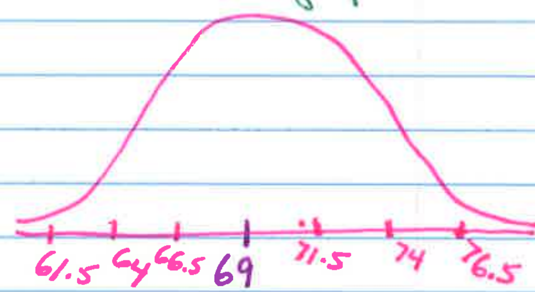
2.2 HW - DAY 2 #'s 41, 43, 45, 47, 49, 51

(41) (1) ALWAYS STATE THE TYPE OF DISTRIBUTION.

NORMAL DISTRIBUTION − $N(\mu, \sigma)$ OR $N(\bar{x}, s_x)$

(2) ALWAYS sketch a normal graph

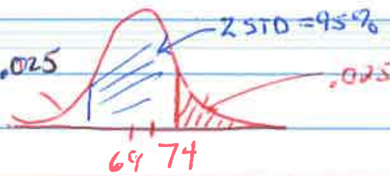
$\boxed{N(69, 2.5)}$



- Label the Center WITH MEAN
- Label +/− 3 STD DEV
- Label Graph (w/UNITS) → Men's height (inches)

(43) → 68-95-99.7 rule →
- 68% are +/− 1 STD DEV
- 95% are +/− 2 STD DEV
- 99.7% are +/− 3 STD DEV

(a)

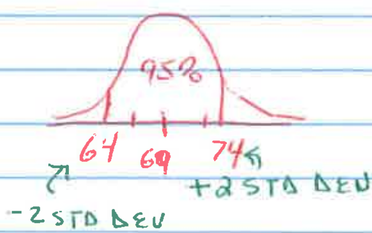


74in is 2 STDEV from mean which means +/− 2 STD is 95%. There fore the tails split 5%

THE MEN TALLER THAN 74 inches is about 2.5%

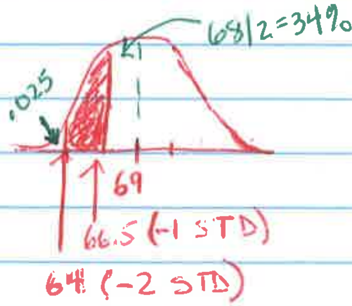
answer in context

(b)



$\boxed{\text{95\% OF THE MEN ARE BETWEEN 64in and 74in}}$

(c)



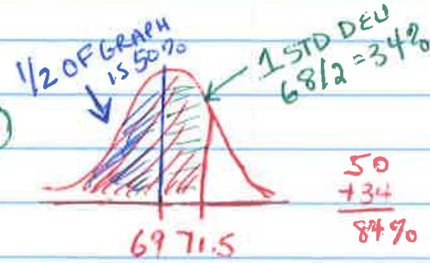
THERE ARE SEVERAL WAYS TO THE %

% = .5 − .34 − .025

% = .135

Approximately 13.5% OF THE men are between 64in and 66.5in

(d)

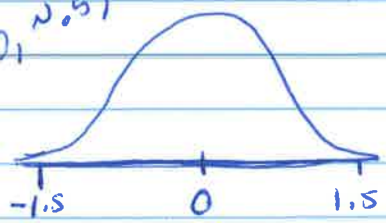


50
+34
84%

A height of 71.5 in is the 84% percentile

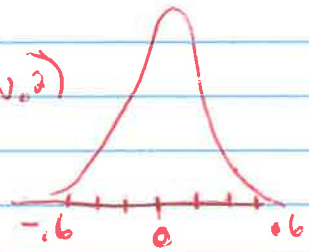
2.2 HW (Con't)
DAY 2

(45) N(0, N.5)



Looking at the flatter curve, the range is about -1.5 to 1.5. Since 99.7% of the graph is +/- 3 STD DEV, we can estimate 1 std dev is about .5 (1.5/3).

N(0, N.2)



The taller graph looks like it goes from -.6 to .6. Therefore 1 std dev is about .2 (.6/3)

(47) Table A Practice

(a) $Z < 2.85 = .9978$

(b) $Z > 2.85 = 1 - .9978 = .0022$

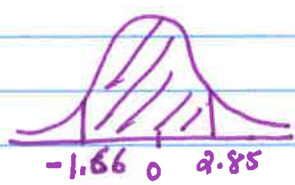
Graph for (a) (b)

(c)

FROM THE TABLE (.0485)

$Z > -1.66 = 1 - .0485$
$= .9515$

(d)



$-1.66 < Z < 2.85 = .9978 - .0485$

from above $Z < 2.85$ | from above $Z < -1.66$

$.9493$

(49) (a) Z is between -1.33 and 1.65

$-1.33 < Z < 1.65 =$

$.9505 - .0918 =$

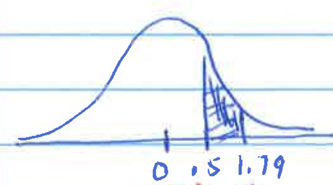
$.8587$

$Z < -1.33 = .0918$ $Z < 1.65 = .9505$

(b) $.50 < Z < 1.79 =$

$.9633 - .6915 =$

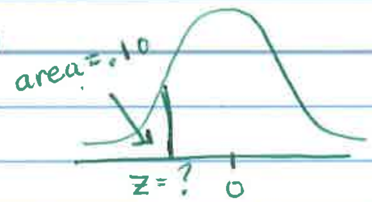
$.2718$



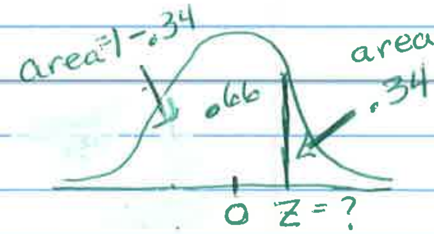
$Z < .5 = .6915$ $Z < 1.79 = .9633$

2.2 Cont DAY 2

51 (a)



(b)



The table A provides the area and z scores. Look within the cells of the table for the desired areas.

(a) The 10th %tile = area of .10. The closest area is .1003 which corresponds to $\boxed{z = -1.28}$

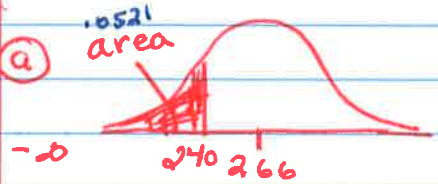
(b) 34% of all observations are greater than z. The table gives all %'s from the left so we must look at the table for area = .66. The cell areas that are closest are .6591 (z = .41) and .6628 (z = .42). Therefore the approximate value is $\boxed{z = .41}$

$\boxed{\text{2.2 HW DAY 3}}$ #'s 53, ~~55~~ 54, ~~57~~, 61, 63a-b-d, 69-74

HW problems Changed skip #'s 55+57 add # 54

(53) N(266 days, 16 days)

(a)



$X = 240$

$Z = \frac{240-266}{16} = -1.625$

area = normalcdf(-1E99, -1.625, 0, 1) = .0521 (ROUND 4 decimals)

ANSWER IN CONTEXT:
About 5.2% of pregnancies last less than 240 days.
(which means that 240 days is in the 5TH percentile)

(b)

$X = 240$

$Z = -1.625$ (above)

$X = 270$

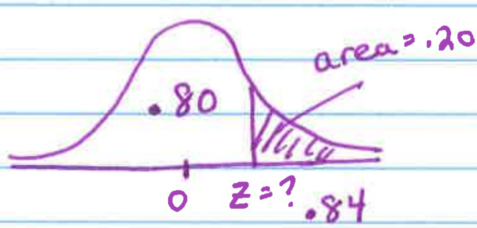
$Z = \frac{270-266}{16}$

$Z = .25$

area = normalcdf(-1.625, .25, 0, 1) = .5466 = 54.66%

Conclusion: The proportion of pregnancies between 240 and 270 days is about 55%.

(c)



$Z = \text{invNorm}(.8, 0, 1) = .8416$

$Z = \frac{X-266}{16} = .84$

$X - 266 = 13.44$

$X = 279.44$ days

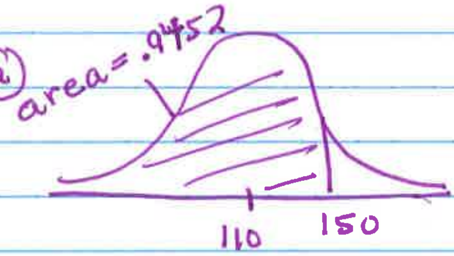
Conclude: The 80th percentile (or the top 20%) for length of pregnancies is about 279.44 days.

2.2 HW

54 X = IQ scores of people aged 20-34

The variable x has the distribution : $N(110, 25)$

(a)



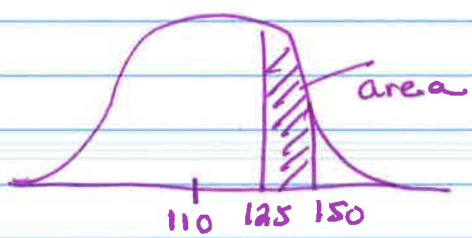
$$Z = \frac{150-110}{25} = 1.6$$

area = normalcdf

$(-1E99, 1.6, 0, 1) = \underline{\underline{.9452}}$

Conclude An IQ score of 150 is approximately the 95^{TH} percentile.

(b)



$$Z = \frac{125-110}{25} = .6$$

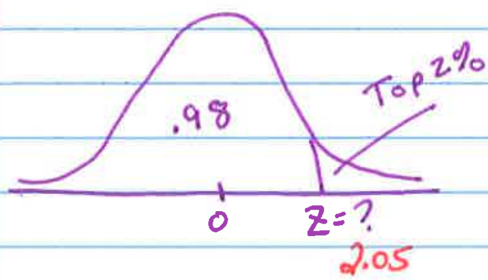
area = normalcdf

$(-1E99, .6, 0, 1) = .7257$

area = .9452(54a) - .7257 = $\underline{\underline{.2194}}$

Conclude: The percent IQ's between 125 and 150 is about 22%.

(c)



$Z = \text{invNorm}(.98, 0, 1) = \underline{\underline{2.05}}$

$$Z = 2.05 = \frac{X-110}{25}$$

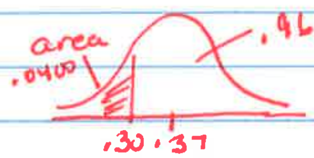
$X = 2.05(25) + 110 = \underline{\underline{161.25}}$

Conclude To be admitted to the elite MENSA, members must have an IQ in the 98^{Th} percentile with an IQ score above 161.

2.2 HW (Cont)
day 3

(55) $N(.37, .04)$

(a)

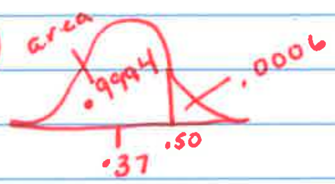


$Z = \frac{.30 - .37}{.04} = -1.75$

area = normalcdf $(-1E99, -1.75, 0, 1) = .04$

Conclude: We would expect the train to arrive on time about 96% of the time.

(b)



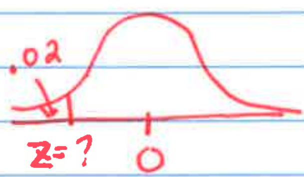
$Z = \frac{.50 - .37}{.04} = 3.25$

area = normalcdf $(-1E99, 3.25, 0, 1) = .9994$

Conclude: We would expect the train to arrive early about .06% of the time.

(c) It make sense to have the value in part (a) to be larger. We want the train to arrive at its destination on time, but not to arrive at the switch point early.

(57) (a)



$Z = \text{invNorm}(.02, 0, 1) = -2.05$

$Z = -2.05 = \frac{.30 \text{ (from 55a)} - \mu}{.04}$

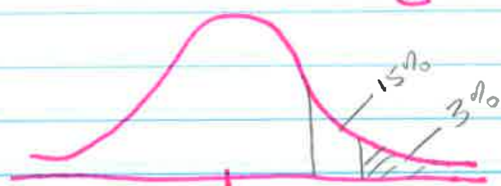
$\mu = .382$

(b) $Z = \frac{.30 - .37}{\sigma} = -2.05$

$\sigma = .034$

2.2 HW

61 $N(\mu, \sigma)$ $\mu = ?$ $\sigma = ?$



$N(\mu, \sigma) \rightarrow$? 60 75

$N(0,1) \xrightarrow{\text{z scores}}$ 0 1.04 1.88

invNorm(.97, 0, 1)

invNorm(.85, 0, 1)

15%	3%
60^+ min	75^+ min
$Z = 1.04$	$Z = 1.88$
$1.04 = \frac{60 - \mu}{\sigma}$	$1.88 = \frac{75 - \mu}{\sigma}$
$1.04\sigma = 60 - \mu$	$1.88\sigma = 75 - \mu$

Solve system

$\mu = 60 - 1.04\sigma = 41.43$

$\mu = 75 - 1.88\sigma = 41.42$

$60 - 1.04\sigma = 75 - 1.88\sigma$

$15 = .84\sigma$

$\sigma = 17.86$

Conclude the flight time normal distribution has

$\mu = 41.43$ min

$\sigma = 17.86$ min

2.2 HW

63 (a) 1-Variable stats

$n = 44$

$\bar{x} = 15.586$

$S_x = 2.550$

$min = 9.4$

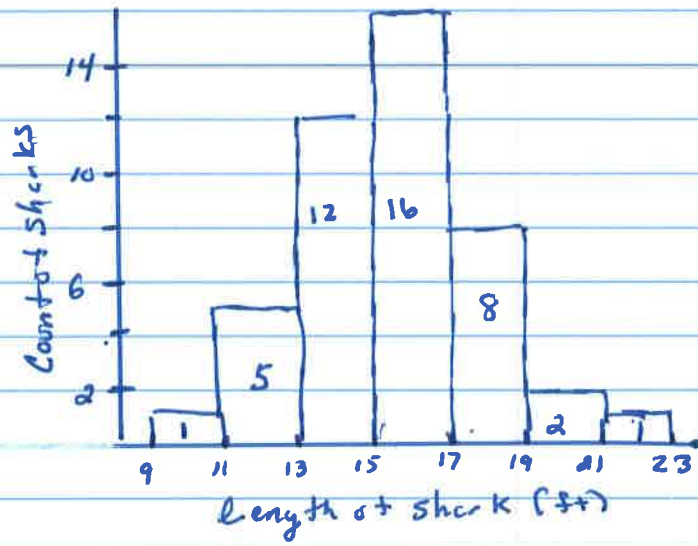
$Q_1 = 13.55$

$Median = 15.75$

$Q_3 = 17.2$

$Max = 22.8$

Very close $\bar{x}$ + M



The distribution of shark lengths is roughly symmetric with a peak at 16ft and varies from 9.4 to 22.8 ft.

(b)

		# sharks	%
$\bar{x} \pm 1 S_x =$	13.036 – 18.136	30	~68.2%
$\bar{x} \pm 2 S_x =$	10.486 – 20.686	42	~95.5%
$\bar{x} \pm 3 S_x =$	7.936 – 23.236	44	100%

Tip: SORT LIST TO COUNT # SHARKS

[2ND] LIST > OPS > 1: SORT A (L1)

* ALSO EASIER TO COUNT THE OUTLIERS

This distribution is 68.2%, 95.5%, 100% which is very close to the empirical rule 68-95-99.7.

(d) The distribution of the lengths of sharks appears to be normal based on

① The mean and median are very close indicating a symmetric distribution which is supported by histogram which is symmetric

② The distribution is very close to the 68-95-99.7 rule.

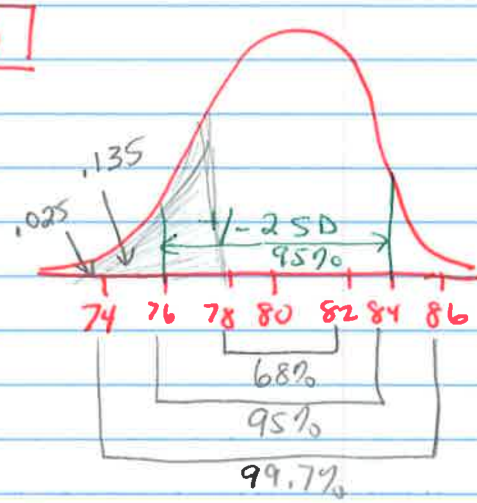
$\boxed{2.2HW}$

Multiple Choice

69. D — FAMILY INCOME tends to be right skewed

70. C — C is 1 SD From mean $\boxed{N(80,2)}$

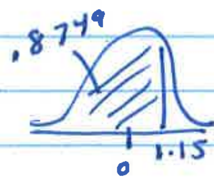
$80-2=78$ ✓



71. B — $+/- 2\text{SD} = 95\%$

72. C — $.025 + .135 = .155 \approx 16\%$

73. C



normalcdf
(-1E99, 1.15, 0, 1)

74. C

normalcdf(-.75, 1E99, 0, 1)