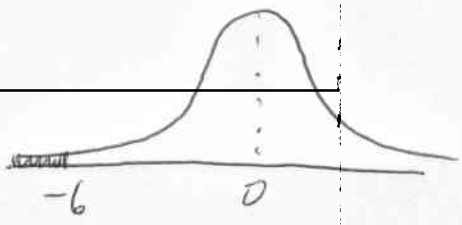
Homework #5 Solutions

Problems from sheet, 1.93, 1.97, 1.103, 3.3, 3.7

Problems from sheet

[redacted]



[redacted]

1) $P(X<8) = P\left(\frac{X-32}{4} < \frac{8-32}{4}\right)$

$= P(Z < -6.0)$

$< P(Z < -3.49)$

$= .0002$

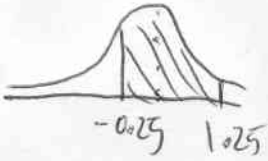
2) $P(27<X) = P\left(\frac{27-32}{4} < \frac{X-32}{4}\right)$

$= P(-1.25 < Z)$

$= 1 - P(Z < -1.25)$

$= 1 - .1056$

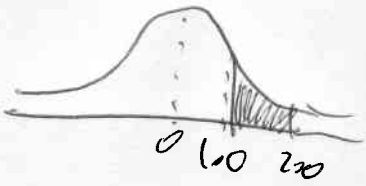
$= .8944$



3) $P(31<X<37) = P\left(\frac{31-32}{4} < \frac{X-32}{4} < \frac{37-32}{4}\right)$

4) $P(36 < x < 40) = P\left(\frac{36-32}{4} < \frac{x-32}{4} < \frac{40-32}{4}\right)$

$= P(1.0 < z < 2.0)$



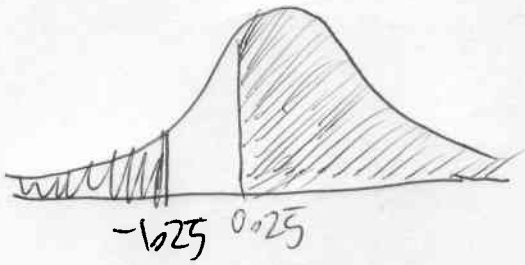
$= P(z < 2.0) - P(z < 1.0)$

$= .9772 - .8413$

$= \underline{.1359}$

5) $P(x < 27 \text{ or } x > 31) = P(x < 27) + P(x > 31)$ (disjoint)

$= P\left(\frac{x-32}{4} < \frac{27-32}{4}\right) + P\left(\frac{x-32}{4} > \frac{31-32}{4}\right)$



$= P(z < -1.25) + P(z > -0.25)$

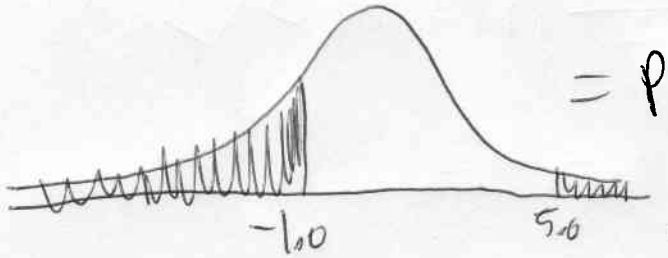
$= .1056 + (1 - .4013)$

$= .1056 + .5987$

$= \underline{.7043}$

6) $P(x < 28 \text{ or } x > 52) = P(x < 28) + P(x > 52)$ (disjoint)

$= P\left(\frac{x-32}{4} < \frac{28-32}{4}\right) + P\left(\frac{x-32}{4} > \frac{52-32}{4}\right)$



$= P(z < -1.0) + P(z > 5.0)$

$\geq .1587 + .0002$

$= \underline{\underline{.1589}}$

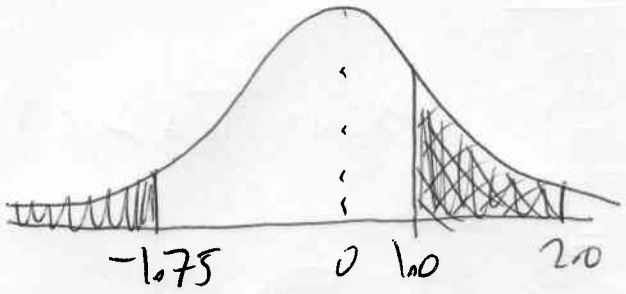
7) $P(X<25 \text{ or } 36<X<40) = P(X<25) + P(36<X<40)$ (disjoint)

$= P\left(\frac{X-32}{4} < \frac{25-32}{4}\right)$

$+ P\left(\frac{36-32}{4} < \frac{X-32}{4} < \frac{40-32}{4}\right)$

$= P(Z<-1.75)$

$+ P(1.0<Z<2.0)$



$= .0401 + (.9772 - .8413)$

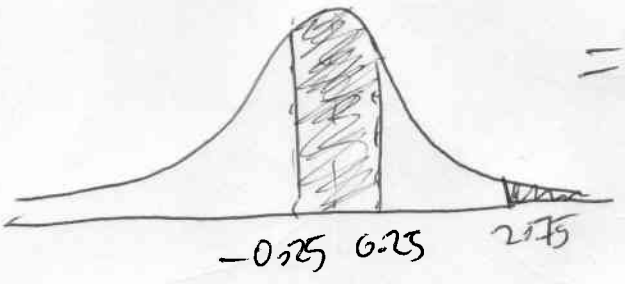
$= .0401 + .1359$

$= .1760$

8) $P(X>43 \text{ or } 31<X<33) = P(X>43) + P(31<X<33)$

$= P\left(Z > \frac{43-32}{4}\right) + P\left(\frac{31-32}{4} < Z < \frac{33-32}{4}\right)$

$= P(Z>2.75) + P(-0.25<X<0.25)$



$= 1 - .9970 + .5987 - .403$

$= .0030 + .1974$

$= .2004$

Problem 1.93

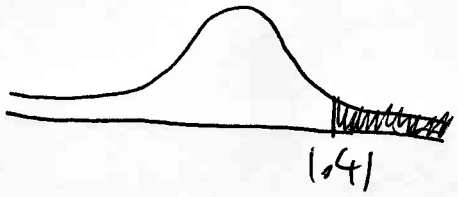
Let X = "cholesterol level of randomly chosen women aged 20 to 34"

X is distributed normally with mean 185 and sd 39.

"demands medical attention" $\equiv X > 240$

(a) $P(X > 240) = P\left(\frac{X-185}{39} > \frac{240-185}{39}\right)$

$= P(Z > 1.41)$



$= 1 - P(Z < 1.41)$

$= 1 - .9207$

$= .0793$

(b) "borderline high" $\equiv 200 < X < 240$

$P(200 < X < 240) = P\left(\frac{200-185}{39} < Z < \frac{240-185}{39}\right)$

$= P(0.38 < Z < 1.41)$

$= .9207 - .6480$

$= .2727$

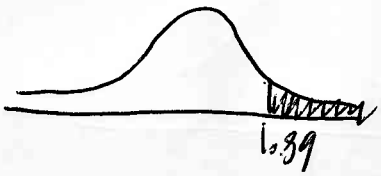
Problem 1.97

Let $X \equiv$ "IQ score for randomly selected man"
Let $Y \equiv$ "IQ score for randomly selected woman"

X is distributed $N(533, 115)$
Y is distributed $N(498, 109)$

a) $P(X > 750) = P\left(Z > \frac{750-533}{115}\right)$

$= P(Z > 1.89)$



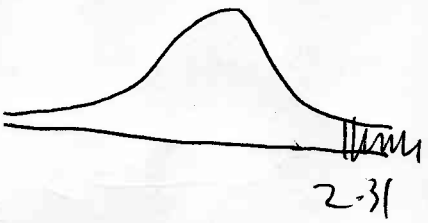
$= 1 - P(Z < 1.89)$

$= 1 - .9706$

$= .0294$ (i.e. about 3%)

b) $P(Y > 750) = P\left(Z > \frac{750-498}{109}\right)$

$= P(Z > 2.31)$



$= 1 - P(Z < 2.31)$

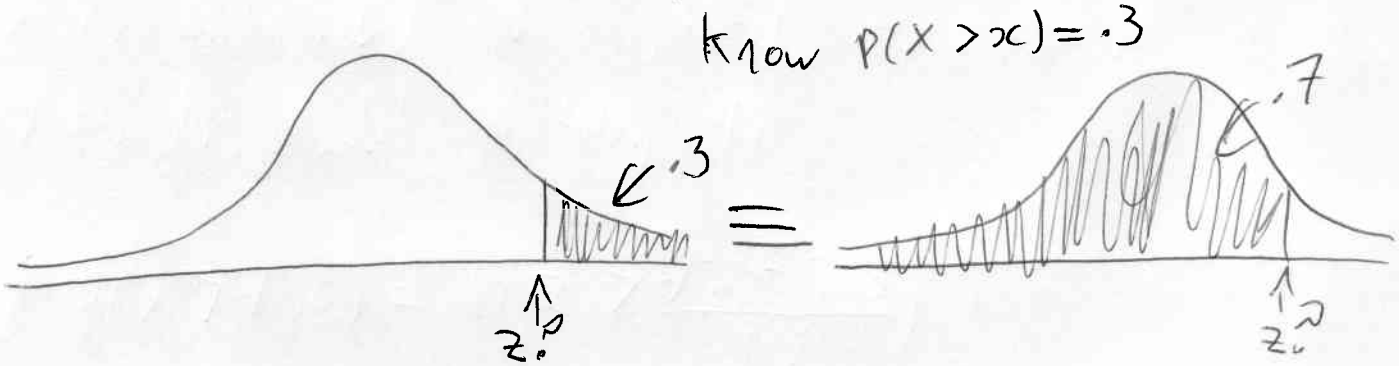
$= 1 - .9896$

$= .0104$ (i.e. about 1%).

Problem 1.103

Let $X \equiv$ "score on SSHA test"

X is distributed $N(114, 30)$



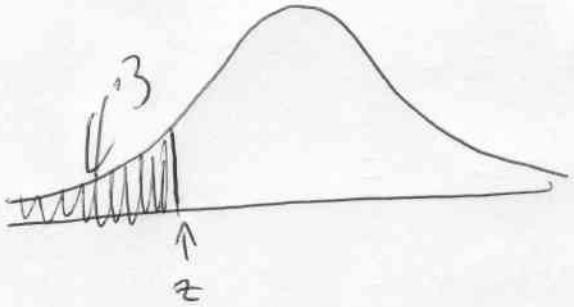
$z = ?$

Looking for .7 in table closest is .6985 which corresponds to .52

i.e. $P(Z < .52) \approx .7$

what is x? $x = .52(30) + 114 = \underline{129.6}$

If instead know $P(X < x) = .3$



Looking for .3 in table closest is .3015 which corresponds to $z = -0.52$

so $x = -0.52(30) + 114 = \underline{98.4}$

Problem 3.3

This is an observational study. The researchers did not have any control over whether the observed individuals used cell phones or not. The response variable is brain cancer rate, the explanatory variable is cellphone usage.

Problem 3.7

Assuming that they are varying the amount of exercise that each subject receives it would be an experiment. The explanatory variable is the exercise, the response variable should be the difference in metabolic rate between the measurement 12 hours later and right before.