The last of the Binomial Distribution

Ex. 2% of students at a large school love poetry. What is the <u>largest</u> sample of students for which the probability is > 0.5 that no one in the group loves poetry?

X = number of poetry lovers in the sample

$X \sim B(n, 0.02)$

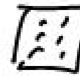
$P(X = 0) > 0.5$

Ex. How many times must you roll a die so that probability of <u>at least one</u> ⚅ is ≥ 0.99?

$$1 - P(\text{no } ⚅) = 1 - \left(\frac{5}{6}\right)^n \geq 0.99$$

$n = 26$

Expected value

<u>EX</u> Roll a die 100 times. X = number of 

Find $E(X)$.

$$\boxed{E(X) = np}$$

$$E(X) = \frac{1}{6}(100) = 16\tfrac{2}{3} = \mu$$

Find $Var(X)$

$$\boxed{Var(X) = npq}$$

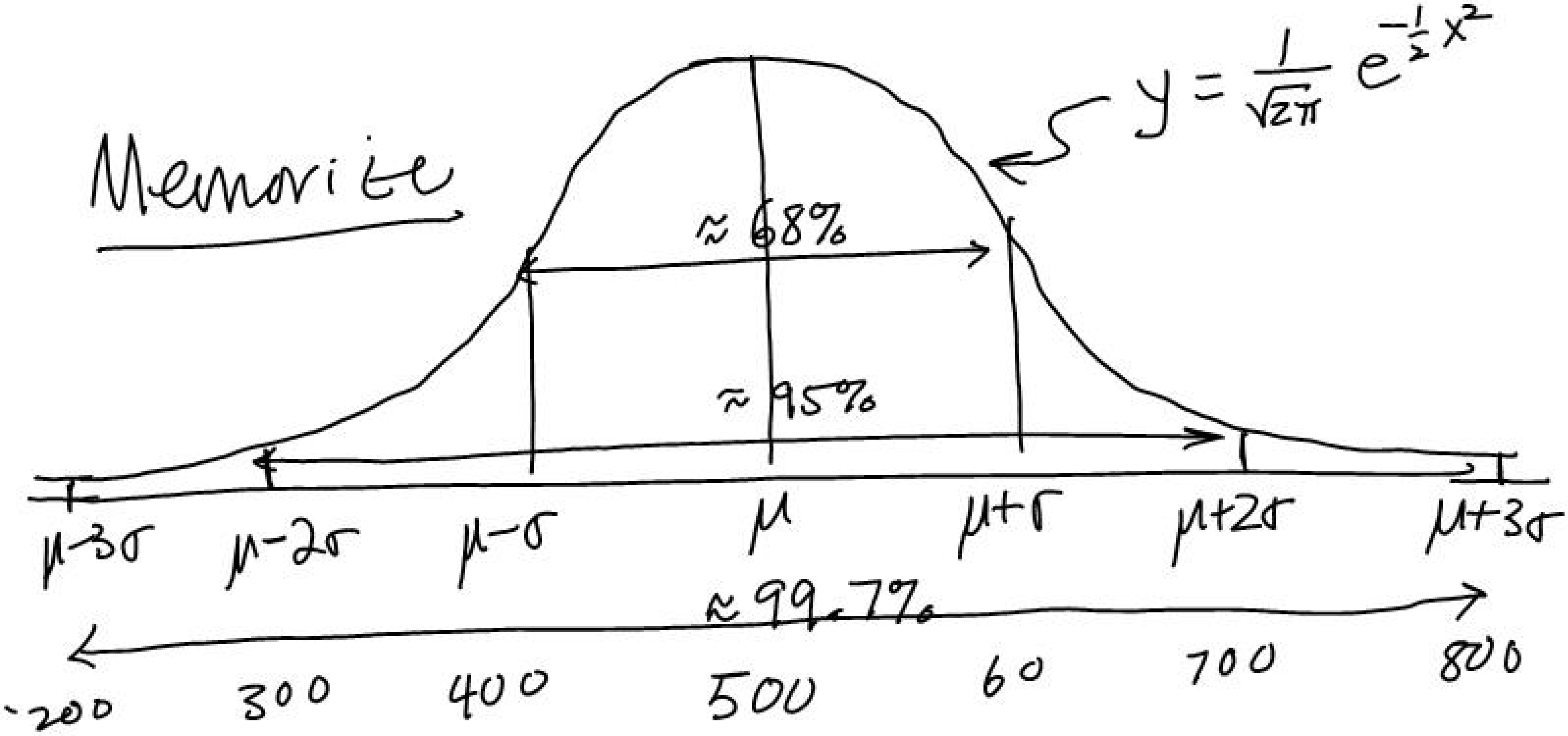
$$\sigma^2 = Var(X) = 100\left(\frac{1}{6}\right)\left(\frac{5}{6}\right) = \frac{500}{36} = 13.9$$

Find the <u>standard deviation</u>.

$$\sigma = \sqrt{\frac{500}{36}} = \frac{5}{3}\sqrt{5} \approx 3.73$$

The Normal Distribution

Memorize



$$\boxed{X \sim N(500, 100^2)}$$ SAT-M

μ   var

$P(X > \underline{600}) = P(Z > 1) =$

z-score (number of std. dev. above or below the mean)

$*\ \boxed{Z = \dfrac{X - \mu}{\sigma}}$ $z = \dfrac{600 - 500}{100} = 1$

$P(Z > 1) = \text{normalcdf}(1, 9)$

$\approx \infty$

Ex. $P(300 < X < 700) = P(-2 < Z < 2)$

$$Z = \frac{300-500}{100}$$

$= -2$

(2 std. dev. <u>below</u> the mean)

$$Z = \frac{700-500}{100}$$

$= 2$

from the diagram, we estimate that

$P(-2 < Z < 2) = 0.95$

$P(-2 < Z < 2) = \text{normalcdf}(-2, 2)$

$= 0.954$

Ex. $P(X < 470) = P(Z < -0.3)$

$$Z = \frac{470-500}{100}$$

$$= \frac{-30}{100}$$

$= -0.3$

$= \text{normalcdf}(-9, -0.3)$

$\approx -\infty$

$= 0.382$

$\boxed{15J}$ X = Euros per week for groceries

$$\boxed{X \sim N(100, 20^2)}$$

(a) $P(X < 130) = P(Z < 1.5)$

$= \text{normalcdf}(-9, 1.5)$

$= 0.933$

$$z = \frac{130-100}{20} = \frac{30}{20} = 1.5$$

(b) $P(X > 90) = P(Z > -0.5)$

$= \text{normalcdf}(-0.5, 9)$

$= 0.691$

$$z = \frac{90-100}{20} = \frac{-10}{20} = -0.5$$

(c) $P(80 < X < 125)$

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

$= \text{normalcdf}(-1, 1.25)$

$= 0.736$

HW $\boxed{15E}$ # 2, 4, 5

$\boxed{15F}$ # 1

(binomial distr.)

$\boxed{15G}$ # 2, 4, 5

$\boxed{15J}$ # 2, 3, 4 (normal distr)