

1. Define **PROBABILITY EXPERIMENT**: This is a chance process or situation that leads to well-defined results called outcomes.
2. Define **OUTCOME**: An outcome is the result of a single trial of a probability experiment.
3. Define **SAMPLE SPACE**: Sample space is the set of all possible outcomes of a probability experiment.
4. Define **EVENT**: An event consists of a set of outcomes of a probability experiment.
5. What is the difference between **Empirical Probability**, **Theoretical (Classical) Probability**, and **Subjective Probability**?
Empirical probability is the ratio of the number of successful trials divided by the total number of trials. Theoretical probability is the number of successful possible outcomes divided by the number of total possible outcomes (assuming each outcome is equally likely). Subjective probability is a professional's estimate of the chance of an outcome occurring.
6. What does the **LAW of LARGE NUMBERS** suggest? The law of large numbers suggests that as more and more trials of a probability experiment are attempted the closer the more likely the empirical probability will match the theoretical probability.

Determine whether each of the following are **EMPIRICAL**, **THEORETICAL**, or **SUBJECTIVE** probability & determine the probability.

1. What is the probability of rolling a standard six sided number cube to a number with 4 letters in the spelling of that number?

Circle one of the following:

☒ Theoretical ☐ Empirical ☐ Subjective

ONE
TWO
THREE
FOUR
FIVE
SIX

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

Decimal: 0.333

Percent: 33.3%

2. Janice attempted to shoot 34 free throws with a basketball. She made 19 of the free throws. Based on those results what would you estimate the probability to be that she makes the next free throw?

Circle one of the following:

☐ Theoretical ☒ Empirical ☐ Subjective

Fraction: $\frac{19}{34}$

Decimal: ≈ 0.559

Percent: 55.9%

3. A weather forecaster suggests that there is a 40% chance of snow and ice on the next day.

Circle one of the following:

☐ Theoretical ☐ Empirical ☒ Subjective

Fraction: $\frac{40}{100} = \frac{4}{10} = \frac{2}{5}$

Decimal: 0.4

Percent: 40%

4. A person has 5 coins in their pocket. A dime, 2 pennies, a quarter, and a nickel. If a person randomly picks one coin out of their pocket. What would the probability be that they get a penny?

Circle one of the following:

☒ Theoretical ☐ Empirical ☐ Subjective

D, P, P, Q, N

Fraction: $\frac{2}{5}$

Decimal: 0.4

Percent: 40%

5. Define **Complement** of an event: The complement of an event is everything in the sample space except the original event.
6. What is the **Complement** of drawing a "numbered" card from a standard deck of shuffled cards? Drawing a lettered card.

CLASSIC PROBABILITY

7. What is the probability of flipping a coin and having it land on "Tails"? (write your answer in fractional form, decimal form, and as a percentage)

T, H

Fraction: $\frac{1}{2}$	Decimal: 0.5	Percent: 50%
-------------------------	--------------	--------------

8. What is the probability of drawing an odd numbered card from a standard deck of shuffled cards?

$$\frac{16}{52}$$

$$16/52 = .3076923077$$

Decimal: $\approx .3077$

9. A person has 20 Rap songs, 15 R&B songs, 20 Alternative songs, 12 Pop songs, 5 Country songs, and 18 Hip Hop songs stored on an MP3 player (a total of 90 songs). If the person set the MP3 player to random shuffle, what is the probability of the first song being played being a Country song?

$$\frac{5}{90}$$

$$5/90$$

$$.0555555556$$

Decimal: $\approx .0556$

10. A radio station is having a contest in which a random date is announced during a non-leap year. If the announcer announces a date that matches with your birthday, you can call in and win a prize. What is the probability that the announcer will pick a date in January (assuming all days are equally likely to be selected)?

31 DAYS IN JAN

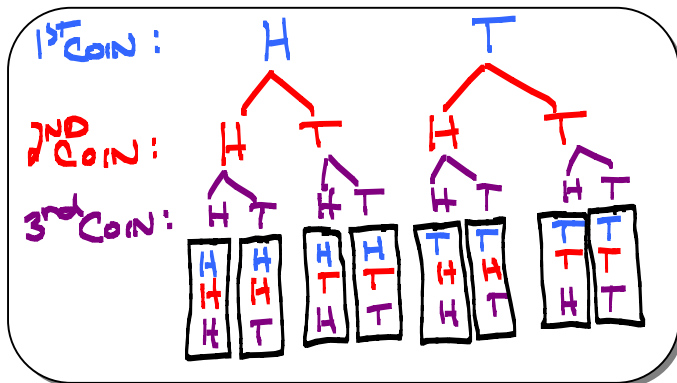
365 DAYS

$$\frac{31}{365}$$

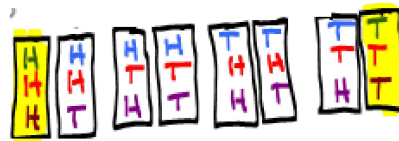
$$31/365 = .0849315068$$

Decimal: $\approx .0849$

11. Create a TREE DIAGRAM showing all of the possible outcomes of flipping three coins.



12. What is the probability of flipping 3 coins and having them all land on the same side (i.e. H,H,H or T,T,T)?



Fraction: $\frac{2}{8} = \frac{1}{4}$

13. What is the probability of flipping 3 coins and having exactly two of them land on tails?



Fraction: $\frac{3}{8} = \frac{3}{8}$

GEOMETRIC and CONTINUOUS PROBABILITIES

14. A repairman is scheduled to stop by a customer's house between 3pm and 5pm. The customer got stopped in traffic and wasn't able to arrive home until 3:30pm. If the repairman is equally likely to get to the customer's home anytime in the scheduled appointment time, what is the probability that the customer will still meet the repairman for the appointment?

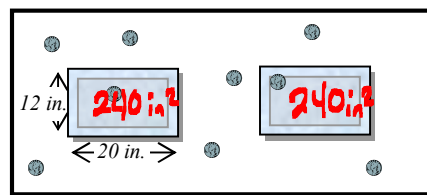
$$\frac{90 \text{ MIN}}{120 \text{ MIN}}$$

$$5 - 3:30 = 1.5 \text{ HOURS}$$

$$5 - 3 = 2 \text{ HRS}$$

Decimal: $\frac{1.5}{2} = 0.75$

15. At an amusement park they allow attendants to try and throw a quarter onto one of two rectangular glass plates from a distance. The glass plates are sitting on a rectangular table. If the quarter is returned to the thrower if it misses the table and we are assuming it equally likely to land anywhere on the table, then what is the probability of landing the quarter somewhere on one of the two glass plates?



AREA PLATE = $l \cdot w = 24 \cdot 12 = 240 \text{ in}^2$
AREA TABLE = $l \cdot w = (72)(36) = 2592 \text{ in}^2$

$$\frac{240 + 240}{2592} = \frac{480}{2592} \approx 0.1852$$

$$\frac{480}{2592} = .1851851852$$

16. A soldier is parachute training. He jumps out of plane high enough that the pilot determines the soldier will land somewhere in an 240 foot radius land zone. The pilot forgot to mention to the soldier that the parachute has very little maneuverability (no steering) and there are 30 trees in the landing zone. Each tree from the air practically outlines a circle with a radius of 8 feet. What is the geometric probability that the soldier will land in a tree?

$$\text{Area of Circle} = \pi r^2$$

$$\frac{6030}{180956} \approx$$

Decimal: 0.0333

AREA TREE = πr^2
= $\pi \cdot 8^2$
= 201 ft^2

AREA OF 30 TREES = $30 \cdot 201 = 6030 \text{ ft}^2$

AREA LANDING ZONE = πr^2
= $\pi (240)^2 \approx 180956 \text{ ft}^2$

