

Dec. 1

Day 8: Binomial Theorem and Probabilities

Suppose you roll a single die six times. What is the probability of guessing the number on the die **once** out of the six rolls?

$$P(x) = {}_n C_x (p^x)(1-p)^{n-x}$$

p - the probability of the outcome successfully occurring

n - the number of times that the experiment is performed

x - the number of successes

Add to the total #

$$\underline{{}_6 C_1 \left( \frac{1}{6} \right) \left( \frac{5}{6} \right)^5 = 0.402}$$

Eg 1) A true-false test has 10 questions. Suppose all questions are answered randomly by guessing. Determine the probability of each event to 3 decimal places.

a. Obtaining exactly 5 correct answers.

$$10C_5 \left(\frac{1}{2}\right)^5 \left(\frac{1}{2}\right)^5 = 0.246$$

b. Obtaining 7 or 8 correct answers.

$$P(7) \rightarrow 10C_7 \left(\frac{1}{2}\right)^7 \left(\frac{1}{2}\right)^3 = 0.117$$

$$P(8) \rightarrow 10C_8 \left(\frac{1}{2}\right)^8 \left(\frac{1}{2}\right)^2 = 0.0439$$

$$0.1609$$

c. Obtaining more than 2 correct answers.

$$P(0) = 10C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{10} = 0.000976$$

$$P(1) = 10C_1 \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^9 = 0.00976$$

$$P(2) = 10C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^8 = 0.0439$$

$$1 - 0.05468 = 0.94532$$

Eg 2) A regular die is rolled 8 times. Determine the probability of each event to 3 decimal places.

a. obtaining exactly 3 sixes.

$${}^8C_3 \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^5 = 0.104$$

b. Obtaining at least 3 sixes.

$$P(0) = {}^8C_0 \left(\frac{1}{6}\right)^0 \left(\frac{5}{6}\right)^8 = 0.233$$

$$P(1) = {}^8C_1 \left(\frac{1}{6}\right)^1 \left(\frac{5}{6}\right)^7 = 0.372$$

$$P(2) = {}^8C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^6 = 0.260$$

$$1 - 0.865 = 0.135$$


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$$0.865$$

The probability that Eric scores a touchdown in a football game is 63%. Determine the probability that Eric scores a touchdown in exactly 4 of the next 6 games.

$$\binom{6}{4} (0.63)^4 (0.37)^2$$

**Assignment**  
**Pg. 457 3-5, 7, 8, 11, 14, 15, 19**