#1.

(a) $\lambda = \frac{1}{4} \Rightarrow m = \left(\frac{1}{4}\right)(T)$

X: #s of cars that arrive in T min.

$X \sim Po(0.25T)$

$\Rightarrow P(X \le 3) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$

$= e^{-m}\left(m^0 + m^1 + \frac{m^2}{2} + \frac{m^3}{3}\right) = 0.6$

Solve by Graphing Cal. $\Rightarrow m = 3.2113$

$T = 3.2113 \times 4 \approx 13$ min

(b) $T = 10$ min. $\Rightarrow m = \frac{10}{4} = \frac{5}{2}$.

Ferry can carry Max. 3 cars on each Trip.

in Next 20 min. ⇒ the Ferry can make two Trips.

$\left(\underline{13:10} \quad \text{OR} \quad \underline{13:20}\right)$

$P(X_1) \qquad P(X_2)$

P(All gets on) ⇒ There are <u>4 possible ways</u>.

1) At most 3 cars arrived before 13:10
~~At most~~ 3 cars arrived between 13:10 ~ 13:20 ⇒ $P(X_1 \le 3)P(X_2 \le 3)$

2) 4 cars arrived before 13:10
then Two cars can be carried if arrived between 13:10 ~ 13:20.
⇒ $P(X_1 = 4)P(X_2 = 2)$

3) 5 cars, 1 cars ⇒ $P(X_1 = 5)P(X_2 = 1)$

→

4) 6 cars
0 cars $\Big\} \Rightarrow P(X_1=6)P(X_2=0)$

$\Rightarrow \therefore$ P(All cars be on the Ferry Next 20 min.)

$= P(X_1 \le 3)P(X_2 \le 3) + P(X_1=4)P(X_1=2) + P(X_1=5)P(X_2=1)$

$+ P(X_1=6)P(X_2=0) = \text{Poissoncdf}(\frac{5}{2}, 0, 3)\,\text{poissoncdf}(\frac{5}{2}, 0, 3)$

$+ \text{Poissonpdf}(\frac{5}{2}, 4)\,\text{Poissonpdf}(\frac{5}{2}, 2) \cdots$

$= (0.573921) + 0.034271 + 0.013708 + 0.002285$

$\approx \boxed{0.624}$

#2. (a) $X \sim Po(4)$

a) $P(3 \le X \le 5) = \text{Poissoncdf}(4, 3, 5) \approx 0.547$

b) $P(X \ge 3) = \text{poissoncdf}(4, 3, \infty) \approx 0.762$

c) $P(3 \le X \le 5 \mid X \ge 3) = \dfrac{\text{Poissoncdf}(4, 3, 5)}{\text{poissoncdf}(4, 3, \infty)} \approx \dfrac{0.547}{0.762} \approx 0.718.$

③

#3. a) $X \sim Po(11)$

i) $P(X \le 11) = $ poisson $(11, 0, 11) \approx \boxed{0.579}$.

ii) $P(X > 8 \mid X < 12)$

$$= \frac{\text{poissoncdf}(11, 9, 11)}{\text{poissoncdf}(11, 0, 11)} \approx 0.59979 \approx \boxed{0.600}$$

$Y \sim Po(m)$

b) i) $P(Y > 3) = 0.24$

$P(Y \le 3) = 0.76$.

$P(X=0) + P(X=1) + P(X=2) + P(X=2) = 0.76$

$e^{-m}\left[1 + m + \frac{m^2}{2} + \frac{m^3}{6}\right] = 0.76$

$\boxed{m = 2.49}$ Solve by Graphing Calculator.

(ii) ~~Two weekends $\Rightarrow m \Rightarrow (2.49)(2) = 4.98$~~

A: Numbers of Accident on weekend.

$A \sim Po(2.49) \Rightarrow P(A > 5) = $ Poisson cdf $(2.49, 6, \infty)$

$= 0.041346 \approx \boxed{0.0413}$

0.0968

W: Weekends Accident. (Must be Binomial, $n=4$)

$W \sim B(4, 0.0423) \Rightarrow P(W \ge 2) = 1 - P(W=0) - P(W=1)$

OR Binomialcdf $(0.0413, 2, 4)$.

$\approx$ 0.0968

OR

$m = (2.49)(2) = 4.98$ (Sunday and Sat.)

$A \sim Po(4.98) \Rightarrow P(A > 5) = \text{poissoncdf}(4.98, 6, \infty)$

$\approx 0.38053 \approx 0.381$

$W \sim B(4, 0.38053)$

$\Rightarrow P(W \geq 2) = \text{Binomialcdf}(0.38052, 2, 4)$

≈ 0.490