STAT 461: Homework 2

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PROBLEM 1

The following is the assignments for the first experiment:

3	3	none
4	4	low
5	5	medium
6	6	high
7	7	low
8	8	none
9	9	high
10	10	medium
11	11	none
12	12	none
13	13	low
14	14	none
15	15	low
16	16	medium
17	17	high
18	18	low
19	19	medium
20	20	medium

PROBLEM 2

The following is the assignments for the second experiment:

3	3	medium
4	4	none
5	5	medium
6	6	low
7	7	high
8	8	low
9	9	low
10	10	none
11	11	medium
12	12	high
13	13	none
14	14	medium
15	15	medium
16	16	none
17	17	low
18	18	high
19	19	low
20	20	high

PROBLEM 3

The following is the assignments for the third experiment:

3	3	r2
4	4	r3
5	5	r3
6	6	r2
7	7	r1
8	8	r1
9	9	r2
10	10	r2
11	11	r3
12	12	r3
13	13	r2

PROBLEM 4

The first correlation was the lighthearted correlation of: US spending on science, space and technology correlated with Suicides by hanging, strangulation and suffocation. One thing interesting about this correlation is that with modern advancements in technology, it is easier to think of possible latent reasons for this correlation rather than counter-examples.

However, on face value, simply increasing the spending budgets for science, space and technology wouldn't induce more suicides. One important piece of information left out is whether or not this spending budget has been adjusted to account for inflation. Even if the dollar amount goes up, it doesn't necessarily mean that the percentage of relative value has increased from the last year.

In contrast, one factor that could increase suicide rates would be the amount of automation implemented by advances in technology, which drives people out of jobs. These forms of suicide are also fairly cheap to accomplish and the loss of income could push people who are already struggling in life over their breaking point.

PROBLEM 5

a)

$W \sim N(2 - 3 + 0, 6 + 2 + 1)$
$W \sim N(-1, 9)$

b)

$Q = 2Y; Y \sim N(-3, 2)$
$Q \sim N(2 * -3, 4 * 2)$
$Q \sim N(-6, 8)$

c)

$P = -2X + 4; \quad 4 \sim N(4, 0); \quad X \sim N(-2, 6)$
$P \sim (-2 * 2, 4 * 6) + (4, 0)$
$P \sim (-4 + 4, 24 + 0)$
$P \sim N(0, 24)$

d)

$X \sim N(2, 6)$
$M \sim aX + b : M \sim (0, 1)$
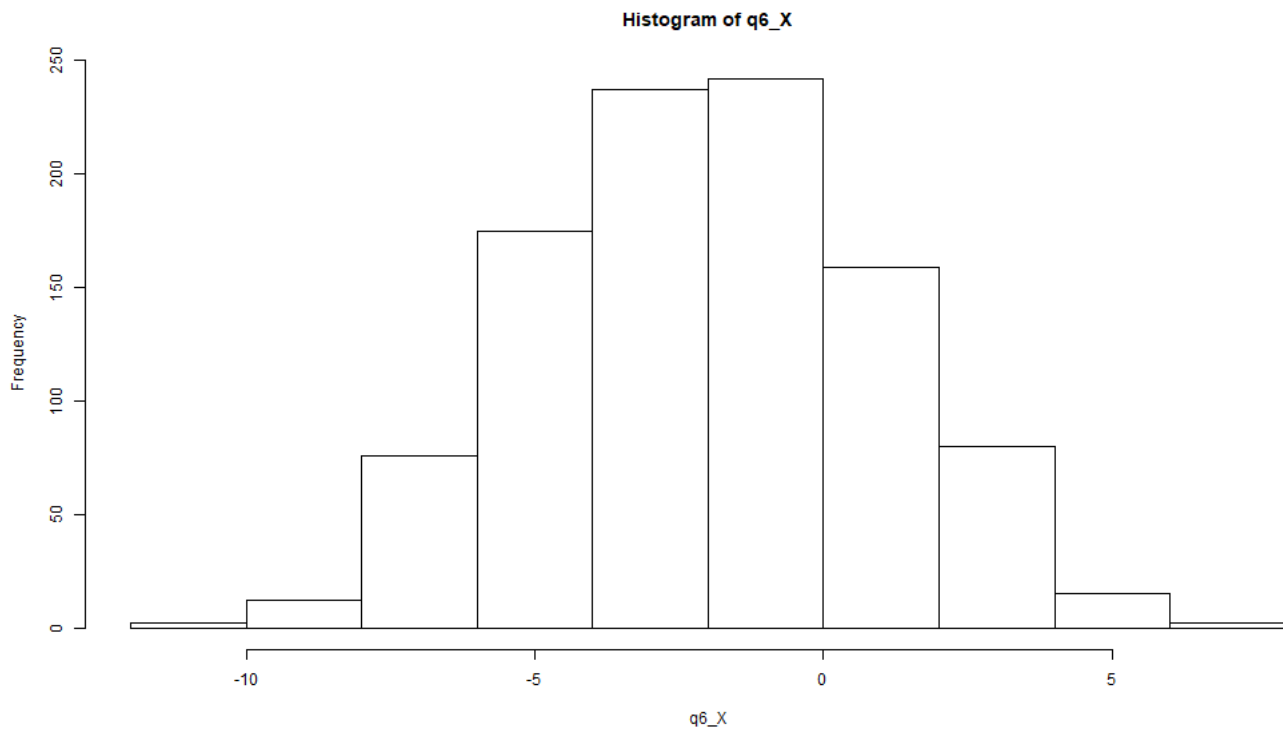$M \sim N(a * 2 + b, a^2 * 6)$
$a = \sqrt{\frac{1}{6}}$
$b = -2 * a$
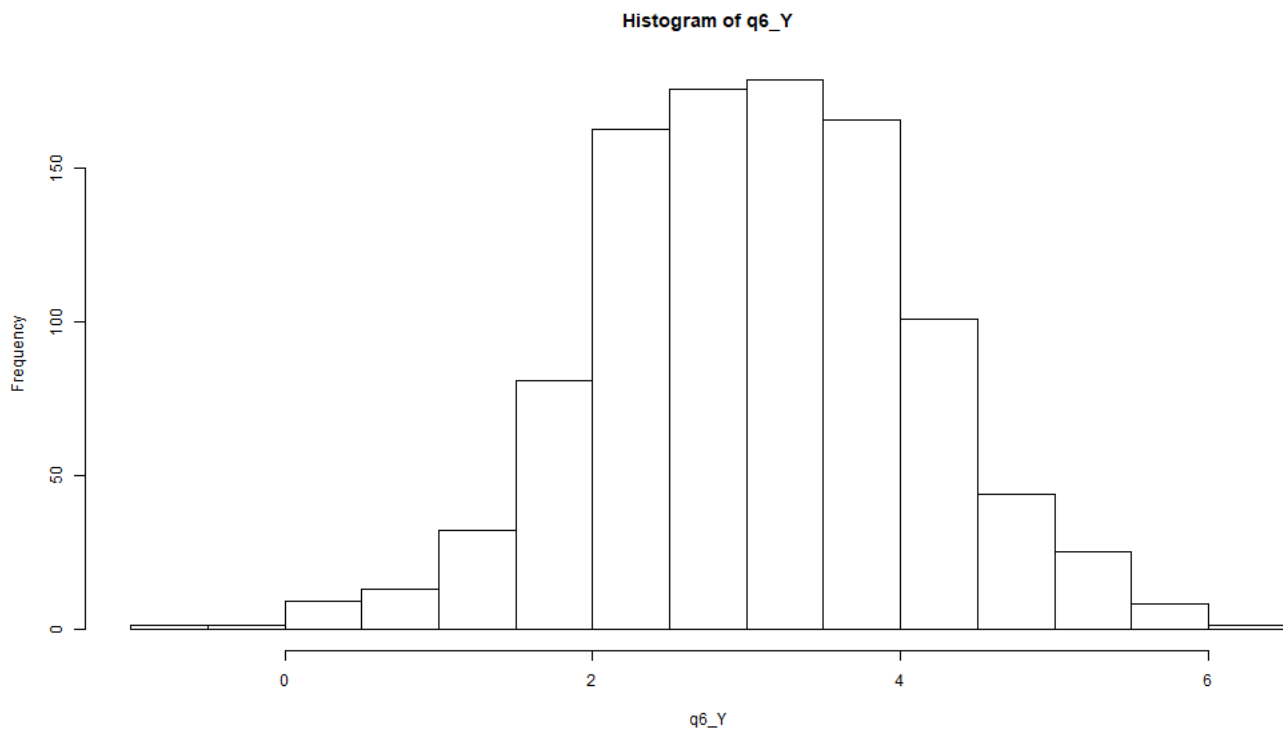$M \sim N\left(\sqrt{\frac{1}{6}} * 2 - \sqrt{\frac{1}{6}} * 2, \left(\sqrt{\frac{1}{6}}\right)^2 * 6\right)$
$M \sim N(0, 1)$

a)

Histogram of q6_X
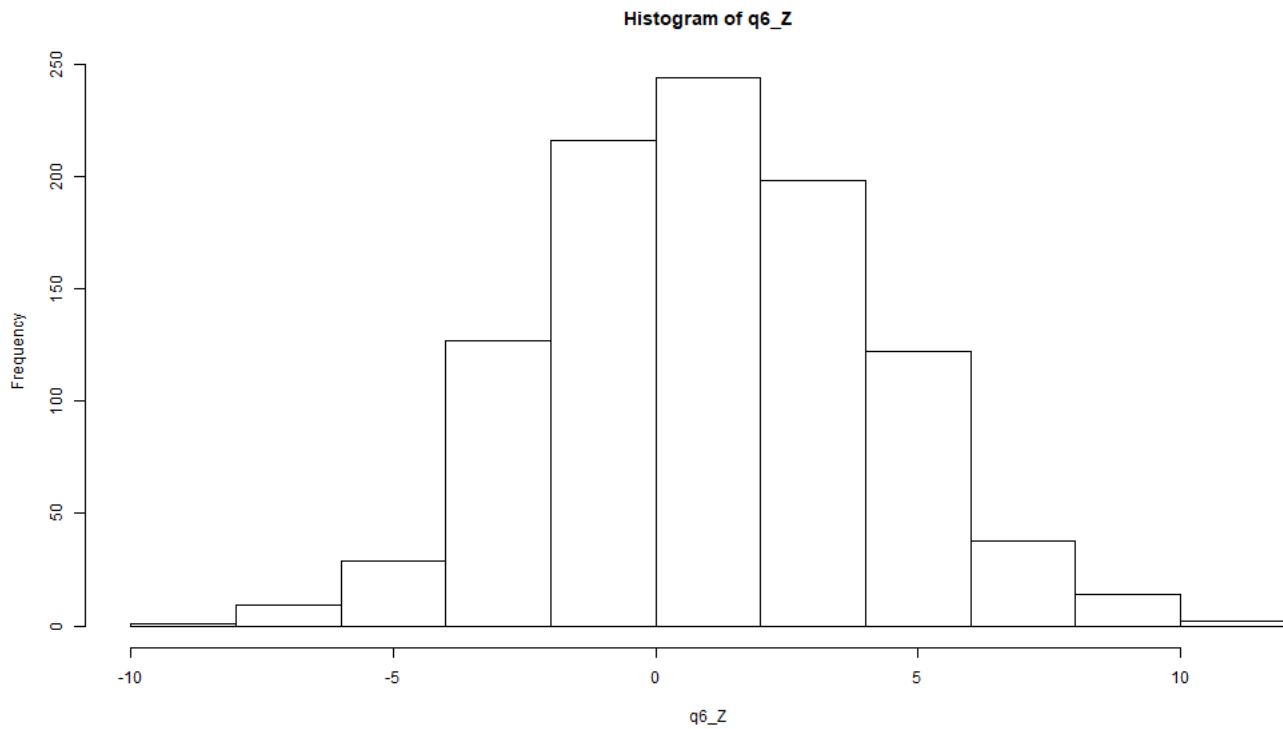
b)

Histogram of q6_Y

c)

Histogram of q6_Z

d)

Yes, although the distribution is a linear combination of the two independent distributions, the samples from Z are not dependent on samples from X or Y.

$$P(Z|A, B) = P(Z)$$

e)

$$Z = X + Y; \quad X \sim N(-2,3); \quad Y \sim N(3,1)$$
$$Z \sim (-2 + 3, 3 + 1)$$
$$Z \sim (1,4)$$

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[1]  3.07499
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