

1) # of professors = 100

values of wealth 400 - 400 000 \$

mean = 40000 \$

median = 25000 \$

mistake 400 000 \$ \rightarrow 4 000 000 \$

answer: median will not change since only the number of the income standing last in the order changed. median is just the amount of income standing in the middle of the ordered data sequence (or if the dataset is even, the average of middle two)

mean will definitely change:

$$E(\text{wealth}) = \frac{400\$ + X_2 + X_3 + X_4 + \dots + 400\,000\$}{100} = 40\,000\$$$

where $(X_1 \dots X_{100})$ is the wealth of each professor in the set.

The first part of the equation circled with red pen will not change after the mistake, so we can denote it with y . Therefore, previously, the last professors expected wealth part was $4000\$ (= \frac{400\,000}{100})$ and other professors:

$$y + 4000\$ = 40\,000\$$$

$$y = 36\,000\$$$

after the mistake

$$E(\text{wealth}) = y + \frac{4\,000\,000}{100} = 36\,000 + 40\,000 = 76\,000\$$$

this means that the mistake almost doubled the mean value.

2) compare expected value and variance of six-sided vs four-sided die

six sided:

$$E(X) = \frac{1}{6}(1+2+3+4+5+6) = \frac{21}{6} = 3,5$$

four sided

$$E(X) = \frac{1}{4}(1+2+3+4) = \frac{10}{4} = 2,5$$

six sided:

$$V(X) = E(X^2) - (E(X))^2 = \frac{1}{6}(1+4+9+16+25+36) - 3,5^2 = \frac{91}{6} - 12,25 = 2,91$$

four sided:

$$V(X) = \frac{1}{4}(1+4+9+16) - 2,5^2 = \frac{30}{4} - 6,25 = 1,25$$

both variance and expected value of six-sided die is higher

3) normally distributed female heights

$$N \sim (66, 2,5^2)$$

what fraction ≥ 70 meters?

first let's standardize the heights of females and then look it up in the normal distribution table





We need to find the value of the point marked with question mark

$$P(X \geq 70) = P\left(Z \geq \frac{70 - 66}{2.5}\right) = P(Z \geq 1.6) = 1 - P(Z < 1.6)$$

In the normal distribution table we need to look up value 1.6. In the table the area is given

on the left side of the distribution function,

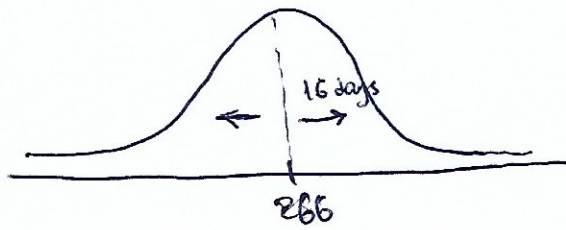
that is why we subtract the given area from 1

$$P(Z < 1.6) = 0.94520$$

$$P(X \geq 70) = 1 - 0.94520 = 0.0548 = 5.48\% \text{ of females}$$

are taller than 70cm

4) distribution of pregnancies:



a) completed pregnancy lasts at least 270 days

$$P(X \geq 270) = P\left(Z \geq \frac{270 - 266}{16}\right) = 1 - \underbrace{P(Z < 0,25)}_{\text{look in the table}} =$$

$$= 1 - 0,59871 = 0,40129$$

answer: $\approx 40\%$ of pregnancies last at least 270 days
or probability of pregnancies lasting more than
270 days is $\approx 0,4$

b) completed pregnancy lasts at least 310 days

$$P(X \geq 310) = P\left(Z \geq \frac{310 - 266}{16}\right) = 1 - \underbrace{P(Z \leq 2,75)}_{\text{look up}} =$$

$$= 1 - 0,99702 = 0,00298$$

answer: only $0,2\%$ of completed pregnancies last
for 310 days, meaning that Abby is a
big exception (outlier)