

2. Let's assume you roll a regular, 6-sided, dice three times and record the result each time.

a) What is the probability you get all 6's?

$$\left(\frac{1}{6}\right) \cdot \left(\frac{1}{6}\right) \cdot \left(\frac{1}{6}\right) = \frac{1}{216} \approx 0.0046 \text{ or } 0.46\%$$

b) What is the probability you get exactly one 6?

$$\begin{aligned} &= \left(\frac{1}{6}\right) \cdot \left(\frac{5}{6}\right) \cdot \left(\frac{5}{6}\right) + \left(\frac{5}{6}\right) \cdot \left(\frac{1}{6}\right) \cdot \left(\frac{5}{6}\right) + \left(\frac{5}{6}\right) \cdot \left(\frac{5}{6}\right) \cdot \left(\frac{1}{6}\right) \\ &\approx 0.349 \text{ or } 34.9\% \end{aligned}$$

c) What's the probability that you get a 3 or less on every roll?

$$\begin{aligned} P(x \leq 3) &= 0.5 \quad (50\% \text{ chance to get a 3 or less}) \\ (0.5) \cdot (0.5) \cdot (0.5) &= (0.5)^3 = 0.125 \text{ or } 12.5\% \end{aligned}$$

4. Doesn't exist yet. It is an unformed glob of nothing, waiting to be a beautiful catapillar. Actually it's going to be something about marbles.

6. The probability that a particular electrical component operates successfully is 0.95. An electrical system consists of three such components that operate independently.

a) What is the probability that all three electrical components operate successfully?

$$(0.95)(0.95)(0.95) = (0.95)^3 \approx 0.857 \text{ or } 85.7\%$$

b) What is the probability that one of the components in the system fails to operate successfully?

$$\begin{aligned} &= (0.05) \cdot (0.95) \cdot (0.95) + (0.95) \cdot (0.05) \cdot (0.95) + (0.95) \cdot (0.95) \cdot (0.05) \\ &\approx 0.135 \text{ or } 13.5\% \end{aligned}$$

c) The system will function successfully if *at least* one of the three components operates successfully. What is the probability that the system operates successfully?

$$= 1 - (0.05)^3 \quad \text{Only way system fails is if every component fails}$$

successfully ≈ 0.9999

It's extremely likely that the system will operate

8. Five 9th grade students at a local high school have said they want to be on the freshman representative council, for which there are only three positions (president, vice president, and treasurer). Here are the students:

Eddy	Ernesto	Fredric	Clyde	Vonda
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Since all the students are qualified, the school believes the fairest way to assign the positions is by random lottery. They will first randomly select the president, then they will randomly select the vice president, and lastly they will randomly select the treasurer.

What is the probability that Eddy is the president and Vonda is the vice president and Clyde is the treasurer? Clyde and Vonda are best friends.

10. Problem 10 is going to use **or**, **and**, as well as **conditional probabilities**.

These problems are tradition probability problems where there is not context or story attached, just two general events, in this case event D and event E:

- a) Events D and E are independent, with $P(D) = 0.6$ and $P(D \text{ and } E) = 0.18$.

$$P(D \text{ or } E) = ?$$

- b) Events D and E are not independent, with $P(D) = 0.5$ and $P(E|D) = 0.82$.

$$P(D \text{ and } E) = ?$$

- c) Events D and E are not independent, with $P(D) = 0.6$ and $P(D \text{ and } E) = 0.2$.

$$P(E|D) = ?$$

$$\approx 0.333 \text{ or } 33.3\%$$

d) Events D and E are independent, with $P(D) = 0.4$ and $P(D \text{ and } E) = 0.12$.

$$P(D \text{ or } E) = ?$$

$P(D \text{ or } E) = P(D) + P(E) - P(D \text{ and } E)$ first, we need to calculate $P(E)$

$$P(D) \cdot P(E) = P(D \text{ and } E)$$

$$0.4 \cdot P(E) = 0.12$$

$$P(E) = 0.3$$

Now we can use our equation above

$$P(D \text{ or } E) = P(D) + P(E) - P(D \text{ and } E)$$

$$P(D \text{ or } E) = 0.4 + 0.3 - 0.12 = 0.58$$

$$P(D \text{ or } E) = 0.58$$