Question 1:

$$\hat{\lambda}_{MOM} = \frac{1}{n} \sum_{i=1}^{n} y_i = \bar{y} = \frac{1+2+3}{3} = 2$$

Question 2:

1. Joint $P(y_1, y_2, y_3, \cdots, y_n) = P(y_1) P(y_2) P(y_3) \cdots P(y_n)$

$$\Rightarrow L(\lambda) = \frac{e^{-\lambda n} \lambda^{\sum_{i=1}^{n} y_i}}{y_1! \cdots y_n!}$$

$$\Rightarrow \ell(\lambda) = -\lambda n + \sum_{i=1}^{n} y_i \ln(\lambda) - \ln(y_1! \cdots y_n!)$$

$$\ell'(\lambda) = -n + \sum_{i=1}^{n} y_i / \lambda = 0$$

$$\Rightarrow \sum_{i=1}^{n} y_i = n\lambda \qquad \Rightarrow \hat{\lambda}_{mle} = \frac{\sum y_i}{n} = \bar{y}$$

$$\Rightarrow \hat{\lambda}_{mle} = \frac{1+2+3}{3} = 2$$

**Question 3 :**

$$E(\hat{\lambda}_{mle}) = E(\bar{y}) = \frac{1}{n} E(\Sigma y_i) = \frac{1}{n} \cdot n \, E(y) = \lambda \qquad \text{as } E(y_i) = \lambda$$

**Question 4 :**

$$V(\hat{\lambda}_{mle}) = V(\bar{y}) = \frac{1}{n^2} V(\Sigma y_i) = \frac{n}{n^2} V(y_i) = \frac{1}{n} V(y) = \frac{\lambda}{n} \qquad \text{as } V(y) = \lambda$$

**Question 5 :** we use B because we know $\sigma^2$ NOT $s^2$

**Question 6 :**

$$L: \; mean(y) - qt(1-\alpha/2, length(y)-1) \cdot sd(y)/\sqrt{length(n)}$$

where $\alpha = 0.2$ and $y = c(3,4,5)$

$$= 2.9113$$

**Question 7 :** they are matched pairs because we are taking Two measurements from the same sample

**Question 8 :**

```
S = read.csv("shallow.csv")
t.Test(S$Actual, S$Predict, Paired=True, conf.level=0.99)$Conf
```

**Question 9 :**

$$Cov(S\$Actual, S\$Predict)/(sd(S\$Actual) * sd(S\$Predict))$$

because $\rho = \frac{cov(x,y)}{\sigma_x \, \sigma_y}$

**Question 10 :**

```
S = read.csv("mow-mow.csv")

Var.Test(S$y_1, S$y_2, conf.level=0.8)$conf
```

**Question 11 :**

```
t.test(S$y_1, S$y_2, conf.level=0.92, var.equal=FALSE)$conf
```

## Question 11

$$V(L) = V(y_1 - 2y_2 + 3y_3) = V(y_1) + V(-2y_2) + V(3y_3)$$

$$= V(y_1) + (-2)^2 V(y_2) + 3^2 V(y_3) = 2 + 4 \cdot 2 + 9 \cdot 2 = 28$$