

Using the Normal Curve to approximate the binomial

Planning a flight to Orlando: United airlines has an on-time rate of 68% for their flights from Newark, NJ to Orlando, FL in February and March 2014. If a group of 12 flights are selected, what is the probability that at least 9 are on time?

Is this a binomial problem? Yes No Why? _____

What are you given?

$n =$ _____ $p =$ _____ $q =$ _____ $x =$ _____

Conditions for this formula:

Is $n \cdot p \geq 5$? _____ AND Is $n \cdot q \geq 5$? _____

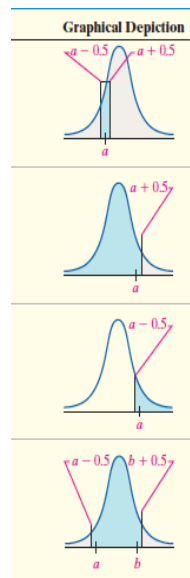
Mean and Standard Deviation

$\mu = n \cdot p$

$\sigma = \sqrt{n \cdot p \cdot q}$

Continuity Correction factor: Every time we calculate a z score using the binomial approximation, we will need to either add or subtract a correction factor of 0.5 to the desired x value.

Probability Using Binomial	Approximate Probability Using Normal
$P(a)$	$P(a - 0.5 \leq x \leq a + 0.5)$
$P(x \leq a)$	$P(x \leq a + 0.5)$
$P(x \geq a)$	$P(x \geq a - 0.5)$
$P(a \leq x \leq b)$	$P(a - 0.5 \leq x \leq b + 0.5)$



Rationale: This is because the binomial is discrete and the normal curve is continuous

Picture: Draw a normal curve. Show the value of the mean. Show the corrected x value. Shade the picture. (Use the arrows if you need to)



Z=

Area: P() = _____

Planning a flight to Orlando Part 2:

Suppose we wanted to find the probability of no more than 9 flights on time. $X = 9, 8, 7, \dots, 0$

Given:

$n =$ _____ $p =$ _____ $q =$ _____ $x =$ _____

Mean and Standard Deviation

$\mu = n \cdot p$

$\sigma = \sqrt{n \cdot p \cdot q}$

Continuity Correction: _____

Z=



Area: P(_____) = _____

Planning a flight to Orlando Part 3: Suppose we wanted the probability of exactly 9 flights on time.

Given:

$n =$ _____ $p =$ _____ $q =$ _____ $x =$ _____

Using the Binomial formula: $nCx \cdot p^x \cdot q^{(n-x)}$ OR BinomPDF(n,p,x) on your calculator for x (DO NOT USE THE CONTINUITY CORRECTION FOR THIS METHOD).

P(_____) = _____

Mean and Standard Deviation

$\mu = n \cdot p$

$\sigma = \sqrt{n \cdot p \cdot q}$

Continuity Correction: _____

Z=



Area: P(_____) = _____

Do you want to go to Walt Disney World?

According to a Walt Disney World travel expert, Len Testa, approximately 12% of all college students go to Walt Disney World during school breaks. If 50 college students are asked if they went to Walt Disney World during their school breaks, what is the probability that 12 or less said "Yes, they went to Disney world"?

Is this a binomial problem? Yes No Why? _____

Given:

$n =$ _____ $p =$ _____ $q =$ _____ $x =$ _____

Conditions for this formula:

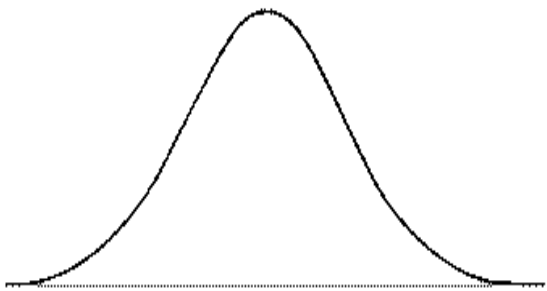
Is $n \cdot p \geq 5$? _____ AND Is $n \cdot q \geq 5$? _____

Mean and Standard Deviation

$$\mu = n \cdot p$$

$$\sigma = \sqrt{n \cdot p \cdot q}$$

Continuity Correction: _____



Z=

Area: P() = _____

ADDITIONAL PROBLEMS

Smoking Based on a recent Harris Interactive survey, 20% of adults in the United States smoke. In a survey of 50 statistics students, it is found that 6 of them smoke. Find the probability that should be used for determining whether the 20% rate is correct for statistics students. What do you conclude?

Is this a binomial problem? Yes No Why? _____

Given:

$n =$ _____ $p =$ _____ $q =$ _____ $x =$ _____

Conditions for this formula:

Is $n \cdot p \geq 5$? _____ AND Is $n \cdot q \geq 5$? _____

Mean and Standard Deviation

$$\mu = n \cdot p$$

$$\sigma = \sqrt{n \cdot p \cdot q}$$

Continuity Correction: _____



Z=

Area: P() = _____

Dream Job In a Marist College poll of 1004 adults, 291 chose professional athlete as their dream job. Assume that 25% of adults consider being a professional athlete their dream job.

- The result of 291 is more than 25% of 1004, so find the probability that among 1004 random adults, 291 or more consider being a professional athlete their dream job.
- If the value of 25% is correct, is the result of 291 unusually high?
- Does the result suggest that the rate is greater than 25%?

Is this a binomial problem? Yes No Why? _____

Given:

n = _____ p = _____ q = _____ x = _____

Conditions for this formula:

Is $n \cdot p \geq 5$? _____ AND Is $n \cdot q \geq 5$? _____

Mean and Standard Deviation

$$\mu = n \cdot p$$

$$\sigma = \sqrt{n \cdot p \cdot q}$$

Continuity Correction: _____



Z=

Area: P() = _____