Assignment 3 - Group 4

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Exercise 3.2

Exercise 3.2.a

The project consists out of 7 activities (1,2,3,4,5,6,7) which all have a respective expected duration $d_i = [1, 3, 2, 3, 4, 5, 2], i \in [1, 2, 3, 4, 5, 6, 7]$

Their finish times FT_i are formulated according to the dependencies depicted in the assignment description as follows:

1. $FT_1 = d_1$
2. $FT_2 = d_1 + d_2$
3. $FT_3 = d_1 + d_3$
4. $FT_4 = d_1 + d_4$
5. $FT_5 = max(d_2, d_3) + d_5$
6. $FT_6 = max(d_3 + d_4) + d_6$
7. $FT_7 = max(d_5, d_6) + d_7$

The activity durations follow an exponential distribution $r(x) = e^{-d_i x}$ and therefore the function $x = \frac{-ln(u)}{\frac{1}{d_i}}$ was used to simulate new values for each activity, where u is a random sample from a uniform distribution.

This was done 10,000 times in Excel and the sample average (expected project finish time) was 14.081.

Exercise 3.2.b

Next up we calculate a 95% confidence interval using the sample standard deviation of 6.167, the z-score 1.96 and the sample size of 10,000.

We can say with 95% confidence that the expected finish time lays between the lower and upper bounds of [13.85, 14.09]

Exercise 3.2.c

The probability that the project takes more than 12 days can be represented as a sample proportion p. Therefore we count the occurences where the finishing time is greater than 12 in our 10,000 samples and divide that by the total number of samples.

Doing so, the sample proportion is 0.581.

Knowing the sample proportion, we can construct the 95% confidence interval using the sample standard deviation of 0.494, the z-score of 1.96, and the sample size of 10,000.

We can say with 95% confidence, that the probability for the expected finishing time to be greater than 12 is between the lower and upper bounds of [0.571, 0,591].