Homework #5 Solutions

1.104, 1.105, 3.1, 3.3, 3.23, 3.28

Problem 1.104

Let $X =$ "IQ score" X is distributed normal with mean 100, standard deviation 15.

Below $100 \equiv X < 100$

(a) $P(X < 100) = P\left(\frac{X-100}{15} < \frac{100-100}{15}\right)$

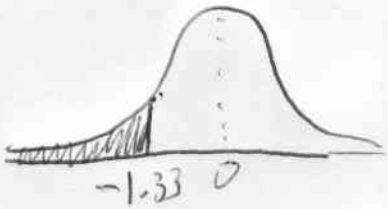
$= P(Z < 0)$

$= 0.5 \quad (50\%)$

Below $80 \equiv X < 80$

(b) $P(X < 80) = P\left(\frac{X-100}{15} < \frac{80-100}{15}\right)$

$= P(Z < -1.33)$

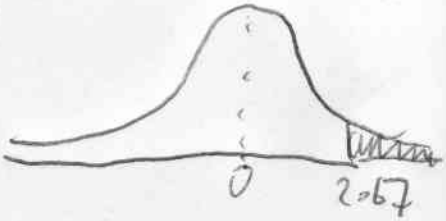


$= .0918 \quad (\approx 9.2\%)$

Above $140 \equiv X > 140$

(c) $P(X > 140) = P\left(\frac{X-100}{15} > \frac{140-100}{15}\right)$

$= P(Z > 2.67)$

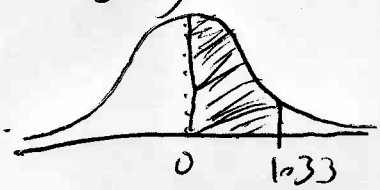


$= 1 - P(Z < 2.67)$

$= 1 - .9962 = .0038 \quad (\approx .4\%)$

Between 100 and 120 $\equiv 100 < X < 120$

(d) $P(100 < X < 120) = P\left(\frac{100-100}{15} < \frac{X-100}{15} < \frac{120-100}{15}\right)$



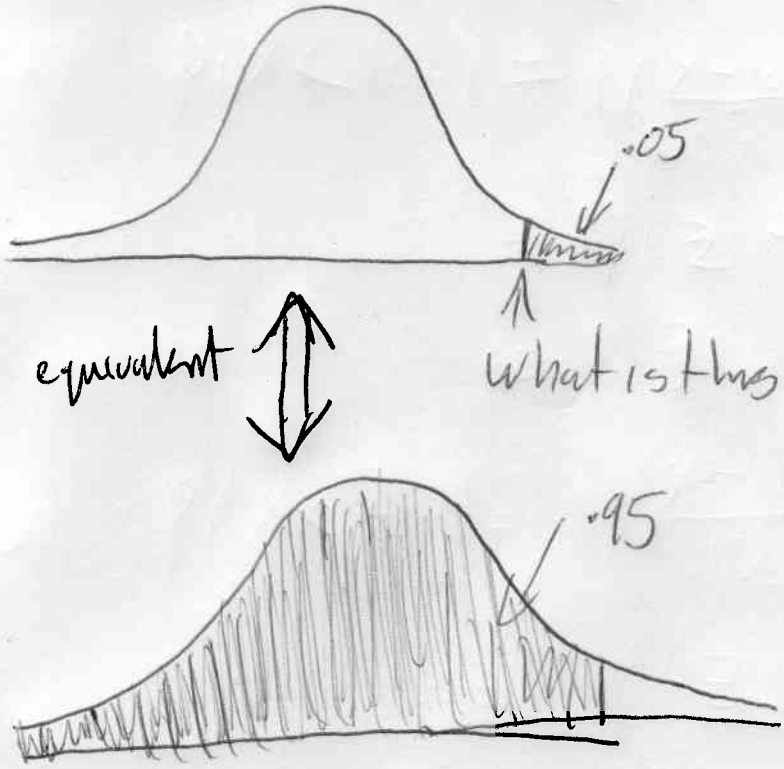
$= P(0 < Z < 1.33)$

$= P(Z < 1.33) - P(Z < 0)$

$= .9082 - .5$

$= .4082$

Problem 1.105



From the normal table searching for $P(Z < z) = .95$

gives $P(Z < 1.64) = .9495$

and $P(Z < 1.65) = .9505$

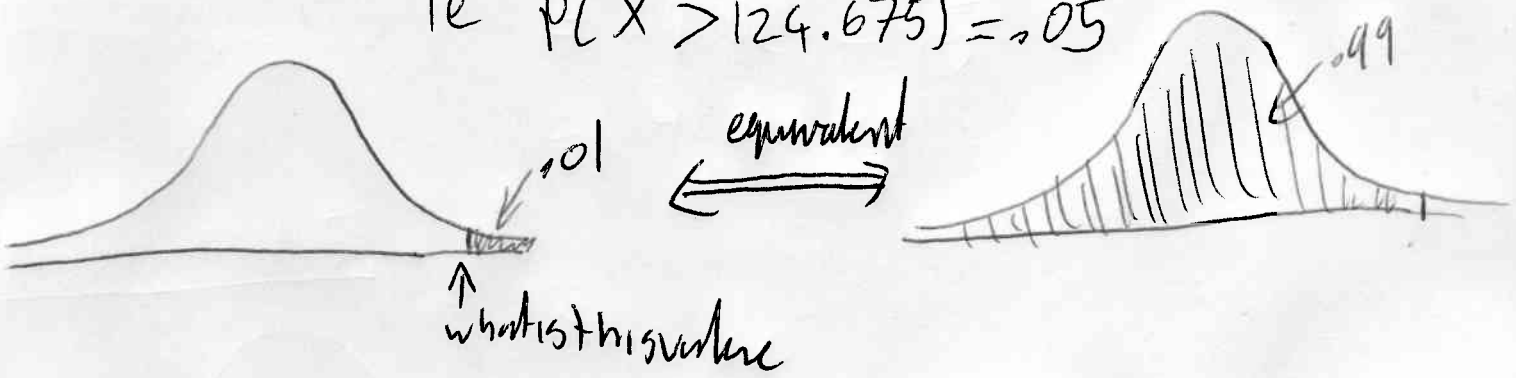
since .95 is about half way between these two values take $z = 1.645$

Need to transform to mean and std dev of original data

so

$x = z\sigma + \mu = (1.645)(15) + 100 = 124.675$

ie $P(X > 124.675) = .05$



From table searching for $P(Z < z) = .99$

gives $P(Z < 2.33) = .9901$

transforming to mean and sd of original data

$x = z\sigma + \mu = (2.33)(15) + 100 = 135$

Problem 3.1

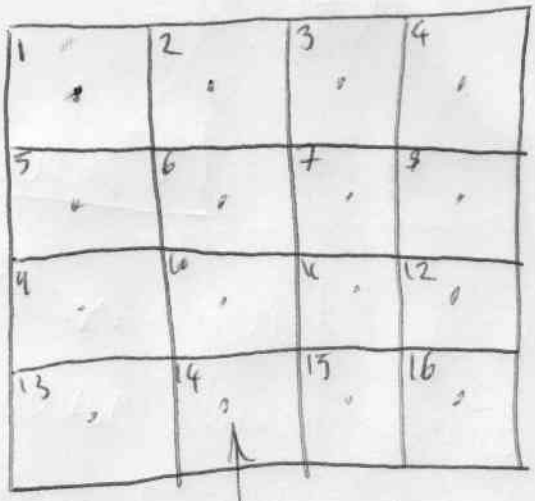
This is not good evidence that cell phones cause brain tumors because it is anecdotal evidence. Her friends could be related in some other way (ie perhaps they all exposed more frequently to some pollutant because they live in same area. In addition she

is basing her view off just two non randomly chosen people.

Problem 3.3

this is an observational study because the researcher did not have any control over any variable. The explanatory variable is cell phone use. The response variable is whether they had brain cancer or not.

Problem 3.23



the field a pole location and grids the numbering will help us assign colors to the poles

The important thing about this problem is how you assign the colors. Note that "randomly" does not mean helter-skelter or just how you feel like doing it. You have to have a method of assigning colors using random number or similar.

First I decide to assign the 4 blue, then 4 green, 4 white and 4 yellow. How do I do this? Make tickets with numbers 1, 2, ..., 16 on them. Put all the tickets into a box and shake vigorously. Then 1 by 1 I draw tickets from the box. The first four numbers correspond to the four poles which get blue. The next four correspond to green, the next four to white and the remaining four to yellow.

My drawing order:

3, 13, 4, 15, 14, 6, 5, 2, 10, 16, 7, 11, 8, 1, 12, 9

So

blue: 3, 13, 4, 15
green: 14, 6, 5, 2
white: 10, 16, 7, 11
yellow: 8, 1, 12, 9

Y	G	B	B
G	G	W	Y
W	W	Y	Y
B	G	B	W

Problem 3.28

(a) Factors: 1. Time question presented
2. Type of question

Levels

Time question presented: before, after (2)

Type of question asked: simple fact, computation, word problem (3)

There are (2)(3)=6 different treatments

trt 1: before ; simple fact
trt 2: before ; computation
trt 3: before ; word problem
trt 4: after ; simple fact
trt 5: after ; computation
trt 6: after ; word problem

} the six possibilities listed.

(b) Assume we start with 12 classes. Assign each class a number between 1 and 12. Using a computer we draw numbers between 1 and 12 in particular we get

1, 9, 4, 5, 2, 6, 8, 3, 11, 10, 7, 12

Use these to assign treatments as follows.

	Simple fact	Computation	word problem
Before	1, 9	4, 5	2, 6
After	8, 3	11, 10	7, 12

After applying the treatments measure the average math score for all students in the classes who received that treatment.