

# Tutorial:

Thursday, April 6, 2017 12:44 PM

On Star Trek Voyager, the odds of crashing the shuttle on any away mission appear to be 75%. If these crashes are independent, what are the odds of

- a) exactly four crashes in five shuttle missions?
- b) at least four " " " " " "

binomial:

a) 
$$P(x=4) = {}_5C_4 (0.75)^4 (0.25)^1$$
$$= 0.395508$$

so 39.6%  
40%

b) 
$$P(x=5) = 0.2373$$

$$P(x \geq 4) = P(x=4) + P(x=5)$$
$$= 0.63 \quad \text{or} \quad \boxed{63\%}$$

---

consider the probability distribution below. Complete the table and then calculate the mean and standard deviation of  $x$ .

$x$	$p(x)$
0	$\frac{1}{10}$
1	$\frac{6}{10}$
2	$\frac{3}{10}$

$$\begin{array}{c|c} \tilde{x} & \tilde{p} \\ 1 & 6/10 \\ 2 & 3/10 \end{array} \quad \leftarrow \text{why?} \quad \text{sum of probs} = 1$$

$$\begin{aligned} E(x) &= \sum x p(x) \\ &= 0 + 1 \cdot \frac{6}{10} + 2 \cdot \frac{3}{10} \\ &= 1.2 \end{aligned}$$

$$\begin{aligned} \sigma^2 &= \sum x^2 p(x) - \mu^2 \\ &= 0 + 1^2 \cdot \frac{6}{10} + 2^2 \cdot \frac{3}{10} - (1.2)^2 \\ &= 0.36 \end{aligned}$$

$$\sigma = 0.6$$

suppose that a random variable has the following probability density:

$$f(x) = \begin{cases} 5e^{-5x} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

- calculate the probability that  $x$  will be between 1 and 3
- calculate the probability that  $x$  will be less than 0.5

c) calculate the probability that  $x$  will be greater than 0.5 (hint: use answer to (b))

$$a) P(1 < x < 3) = \int_1^3 5e^{-5x} dx$$

$$= -e^{-5x} \Big|_1^3$$

$$= -e^{-15} + e^{-5}$$

$$\approx 0.006738$$

$$\approx 0.67\%$$

$$b) P(0 < x < 0.5) = \int_0^{0.5} 5e^{-5x} dx$$

$$= -e^{-5x} \Big|_0^{0.5}$$

$$= -e^{-2.5} + e^0$$

$$\approx 0.917915$$

$$\approx 92\%$$

$$c) P(x > 0.5) = 1 - P(x < 0.5) \\ = 8\%$$