

Probability and Statistics

SECONDARY MATH II NOTES

{ INTR }

Important Definitions:

Experiment: process with a measurable outcome ex) rolling a die, picking a card

Event- certain outcome in an experiment ex) rolling a 6

Outcome- result in experiment

Sample Space- all possible outcomes in experiment

Probability- the chance/likelihood of an event happening in an experiment, can be written as percents, decimals, or fractions.

$$P(A) = \frac{\# \text{ of ways } A \text{ can happen}}{\# \text{ of all possible outcomes}}$$

Combined/joint probability- the probability of two events

Conditional probability- the probability of an event based on another probability that already occurred

Independent probability- one probability does not affect the outcome of another (with replacement)

Dependent probability- one probability does affect the outcome of another (without replacement)

Marginal frequency- totals in a specific category

Examples:

A jar contains 60 equal sized marbles, of which 35 are white and 25 are black. You take one from the jar without looking.

(a) List all of the possible outcomes. 1 black or 1 white

(b) What is the probability of picking a black marble? $P(\text{black}) = \frac{25}{60} = \frac{5}{12} = 0.417$

(c) What is the probability of picking a red marble? $P(\text{red}) = \frac{0}{60} = 0$

What is the probability that a card drawn from a pack of cards(normal playing cards) will be:

(a) a red card $P(\text{red}) = \frac{26}{52} = \frac{1}{2} = 0.5$

(b) a picture card $P(\text{picture}) = \frac{12}{52} = \frac{3}{13} = 0.23$

(c) an ace $P(\text{ace}) = \frac{4}{52} = \frac{1}{13} = 0.08$

John bought 10 tickets in a raffle in which 500 tickets were sold. What is the probability that he will win the prize? Give your answer in decimals. $P(\text{winning}) = \frac{10}{500} = \frac{1}{50} = 0.02$

A small packet of smarties has 5 yellow, 6 red, 5 green, 6 brown and 3 blue smarties. What is the probability of picking a blue one? Give your answer as a percentage. $P(\text{blue}) = \frac{3}{25} = 0.12 = 12\%$

What is the probability of picking a red one? Give your answer as a percentage

$$P(\text{red}) = \frac{6}{25} = 0.24 = 24\%$$

A positive integer less than 100 is randomly selected. What is the probability that the integer is odd?

$$P(\text{odd}) = \frac{50}{99} = 0.505$$

What is the probability that the integer is even? $P(\text{even}) = \frac{49}{99} = 0.494$

There are four green blocks and four red blocks in a bag. Two blocks are selected at random. What is the probability that they are both red? $P(\text{both red}) = \frac{1}{2} \cdot \frac{3}{7} = \frac{3}{14} = 0.214$

Using a standard deck of cards: 52 cards in four suits, 13 in each suit: A 2 3 4 5 6 7 8 9 10 J Q K.

1. What is the probability of selecting a heart from a shuffled deck of cards? $P(\text{heart}) = \frac{13}{52} = \frac{1}{4} = 0.25$

2. What is the probability of selecting two cards from different suits (with replacement)?

$$P(\text{two suits}) = \frac{52}{52} \cdot \frac{39}{52} = \frac{3}{4} = 0.75$$

3. You are dealt two card from a shuffled deck. What is the probability of getting two face cards?

$$P(\text{two face}) = \frac{12}{52} \cdot \frac{11}{51} = \frac{132}{2652} = 0.05$$

4. What is the probability of selecting an Ace from the deck, keeping it, then selecting a spade? (There are multiple cases to consider: remember, the ace could be a spade.)

$$P(\text{ace, spade}) = \frac{1}{4} \cdot \frac{13}{51} = 0.063 \text{ or } \frac{1}{4} \cdot \frac{12}{51} = 0.059$$

A fair coin is tossed 100 times, landing 59 times on tails, and 41 times on heads. What is the probability that the next flip will be tails? $P(\text{tails}) = \frac{1}{2} = 0.5$

You roll a pair of dice, one is red and the other is green. What is the probability of rolling a 5 on the red die and an even number on the green one? $P(5, \text{even}) = \frac{1}{6} \cdot \frac{3}{6} = \frac{3}{36} = 0.083$

All of the arrangements of the letters in the word ALGEBRA are written on a list, and one of the arrangements is selected at random. What is the probability that the selected arrangement contains a double-A? $P(\text{double A}) = \frac{120}{5040} = 0.024$

The two-way frequency table, shown below, displays the data collected from a random group of high school students regarding whether they "liked" skateboards and/or "liked" snowmobiles. Answer the questions below, regarding this table.

	Like Skateboards	Do Not Like Skateboards	Totals
Like Snowmobiles	80	25	105
Do not like Snowmobiles	45	10	55
Totals	125	35	160

Find these probabilities:

How many students participated in the survey? 160

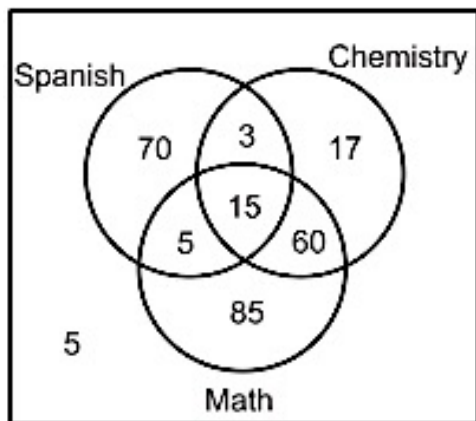
How many students said they "like" snowmobiles? 105

Which of the following values is referred to as a "marginal frequency"? 125, 35, 105, 55

How many of the students "like" snowmobiles, but "do not like" skateboards? 25

How many students said they "do not like" skateboards? 35

In a class of 260 seniors, a Venn Diagram was created to display the number of students enrolled Spanish, Chemistry, and/or Math.



Find these probabilities:

How many students take Spanish and Chemistry? 18

How many students take Spanish and Math? 20

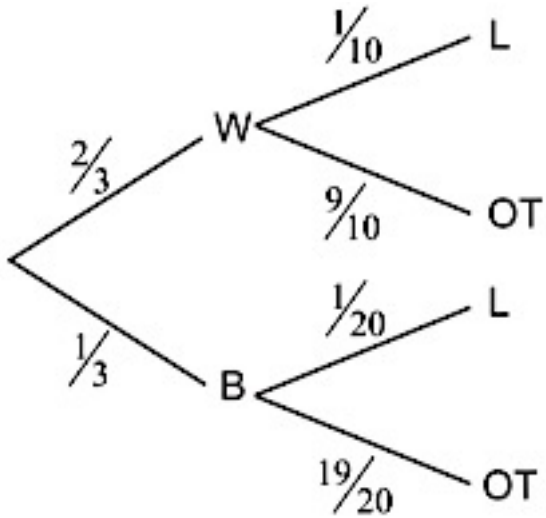
How many students are enrolled in Chemistry? 95

How many students are taking all three classes? 15

How many students aren't taking any of the three classes? 5

How many students are enrolled in Spanish but not Chemistry? 75

Sarah either walks or rides the bus to school. When she walks she is more likely to be late to school than when she rides the bus. The following tree diagram models the data from 60 days of school:



How often did Sarah walk to school? 40

When Sarah bused to school, how often was she on time to class? 19

Find these probabilities: