S12 - 3.7 - Poisson Distribution Notes

let $x = $ # customers per day. $\bar{x} = 12$. Find $P(x = 8)$.

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

$$P(8) = \frac{12^8 e^{-12}}{8!}$$

$p(8) = 0.0655$

let $x = $ # texts/2hrs. $\bar{x} = 7$. Find $P(x = 9)$.

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

$$P(8) = \frac{7^9 e^{-7}}{9!}$$

$p(8) = 0.1014$

$P(24)$; 8 hrs.

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

$$P(24) = \frac{28^{24} e^{-28}}{24!}$$

$P(24) = 0.0601$

$$\bar{x} = \frac{4}{2hrs} \times \frac{4}{4}$$

$$\bar{x} = \frac{28 texts}{8hrs}$$

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let $x = $ # calls/h. $\bar{x} = 5$. Find $P(x = 3)$.

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

$$P(x = 7) = \frac{5^3 e^{-5}}{3!}$$

$p(x = 7) = 0.1404$

$P(x \le 3)$

$$P(x \le 3) = P(x = 1) + P(x = 2) + P(x = 3)$$

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

$$P(x \le 3) = e^{-\mu}\left(\frac{\mu^x}{x!}\right) \quad \boxed{GCF = e^{-\mu}}$$

$$P(x \le 3) = e^{-5}\left(\frac{5^0}{0!} + \frac{5^1}{1!} + \frac{5^2}{2!} + \frac{5^3}{3!}\right)$$

$P(x \le 3) = 0.2650$

$$p(x > 4) = 1 - p(x \le 3)$$
$$= 1 - 0.1912$$
$$= 0.8088$$

Poisson Distribution Table $p(X \le x)$

$\lambda =$	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
X=0	0.6065	0.3679	0.2231	0.1353	0.0821	0.0498	0.0302	0.0183	0.0111	0.0067
1	0.9098	0.7358	0.5578	0.4060	0.2873	0.1991	0.1359	0.0916	0.0611	0.0404
2	0.9856	0.9197	0.9197	0.8088	0.6767	0.5438	0.4232	0.3208	0.2381	0.1247
3	0.9982	0.9810	0.9344	0.8571	0.7576	0.6472	0.5366	0.4335	0.3423	0.2650
4	0.9998	0.9963	0.9814	0.9473	0.8912	0.8153	0.7254	0.6288	0.5321	0.4405
5	1.0000	0.9994	0.9994	0.9955	0.9834	0.9161	0.8576	0.7851	0.7029	0.6160
6	1.0000	0.9999	0.9991	0.9955	0.9858	0.9665	0.9347	0.8893	0.8311	0.7622
7	1.0000	1.0000	0.9998	0.9989	0.9958	0.9881	0.9733	0.9489	0.9134	0.8666
8	1.0000	1.0000	1.0000	0.9998	0.9989	0.9962	0.9901	0.9786	0.9597	0.9319
9	1.0000	1.0000	1.0000	1.0000	0.9997	0.9989	0.9967	0.9919	0.9829	0.9682
10	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990	0.9972	0.9933	0.9863