REFERENCE PAGES

PROBABILITY DISTRIBUTIONS

BERNOULLI DISTRIBUTION: $X \sim Bern(p)$

1. Cumulative Distribution Function: $F(X) = \begin{cases} 0, k < 0 \\ q, 0 \le k < 1 \\ 1, k \ge 1 \end{cases}$

2. Probability Mass Function: $p(x) = \begin{cases} q, k = 0 \\ p, k = 1 \end{cases}$

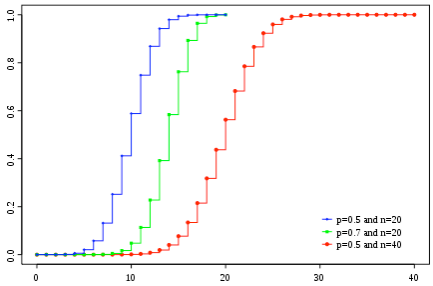
3. Moment Generating Function: $m(t) = q + pe^t$

4. Expected Value: $E(X) = \mu = 1 - p = q$

5. Variance: $V(X) = \sigma^2 = q - q^2 = q(1-q) = pq$

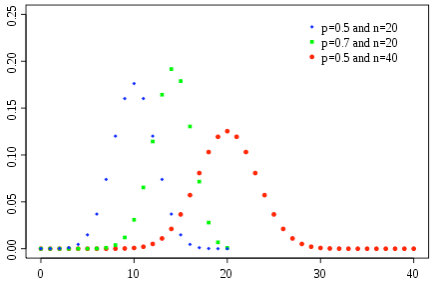
BINOMIAL DISTRIBUTION: $X \sim Bin(n, p)$

6. Cumulative Distribution Function:



$$F(X) = \sum_{k=0}^{x} \binom{n}{k} p^k q^{n-k}$$

7. Probability Mass Function:



$$p(x) = \binom{n}{k} p^k q^{n-k}$$

8. Moment Generating Function: $m(t) = \sum_{x=0}^{n} e^{tx} \binom{n}{x} p^x q^{n-x}$

9. Expected Value: $E(X) = \mu = np$

10. Variance: $V(X) = \sigma^2 = np(1-p)$

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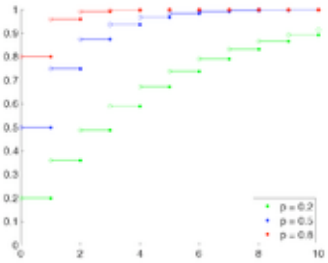
PROBABILITY DISTRIBUTIONS

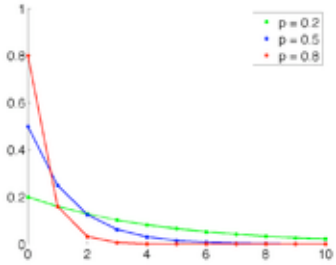
GEOMETRIC DISTRIBUTION: $X \sim Geom(p)$

11. Cumulative Distribution Function:



$$F(X) = 1 - (1-p)^{k+1}$$

12. Probability Mass Function:



$$p(x) = (1-p)^k p$$

13. Moment Generating Function: $m(t) = \dfrac{pe^t}{1-(1-p)e^t}$

14. Expected Value: $E(X) = \mu = \dfrac{1}{p}$

15. Variance: $V(X) = \sigma^2 = \dfrac{1-p}{p^2}$

HYPERGEOMETRIC PROBABILITY DISTRIBUTION: $X \sim HypGeom(N, n, r, y)$

16. Probability Density Function: $f(X) = \dfrac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}}$

17. Expected Value: $E(X) = \mu = \dfrac{nr}{N}$

18. Variance: $V(X) = \sigma^2 = n\left(\dfrac{r}{N}\right)\left(\dfrac{N-r}{N}\right)\left(\dfrac{N-n}{N-1}\right)$

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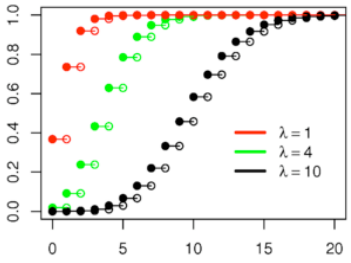
PROBABILITY DISTRIBUTIONS

POISSON DISTRIBUTION: $X \sim Poisson(\lambda)$

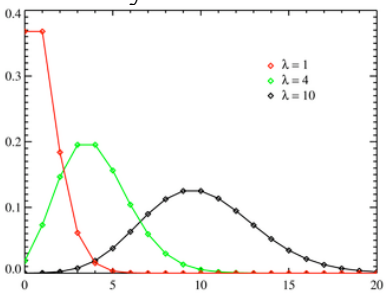
19. Cumulative Distribution Function:



$$F(X) = \frac{\Gamma([k+1],\lambda)}{[k]!}, k \geq 0$$

where $\Gamma(a,x) = \int_x^\infty t^{a-1}e^{-t}dt$

20. Probability Mass Function:



$$p(x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

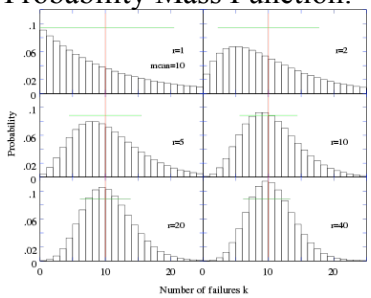
21. Moment Generating Function: $m(t) = \exp\left[\lambda\left(e^t - 1\right)\right]$

22. Expected Value: $E(X) = \mu = \lambda$

23. Variance: $V(X) = \sigma^2 = \lambda$

NEGATIVE BINOMIAL DISTRIBUTION: $X \sim NB(r,p)$

24. Probability Mass Function:



$$p(x) = \binom{x-1}{r-1} p^r q^{x-r}, y = r, r+1, \ldots$$

25. Moment Generating Function: $m(t) = \left[\frac{pe^t}{1-(1-p)e^t}\right]^r$

26. Expected Value: $E(X) = \mu = \frac{r}{p}$

27. Variance: $V(X) = \sigma^2 = \frac{r(1-p)}{p^2}$