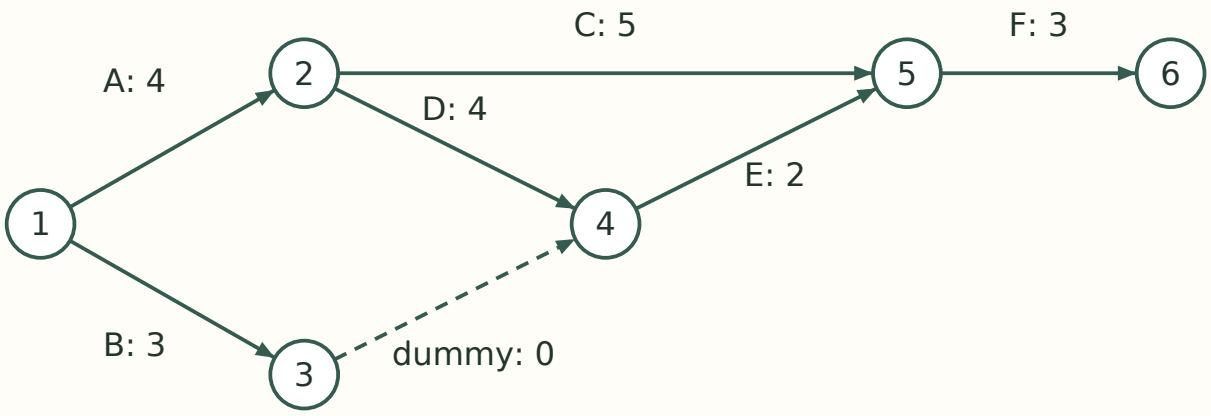
Earliest/latest times

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Use the display project to find ES, EF, LS and LF for B. [3 marks]



Activity-on-arrow network; durations are in days.

Forward and backward scans for the display network, with completion at day 13.

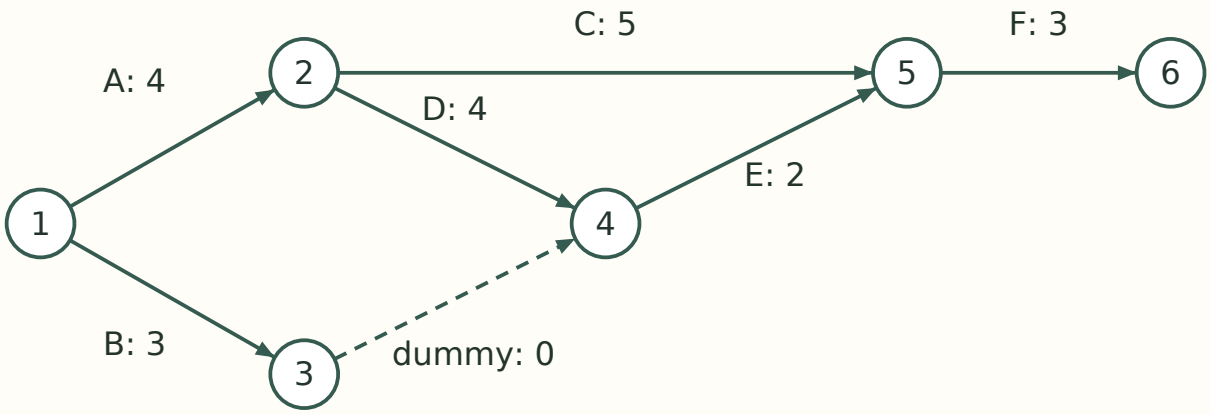
Event	Earliest time	Latest time
1	0	0
2	4	4
3	3	8
4	8	8
5	10	10
6	13	13

B is 1→3 of duration 3.

$\text{ES} = E_1 = 0$; $\text{EF} = 3$; $\text{LF} = L_3 = 8$; $\text{LS} = 8 - 3 = 5$.

Answer: 0, 3, 5 and 8 days respectively.

2. Find all four activity times for C in the display project. [3 marks]



Activity-on-arrow network; durations are in days.

Forward and backward scans for the display network, with completion at day 13.

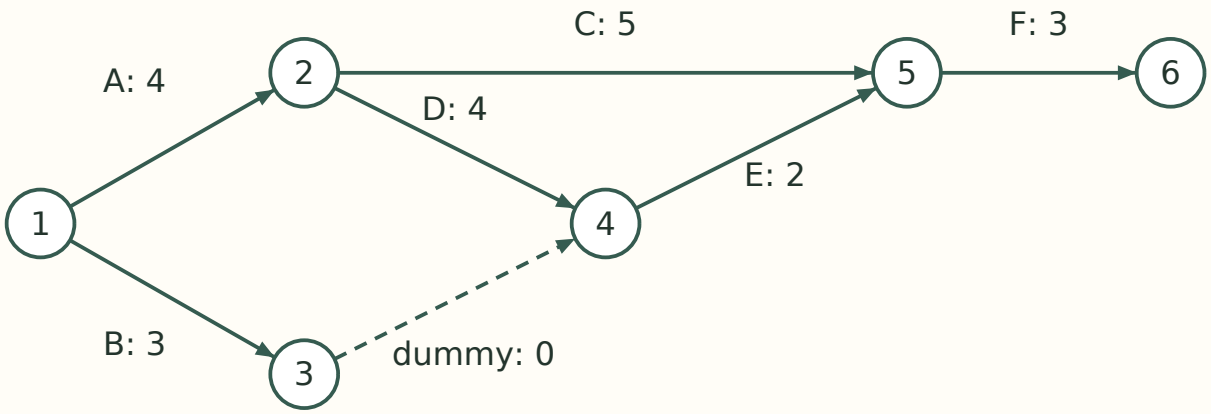
Event	Earliest time	Latest time
1	0	0
2	4	4
3	3	8
4	8	8
5	10	10
6	13	13

C is 2→5 of duration 5.

$\text{ES} = 4;\ \text{EF} = 4 + 5 = 9;\ \text{LF} = 10;\ \text{LS} = 10 - 5 = 5.$

Answer: $\text{ES} = 4,\ \text{EF} = 9,\ \text{LS} = 5,\ \text{LF} = 10$ days.

3. Find all four times for E in the display project. [2 marks]



Activity-on-arrow network; durations are in days.

Forward and backward scans for the display network, with completion at day 13.

Event	Earliest time	Latest time
1	0	0
2	4	4
3	3	8
4	8	8
5	10	10
6	13	13

E is 4→5 of duration 2.

Use $E_4 = 8$ and $L_5 = 10$.

Answer: $\mathrm{ES} = 8$, $\mathrm{EF} = 10$, $\mathrm{LS} = 8$, $\mathrm{LF} = 10$ days.

4. A task lasts 8 minutes. Its ES is 12 and LS is 15. Find EF and LF. [2 marks]

Add the same fixed duration to each start.

$12 + 8 = 20;\ 15 + 8 = 23.$

Answer: $\mathrm{EF} = 20$ and $\mathrm{LF} = 23$ minutes.

5. An activity runs 2→5 for 3 days. $E_2 = 6$, $E_5 = 12$ and $L_5 = 14$. Find its earliest finish and explain why it differs from E_5. [3 marks]

The task itself finishes at $6 + 3 = 9$.

An event combines all incoming requirements.

Answer: $\mathrm{EF} = 9$ days; event 5 waits for another incoming activity until day 12.

6. A claimed schedule gives $\mathrm{ES} = 5$, $\mathrm{EF} = 11$, $\mathrm{LS} = 9$ and $\mathrm{LF} = 14$ for one fixed-duration activity. Identify the inconsistency. [2 marks]

$11 - 5 = 6.$

$14 - 9 = 5$; the same activity cannot have both durations in this model.

Answer: The duration would be 6 from ES/EF but 5 from LS/LF.