Answer on Question #63722 – Math – Statistics and Probability

Suppose we have a binomial experiment in which success is defined to be a particular quality or attribute that interests us.

(a) Suppose n = 36 and p = 0.23.

Question

Can we approximate p̂ by a normal distribution? Why? (Use 2 decimal places.)

Solution

np = $36 * 0.23 = 8.28 > 5$
nq = $36 * 0.77 = 27.22 > 5$
and p̂ can be approximated by a normal random variable, because

$np > 5 \; and \; nq > 5.$

Answer: yes; because $np > 5 \; and \; nq > 5.$

Question

What are the values of μp̂ and σp̂? (Use 3 decimal places.)

Solution

μp̂ = $np = 8.280$
σp̂ = $\sqrt{npq} = 2.525$

Answer: 8.28; 2.525.

(b) Suppose n = 25 and p = 0.15.

Question

Can we safely approximate p̂ by a normal distribution? Why or why not?

Solution

np = $25 * 0.15 = 3.75 < 5$
nq = $25 * 0.85 = 21.25 > 5$
and p̂ cannot be approximated by a normal random variable because $np < 5$.
Answer: no; because $np < 5$.

(c) Suppose n = 58 and p = 0.21.

Question

Can we approximate p̂ by a normal distribution? Why? (Use 2 decimal places.)

Solution

np = $58 * 0.21 = 12.18 > 5$
nq = $58 * 0.79 = 45.82 > 5$
and p̂ can be approximated by a normal random variable because
$np > 5 \; and \; nq > 5$.
Answer: yes; because $np > 5 \; and \; nq > 5$.

Question

What are the values of μp̂ and σp̂? (Use 3 decimal places.)

Solution

μp̂ = $np = 12.180$
σp̂ = $\sqrt{npq} = 3.102$
Answer: 12.180; 3.102