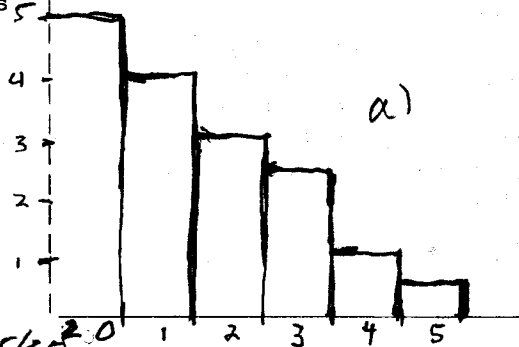


Clearly show how to find the answers. You don't need to carry out the arithmetic, but you must show the calculations. Follow the Honor Code.

- (6) 1. For a given population: 5,000 people have 0 accidents; 4,000 have 1; 3,000 have 2; 2,500 have 3; 1,000 have 4; 500 have 5.

- a) Draw a histogram for the number of accidents.
b) Find the mean number of accidents.
c) Find the standard deviation.
d) Find the median.
e) Find the 5-number summary.
f) Draw the box plot.

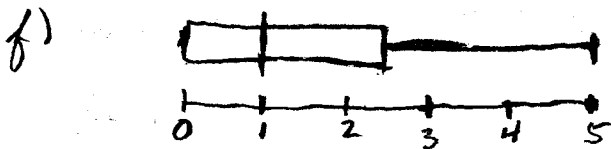


$$b) \mu = \frac{5 \cdot 0 + 4 \cdot 1 + 3 \cdot 2 + 2.5 \cdot 3 + 1 \cdot 4 + 0.5 \cdot 5}{16} = \frac{24}{16} = 1.5$$

$$c) \sigma^2 = \frac{5(1.5)^2 + 4(.5)^2 + 3(.5)^2 + 2.5(1.5)^2 + 1(2.5)^2 + 0.5(3.5)^2}{16}$$

d) median is between 8000' and 8001', so $\boxed{1}$

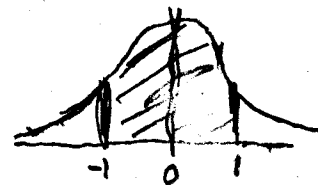
e) $Q_1 = 0$; $Q_3 = 2.5$ so 0, 0, 1, 2.5, 5



- (2) 2. If you replace the largest number in a data set by an even larger number, what change will that make, if any, in: a) the mean; b) the median? Explain.

- a) Increases the mean because sum of data is larger.
b) No change, because the middle is still in the middle.

- (3) 3. For the standard normal distribution Z:
a) What are the expected value and standard deviation.
b) Find the probability that $-1 \leq Z \leq 1$.
c) Find z such that the probability that $-z \leq Z \leq z$ is .96.

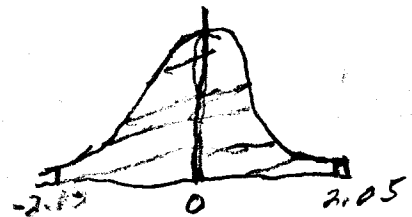


a) $\mu = 0$; $\sigma = 1$

b) $P(-1 \leq Z \leq 1) = P(Z \leq 1) - P(Z \leq -1) = .8413 - .1587 = \boxed{.6826}$

c) $P(-z \leq Z \leq z) = .96 = .98 - .02 = P(Z \leq z) - P(Z \leq -z)$

$\therefore z = 2.05$ and $-z = -2.05$



- (2) 4. You choose a random sample of 4 people from a population of 6 women and 2 men. What is the probability that exactly three are women?

choose 4 from 8; rep: NO; order: NO

$$n(S) = C(8, 4) = \frac{8 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2} = 70$$

$$n(E) = C(6, 3) \cdot C(2, 1) = \frac{6 \cdot 5 \cdot 4}{3 \cdot 2} \cdot 2 = 40$$

$$\text{So } P(E) = \frac{40}{70} = \boxed{\frac{4}{7}}$$

- (4) 5. You chose a random sample of 4 people from a population that contains 6 million women and 2 million men. For the number of women in the sample, find:
a) the probability distribution; b) the mean; c) the standard deviation.

X is # of women; $p = \frac{3}{4}$; $q = \frac{1}{4}$; $n = 4$

a)

X	0	1	2	3	4
Prob	$(\frac{1}{4})^4$	$4 \cdot \frac{3}{4} \cdot (\frac{1}{4})^3$	$6 \cdot (\frac{3}{4})^2 (\frac{1}{4})^2$	$4 (\frac{3}{4})^3 \frac{1}{4}$	$(\frac{3}{4})^4$

b) $\mu = p \cdot n = \frac{3}{4} \cdot 4 = \boxed{3}$

c) $\sigma^2 = p \cdot q \cdot n = \frac{3}{4} \cdot \frac{1}{4} \cdot 4 = \frac{3}{4}$, so $\sigma = \sqrt{.75} = \boxed{.87}$

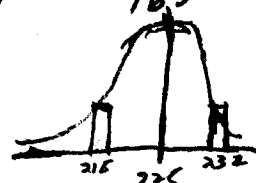
- (2) 6. If you choose a random sample of 300 people from the population above, use normal distribution to estimate the probability that the number of women is between 218 and 232.

$$p = \frac{3}{4}; q = \frac{1}{4}; n = 300; \mu = \frac{3}{4} \cdot 300 = 225; \sigma^2 = \frac{3}{4} \cdot \frac{1}{4} \cdot 300 = \frac{900}{16}; \sigma = 7.5$$

Y is normal with same μ & σ $z = \frac{Y - 225}{7.5}$

$$P(218 \leq X \leq 232) = P(217.5 \leq Y \leq 232.5) =$$

$$P(-1 \leq z \leq 1) = .6826 \text{ by prob. 3b)}$$



- (3) 7. For the same population: a) What proportion is female?
b) Find a 96% confidence interval for the proportion of females in random samples of 300.

a) $\frac{6 \cdot 10^6}{8 \cdot 10^6} = \frac{3}{4} = x$; $\mu = x = \frac{3}{4}$; $\sigma^2 = \frac{\frac{3}{4} \cdot \frac{1}{4}}{300} = \frac{1}{1600}$; $\sigma = \frac{1}{40} = .025$

$$z = \frac{p - .75}{.025} \text{ From prob 3c, } .96 = P(-2.05 \leq z \leq 2.05)$$

$$p = .75 \pm 2.05 \cdot .025 = .75 \pm .051 = P(.699 \leq p \leq .801)$$