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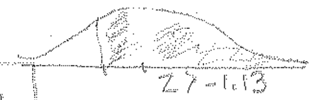
Chapter 3 Exercises

3.2) What percent of a standard normal distribution $N(\mu=0, \sigma=1)$ for each region? Draw a graph.

a) $Z > -1.13$

% at $z = -1.13$ is $.1292$

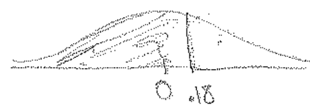
$1 - .1292 = .8708 \approx \boxed{87.08\%}$



b) $z < .18$

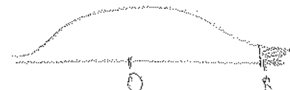
% @ $z = .18$ is $.5714$

so our percent $= \boxed{57.14\%}$



c) $z > 8$

% @ $z = 8$ is $\approx \boxed{0}$



as per the book, the probability of being further than 4 standard deviations from mean is 1 in 30000, 5 is 1 in 3.5 million, 6 1 in 1 billion so for $z > 8$ would be smaller than 1 in 1 billion.

d) $|z| < .5 \Rightarrow z < .5 \quad z > -.5$

$.6915 - .3085 = .383 = \boxed{38.3\%}$

3.4) Leo (4948 seconds) mean = 4313 SD = 583 seconds
Mary (5513 seconds) mean = 5261 SD = 807 seconds

Normal distribution

a) Mens, Ages 30-34 $\Rightarrow \boxed{N(\mu = 4313, \sigma = 583)}$
Womens, Ages 25-29 $\Rightarrow \boxed{N(\mu = 5261, \sigma = 807)}$

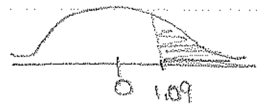
b) $Z = \frac{x - \mu}{\sigma}$ for Leo $\frac{4948 - 4313}{583} = \boxed{1.09}$

for Mary $\frac{5513 - 5261}{807} = \boxed{.31}$

~~The z scores tells us that Mary's time is closer to the mean but since Leo's time was 1.09 SD's above the mean he performed better. His time is more unusual than Mary's.~~

The z scores tells us that Leo's time is more unusual (greater S.D's away from mean.

c) $Z_{Leo} = 1.09$

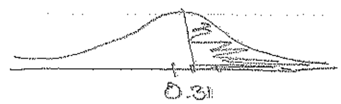


using chart we get .8621

to find % who did better we take: $1 - .8621 = .1379 \approx 13.79\%$ did better than Leo

$Z_{Mary} = .31$

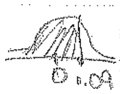
using chart we get .6217



$1 - .6217 = .3783 \approx 37.83\%$

37.83% of participants peformed better than Mary

we can conclude that Leo did better as there's a lesser percent of participants who did better than him. $13.79 < 37.83$.



d) from above: Leo finished faster than $.8621 \approx$ $\boxed{86.21\% \text{ of participants}}$

e) from above: Mary finished faster than $.6217 \approx$ $\boxed{62.17\% \text{ of participants}}$

f) Yes, they would change. We would be able to use the standard normal probabilities table.

3.18) $\mu = 61.52$

$\sigma = 4.58$

one S.D: 56.94, 66.1 $\Rightarrow$ 17 of 25 fall between 56 and 66 = 68%

two SD: 52.36, 70.68 $\Rightarrow$ 24 of 25 fall between 53 and 70 = 96%

3 SD: 47.78, 75.26 all so 100%

68-96-100 the heights approximately follow 68-95-99.7 rule.

b) Yes, they do seem to follow normal distribution. When compared to the standards provided in the text, we see they are very similar.

3.38) $p(boy) = .51$, 3 kids. $\binom{n}{k} p^k (1-p)^{n-k} = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k}$

success = boy = k = 2

$n = 3 \Rightarrow \frac{3!}{2!(3-2)} .51^2 (1-.51)^{3-2}$

$p = .51$

$= 6/2 (.2601)(.49)$

$= 3(.2601)(.49) = \boxed{.3823}$

b) scenario #1 ⇒ $\overset{b}{.51} \cdot \overset{b}{.51} \cdot \overset{g}{.49} = .1274$

scenario #2 ⇒ $\overset{b}{.51} \cdot \overset{g}{.49} \cdot \overset{b}{.51}$

scenario #3 ⇒ $\overset{g}{.49} \cdot \overset{b}{.51} \cdot \overset{b}{.51}$

add all 3 scenarios : $.1274 \cdot 3 = \boxed{.3823}$

my answers match.

e) We would have quite a few more scenarios to consider and it will get tedious. In part (a) we could ~~pl~~ plug in the appropriate values into our formula.

3.22) 2% defective rate $(1-p)^{n-1} p$

98% non defective. random & independent. success = defective

$p = .02$

$n = 10$

a) $(1-.02)^9 \cdot .02 =$

$.8337 \cdot .02 = \boxed{.0167}$

b) $.98^{100} = \boxed{.1326}$

c) $\mu = 1/p = 1/.02 = \boxed{50}$

$\sigma = \sqrt{\frac{1-p}{p^2}} = \sqrt{\frac{1-.02}{.02^2}} = \boxed{49.50}$

d) $\mu = 1/.05 = \boxed{20}$

$\sigma = \sqrt{\frac{1-.05}{.05^2}} = \sqrt{\frac{.95}{.0025}} = \boxed{19.49}$

it decreases wait time and decreases the mean & standard deviation

3.42) 15% making serve.- independent.

a) $p = .15$ $n = 10$ $K = 3$ $\frac{n!}{K!(n-K!)} p^K (1-p)^{n-K}$

$\frac{10!}{8!(10-7!)} .15^3 (1-.15)^{10-3}$

$= \frac{3628800}{6 \cdot 5040} \cdot .003375(.85)^7$

$120 \cdot .00108 = \boxed{.1298}$

b) $p = .15$

c) because each serve is independent, we only looked @ p of that particular serve being successful.