

Mar. 31 3.5 Approximation to the Binomial Distribution

A true and false test has 10 questions. A student guesses to answer all of the questions. Use the binomial distribution to determine the mean and standard deviation. Then determine the probability that they get at least 7 correct on the exam.

$$\text{binompdf}(10, 0.5)$$

$$L_2(8) + L_2(9) + L_2(10) + L_2(11)$$

$$0.171875$$

$$\mu = n \times p$$

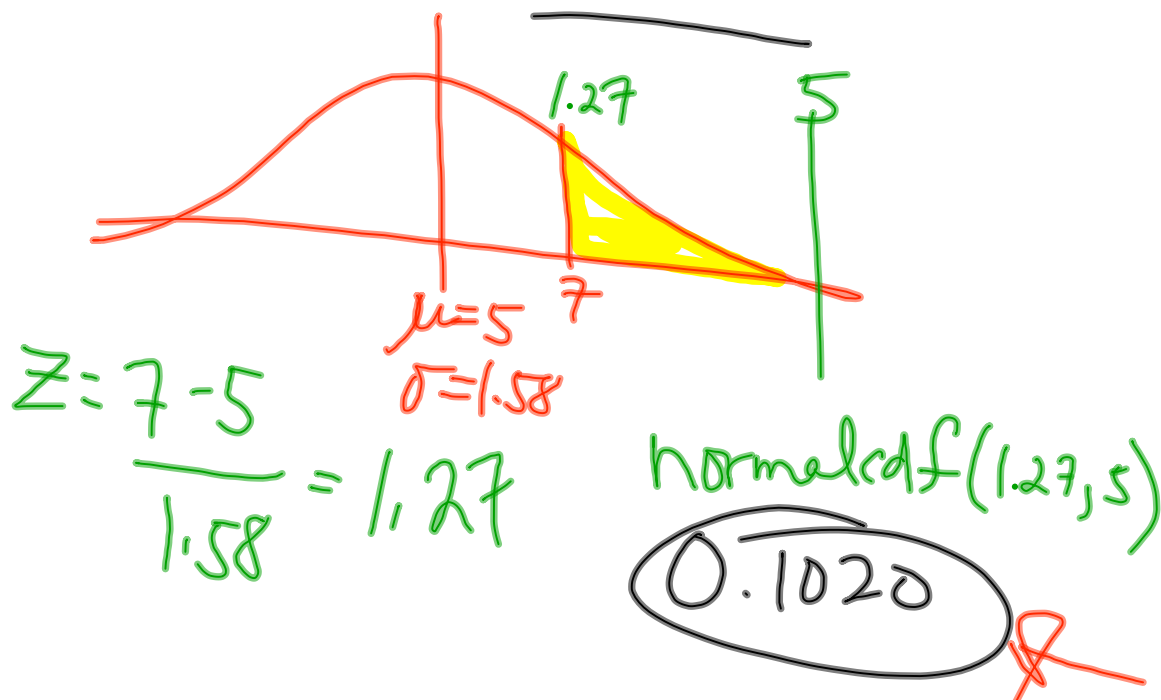
$$\mu = 10(0.5)$$

$$\mu = 5$$

$$\sigma = \sqrt{n \times p \times (1-p)}$$

$$\sigma = \sqrt{10 \times 0.5 \times (1-0.5)}$$

$$\sigma = 1.58$$



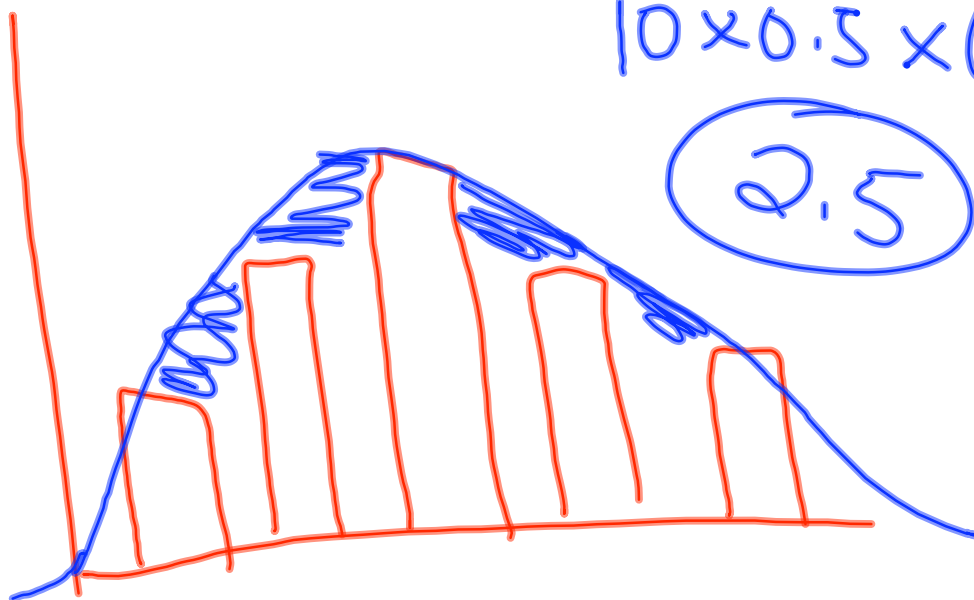
Test for sample size

$$n \times p \times (1-p) \geq 10$$

Sample size is large enough to allow you to use a bell curve to calculate the solution.

$$10 \times 0.5 \times (1-0.5)$$

2.5



Example:

A running shoe manufacturer estimates from previous inspections that 3.2% of shoes made are defective. If an inspector randomly selects 500 shoes, estimate the probability that between 8 and 15 of these are defective.

$$\text{Test } n \times p \times (1-p) \geq 10$$

$$500 \times (0.032) \times (1-0.032)$$

$$15.48$$

$$\mu = n \times p$$

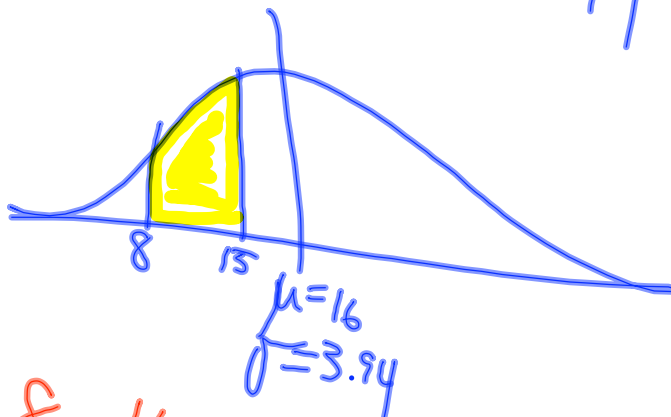
$$\mu = 500 \times 0.032$$

$$\mu = 16$$

$$\sigma = \sqrt{n \times p \times (1-p)}$$

$$\sigma = \sqrt{500 \times 0.032 \times (1-0.032)}$$

$$\sigma = 3.94$$



$$Z = \frac{8 - 16}{3.94}$$

$$-2.03$$

$$Z = \frac{15 - 16}{3.94}$$

$$-0.25$$

$$\text{normalcdf}(-2.03, -0.25)$$

$$= 0.38011$$

$$P_{9.130} \text{ } 1-8$$