Binomial distribution: $X \sim bin(n, p)$

Expected value (mean), variance, standard deviation

$$EX = np; VX = npq; SDX = +\sqrt{VX}$$

$$X \sim bin(20, 0.35)$$

On average, how many tricks can the dolphin do (on average, how many successes will occur)

$EX = np = 20(0.35) = 7$ successes

$VX = npq = 20(0.35)(0.65) = 4.55$ successes^2 (???) ➔

$SDX = +\sqrt{4.55} = 2.13$ successes

Average number of particles given off in a one-minute interval: 3.2

$$X \sim pois(3.2)$$

$$P(X = x) = \frac{e^{-\mu}\mu^x}{x!}$$

Probability of exactly 2 particles in the next 1-second interval?

$$P(X = 2) = \frac{e^{-3.2}(3.2)^2}{2!} = 0.2087 \approx 21\%$$

Probability of no particles given off in next 1-second interval?

$$P(X = 0) = \frac{e^{-3.2}(3.2)^0}{0!} = e^{-3.2} = 0.0408$$

Probability of more than 2 particles in next 1-second interval?

$P(X > 2)$: MUST use complement rule with area to the right (more than, at least)

$$P(X > 2) = 1 - P(X \leq 2) = 1 - [P(0) + P(1) + P(2)]$$

$$P(X = 1) = \frac{e^{-3.2}(3.2)^1}{1!} = 0.1304$$

$$P(X > 2) = 1 - [0.0408 + 0.1304 + 0.2087] = 1 - 0.3799 = 0.6201$$

62% chance that more than 2 alpha particles are given off in the next 1-second interval

$EX = \mu = 3.2$ particles

$VX = \mu = 3.2$ particles^2

$SDX = +\sqrt{3.2} = 1.79$ particles