

# P8130\_HW2\_wl2829

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## Problem 1

### Problem 1 (a)(b)

```
## problem 1 (a)
dbinom(24, size = 40, prob = 0.65)
```

```
## [1] 0.1031167
```

```
## problem 1 (b)
pbinom(23, size = 40, prob = 0.65, lower.tail = FALSE)
```

```
## [1] 0.7977604
```

### problem 1 (c)

$p = 0.65$ ,  $q = 1 - 0.65 = 0.35$ ,  $np > 5$  and  $nq > 5$ , so we can use normal approximation to calculate the probabilities. By using the continuity correction factor, we can use  $P(n - 0.5 < X < n + 0.5)$  to replace  $P(X = n)$ ,  $P(X > n - 0.5)$  to replace  $P(X \geq n)$ .

### Problem 1 (d)

The expectation  $E$  is equal to

```
Expectation = np = 40 * 0.65
Expectation
```

```
## [1] 26
```

### Problem 1 (e)

```
sigma_sq = sqrt(40 * 0.65 * 0.35)
sigma_sq
```

```
## [1] 3.016621
```

The SD is 3.0166206.

## Problem 2

### Problem 2 (a)

```
Lessthan3 = ppois(2, 7, lower.tail = TRUE)
Lessthan3
```

```
## [1] 0.02963616
```

### Problem 2 (b)

```
equalto3 = dpois(3, 7, log = FALSE)
equalto3
```

```
## [1] 0.05212925
```

### Problem 2 (c)

```
morethan3 = ppois(3, 7, lower.tail = FALSE)
morethan3
```

```
## [1] 0.9182346
```

## Problem 3

### Problem 3 (a)

```
above137 = pnorm(137, mean = 132, sd = 9.8, lower.tail = FALSE)
above137
```

```
## [1] 0.3049542
```

### Problem 3 (b)

```
lessthan129 = pnorm(129, mean = 132, sd = 9.8, lower.tail = TRUE)
lessthan129
```

```
## [1] 0.3797557
```

### Problem 3 (c)

```
sample = rnorm(40, 132, 9.8)
quantile(sample, 0.9)
```

```
##      90%
## 147.7682
```

### Problem 4

#### Problem 4 (a)

```
## sample mean = 75, sd = 8, sample size = 30
error = qnorm(0.975) * 8 / sqrt(30)
lower = 75 - error
upper = 75 + error
c(lower, upper)
```

```
## [1] 72.13729 77.86271
```

#### Problem 4 (b)

We are 95% confident that the population parameter is between 72.1372894 and 77.8627106.

#### Problem 4 (c)

Yes, we don't need to do extra calculation to reject  $H_0$ , because the 95% confidence interval is between 72.1372894 and 77.8627106, which does not contain "70". Therefore, the null hypothesis  $\mu = \mu_0$  is rejected.