

2.1.1

THINKING ABSTRACTLY

TOPIC WISE EXAM QUESTIONS

A-LEVEL

OCR

1.1 Thinking abstractly

- a) The nature of abstraction.
- b) The need for abstraction.
- c) The differences between an abstraction and reality.
- d) Devise an abstract model for a variety of situations.

Candidates need to understand the term abstraction and its purpose in the design and creation of computer programs. Candidates need to understand the benefits of abstraction and apply these benefits to a specific scenario. Candidates may be given a scenario and be asked how abstraction can be applied to it, how it has been applied or how further abstraction can be applied. Candidates need to have an understanding of how reality differs to abstraction and understand the differences between reality and abstraction. Candidates may be given a scenario/example and be asked how the abstraction differs from the reality.

GCST

9 A text-based computer game allows a user to dig for treasure on an island. The island is designed as a grid with 10 rows and 20 columns to store the treasure. Each square is given an x and y coordinate. Some of the squares in the grid store the name of a treasure object. Each treasure object has a value, e.g. 100 and a level, e.g. "Bronze."

(a) The computer game makes use of abstraction.

(i) Describe what is meant by the term abstraction and give an example of how abstraction can be used in the treasure game.

Description:

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Example:

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[3]

(ii) Give **three** benefits of using abstraction when writing a program.

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[3]

2 Taylor is designing a program for a client who would like to simulate earthquakes on major cities around the world in 3D. The client would like to be able to view any stage of an earthquake such as:

1. the build-up of the earthquake
2. the earthquake taking place
3. the aftershocks of the earthquake.

The client would also like to be able to play the simulation at different speeds. For example, a slow, normal or fast speed.

(a) Give **three** examples of where abstraction can be used in the design of this program.

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AS - Level

4 A programmer is developing an aeroplane simulator. The user will sit in a cockpit and the simulated environment will be displayed on screens around them.

(a) The programmer uses computational methods to design a solution for the program.

(i) Complete the table by writing a definition for each computational method.

Computational Method	Definition
Abstraction	
Decomposition	

[2]

(ii) Give **three** potential differences between the abstracted aeroplane simulator and reality.

- 1
- 2
- 3

[3]

(iii) Identify **two** reasons why abstraction is used when designing a solution to the problem.

- 1
- 2

[2]

- 1 Kira is creating a computer game where the user can play against the computer.

In each turn, each character can make one move from a selection of possible moves.

Kira uses a tree data structure shown in **Fig. 1** to identify the range of possible moves the computer can make from starting position A. Each connection is a move, with each node representing the result of the move.

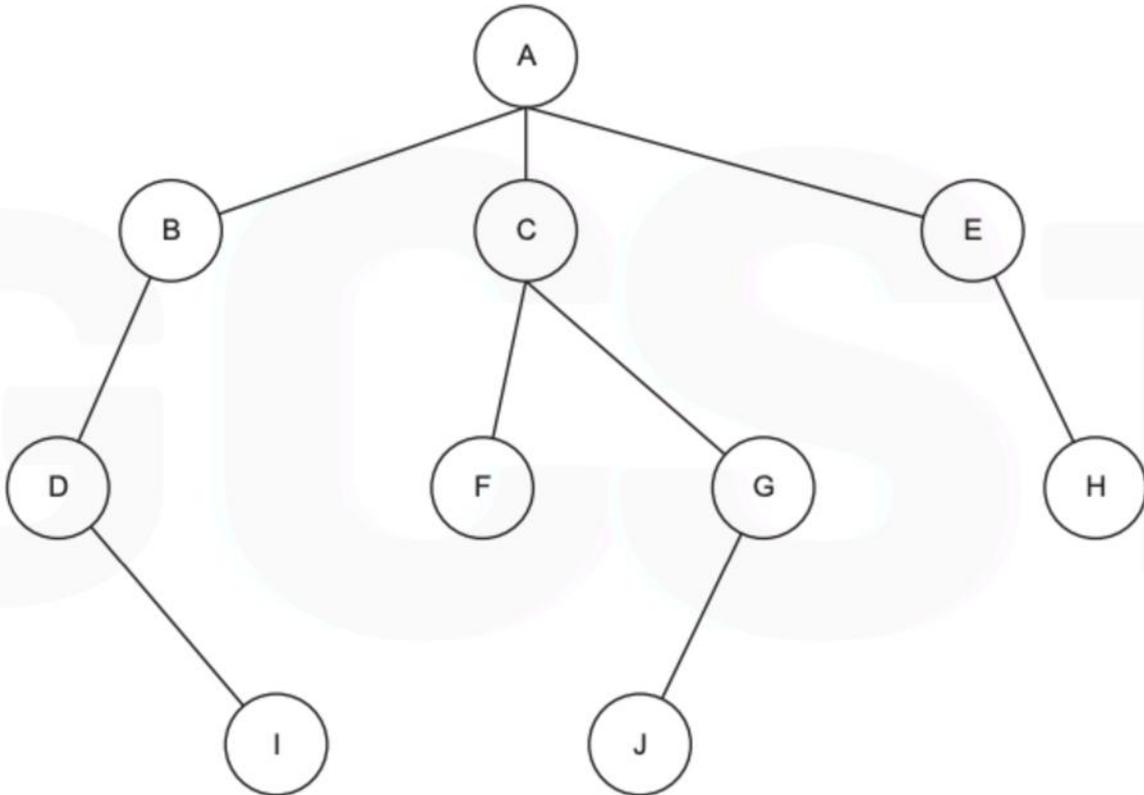


Fig. 1

- (a) State what is meant by the term 'abstraction' and describe how Kira has used abstraction in her design of the tree.

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[3]

- 1 Sally is a classroom teacher. She would like a program to be able to organise where students will sit in her classroom.

A plan of her classroom is shown in Fig. 1.

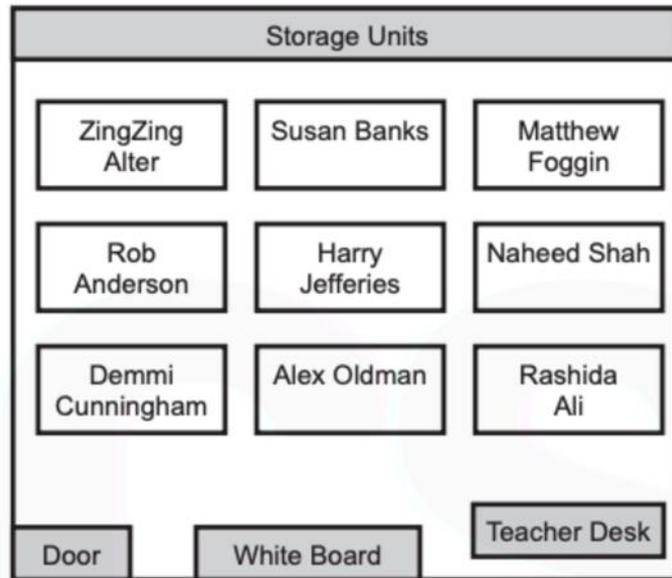


Fig. 1

- (a) (i) State **three** ways that Sally has made use of abstraction in Fig. 1.

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[3]

- (ii) Explain **two** benefits to Sally of using abstraction before creating the programming code.

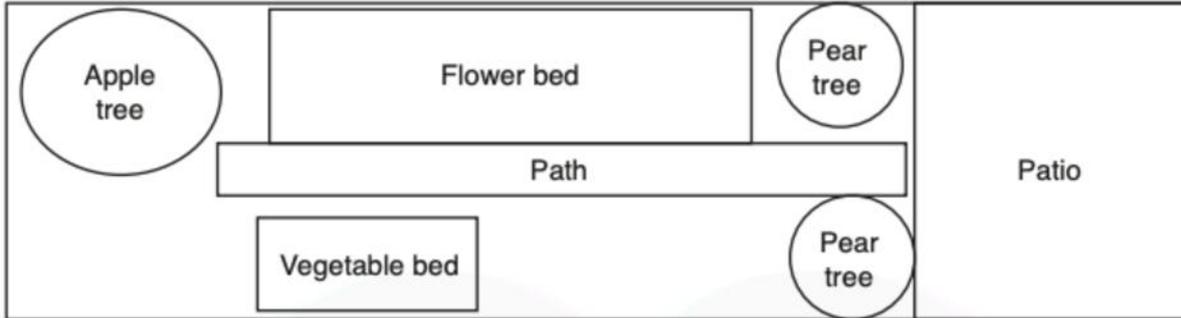
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[4]

7 A program is needed to plan the layout of a garden.

The program will allow the user to create an image of the garden, for example:



(a) The programmer will use abstraction to produce the program interface to represent the garden.

(i) Give **two** different examples of how abstraction has been used to produce the layout of the garden.

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- 2
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[2]

(ii) Explain the need for abstraction in the production of this program.

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[3]

- 3 A puzzle has multiple ways of reaching the end solution. Fig. 3 shows a graph that represents all possible routes to the solution. The starting point of the game is represented by A, the solution is represented by J. The other points in the graph are possible intermediary stages.

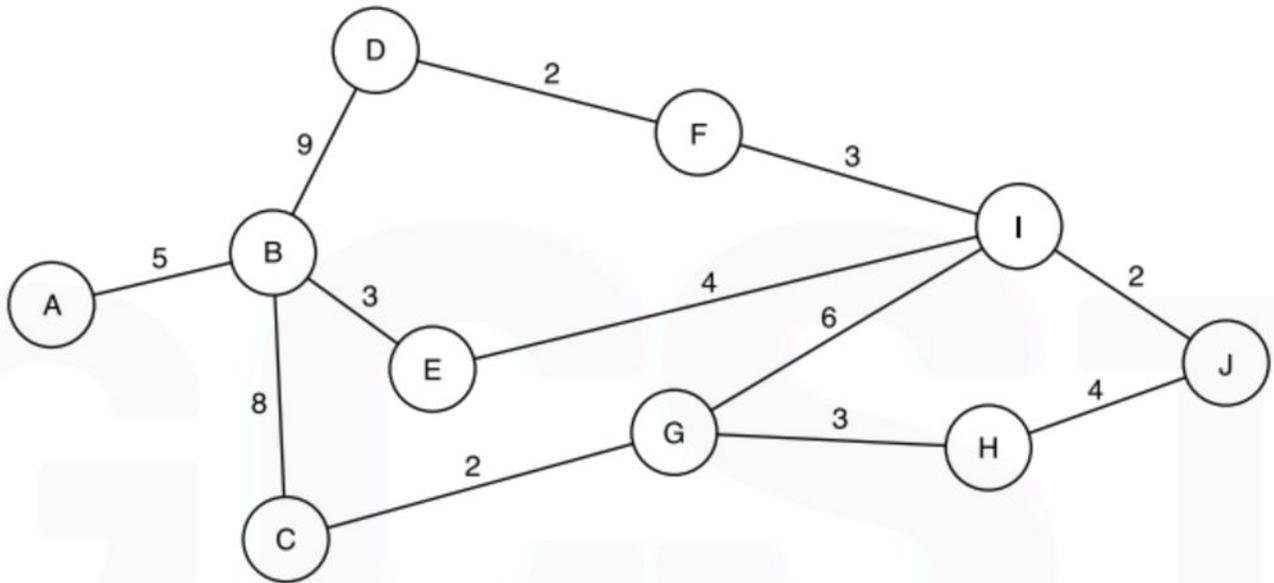


Fig. 3

- (ii) Explain how the graph is an abstraction of the problem.

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- 3 A country's national rail operator wants to represent their rail network on a computer system to keep track of the location of trains, and any problems on the network.

After studying the rail network, the operator uses abstraction to create the virtual representation.

- (a) (i) Define the term 'abstraction'.

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- (ii) Identify **two** reasons why abstraction is needed in the rail network program.

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..... [2]

- (iii) Describe **one** potential difference between the virtual and real rail network.

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6 A software developer is creating a Virtual Pet game.

The user can choose the type of animal they would like as their pet, give it a name and then they are responsible for caring for that animal. The user will need to feed, play with, and educate their pet.

The aim is to keep the animal alive and happy, for example if the animal is not fed over a set period of time then the pet will die.

- The game tells the user how hungry or bored the animal is as a percentage (%) and the animal's intelligence is ranked as a number between 0 and 150 (inclusive).
- Hunger and boredom increase by 1% with every tick of a timer.
- When the feed option is selected, hunger is reduced to 0.
- When the play option is selected, bored is reduced to 0.
- When the read option is selected, the intelligence is increased by 0.6% of its current value.

(e*) The developer made use of abstraction when creating the Virtual Pet game.

Discuss the need for and purpose of abstraction and how abstraction will be used in the development of the game. [9]

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1(a). The map shown below in Fig.1 is of a city and surrounding districts. The map is an *abstraction* made up of a number of component parts.



Fig.1

Using the map in Fig.1 as an example, define the term *abstraction*.

[4]

2(a). DriveSim Tutor is a 3D driving simulator program designed to allow learner drivers to practice following the Highway Code whilst driving through a virtual town.

The simulator's developers study a real town. They then use abstraction on their findings before designing a virtual town.

Explain why it is necessary for the developers to use abstraction.

[2]

(b). As a result of abstraction there will be similarities and differences between the virtual and real town.

(i) State **two** similarities there might be between the virtual and real town. Explain why these similarities exist.

1

2

[4]

(ii) State **two** differences between the virtual and real town.

1

2

[2]

3. A car racing team uses a car simulator to test their drivers in a range of cars on different race tracks.

The car simulator uses an abstraction of the real car and race track. Identify **two** ways in which the simulator could use abstraction.

1

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[2]

**If you found this
useful, drop a follow
to help me out!**

THANK YOU!

GCST