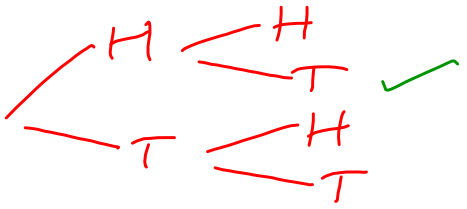
Solutions

1. A fair coin is flipped twice. What is the probability that it will come up heads followed by tails?

A 0 B $\frac{1}{8}$ C $\frac{1}{4}$ D $\frac{1}{2}$



$= \frac{1}{4} \Rightarrow C$

2. Hanna forgot to study for her math quiz. In the multiple-choice section there are two questions, each with four answer choices. If Hanna randomly guesses the answer to both questions, what is the probability that she will get them both correct?

A 0% B 6.25% C 12.5% D 25%

$P(\text{Both}) = P(1^{ST}) \times P(2^{ND})$

$= \frac{1}{4} \times \frac{1}{4}$

$= \frac{1}{16} = 6.25\% \Rightarrow B$

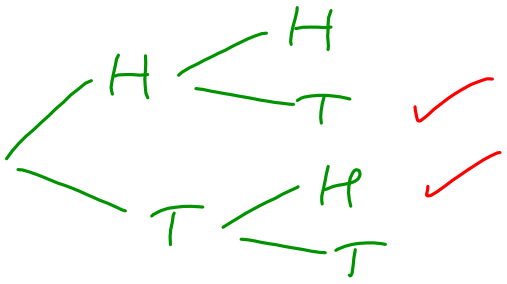
3. A fair coin is flipped twice. What is the probability that it will come up once heads and once tails, in either order?

A 0

B $\frac{1}{8}$

C $\frac{1}{4}$

D $\frac{1}{2}$



$= \frac{2}{4}$

$= \frac{1}{2} \Rightarrow D$

4. Two green tiles, one red tile, and a blue tile are put into a paper bag.

a) What is the probability that a green tile is drawn, followed by a blue tile, assuming the first tile is replaced before the second tile is drawn?

b) How does the answer to part a) change if the first tile drawn is not replaced?

c) Explain why these answers are different.

2 Green
1 Red
1 Blue
Total = 4 tiles

a) $P(GB) = P(G) \times P(B)$

$= \frac{2}{4} \times \frac{1}{4}$

$= \frac{2}{16} = \frac{1}{8}$

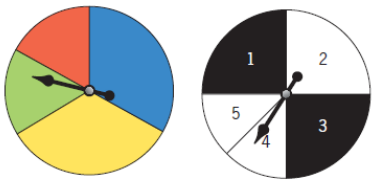
b) $P(GB) = P(G) \times P(B|G)$

$= \frac{2}{4} \times \frac{1}{3}$

$= \frac{2}{12} = \frac{1}{6}$

c) The events in (b) are dependent, so the probability changes with one less tile in the bag.

5. **Thinking** Crazy Spinners is a game in which the two spinners below are spun at the same time.



a) Player A wins a point if the result is Red-1. Player B wins a point if the result is Blue-4. Is this a fair game? Explain.

b) **Open Question** Change the rules so that this game is almost but not quite fair.

$P(\text{Red}) = \frac{1}{6}$ $P(\text{Green}) = \frac{1}{6}$
$P(\text{Blue}) = \frac{1}{3}$ $P(\text{Yellow}) = \frac{1}{3}$
$P(1) = \frac{1}{4}$ $P(2) = \frac{1}{4}$
$P(3) = \frac{1}{4}$ $P(4) = \frac{1}{8}$
$P(5) = \frac{1}{8}$

a) $P(\text{Red}, 1) = P(\text{Red}) \times P(1)$
$= \frac{1}{6} \times \frac{1}{4}$
$= \frac{1}{24}$

$P(\text{Blue}, 4) = P(\text{Blue}) \times P(4)$
$= \frac{1}{3} \times \frac{1}{8}$
$= \frac{1}{24}$

Yes, it is a fair game because the probabilities are equal.

b) A gets a point if Red, 1
B gets a point if Green/Blue, 4

$P(\text{Red}, 1) = \frac{1}{24}$
$= 4.2\%$

$P(\text{G or B}, 4)$
$= \frac{1}{2} \times \frac{1}{8}$
$= \frac{1}{16}$
$= 6.25\%$

6. Kevin works in car sales. Over a period of time he spoke with 400 customers. The experimental probability of a customer going for a test drive was 20%. If a customer went for a test drive, there was a 5% conditional probability that Kevin made a sale. Assuming that Kevin did not make a sale if there was no test drive, how many sales did Kevin make over this time period?

$P(\text{Sale}) = P(TD) \times P(S|TD)$
$= 0.20 \times 0.05$
$= 0.01$

$\#\text{Sales} = \#\text{ of customers} \times P(\text{sale})$
$= 400 \times 0.01$
$= 4 \text{ sales}$

7. **Application** While playing an online adventure game, Briony finds herself lost in the Maze of Misfortune, as shown below:

Briony is being pursued and has no time to second-guess any of her path decisions.

a) Assuming she has no knowledge of the maze, what is the probability that Briony will successfully escape the Maze of Misfortune?

b) What is the conditional probability that Briony will successfully navigate the maze given that she makes
- her first path decision correctly?
- her first two path decisions correctly?

a) Has to make 4 correct decisions

$P(4 \text{ correct}) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$= \frac{1}{16}$

b) $P(4 \text{ correct} \mid 1^{ST} \text{ correct}) = P(\text{last 3 correct}) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

$P(4 \text{ correct} \mid 1^{ST} \text{ and } 2^{ND} \text{ correct}) = P(\text{last 2 correct}) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

8. Refer to Rolly's James Bond movie collection from page 37.

Actor	Number of Movies
Sean Connery	6
George Lazenby	1
Roger Moore	7
Timothy Dalton	2
Pierce Brosnan	4
Daniel Craig	2

Suppose Rolly randomly picks a movie to watch, and then randomly picks a second movie without putting the first movie back on the shelf. Determine the probability of each of the following scenarios:

a) Rolly will watch a Connery movie followed by a Moore movie.

b) Rolly will watch two consecutive Dalton movies.

c) Rolly will watch three consecutive Craig movies.

a) $P(Co, M) = P(Co) \times P(M \mid Co)$

$= \frac{6}{22} \times \frac{7}{21}$

$= \frac{3}{11} \times \frac{1}{3}$

$= \frac{1}{11}$ (9.09%)

b) $P(D, D) = P(D) \times P(D \mid D)$

$= \frac{2}{22} \times \frac{1}{21}$

$= \frac{1}{231}$ (0.0043%)

c) $P(Cr, Cr, Cr)$

$\Rightarrow$ IMPOSSIBLE as Rolly only has two Craig movies