A-level
COMPUTER SCIENCE

Paper 1

June 2026

Preliminary Material

To be opened and issued to candidates on or after 1 September 2025, subject to the instructions given in the Teacher's Notes (7517/1/TN).

Note

- The Preliminary Material and Skeleton Program are to be seen by candidates and their teachers **only**, for use during preparation for the examination on **10 June 2026**. They **cannot** be used by anyone else for any other purpose, other than that stated in the instructions issued, until after the examination date has passed. They must **not** be provided to third parties.

Information

- A Skeleton Program is provided separately by your teacher and must be read in conjunction with this Preliminary Material.
- You are advised to familiarise yourselves with the Preliminary Material and Skeleton Program before the examination.
- A copy of this Preliminary Material and the Skeleton Program will be made available to you in hard copy and electronically at the start of the examination.
- You must **not** take any copy of the Preliminary Material, Skeleton Program or any other material into the examination room.

INSTRUCTIONS FOR CANDIDATES

Electronic Answer Document

Answers for all questions in all sections must be entered into the word-processed document made available to you at the start of the examination and referred to in the question paper rubrics as the **Electronic Answer Document**.

Preparation for the examination

You should ensure that you are familiar with the **Preliminary Material** and the **Skeleton Program** for your programming language.

Ant Simulation

Ant Simulation is a program that allows a user to see how ant populations change over time. Like all simulations, it is a simplified version of what happens in the real world.

In the simulation there are one or more ant nests, some ants and some food sources. The "world" is represented as a two-dimensional grid.

The simulation contains two of the many different types of ant that exist in the real world – queen ants and worker ants.

Queen ants stay in their nest and reproduce (create new ants). They are only able to reproduce when there is enough food at the nest to allow the population to increase.

Worker ants move randomly around the grid searching for a source of food. When they find one, they bring some food from the source back to their nest, laying a pheromone (scent) trail as they return to their nest. This pheromone trail is used so ants can follow it to the source of food.

If a worker ant detects a pheromone trail, they stop moving randomly and follow the pheromone trail instead. If there are several pheromones detected, the ant will follow the trail containing the strongest pheromone. As time passes, the strength of a pheromone trail fades.

If the level of food at the nest is low then the population of the nest will decrease. The ants to be removed from the simulation are selected randomly.

The simulation is advanced one stage at a time. At each stage an ant takes one action: move to a new cell, pick up food or add food to the nest. The amount of food in the nest decreases at each stage by an amount determined by the number of ants that belong to the nest.

In the Skeleton Program, there are four different simulations to select from:

- **Simulation 1** is a 5×5 grid with one nest. Five ants belong to that nest (one queen and four workers). At the start of the simulation the nest has 500 food units in it. There are three sources of food in the grid. It is possible that some of the food sources could be in the same cell as each other. The strength of a new pheromone is 1000 and the pheromone decay rate is 50 per stage.
- **Simulation 2** is the same as simulation 1 except the pheromone decay rate is 100 per stage.
- **Simulation 3** is a 10×10 grid with one nest. Nine ants belong to that nest (one queen and eight workers). At the start of the simulation the nest has 500 food units in it. There are three sources of food in the grid. It is possible that some of the food sources could be in the same cell as each other. The strength of a new pheromone is 1000 and the pheromone decay rate is 25 per stage.
- **Simulation 4** is a 10×10 grid with two nests. Six ants belong to each nest (one queen and five workers). At the start of the simulation each nest has 500 food units in it. There are three sources of food in the grid. It is possible that some of the food sources could be in the same cell as each other. The strength of a new pheromone is 1000 and the pheromone decay rate is 25 per stage.

After choosing which simulation to use the user repeatedly selects one of the options from the menu until they choose the quit option. The other options available are to display overall details about the simulation, to display details about a selected area in the grid, to inspect one cell in the grid in detail, to advance the simulation by one stage or to advance the simulation by X stages (where X is a value specified by the user).

There could be errors in the implementation of the simulation in the Skeleton Program, which mean that it does not work correctly under all circumstances.

END OF PRELIMINARY MATERIAL