Hw 7.2 21-24 pages 431 prob 27, 29, 33, 35, 37, 41

21) D

22) E

23) C variability depends on sample size (not population)

24) B

27) a) We would not be surprised to find a sample of 25 candies to contain 8 orange candies. Figure 7.11 shows a fair # of simulations in which there were 8 or fewer orange candies.

There were only a couple simulations where 5 (20 %) or fewer orange candies occured, so if we get a sample with 5 candies we should be surprised.

b) It is more surprising to get 32 % orange candies in a sample of 50 than it is in a sample of 25. Comparing the two graphs (7.11 + 7.12) there were a fair amount of simulations in sample size 25 with 32 % or less, but very few in sample size 50 with 32 % or less.

29) a) The mean of the sampling distribution is the same as the population proportion, so $\mu_{\hat{p}} = p = .45$

b) ✓ 10 % condition $n = 25$ $10(25) \le$ Population $250 \le$ Population

It is reasonable to assume that there are at least 250 candies in the machine

so $\sigma_{\hat{p}} = \sqrt{\frac{.45(.55)}{25}} = .0995$

27) c) ✓ normal conditions $n = 25$ $p = .45$

$np \geq 10$ $\quad$ $n(1-p) \geq 10$

$25(.45) \geq 10$ $\quad$ $25(.55) \geq 10$

$11.25 \geq 10$ ✓ $\quad$ $13.75 \geq 10$ ✓

∴ The sampling distribution of $\hat{p}$ is approximately Normal

d) $n = 50$

✓ 10% condition

$n(10) \leq$ population

$10(50) \leq$ population

✓ $500 \leq$ population reasonable to assume at least 500 candies in machine

✓ normal conditions

$50(.45) \geq 10$ $\quad$ $50(.55) \geq 10$

$22.5 \geq 10$ ✓ $\quad$ $27.5 \geq 10$

∴ sampling distribution is approximately normal

So when $n = 50$ $\mu_{\hat{p}} = .45$ $\sigma_{\hat{p}} = \sqrt{\frac{.45(.55)}{50}} \approx .0704$

and sampling distribution ≈ Normal

(38) ✓ to see if Normal conditions are met

$n = 15$ $p = .30$

Is $np \geq 10$

$15(.3) \geq 10$

$4.5 \geq 10$ no $\therefore$ not Normal Condition

(35) a) The mean of the sampling distribution is the same as the population proportion, so $\mu_{\hat{p}} = p = 0.70$

b) ✓ 10% condition $n = 1012$

$10(1012) \leq$ Population (U.S. Adults)

$10{,}120 \leq$ Pop (U.S. Adults)

It is reasonable to assume population of U.S. Adults is at least 10,120

$\therefore$ 10% condition met

so $\sigma_{\hat{p}} = \sqrt{\dfrac{.70(.30)}{1012}} \approx .0144$

c) ✓ Normal Conditions

$np \geq 10$ $n(1-p) \geq 10$

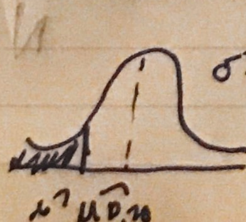
$1012(.70) \geq 10$ $1012(.30) \geq 10$

✓ $708.4 \geq 10$ $303.6 \geq 10$ ✓ $\therefore$ Sampling Dist. $\approx$ Normal

If 70% of population actually drink the cereal milk the $P(\hat{p} \leq .67)$ is a fairly unusual result

d) $P(\hat{p} \leq .67)$

$N(.70, .0144)$



$\sigma = .0144$

normcdf$(-10{,}000, .67, .70, .0144) \approx .0186$

(37) $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$ so to get $\frac{1}{2}\sigma_{\hat{p}}$ multiply both sides by $\frac{1}{2}$

$$\frac{1}{2}\sigma_{\hat{p}} = \frac{1}{2}\cdot\sqrt{\frac{p(1-p)}{n}}$$

$$\frac{1}{2}\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{4n}}$$

so if $n = 1012$ U.S adults originally then to get $\frac{1}{2}\sigma_{\hat{p}}$ multiply n by 4

$4n = 4(1012) =$ **4048 U.S. adults**

(41) State: What is the probability that the proportion in an SRS of 100 orders is as small as the proportion in your sample ($86/100$) or smaller if company really ships 90% of orders on time? $P(\hat{p} \le .86)$

$86/100 = .86$

Plan: $\mu_{\hat{p}} = .90$ ✓ 10% condition for $\sigma_{\hat{p}}$ Population = 5000

$10(100) \le$ Population

$1000 \le 15000$ ✓

so $\sigma_{\hat{p}} = \sqrt{\frac{.9(.1)}{100}} = .03$

Now ✓ if distribution of $\hat{p}$ can be approximated by a Normal Distribution

✓ $np \ge 10$ and $n(1-p) \ge 10$

$100(.9) \ge 10$ $100(.1) \ge 10$

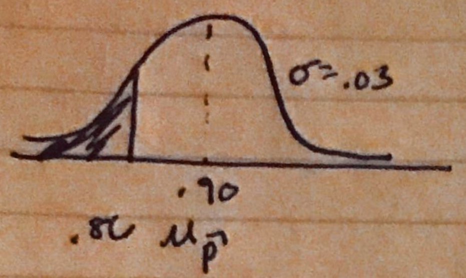
$90 \ge 10$ ✓ $10 \ge 10$ ✓

∴ Distribution is Approximately Normal with

$N(.90, .03)$

(41) Do: $P(\hat{p} \leq .86)$

$N(.90, .03)$



Normcdf $(-10{,}000, .86, .90, .03) \approx .0912$

Conclude: There is about a 9.12% chance that we would get a sample in which 86% or fewer of the orders were shipped within 3 working days.

B) If the claim of shipping orders within 3 working days is correct, then we can expect to observe 86% or fewer orders shipped on time in about 9.12% of the samples this size. Getting a sample proportion at or below 0.86 is not an unlikely event.