Unit 3 Word Problems

A retail store experiences a 3.2% rate of customer complaints. If 850 customers are tracked and what is the mean and standard deviation of the number of complaints?

Binomial (complain or don't) : $\mu = n\,p = 850 \times 0.032 = 27.2$ $\sigma = \sqrt{n \times p \times q} = \sqrt{850 \times 0.032 \times 0.968} = 5.1$

Test scores have a mean of 502 and a standard deviation of 109. If 40 test takers are randomly selected, what is the probability the mean score is at least 535?

Central Limit Theorem : Normal ? No , n > 30 ? Yes $\mu_{\bar{x}} = \mu = 502$ $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{109}{\sqrt{40}} = 17.2$

$z_{\bar{x}} = \dfrac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \dfrac{535 - 502}{17.2} = 1.92$ Use Table A-2 : $P(\bar{x} \geq 535) = P(z_{\bar{x}} \geq 1.92) = 1 - 0.9726 = 0.0274$

Women's heights are normally distributed with a mean of 63.6 in and a standard deviation of 2.5 in. The Army excludes women from serving if they are in the shortest 1% or the tallest 1%. What are the minimum and maximum acceptable heights?

Find P_1 and P_{99} for normal data : $x = \mu + (z \times \sigma)$, Use Table A-2 to find z-scores.

z for $P_1 = -2.33$ $P_1 = 63.6 + (-2.33 \times 2.5) = 57.76$

z for $P_{99} = 2.33$ $P_1 = 63.6 + (2.33 \times 2.5) = 69.43$

According to past records, there is a 0.120 probability that a World Series will last 4 games, a 0.253 probability it will last 5 games, a 0.217 probability it will last 6 games, and 0.410 probability it will last 7 games. Find the mean and standard deviation for the numbers of games a World Series will last. Is it unusual for a team to sweep?

x	P(x)	x ∗ P(x)	x^2 ∗ P(x)
4	0.120	0.48	1.92
5	0.253	1.265	6.325
6	0.217	1.302	7.812
7	0.410	2.87	20.09
Σ	1.000	5.917	36.147

$\mu = \Sigma[x^2 * P(x)] = 5.9$

$\sigma = \sqrt{\Sigma[x^2 * P(x)] - \mu^2} = \sqrt{36.147 - 5.917^2} = 1.1$

Ordinary values : minimum = $5.9 - 2 \times 1.1 = 3.7$, maximum = $5.9 + 2 \times 1.1 = 8.1$ Not unusual to sweep.

If 26% of all 4-year college students live on campus, find the probability that one out of 6 randomly selected students lives on campus.

Binomial (on campus or not) : $n = 6$, $x = 1$, $p = 0.26$, $q = 1 - p = 0.74$

$$P(1) = \frac{6!}{(6-1)!1!} * 0.26^1 * 0.74^5 = 0.346$$

A medical journal contains a report that the weights of babies born in the U.S. are normally distributed with a mean of 3420 g and a standard deviation of 495 g. What percentage of babies are born weighing under 2200 g ?

Normal distribution : $z = \dfrac{(2200 - 3420)}{495} = -2.46$ Use Table A-2 : $P(x < 2200) = P(z < -2.46) = 0.0069$

If 20% of all TVs are tuned to CBS, find the probability that in ten households, none are watching CBS. What is the probability at least one is watching CBS?

Binomial (watching or not) $n = 10$, $x = 0$, $p = 0.20$ Use Table A-1 : P(0) = 0.107

P(at least 1) = 1 – P(0) = 0.893