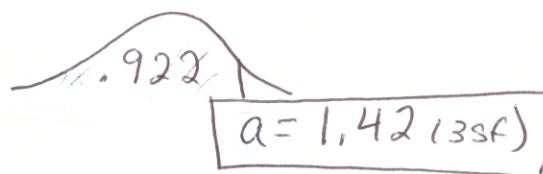


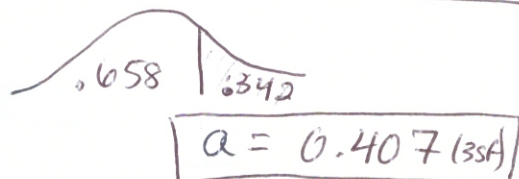
Problem Set #10

15K

① a) $P(Z < a) = 0.922$

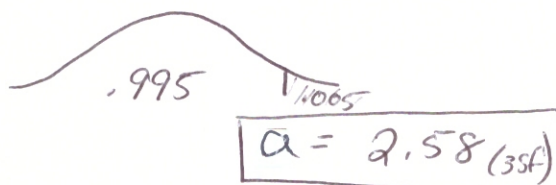


b) $P(Z > a) = 0.342$



$\Rightarrow P(Z < a) = 0.658$

c) $P(Z > a) = 0.005$



$\Rightarrow P(Z < a) = 0.995$

④ a)



$P(Z < a) = .95$

$a = 1.64$

b)



$P(Z > a) = .2$

$P(Z < a) = .8$

$a = .842$

15L

① $X \sim N(5.5, 0.2^2)$

(I know you can just type this in w/ $\mu = 5.5$ and $\sigma = 0.2$ but practice w/ Z)

$P(X > a) = 0.235 \rightarrow P(Z < b) = 0.235$

$b \approx -0.722479$

$Z = \frac{X - \mu}{\sigma} \Rightarrow -0.722479 = \frac{a - 5.5}{0.2}$

$-0.6144495811 = a - 5.5$

$5.49 = a$
(3sf)



15 L cont...

② $M \sim N(420, 10^2)$ 25th percentile

a) Find first quartile

$$P(Z < b) = 0.25$$

$$b = -0.6744897$$

$$Z = \frac{x - \mu}{\sigma}$$

$$-0.6744897 = \frac{a - 420}{10}$$

$$-6.744897 = a - 420$$

$$\boxed{413 \approx a \text{ (3sf)}}$$

b) Find 90th Percentile

$$P(Z < b) = .9$$

$$b \approx 1.28155$$

$$Z = \frac{x - \mu}{\sigma}$$

$$1.28155 = \frac{a - 420}{10}$$

$$12.8155 = a - 420$$

$$432.8155 = a$$

$$\boxed{433 \approx a \text{ (3sf)}}$$

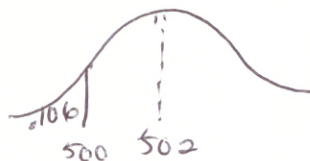
③ $X \sim N(502, 1.6^2)$

a) $P(X < 500)$

$$Z = \frac{500 - 502}{1.6}$$

$$Z = -1.25$$

$$P(Z < -1.25) \approx \boxed{.106 \text{ (3sf)}}$$



b) $P(500 < X < 505) = P(X < 505) - P(X < 500)$

$$= .9696 - .1056$$

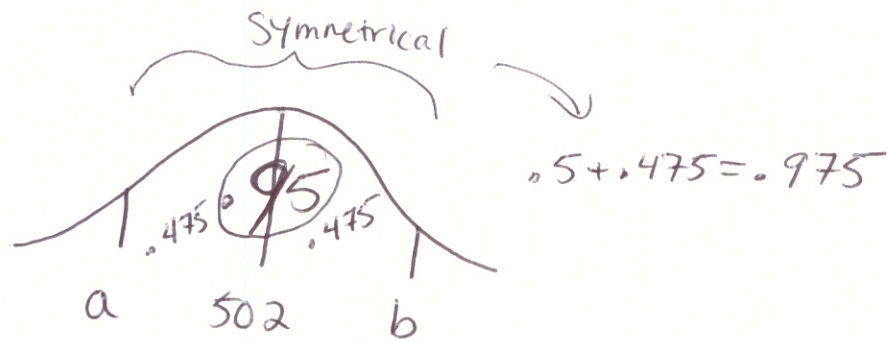
$$\approx \boxed{.864 \text{ (3sf)}}$$



* treat like a shaded region area problem

15L cont, ...

③ c)



$$P(X < b) = .975$$

$$b = 505.1359424$$

$$b - 502 = 3.14$$

$$502 - 3.14 = 498.9$$

$a = 499$	$b = 505$
3sf	

15m

① $X \sim N(30, \sigma^2)$ $P(X > 40) = 0.115$ And σ

so, $P(X < 40) = 0.885$

$$\Rightarrow P(Z < b) = 0.885$$

$$b = 1.20$$

$$Z = \frac{X - \mu}{\sigma}$$

$$1.20 = \frac{40 - 30}{\sigma}$$

$$1.20\sigma = 10$$

$\sigma = 8.33$ (3sf)

15m cont...

$$\textcircled{2} \quad X \sim N(\mu, 4^2) \quad P(X < 20.5) = 0.9$$

$$P(Z < b) = 0.9$$

$$b = 1.28155$$

$$Z = \frac{X - \mu}{\sigma}$$

$$1.28155 = \frac{20.5 - \mu}{4}$$

$$5.126 = 20.5 - \mu$$

$$\boxed{\mu = 15.4 \text{ (3sf)}}$$

$$\textcircled{3} \quad X \sim N(\mu, \sigma^2)$$

$$P(X < 58.39) = 0.0217$$

$$P(X < 58.39) = 0.9783$$

$$P(Z < b) = 0.9783$$

$$b \approx 2.0198$$

$$P(X < 41.82) = 0.0287$$

$$P(Z < c) = 0.0287$$

$$c \approx -1.9$$

$$Z = \frac{X - \mu}{\sigma}$$

$$2.0198 = \frac{58.39 - \mu}{\sigma}$$

$$2.0198\sigma = 58.39 - \mu$$

$$\mu = 58.39 - 2.0198\sigma$$

$$Z = \frac{X - \mu}{\sigma}$$

$$-1.9 = \frac{41.82 - \mu}{\sigma}$$

$$-1.9\sigma = 41.82 - \mu$$

$$\mu = 41.82 + 1.9\sigma$$

$$58.39 - 2.0198\sigma = 41.82 + 1.9\sigma$$

$$16.57 = 3.9198\sigma$$

$$\boxed{4.23 = \sigma}$$

$$\mu = 41.82 + 1.9(\sigma)$$

$$\boxed{\mu \approx 49.9 \text{ (3sf)}}$$

15 m cont

⑤ $\mu = 136$

$$X \sim N(136, \sigma^2)$$

$$P(X > 145) = .12 \rightarrow P(X < 145) = .88$$

Find σ

$$P(Z < b) = .88$$

$$b = 1.174986791$$

$$Z = \frac{X - \mu}{\sigma}$$

$$1.174986791 = \frac{145 - 136}{\sigma}$$

$$1.174986791 \sigma = 9$$

$$\boxed{\sigma \approx 7.66 \text{ (3sf)}}$$

⑦ $X \sim N(0.85, \sigma^2)$

$$P(X < 1.1) = .74$$

$$P(Z < b) = .74$$

$$b \approx .643345$$

a) $Z = \frac{X - \mu}{\sigma}$

$$.643345 = \frac{1.1 - 0.85}{\sigma}$$

$$.643345 \sigma = .25$$

$$\boxed{\sigma = .389 \text{ (3sf)}}$$

just use
calculator
at this point

\rightarrow b) $P(X > 1) = \boxed{.350 \text{ (3sf)}}$

⑩ $P(X < 108) = .3 \rightarrow P(Z < b) = .3 \quad b \approx -.5244$

$$P(X > 154) = .2$$

$$\therefore P(X < 154) = .8 \rightarrow P(Z < c) = .8 \quad c \approx .8416$$

a) $Z = \frac{X - \mu}{\sigma}$

$$Z\sigma = X - \mu$$

$$\mu = X - Z\sigma$$

$$108 + .5244\sigma = 154 - .8416\sigma$$

$$1.366\sigma = 46$$

$$\boxed{\sigma \approx 33.7 \text{ (3sf)}}$$

$$\mu = 108 + .5244\sigma \approx \boxed{126 \text{ (3sf)}}$$

15m cont

(10) b) $P(X > 117) = .6$
 $P(X < 117) = .4$

If $X \sim N(126, 33.7^2)$ calculator

Then $P(X < 117)$ should be \downarrow .3947

Since .4 is reasonably close to this value
it is consistent w/ normal distribution
