

MDM 4U

GEOMETRIC DISTRIBUTIONS

The **geometric distribution** represents the number of failures before you get a success in a series of Bernoulli trials. The experiment being modeled is a sequence of independent trials. There are only two possible outcomes for each trial, often designated success or failure. The probability of success, p , is the same for every trial.

The levels to a tree diagram varies, depending on the number of trials.

$$E(x) = \frac{q}{p}$$
$$P(X = x) = q^x p$$
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EXAMPLES:

- ① A die is rolled.
 - A) How many times would you expect to roll the die before a 3 appears?
 - B) What is the probability of rolling a 3 six times in a row?
 - C) What is the probability of rolling a 3 on the sixth roll?
 - D) What is the probability of not rolling a 3 until the sixth roll?
 - E) What is the probability of rolling a 3 in fewer than six rolls?
- ② Two dice are rolled. Let X = rolling a sum greater than 7.
 - A) How many rolls of the dice is expected before a sum greater than 7 occurs?
 - B) What is the probability of not rolling a sum greater than 7, four times in a row?
 - C) What is the probability of not rolling a sum greater than 7 until the 4th roll?
 - D) What is the probability of rolling a sum greater than 7 within 4 rolls?
- ③ The assembly line for the production of an automobile has a 0.05 probability of producing a defective part.
 - A) What is the expected number of parts which will be produced before a defective part appears?
 - B) What is the probability a defective part occurs on the first 10 parts?
 - C) What is the probability a defective part will not occur until the 10th part?
 - D) What is the probability no defective part occurs with the first 10 parts?
 - E) What is the probability a defective part occurs in fewer than 4 parts?

Answers:

1. a) 5, b) 1/46656, c) 1/6, d) $3125/46656=0.0670$, e) 0.5981, 2. a) 1.4, b) 0.1158, c) 0.0827, d) 0.8015,
3. a) 19, b) 0.3151, c) 0.0315, d) 0.5987, e) 0.1426