§16.3 Probabilities of Compound Events.

Tossing a Coin three times: $\underset{1st}{2} \cdot \underset{2nd}{2} \cdot \underset{3rd}{2} = 8$ total outcomes.

*Rolling two dice: $6 * 6 = 36$ total outcomes.

Spinning a 4 section spinner twice: $4 * 4 = 16$ total outcomes

Pg 739.

#1

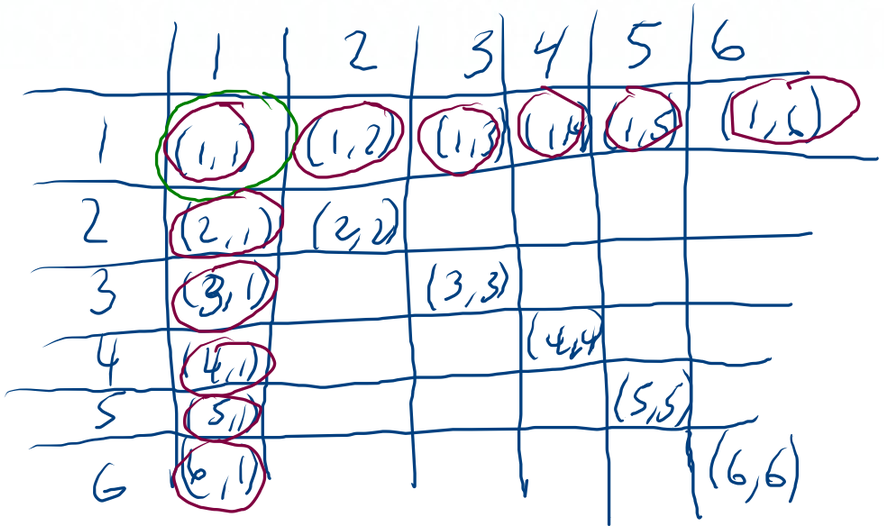
1. Consider the experiment of rolling a number cube 2 times.

a. Determine the probability of getting a 1 on both rolls of the number cube. Explain your answer.

$$P(\{1,1\}) = \frac{\#\text{ of times shaPening}}{\text{total \# of outcomes}} = \frac{1}{36}$$

b. Determine the probability of getting a 1 on either the first or the second roll of the number cube. Explain your answer.

$$P(1 \text{ on } 1^{st} \text{ or } 2^{nd}) = \frac{11}{36}.$$



Pg 739

3. Suppose you have 3 marbles in a bag, 1 red and 2 green. If you reach into the bag without looking and randomly pick out 2 marbles at once, what is the probability that both of the marbles you pick will be green?

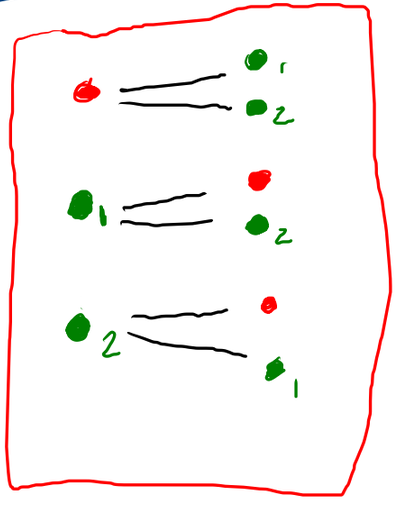
With replacement

You are allowed to put the marble back after the first pick.

and

without replacement:

You are not allowed to put the marble back in the bag after first pick.

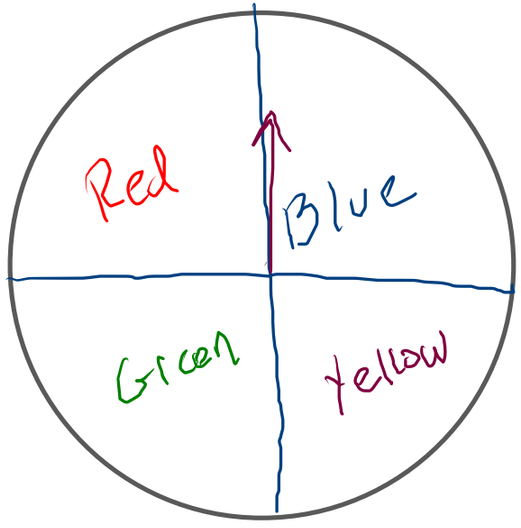


$3 \cdot 2 = 6$ total outcomes

$P(2G) = \frac{2}{6} = \frac{1}{3}$

P 741

#2 A children's game has a spinner that is equally likely to land on any 1 of 4 colors: red, blue, yellow, or green. Determine the probability of spinning a red at least once on 2 spins. Explain your reasoning.



$4 \cdot 4 = 16$

	R	B	G	Y
R	RR	RB	RG	RY
B	BR	BB	BG	BY
G	GR	GB	GG	GY
Y	YR	YB	YG	YY

P (Red at least once)

$= \frac{7}{16}$ ✓

§16.4 Fraction Arithmetic to find Probabilities.

The "OR" rule of Probability

If they're several outcomes of an experiment that cannot occur simultaneously, the prob. that either one of these outcomes will occur is the Sum of their Prob.

$$P(A \text{ or } B) = P(A) + P(B)$$

Ex] From a single die, what's the Prob of rolling a 2 or 5?

$\{1, 2, 3, 4, 5, 6\}$, $P(2 \text{ or } 5) = P(2) + P(5) = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \boxed{\frac{1}{3}}$.

Rolling 3 or 2 or 5

$\frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{3}{6} = \boxed{\frac{1}{2}}$

The "AND" Rule of Probability

If events A and B are independent of each other, the probability that both events will occur is the Product of their Probability.

$$P(A \text{ and } B) = P(A)\,P(B)$$

where independence is where one event does not rely on one another.

Ex • Spinning a Spinner twice.

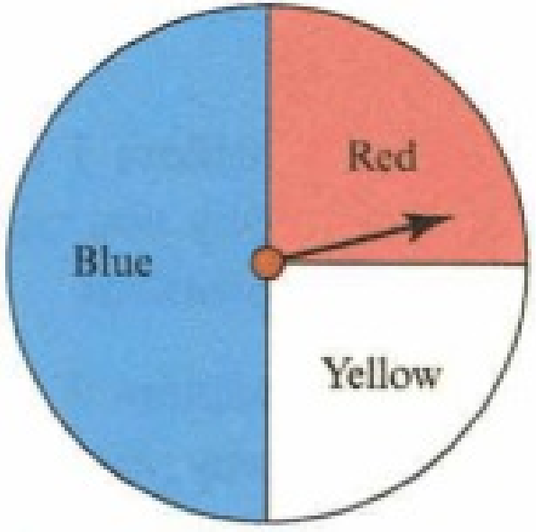
• Two Rolls of a die.

#1
p 747.

What is the probability of spinning a yellow followed by a blue in 2 spins on the spinner in Figure 16.21? Explain how to solve this problem with fraction multiplication, and explain why this method makes sense.

AND

Followed by
↳ AND



$P(B) = \frac{1}{2}$

$P(R) = \frac{1}{4}$

$P(Y) = 1/4$

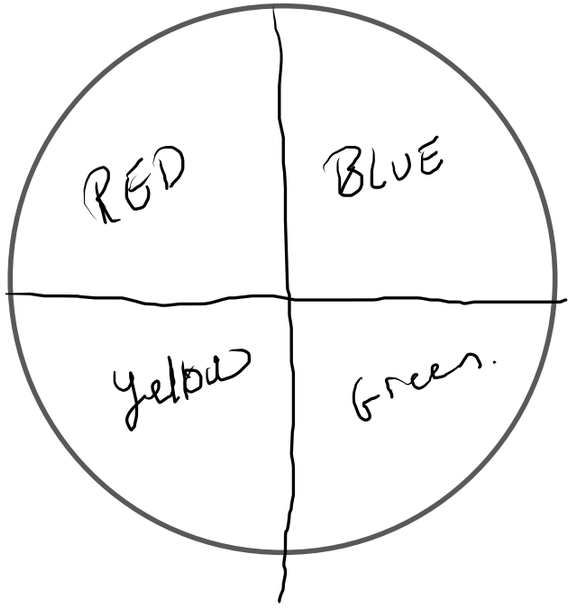
$P(\text{Yellow and Blue}) = P(\text{Yellow})\,P(\text{Blue})$

$= \left(\frac{1}{4}\right)\cdot\left(\frac{1}{2}\right)$

$= \frac{1}{8}$

Pg 748

1. A children's game has a spinner that is equally likely to land on any 1 of 4 colors: red, blue, yellow, or green. What is the probability of spinning a red followed by a green in 2 spins? Explain how to solve this problem with fraction multiplication, and explain why this method makes sense.



AND

$P(\text{Red and Green}) = P(\text{Red})\,P(\text{Green}) = \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$

Pg 748

2. Suppose you flip a coin and roll a number cube (die). What is the probability of getting a head and rolling a 6? (The numbers 1 through 6 are all equally likely to occur.) Explain how to solve this problem with fraction multiplication, and explain why this method makes sense.

$P(H \text{ and } 6) = P(H)P(6) = \frac{1}{2} * \frac{1}{6} = \frac{1}{12}$

#10
P 749

A game consists of spinning a spinner and then rolling a number cube (die). The spinner is equally likely to land on any 1 of the 4 colors red, yellow, green, or blue. The number cube is equally likely to land with any of the 6 sides labeled 1 through 6 up. To win the game, a contestant must either spin red and roll a 1 or spin green and roll a 6. What is the probability of winning this game? Explain why you can use fraction arithmetic to solve this problem.

$P(\text{(Red and 1) or (Green and 6)})$

$P(\text{Red and 1}) + P(\text{Green and 6})$

$P(\text{Red})\,P(1) + P(\text{Green})\,P(6)$

$\frac{1}{4} \cdot \frac{1}{6} + \frac{1}{4} \cdot \frac{1}{6}$

$\frac{1}{24} + \frac{1}{24}$

$\frac{2}{24} = \boxed{\frac{1}{12}}$