Probability and Statistics - IT2120

LAB 6

```
> # Problem 1
> # p = 0.85, n = 50; X = number who passed
> n <- 50
> p <- 0.85
>
>
> # (i) Distribution of X
> dist1 <- "Binomial(n = 50, p = 0.85)"
> cat("1(i) Distribution of X: ", dist1, "\n\n")
1(i) Distribution of X:  Binomial(n = 50, p = 0.85)

>
> # (ii) Probability that at least 47 students passed: P(X >= 47)
> # Method A: use 1 - P(X <= 46)
> prob_at_least_47_A <- 1 - pbinom(46, size = n, prob = p)
>
> # Method B: sum of dbinom for k = 47..50 (equivalent)
> prob_at_least_47_B <- sum(dbinom(47:50, size = n, prob = p))
>
> cat("1(ii) P(X >= 47)  (Method A) = ", prob_at_least_47_A, "\n")
1(ii) P(X >= 47)  (Method A) =  0.04604658
> cat("1(ii) P(X >= 47)  (Method B) = ", prob_at_least_47_B, "\n\n")
1(ii) P(X >= 47)  (Method B) =  0.04604658

>
> # Print as percentage
> cat("1(ii) P(X >= 47) = ", round(prob_at_least_47_A, 8),
+     " (approx ", round(100 * prob_at_least_47_A, 4), "% )\n\n")
1(ii) P(X >= 47) =  0.04604658  (approx  4.6047 % )

>
> # Problem 2
> # average (mean) calls per hour = 12
> lambda <- 12
>
> # (i) Random variable
> cat("2(i) X = number of calls received in one hour\n\n")
2(i) X = number of calls received in one hour
```

```
>
> # (ii) Distribution
> dist2 <- "Poisson(lambda = 12)"
> cat("2(ii) Distribution of X:", dist2, "\n\n")
2(ii) Distribution of X: Poisson(lambda = 12)

>
> # (iii) Probability that exactly 15 calls are received: P(X = 15)
> prob_eq_15 <- dpois(15, lambda = lambda)
> cat("2(iii) P(X = 15) = ", prob_eq_15, "\n")
2(iii) P(X = 15) =  0.07239112
> cat("2(iii) P(X = 15) = ", round(prob_eq_15, 8),
+     " (approx ", round(100 * prob_eq_15, 6), "% )\n")
2(iii) P(X = 15) =  0.07239112  (approx  7.239112 % )
> 
```

```
# Problem 1
# p = 0.85, n = 50; X = number who passed
n <- 50
p <- 0.85


# (i) Distribution of X
dist1 <- "Binomial(n = 50, p = 0.85)"
cat("1(i) Distribution of X: ", dist1, "\n\n")

# (ii) Probability that at least 47 students passed: P(X >= 47)
# Method A: use 1 - P(X <= 46)
prob_at_least_47_A <- 1 - pbinom(46, size = n, prob = p)

# Method B: sum of dbinom for k = 47..50 (equivalent)
prob_at_least_47_B <- sum(dbinom(47:50, size = n, prob = p))

cat("1(ii) P(X >= 47)  (Method A) = ", prob_at_least_47_A, "\n")
cat("1(ii) P(X >= 47)  (Method B) = ", prob_at_least_47_B, "\n\n")

# Print as percentage
cat("1(ii) P(X >= 47) = ", round(prob_at_least_47_A, 8),
    " (approx ", round(100 * prob_at_least_47_A, 4), "% )\n\n")
```

```r
# Problem 2
# average (mean) calls per hour = 12
lambda <- 12

# (i) Random variable
cat("2(i) X = number of calls received in one hour\n\n")

# (ii) Distribution
dist2 <- "Poisson(lambda = 12)"
cat("2(ii) Distribution of X:", dist2, "\n\n")

# (iii) Probability that exactly 15 calls are received: P(X = 15)
prob_eq_15 <- dpois(15, lambda = lambda)
cat("2(iii) P(X = 15) = ", prob_eq_15, "\n")
cat("2(iii) P(X = 15) = ", round(prob_eq_15, 8),
    " (approx ", round(100 * prob_eq_15, 6), "% )\n")
```

Values	
dist1	"Binomial(n = 50, p = 0.85)"
dist2	"Poisson(lambda = 12)"
lambda	12
n	50
p	0.85
prob_at_least_47_A	0.0460465788923019
prob_at_least_47_B	0.0460465788923018
prob_eq_15	0.0723911201466387