Answer on Question #55614 – Math – Statistics and Probability

In 2014 the Department of Social Services reported that 32% of current marriages in Australia were expected to end in divorce.

Find the probability that more than 8 marriages out of a random sample of 20 marriages which were current in 2014 would end in divorce.

Solution

Let a random variable X have a binomial distribution with $p = 0.32$ and $n = 20$.

Consider the event "$X > 8$", which means that more than 8 marriages out of a random sample of 20 marriages which were current in 2014 would end in divorce.

The probability of this event is

$$P(X > 8) = 1 - P(X \leq 8),$$

where

$$P(X \leq 8) = binomialcdf(8; 20; 0.32) = \sum_{k=0}^{8} \frac{20!}{k!(20-k)!} 0.32^k (1 - 0.32)^{20-k} = 0.84315,$$

$binomialcdf(x; N; p)$ =the cumulative distribution function,

x= the given value,

N= the corresponding number of trials,

p= probability of success for each trial.

In Excel the cumulative distribution function and $P(X \leq 8)$ respectively are calculated by means of

$$= BINOMDIST(8,20,0.32, TRUE)$$

Thus,

$P(X > 8) = 1 - 0.84315 = 0.15685.$

Answer: $0.15685.$