DISTRIBUTION ASSIGNMENT

2. $\mu = 38,000 \quad \sigma = 10000$

a) $X \Rightarrow$ over 50,000

$\therefore z = \frac{50000 - 38000}{10000} = \frac{12000}{10000} = (1.2)_z$

$z. = 0.8849$

Since greater than 50,000 $\Rightarrow 1 - 0.8849$

$\Rightarrow 0.1151$ //

b) 38,500 and 41,000

$z_1 = \frac{38,500 - 38000}{10000} = \frac{500}{10000} = (0.05)_z$

$= 0.5199$

$z_2 = \frac{41,000 - 38000}{10000} = \frac{3000}{10000} = (0.3)_z$

$= 0.6179.$

$\therefore 0.6179 - 0.5199 \Rightarrow 0.098$ // $\Rightarrow 9.8\%$

c) $z_1 = \frac{30000 - 38000}{10000} = (-0.8)_z$

$= 0.2119$

$\Rightarrow 0.8849 - 0.2119$

$= 0.673$ //

3. $n = 20$ MCQ's

$r = 5$ wrong answers.

$q$ = $1/4$ correct answer.

$p$ = $3/4$ wrong answer.

$$\text{pbty} = {}^{n}C_{r}\,(p)^{r}(q)^{n-r}$$

$$= {}^{20}C_{5}\,(3/4)^{5}\,(1/4)^{15}$$

$$= \frac{20!}{5!\;15!}\,(3/4)^{5}(1/4)^{15}$$

$$= \frac{20\times19\times18\times17\times16}{5\times4\times3\times2}\,(3/4)^{5}(1/4)^{15}$$

$$= 0.0000034//$$

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4. Average number of photons per second is

$\lambda = 4$ , need to determine pbty for $r = 0$

$$\text{PMF} = \frac{e^{-\lambda}\times\lambda^{r}}{r!}$$

$$= \frac{e^{-4}\times4^{0}}{0!}$$

$$= 0.0183//$$

$$= 1.83\%$$

5. a) $\lambda = 3$/per minute $\quad r = 0$

$\therefore$ PMF $(r=0) = \dfrac{e^{-\lambda}\lambda^{r}}{r!}$

$= \dfrac{e^{-3}\,3^{0}}{0!} = 0.0497$//

b) atleast 2 calls / 2 minute.

Then $\lambda$ would be $\Rightarrow$ 6/per 2 minutes.

$\therefore$ PMF $(r \geq 2) \Rightarrow$ ~~PMF(~~

$\Rightarrow 1 -$ PMF $(r < 2)$

$= 1 -$ PMF $(r=0) -$ PMF $(r=1)$

$= 1 - \dfrac{e^{-6}6^{0}}{0!} - \dfrac{e^{-6}6^{1}}{1!}$

$= 1 - e^{-6}[1+6]$

$= 0.9826$//

7. $p = 0.3 \quad q = 0.7 \quad \lambda = 5 \quad r = 2.$

atmost 2.

PMF $(r \leq 2) \Rightarrow$ PMF$(r=0)$ + PMF$(r=1)$ + PMF$(r=2)$

$= \dfrac{e^{-5}(5)^{0}}{0!} + \dfrac{e^{-5}(5)^{1}}{1!} + \dfrac{e^{-5}(5)^{2}}{2!}$

$= e^{-5} + e^{-5}(5) + e^{-5}\left(\dfrac{25}{2}\right)$

$= {}^5C_0(0.3)^0(0.7)^5 + {}^5C_1(0.3)^1(0.7)^4$

$+ {}^5C_2(0.3)^2(0.7)^3$

$= 0.16807 + 0.36015 + 0.3087$

$= 0.83692$ //

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8. lift can accomodate 800kg.

a) 10 people.

$\mu = 70kg \qquad \sigma = 20kg$

$P(X=10) = \dfrac{(800/10) - 70}{0.2}$

$= \dfrac{80-70}{0.220} = \dfrac{10}{0.220} = (0.5)_z$

$= 0.6915$ //

$P(X=12) = \dfrac{66.66 - 70}{20} = -0.167.$

$= 0.4364$ //

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9. When two choices.

$p = 1/2$ (correct answer) $\qquad n = 50$

$q = 1/2$ (wrong answer) $\qquad r = 20$

$\text{pbty} = {}^{50}C_{20}\left(\frac{1}{2}\right)^{20}\left(\frac{1}{2}\right)^{30}$

$= 0.0418$ //

$= {}^5C_0(0.3)^0(0.7)^5 + {}^5C_1(0.3)^1(0.7)^4$

$+ {}^5C_2(0.3)^2(0.7)^3$

$= 0.16807 + 0.36015 + 0.3087$

$= 0.83692$ //

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8. lift can accomodate 800kg.

a) 10 people.

$\mu = 70kg \qquad \sigma = 20kg$

$P(X=10) = \dfrac{(800/10) - 70}{0.2}$

$= \dfrac{80-70}{20} = \dfrac{10}{20} = (0.5)_z$

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$P(X=12) = \dfrac{66.66 - 70}{20} = -0.167.$

$= 0.4364$ //

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9. when two choices.

$p = 1/2$ (correct answer) $\qquad n = 50$

$q = 1/2$ (wrong answer) $\qquad r = 20$

$\text{pbty} = {}^{50}C_{20}(1/2)^{20}(1/2)^{30}$

$= 0.0418$ //

when 4 choices.

$p = 1/4 \quad q = 3/4$

$= {}^{50}C_{20} (1/4)^{20} (3/4)^{30}$

$= 0.00765 //$

10. $n = 6 \quad p = 0.3$

$r = 2 \quad q = 0.7$

$\text{pbty } (r=2) = {}^{n}C_{r} (p)^{r} (q)^{n-r}$

$= {}^{6}C_{2} (0.3)^{2} (0.7)^{4}$

$= 0.3241 //$

12. $p = 0.05$ (contains dioxin)

$n = 20$

a) Less than 1;

$P(r<1) = P(r=0)$

$= {}^{20}C_{0} (0.05)^{0} (0.95)^{20}$

$= 0.358 //$

b) Less than or equal to 1;

$\Rightarrow P(r=0) + P(r=1)$

$\Rightarrow 0.358 + {}^{20}C_{1} (0.05)^{1} (0.95)^{19} \Rightarrow 0.377 //$ (+0.358)

$= 0.735 //$

c) $P(r=0) + P(r=1) + P(r=2)$

$\Rightarrow 0.358 + 0.377 + {}^{20}C_2 (0.05)^2 (0.95)^{18}$

$\Rightarrow 0.188 // + 0.358 + 0.377 = 0.923 //$

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13. a) $p = 0.05$ ; $r = 2$, $n = 5$

$P(r=2) = {}^5C_2 (0.05)^2 (0.95)^3$

$= 0.0214 //$

b) $n = 2$

$P(r=2) = {}^2C_2 (0.05)^2 (0.95)^0$

$= 0.0025 //$

c) $P(r \geq 1) = 1 - P(r=0)$ ; $n = 4$

$= 1 - {}^4C_0 (0.05)^0 (0.95)^4$

$= 1 - 0.8145$

$= 0.185 //$

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14. $p = 0.2$ ; $n = 15$

a) $r = 2$

$P(r=2) = {}^{15}C_2 \times (0.2)^2 \times (0.8)^{13}$

$= 0.2308$

b) $P(r \geq 1) = 1 - P(r=0)$

$= 1 - {}^{15}C_0 (0.2)^0 \times (0.8)^{15}$

$= 0.9648 //$