

3. 70% of the US population are troubled by the economy. You randomly sample 20 people. Let X be the number in your sample who are troubled by the economy.

a. What type of random variable is this? What are the parameters of the model?

BINOMIAL $n = 20$ $p = .7$

b. Find the population mean and standard deviation.

$$\mu = np = (20)(.7) = 14$$

$$\sigma = \sqrt{npq} = \sqrt{(20)(.7)(.3)} = 2.05$$

c. Find the probability that exactly 15 people in your sample are troubled by the economy.

$$P(X=15) = .179$$

d. Find the probability that more than 15 people in your sample are troubled by the economy.

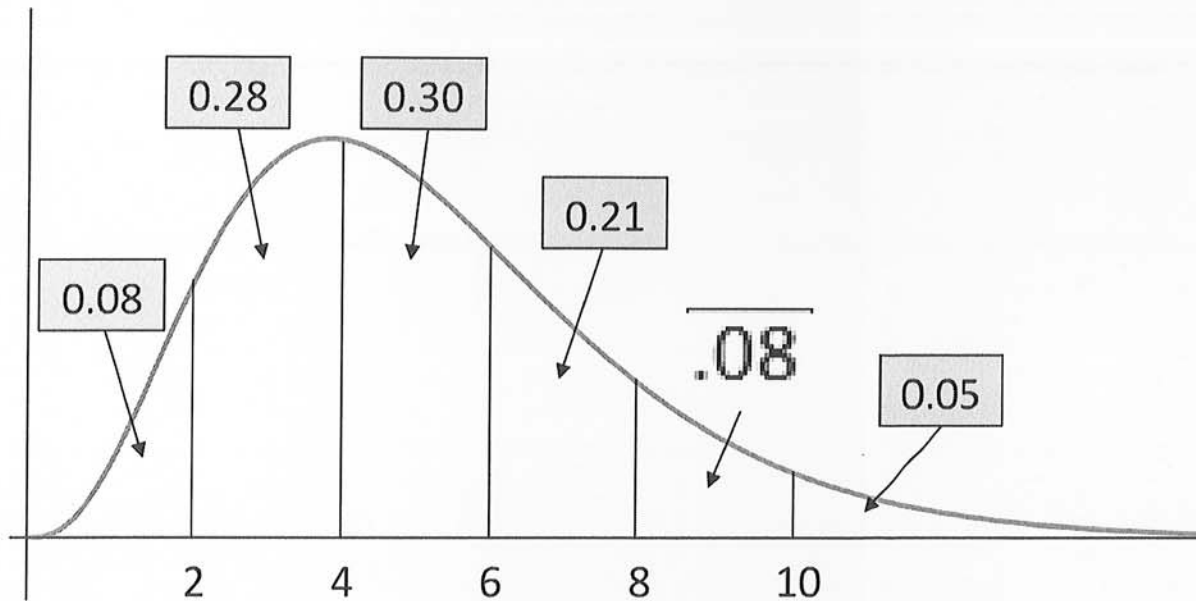
$$P(X > 15) = P(16) + P(17) + P(18) + P(19) + P(20) = .238$$

e. Would it be unusual if only 7 people in your sample were troubled by the economy? Justify your answer.

$$P(X \leq 7) = .001 \rightarrow \text{this is highly unlikely.}$$

Math 10 – Continuous Random Variables

1. The completion time (in minutes) for a student to complete a short quiz follows the probability density function shown here, with some areas calculated.



- a. Find the probability that a student completes the exam in 4 minutes or less.

$$0.08 + 0.28 = 0.36$$

- b. Find the probability that a student needs between 8 and 10 minutes to finish the quiz.

$$0.08 + 0.05 = 0.13$$

- c. If the instructor allows 10 minutes for the quiz and the class has 40 students, how many students will run out of time before the quiz is finished?

$$(0.05)(40) = 2 \text{ students}$$

- d. Find the 66th percentile of the distribution.

$$6 \text{ minutes } (P(X < 6)) = .66$$

2. Annual rainfall in a Bay Area city follows a Normal distribution with $\mu=20$ inches and $\sigma=5$.

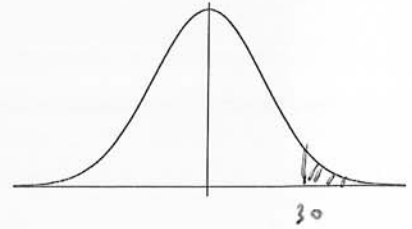
- a. Find and shade the probability of 30 or more inches of rain in a randomly selected year.

$$P(X \geq 30)$$

$$P\left(z \geq \frac{30-20}{5}\right)$$

$$P(z \geq 2) = 1 - .9772$$

$$.0228$$



- b. Find and shade the probability of less than 15 inches of rain in a randomly selected year.

$$P(X < 15)$$

$$P\left(z < \frac{15-20}{5}\right)$$

$$P(z < -1.00) = .1587$$



- c. Find and shade the probability of between 15 and 25 inches of rain in a randomly selected year.

$$P(15 < X < 25)$$

$$P\left(\frac{15-20}{5} < z < \frac{25-20}{5}\right)$$

$$P(-1.00 \leq z \leq 1.00)$$

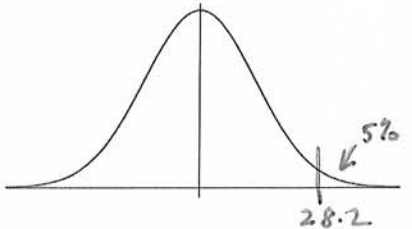
$$.8413 - .1587 = .6826$$



- d. Find and graph the 95th percentile of rainfall in a randomly selected year.

$$z_{.95} = 1.645$$

$$X = 20 + (1.645)(5) = 28.2 \text{ gallons/day}$$



- e. Find and graph the Interquartile range.

$$z_{.25} = -.67$$

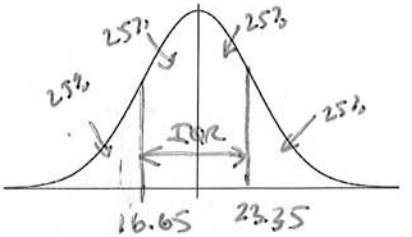
$$Q_1 = 20 - .67(5) = 16.65$$

$$z_{.75} = .67$$

$$Q_3 = 20 + .67(5) = 23.35$$

$$IQR = 23.35 - 16.65$$

$$= 6.7 \text{ gal/day}$$



- f. Between what two numbers would you expect to find the annual rainfall 95% of the time?

$$20 \pm 1.96(5)$$

$$\text{between } 10.2 \text{ and } 29.8 \text{ gallons}$$

