

Unit 8

Lesson 5

Theoretical vs Experimental

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Unit 9 – Probability

Date _____

Pd _____

Lesson 5 → Theoretical vs. Experimental Probability

Theoretical Probability is what should happen in an ideal situation. $P(E) = \frac{\text{\# of favorable outcomes}}{\text{total \# of possible outcomes}}$

- What is expected to happen
- $P(\text{Tossing a coin and getting a head}) = \frac{1}{2}$

Experimental Probability is what actually happens when you do an experiment. $P(E) = \frac{\text{\# of times event occur}}{\text{total \# of trials}}$

- Result of an experiment or a survey
- Tossing a coin 10 times and recording 3 heads and 7 tails:

$$P(\text{Getting a head}) = \frac{3}{10}$$

$$P(\text{Getting a tail}) = \frac{7}{10}$$

Examples:

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- 1) A baseball collector checked 350 cards in a case on the shelf and found that 85 of them were damaged. Find the **experimental probability** of the cards being damaged.

$$85/350 \approx 24\%$$

- 2) Jimmy rolls a die 30 times. He records that the number 6 was rolled 9 times.

A. According to Jimmy's records, what is the **experimental probability** of rolling a 6?

$$9/30$$

B. What is the **theoretical probability** of rolling a 6?

$$1/6$$

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3) Antonia has 9 pairs (18) of white socks and 7 pairs (14) of black socks. Without looking, she pulls a black sock from the drawer. What is the probability that the next sock she pulls out will also be black?

~~$\frac{14}{32}$~~ $\frac{13}{31}$

4) Lenny tosses a nickel 50 times. It lands heads up 32 times and tails 18 times.

A. What is the **experimental** probability that the nickel lands tails?

$\frac{18}{50}$

B. What is the **theoretical** probability of a nickel landing on tails?

$\frac{1}{2}$ 50%

$\frac{25}{50}$

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5) Amanda 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 in the table below.

Diamonds	
Hearts	
Spades	
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?

$9/30 = 30\%$

$13/52 = 1/4 = 25\%$

$18/30 = 60\%$

$26/52 = 50\%$

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6) Dale conducted a survey of the students in his classes to observe the distribution of eye color. The table shows the results of his survey.

Eye color	Blue	Brown	Green	Hazel
Number	12	58	2	8

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

$P(\text{blue}) = \frac{12}{80}$
 $P(\text{brown}) = \frac{58}{80}$
 $P(\text{green}) = \frac{2}{80}$
 $P(\text{hazel}) = \frac{8}{80}$

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

$\frac{14}{80}$ 17.5%

C. Based on the survey, what is the **experimental** probability that a student in Dale's class does not have green or hazel eyes?

$1 - (\frac{10}{80}) = \frac{70}{80}$ 87.5%

D. If the distribution of eye color in Dale's grade is similar to the distribution in his classes, about how many of the 360 students in his grade would be expected to have brown eyes?

$(\frac{58}{80})(360) = 261$

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