



ANSWER BOOK

Critical path analysis

Decision Mathematics 1 · Year FM

6 questions · 20 marks

NAVY EDITION

SECTION A · Warm-up

- A1** An arrow of zero duration carrying a dependency without representing any work. It is [2] needed when two activities share some but not all of their predecessors, so that the network shows exactly the right dependencies, and also to give two activities distinct pairs of events when they would otherwise run between the same two.
- A2** A finishes at 3 and B at 5. C runs 3 to 7 [3], D runs 3 to 5. E waits for the later of B and C, so it runs 7 to 13; F runs 5 to 8. G waits for the later of E and F, so it runs 13 to 15: the project takes 15 days.

SECTION B · Standard

- B1** From 15: G must start by 13. E and F must both finish by 13, so E starts [4] by 7 and F by 10. C must finish by 7, starting by 3; D must finish by 10, starting by 8; B must finish by 7, starting by 2. A must finish by 3. Early and late starts agree for A, C, E and G: that is the critical path, $3 + 4 + 6 + 2 = 15$.
- B2** What matters is the total duration along a route, not how many activities it contains. [4] Here A, C, E, G has four activities and takes 15 days, while A, D, F, G also has four and takes only 10. A route with more but shorter activities can easily be shorter overall. The critical path is defined by zero float, which is the same as being the longest route in time.
- B3** Its latest start is $13 - 4 = 9$, which is later than its earliest start of 6. The [4] float is 3 days, so the activity is not critical: it could be delayed by up to three days without extending the project.

SECTION C · Stretch

- C1** B previously had 2 days of float, so 3 extra days uses it up and pushes past it. B now [4] finishes at 8, so E cannot start until 8 and finishes at 14, and G finishes at 16. The project has lengthened by one day, and the critical path becomes B, E, G, since A and C now have a day of float. A change to a non-critical activity can create a new critical path once it exceeds the float.