

Name: _____
Date: _____

Business Data Analysis
201-316-VA

In Class Exercise #10: Binomial and Geometric Distributions

1. Illiteracy

USA Today reported that about 20% of all people in the United States are illiterate. Suppose you interview 7 people at random off a city street.

- (a) What is the probability that 2 of them would be illiterate?

$$P(r=2) = {}^7C_2 (0.2)^2 (0.8)^{7-2} = 0.2753$$

- (b) What is the probability that 2 of them or less would be illiterate?

$$\begin{aligned} P(r \leq 2) &= P(r=0) + P(r=1) + P(r=2) \\ &= {}^7C_0 (0.2)^0 (0.8)^{7-0} + {}^7C_1 (0.2)^1 (0.8)^{7-1} + 0.2753 \\ &= 0.2097 + 0.3670 + 0.2753 = 0.8520 \end{aligned}$$

- (c) What would the expected number of illiterate people be? What is the standard deviation?

$$\begin{aligned} \mu &= np = 7(0.2) = 1.4 & \mu &= 1.4 \\ \sigma &= \sqrt{npq} = \sqrt{7(0.2)(0.8)} = & \sigma &\approx 1.0583 \end{aligned}$$

- (d) Instead of interviewing 7 people, you instead decide to interview people until you meet one who is illiterate. What is the probability that the first illiterate person you interview is the third one you speak to?

Geometric dist

$$P(n=3) = 0.2(0.8)^{3-1} = 0.128$$

- (e) Instead of interviewing 7 people, you instead decide to interview people until you meet one who is illiterate. How many people do you expect to interview before speaking to one that is illiterate?

Geometric dist

$$\mu = \frac{1}{p} = \frac{1}{0.2} = 5$$

2. Using the Z Table

Let Z be a standard normal distribution. Use the normal table to find the following probabilities.

(a) $P(z < 0.27)$

$$0.6064$$

(b) $P(z \geq 1.89)$

$$1 - 0.9706 = 0.0294$$

(c) $P(z > -2.41)$

$$0.9922$$

(d) $P(z \leq -0.72)$

$$1 - 0.7642 = 0.2358$$

(e) $P(0.5 < z < 1.5)$

$$0.9332 - 0.6915 = 0.2417$$

(f) $P(-2.44 \leq z < -0.72)$

$$0.9927 - 0.7642 = 0.2285$$

(g) $P(-1.66 < z \leq 1.88)$

$$0.9699 - (1 - 0.9515) = 0.9214$$

(h) $P(z > -6)$

$$1$$