assignment 4

Group 25

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Solution 1:
Let X denote the no. of DVD players in the sample.
i) P($X <= 1$) given n=12, p=0.2
P($X <= 1$) $= P(X = 0) + P(X = 1)$
$= \binom{12}{0} (0.2)^0 (0.8)^{12} + \binom{12}{1} (0.2)^1 (0.8)^{11}$
$0.069 + 0.206$
0.275
ii) P($X > 1$) given n=12, p=0.1
$= 1 - P(X <= 1)$
$= 1 - [P(X = 0) + P(X = 1)]$
$= 1 - \left[\binom{12}{0} (0.1)^0 (0.9)^{12} + \binom{12}{1} (0.1)^1 (0.9)^{11}\right]$
$1 - [0.659]$
0.341

Solution 2:
Poisson random variable
$\lambda = 5\ hits/second$
i) $\lambda = 5 * 2 = 10$
$P(X = k) = e^{-\lambda} \lambda^k / k!$
$P(X = 0) = e^{-10} 10^0 / 0!$
$= e^{-10}$
ii) $\lambda = 5$
$P(X >= 1) = 1 - P(X = 0)$
$= 1 - \left(e^{-5} 5^0\right) / 0!$
$= 1 - e^{-5}$

Solution 3:
Geometric random variable
i) Pmf for r.v. 'Y'
$P_Y(k) = p(1 - p)^{k-1}$ for $k >= 1$
$p(A) = 0.95, p(C) = 0.15$
$E[Y] = \frac{1}{p}$
for A, $E[Y] = \frac{1}{0.95}$
for C, $E[Y] = \frac{1}{0.15}$

$= 6.6666$

Solution 4: Average rate $\lambda = 1.8$
$P\left(X = x\right) = \frac{e^{-\lambda}\lambda^{x}}{x!}$
i) probability of occurring 4 births,
$P\left(x = 4\right) = \frac{e^{-1.8}1.8^{4}}{4!}$
$\frac{0.1653 * 10.4976}{24}$
$= 0.0723$
ii) occurring more than or equal to 2 births
$= P\left(X >= 2\right) = P\left(X = 2\right) + P\left(X = 3\right) + ...$
$= 1 - P\left(X < 2\right)$
$= 1 - \left[P\left(X = 0\right) + P\left(X = 1\right)\right]$
$= 1 - \left[\frac{e^{-1.8}1.8^{0}}{0!} + \frac{e^{-1.8}1.8^{1}}{1!}\right]$
$= 0.537$

Solution 5: Let 1 unit of distance be 1000 miles.
on an average, one battery failure over 10 units of distance.
$\lambda = \frac{1}{10}$
$P\left(remaininglifetime > 5\right) = 1 - P\left(X = 5\right)$
$= e^{-5\lambda}$
$= e^{\frac{5}{10}}$
$= 0.604$