IT24101007

PS – Lab 7

IT24100716.R

Source on Save

```r
# IT24100716
# Lab sheet 07

# 1.
p1 <- punif(25, min = 0, max = 40) - punif(10, min = 0, max = 40)
p1

# 2.
lambda <- 1/3
p2 <- pexp(2, rate = lambda)    # P(X <= 2)
p2

# 3.
p3_i <- 1 - pnorm(130, mean = 100, sd = 15)
p3_i

# ii)
iq95 <- qnorm(0.95, mean = 100, sd = 15)
iq95

```

```
> # 1.
> p1 <- punif(25, min = 0, max = 40) - punif(10, min = 0, max = 40)
> p1
[1] 0.375
> # 2.
> lambda <- 1/3
> p2 <- pexp(2, rate = lambda)    # P(X <= 2)
> p2
[1] 0.4865829
> # 3.
> p3_i <- 1 - pnorm(130, mean = 100, sd = 15)
> p3_i
[1] 0.02275013
> # ii)
> iq95 <- qnorm(0.95, mean = 100, sd = 15)
> iq95
[1] 124.6728
```

Values	
iq95	124.672804404272
lambda	0.333333333333333
p1	0.375
p2	0.486582880967408
p3_i	0.0227501319481792

1. A train arrives at a station uniformly between 8:00 a.m. and 8:40 a.m. Let the random variable X represent the number of minutes the train arrives after 8:00 a.m. What is the probability that the train arrives between 8:10 a.m. and 8:25 a.m.?

Uniform(0,40): probability train arrives between 10 and 25 = (25−10)/40 = 15/40 = 0.375 (37.5%).

2. The time (in hours) to complete a software update is exponentially distributed with rate λ = 1 3 . Find the probability that an update will take at most 2 hours.

Exponential(rate = 1/3): P(T ≤ 2) = 1 − exp(−(1/3)*2) = 1 − e^(−2/3) ≈ 0.4865829 (≈48.66%).

3. Suppose IQ scores are normally distributed with a mean of 100 and a standard deviation of 15.
   i. What is the probability that a randomly selected person has an IQ above 130?
   ii. What IQ score represents the 95th percentile?

Normal(μ=100, σ=15):

i. P(IQ > 130) = 1 − Φ((130−100)/15) = 1 − Φ(2) ≈ 0.02275 (≈2.275%).

ii. 95th percentile = μ + z_{0.95}·σ = 100 + 1.6448536·15 ≈ 124.6728 (≈124.67 IQ).