1

$P(X) = \frac{8}{7}\frac{1}{2}^X$

$\text{cdf} = F(a) = \sum_{n=1}^{a} f(n) = \sum_{n=1}^{a} \frac{8}{7}\frac{1}{2}^n$

$$F(x) = \begin{cases} 0 & \text{for} \quad x < 1 \\ \frac{4}{7} & \text{for} \quad x = 1 \\ \frac{6}{7} & \text{for} \quad x = 2 \\ 1 & \text{for} \quad x = 3 \end{cases}$$

A $P(X < 1.5)$

$P(X < 1.5) = F(1) = \frac{4}{7}$

B $P(X \leq 3)$

$P(X \leq 3) = F(3) = 1$

C $P(X > 2)$

$P(X > 2) = F(3) - F(2) = \frac{1}{7}$

D $P(1 < X \leq 2)$

$P(1 < X \leq 2) = F(2) - F(1) = \frac{2}{7}$

2

A

$$f(X) = \begin{cases} 0.06 & \text{for} \quad x = 350 \\ 0.1 & \text{for} \quad x = 450 \\ 0.47 & \text{for} \quad x = 550 \\ 0.37 & \text{for} \quad x = 650 \end{cases}$$

B

$\mu = E(X) = \sum_x xf(x) = 0.06 * 350 + 0.1 * 450 + 0.47 * 550 + 0.37 * 650 = 565$

$\sigma = \sqrt{VAR(X)} = \sqrt{E(X^2) - \mu^2} = \sqrt{0.06 * 350^2 + 0.1 * 450^2 + 0.47 * 550^2 + 0.37 * 650^2 - 565^2} = \sqrt{6875} = 82.9156$

3

A Exactly 5 right

$P(X = 5) = C_5^{25}(0.25)^5(0.75)^{20} = \frac{25*24*23*22*21}{5*4*3*2}0.25^5 0.75^{20} = 0.16453$

B More than 2

$P(2 < X) = 1 - P(X \leq 2) = 0.96789$

C Fewer than 3

$P(X < 3) = P(X \leq 3) - P(X = 3) = 0.0321$

D

```r
A <- dbinom(5,25,0.25)
print(paste("A:", A))
```

```
[1] "A: 0.164537588198792"
```

```r
print(paste("B:", (1-pbinom(2,25,0.25))))
```

```
[1] "B: 0.967891479118293"
```

```r
print(paste("C", (pbinom(3,25,0.25)-dbinom(3,25,0.25))))
```

```
[1] "C 0.0321085208817067"
```

E

$\mu = np = 6.25$

$\sigma = np(1 - p) = 4.6875$

4

12 per hour = 0.2 per minute, so $\lambda = 0.2, T =$ minutes

A

5 minutes, so $\lambda T = 1$

$P(X = 0) = \frac{e^{-0.2(5)}(0.2*5)^0}{1} = \frac{1}{e} = 0.36788$

B

$P(X \geq 3) = 1 - P(X \leq 3) + P(X = 3) = 0.0803$

C

10 mintes, so $\lambda T = 2$

$P(X = 0) = \frac{e^{-2}(0.2*5)^0}{1} = \frac{1}{e^2} = 0.135335$

D

$P(X = 0) = 0.001 = \frac{e^{-0.2*T}(0.2T)^0}{1} \rightarrow 0.001 = e^{-0.2T} \rightarrow 1000 = e^{0.2T} = 0.2T = \ln(1000) \rightarrow T = 5\ln(1000)$

E

```r
print(paste("A:", dpois(0,0.2*5)))
```

```
[1] "A: 0.367879441171442"
```

```r
print(paste("B:",1-ppois(3,1)+dpois(3,1)))
```

```
[1] "B: 0.0803013970713942"
```