Blue	Brown	Green	Hazel
Number	12	58	2	8

TOTAL = 80

A) Find the experimental probability of the distribution for each eye color.

P(blue) = $\frac{12}{80}$ = $\frac{3}{20}$ P(brown) = $\frac{58}{80}$ = $\frac{29}{40}$ P(green) = $\frac{2}{80}$ = $\frac{1}{40}$ P(hazel) = $\frac{8}{80}$ = $\frac{1}{10}$

B) Based on the survey, what is the experimental probability that a student in Chip's class has blue or green eyes?

Blue + Green

12 + 2

14

exp P(Blue or Green) = $\frac{14}{80} = \frac{7}{40}$

C) If the distribution of eye color in Chip's grade is similar to the distribution in his classes, about how many of the 360 students in his grade would expect to have brown eyes?

TOTAL

$\left(\frac{\text{Brown}}{\text{TOTAL}}\right)$ $\frac{58}{80} = \frac{x}{360}$

$80x = 58(360)$

$\frac{80x}{80} = \frac{20880}{80}$

$x = 261$

exp P(Brown) × TOTAL

$\frac{58}{80} \cdot \frac{360}{1}$

$\frac{20880}{80}$

261

NAME: KEY DATE: _____

PROBABILITY PERIOD: _____

Theoretical Probability
Vs
Experimental Probability

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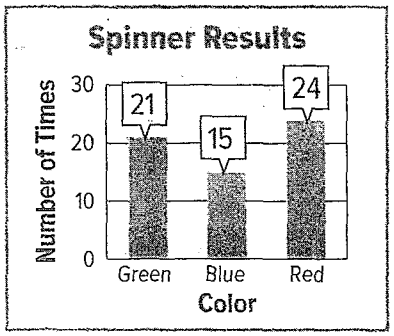
The theoretical probability and the experimental probability of an event may or may not be the same. As the number of attempts increases, the theoretical probability and the experimental probability should become closer in value.

1. The graph shows the results of an experiment in which a spinner with 3 equal sections is spun sixty times. Find the experimental probability of spinning red for this experiment.



total = 60

$$\text{exp } P(\text{red}) = \frac{24}{60} = \frac{2}{5}$$

2. Compare the experimental probability you found in Question #1 to its theoretical probability.

The spinner has 3 equal sections: red, blue, and green. So, the theoretical probability of spinning red is $\frac{1}{3}$. Since $\frac{2}{5} \approx \frac{1}{3}$, the experimental probability is close to the theoretical probability.

3. Refer to Question #1. If the spinner was spun 3 more times and landed on green each time, find the experimental probability of spinning a green for this experiment.

$$\text{exp } P(\text{Green}) = \frac{24}{63} = \frac{8}{21}$$

4. Compare the experimental probability you found in Question #3 to its theoretical probability.

The experimental probability is close to the theoretical probability since $\frac{8}{21} \approx \frac{1}{3}$.

5. Two number cubes are rolled together 20 times. A sum of 9 is rolled 8 times. What is the experimental probability of rolling a sum of 9?

$$P(\text{sum of } 9) = \frac{\#\text{ of times a sum of } 9 \text{ occurs}}{\text{total } \#\text{ of rolls}} = \frac{8}{20} = \frac{2}{5}$$

6. Compare the experimental probability you found in Question #5 to its theoretical probability. If the probabilities are not close, explain a possible reason for the discrepancy.

Rolls w/ Sum of 9

1st Cube	2nd Cube
3	6
4	5
5	4
6	3

When rolling 2 # cubes, there are 36 outcomes. The theoretical probability of rolling a sum of 9 is $\frac{4}{36} = \frac{1}{9}$. Since $\frac{1}{9}$ is not close to $\frac{2}{5}$, the experimental probability is not close to the theoretical probability. One possible explanation is that there were not enough trials.

7. In Question #5, what is the experimental probability of rolling a sum that is *not* 9?

exp P(sum of 9) $= \frac{2}{5}$

P(sum of not 9) $= \frac{3}{5}$

8. Two coins are tossed 10 times. Both coins landed on heads 6 times. Compare the experimental probability to the theoretical probability. If the probabilities are not close, explain a possible reason for the discrepancy.

9. Last year, a DVD store sold 670 action DVDs, 580 comedy DVDs, 450 drama DVDs, and 300 horror DVDs. A media buyer expects to sell 5,000 DVDs this year. Based on these results, how many comedy DVDs should she buy? Explain. TOTAL = 2,000

$\left(\frac{\text{comedy}}{\text{total}}\right)$ $\frac{580}{2000} = \frac{x}{5000}$

$2000x = 580(5000)$

$\frac{2000x}{2000} = \frac{2,900,000}{2000}$

$x = 1450$

P(comedy) × Total

$\frac{580}{2000} \cdot \frac{5000}{1}$

$\frac{2900000}{2000} = 1,450$

10. A survey of Mrs. Meyer's students showed that 30 students will have pizza for lunch, 17 will have macaroni and cheese, 12 will have a hamburger, and 5 will have chicken fingers. Suppose Mrs. Meyer surveys all 1,200 students in the school. How many students can she expect to choose hamburgers for lunch? TOTAL = 64

$\left(\frac{\text{hamburgers}}{\text{total}}\right)$ $\frac{12}{64} = \frac{x}{1200}$

$64x = 12(1200)$

$\frac{64x}{64} = \frac{14400}{64}$

$x = 225$

P(Hamburger) × Total

$\frac{12}{64} \cdot \frac{1200}{1}$

$\frac{14400}{64} = 225$

NAME: KEY

DATE: _____

PROBABILITY

PERIOD: _____

Experimental Probability

1 Geoff rolled a number cube 50 times. He rolled a 1 five times. What is exp $P(1)$?

$\frac{5}{50} = \frac{1}{10}$

A $\frac{1}{5}$

(B) $\frac{1}{10}$

C $\frac{1}{25}$

D $\frac{1}{50}$

2 Peter flipped a two-sided coin 45 times and flipped heads 9 times. What is exp $P(H)$?

$\frac{9}{45} = \frac{1}{5}$

A $\frac{1}{45}$

B $\frac{1}{9}$

(C) $\frac{1}{5}$

D $\frac{1}{2}$

3 Jessica rolled a number cube 10 times. She rolled a 5 nine times. Based on this data, what is the best prediction?

A The next roll will be a 4.

(B) The next roll will be a 5.

C The next roll will be a 2.

D The next roll will be a 1.

4 Torri randomly selected a marble from a bowl, recorded the color as orange (O) or black (B), and replaced the marble. The list shows the results of the experiment.

O, B, B, O, O, O, B, O, B TOTAL = 9

Based on Torri's results, which statement is correct?

A exp $P(B) = \frac{1}{4}$

(B) exp $P(O) = \frac{5}{9}$

C It is very likely that the next marble will be black.

D exp $P(B)$ = exp $P(O)$

5 Luke flipped a two-sided coin 19 times and flipped heads 0 times. What is exp $P(T)$?

H = 0

T = 19

A 0

B $\frac{1}{19}$

C $\frac{1}{2}$

(D) 1

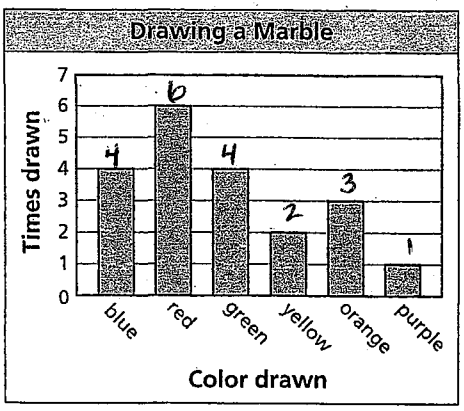
$\frac{19}{19} = 1$

NAME: _____ DATE: _____ 20/20

PROBABILITY PERIOD: _____

Finding Experimental Probability & Theoretical Probability

Use the bar graph to find the experimental probability of the event.



1 TOTAL = 20

1. Drawing red

$\frac{6}{20} = \frac{3}{10}$

2. Drawing orange

$\frac{3}{20}$

3. Drawing *not* yellow

$\frac{18}{20} = \frac{9}{10}$

4. Drawing a color with more than 4 letters in its name

$\frac{10}{20} = \frac{1}{2}$

5. There are 25 students' names in a hat. You choose 5 names. Three are boys' names and two are girls' names. How many of the 25 names would you expect to be boys' names?

$\frac{3}{5} \overset{\times 5}{=} \frac{n}{25}$ ($\times 5$)

15 boys

Use a number cube to determine the theoretical probability of the event.

6. Rolling a 2

$\frac{1}{6}$

7. Rolling a 5

$\frac{1}{6}$

8. Rolling an even number

$\frac{1}{2}$

9. Rolling a number greater than 1

$\frac{5}{6}$