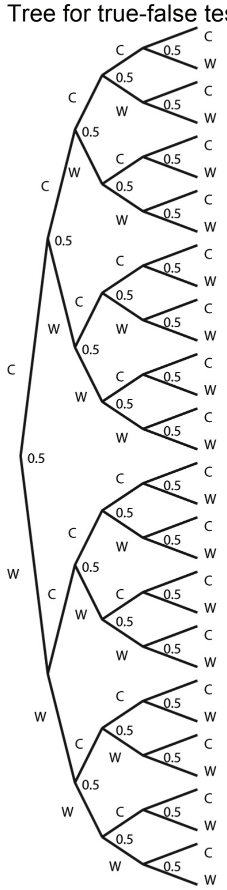
$P(\text{at least 3 correct answers})$

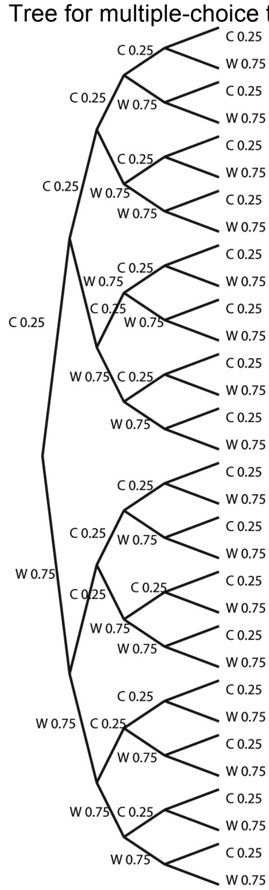
$$= \left(\frac{1}{4}\right)^5 + 5\left(\frac{1}{4}\right)^4 \cdot \left(\frac{3}{4}\right) + 10\left(\frac{1}{4}\right)^3 \cdot \left(\frac{3}{4}\right)^2$$
$$= \frac{1}{1024} + \frac{15}{1024} + \frac{90}{1024}$$
$$= \frac{106}{1024}$$
$$= \frac{53}{512} \text{ or } 0.1035...$$

The probability of passing the multiple-choice test is $\frac{53}{512}$ or about 0.1035.

Tree for true-false test



Tree for multiple-choice test



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The group found that the experiment of drawing one ball at a time was the most productive. This is because when two balls are drawn at once, conditional probability exists, which can be hard to deal with.
The best way to make the conjecture more reliable is to increase the number of trials. When this is done, the experimental probability slowly begins to act more like the theoretical probability.
However, there is no type of experiment that can guarantee a correct conjecture. This is because theoretical probability is just that; theoretical. This probability is only guaranteed to work after millions or possibly billions of trials, or continuous trials.

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1. Outcome Table

	Tile 1						
Tile 2	**SUM**	**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

$P(\text{odd sum}) = \frac{18}{36}$ $P(\text{even sum}) = \frac{18}{36}$

$P(\text{odd sum}) = \frac{1}{2}$ $P(\text{even sum}) = \frac{1}{2}$

Yes, e.g., The probabilities of winning are equal.

2. Let A represent an Inuit person being able to converse in at least two Aboriginal languages.

$P(A) = \frac{7}{7+3}$

$P(A) = \frac{7}{10}$

The probability that an Inuit person can converse in at least two Aboriginal languages is $\frac{7}{10}$, 0.7 or 70%.

3. Let A represent a passcode with 3 different even digits, and let O represent all 3-digit passcodes. There are 5 different possibilities for even digits: 0, 2,4,6, and 8. Since these numbers cannot be repeated, the total number of passcodes using 3 different even digits is equal to ${}_5P_3$.

$$n(A) = {}_5P_3$$
$$n(A) = \frac{5!}{(5-3)!}$$
$$n(A) = \frac{5!}{2!}$$
$$n(A) = \frac{5 \cdot 4 \cdot 3 \cdot 2!}{2!}$$
$$n(A) = 5 \cdot 4 \cdot 3$$
$$n(A) = 60$$

The number of 3 digit passcodes is 10^3, or 1000, because there are 10 possible digits to use in 3 spaces, and repeating is allowed.

$$P(A) = \frac{n(A)}{n(O)}$$
$$P(A) = \frac{60}{1000}$$
$$P(A) = \frac{3}{50}$$

The probability that Braydon's passcode is made up of three different even digits is $\frac{3}{50}$, 0.06 or 6%.

4. Let A represent a hand containing 4 hearts and 4 spades, and let O represent all 8-card hands. There are 13 hearts and 13 spades in a standard deck. Therefore, the total number of hands that contain 4 hearts and 4 spades is ${}_{13}C_4 \cdot {}_{13}C_4$, or $({}_{13}C_4)^2$.

$$n(A) = \left({}_{13}C_4\right)^2$$
$$n(A) = \left(\frac{13!}{(13-4)! \cdot 4!}\right)^2$$
$$n(A) = \left(\frac{13!}{9! \cdot 4!}\right)^2$$
$$n(A) = \left(\frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9!}{9! \cdot 4 \cdot 3 \cdot 2 \cdot 1}\right)^2$$
$$n(A) = \left(\frac{13 \cdot 12 \cdot 11 \cdot 10}{4 \cdot 3 \cdot 2}\right)^2$$
$$n(A) = \left(5 \cdot 11 \cdot 13\right)^2$$
$$n(A) = 5^2 \cdot 11^2 \cdot 13^2$$

The total number of 8-card hands is ${}_{52}C_8$.

$$n(O) = {}_{52}C_8$$
$$n(O) = \frac{52!}{(52-8)! \cdot 8!}$$
$$n(O) = \frac{52!}{44! \cdot 8!}$$
$$n(O) = \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 \cdot 47 \cdot 46 \cdot 45 \cdot 44!}{44! \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$$
$$n(O) = \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 \cdot 47 \cdot 46 \cdot 45}{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2}$$
$$n(O) = \frac{48}{8 \cdot 6} \cdot \frac{49}{7} \cdot \frac{50}{5} \cdot \frac{52}{4} \cdot \frac{51}{3} \cdot \frac{46}{2} \cdot 45 \cdot 47$$
$$n(O) = 7 \cdot 10 \cdot 13 \cdot 17 \cdot 23 \cdot 45 \cdot 47$$

Now determine the probability:

$$P(A) = \frac{n(A)}{n(O)}$$
$$P(A) = \frac{5^2 \cdot 11^2 \cdot 13^2}{7 \cdot 10 \cdot 13 \cdot 17 \cdot 23 \cdot 45 \cdot 47}$$
$$P(A) = \frac{11^2 \cdot 13}{2 \cdot 7 \cdot 9 \cdot 17 \cdot 23 \cdot 47}$$
$$P(A) = \frac{1573}{2\ 315\ 502}$$

The probability that a hand consists of 4 hearts and 4 spades is $\frac{1573}{2315502}$ or about 0.000 679.

5. $P(\text{truck or yo-yo}) = \frac{10}{50}$

$P(\text{truck or yo-yo}) = \frac{1}{5}$

$P(\text{truck or yo-yo}) = 0.2$

The probability that Kaylee will win either a toy truck or a yo-yo is 0.2, or 20%.

6. These events are independent.
Let A represent Hans flipping a coin on heads, and let B represent Hans drawing an 8.

$$P(A) = \frac{1}{2}$$
$$P(B) = \frac{4}{52}$$
$$P(B) = \frac{1}{13}$$
$$P(A \cap B) = P(A) \cdot P(B)$$
$$P(A \cap B) = \frac{1}{2} \cdot \frac{1}{13}$$
$$P(A \cap B) = \frac{1}{26}$$

The probability that Hans will flip a head and draw an 8 is $\frac{1}{26}$, or about 0.0385 or 3.85%.

7. Let F represent making a free throw.
a) $P(F) = 0.7$
$P(F \cap F) = 0.7 \cdot 0.7$
$P(F \cap F) = 0.49$
The probability Jarrod will make both shots is 0.49, or 49%.

b) $P(F') = 0.3$
$P(F' \cap F') = 0.3 \cdot 0.3$
$P(F' \cap F') = 0.09$
The probability Jarrod will make both shots is 0.09, or 9%.
c) In this case, there are only 3 possibilities. These are make both shots, make one shot, and make neither shot.
Let O represent Jarrod making exactly one shot.
$P(O) = 100\% - P(F \cap F) - P(F' \cap F')$
$P(O) = 100\% - 49\% - 9\%$
$P(O) = 42\%$
The probability Jarrod will make one shot is 0.42 or 42%.
d) Let A represent Jarrod making at least one shot.
$P(A) = 100\% - P(F' \cap F')$
$P(A) = 100\% - 9\%$
$P(A) = 91\%$
The probability Jarrod will make at least one shot is 0.91 or 91%

8. Let H represent two hearts being drawn from the deck, and let O represent all possible drawings. There are 6 hearts in every euchre deck. Therefore, the number of ways to draw two hearts from a Euchre deck is ${}_6C_2$.

$$n(H) = {}_6C_2$$
$$n(H) = \frac{6!}{(6-2)! \cdot 2!}$$
$$n(H) = \frac{6!}{4! \cdot 2!}$$
$$n(H) = \frac{6 \cdot 5 \cdot 4!}{4! \cdot 2 \cdot 1}$$
$$n(H) = \frac{6 \cdot 5}{2}$$
$$n(H) = 15$$

The number of ways to draw 2 cards from a Euchre deck is ${}_{24}C_2$.

$$n(O) = {}_{24}C_2$$
$$n(O) = \frac{24!}{(24-2)! \cdot 2!}$$
$$n(O) = \frac{24!}{22! \cdot 2!}$$
$$n(O) = \frac{24 \cdot 23 \cdot 22!}{22! \cdot 2 \cdot 1}$$
$$n(O) = \frac{24 \cdot 23}{2}$$
$$n(O) = 276$$

Now determine the probability.

$$P(H) = \frac{n(H)}{n(O)}$$
$$P(H) = \frac{15}{276}$$
$$P(H) = \frac{5}{92}$$

The probability that George draws two hearts is $\frac{5}{92}$, or about 0.0543 or 5.43%.

9. Let S represent a set alarm clock, and let N represent an alarm clock that is not set. Let L represent Miguel being late.

$$P(S \cap L) = P(S) \cdot P(L|S)$$
$$P(S \cap L) = 0.72 \cdot 0.10$$
$$P(S \cap L) = 0.072$$
$$P(N \cap L) = P(N) \cdot P(L|N)$$
$$P(N \cap L) = 0.28 \cdot 0.70$$
$$P(N \cap L) = 0.196$$
$$P(L) = 0.072 + 0.196$$
$$P(L) = 0.268$$
$$P(S|L) = \frac{P(S \cap L)}{P(L)}$$
$$P(S|L) = \frac{0.072}{0.268}$$
$$P(S|L) = 26.865...\%$$

The probability that Miguel remembered to set his alarm is about 0.269 or 26.9%.

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1. a) Outcome Table

Coin Flips	Winner
HHHH	Chloe
HHHT	Tie
HHTH	Tie
HHTT	Camila
HTHH	Tie
HTHT	Camila
HTTH	Camila
HTTT	Tie
THHH	Tie
THHT	Camila
THTH	Camila
THTT	Tie
TTHH	Camila
TTHT	Tie
TTTH	Tie
TTTT	Chloe

$$P(\text{Chloe wins}) = \frac{2}{16}$$
$$P(\text{Chloe wins}) = \frac{1}{8}$$
$$P(\text{Camila wins}) = \frac{6}{16}$$
$$P(\text{Camila wins}) = \frac{3}{8}$$

This game is not fair, e.g., Camila has a better chance of winning.