2.1 COMPUTATIONAL THINKING · 2.1.1

Thinking abstractly — Mark scheme

30 marks · spec 2.1.1(a)–(d)

AO key: AO1 = knowledge · AO2 = application · AO3 = reasoned judgements. Credit any valid alternative; do not award the same point twice.

Q	ANSWER	AO	MARKS
1(a)	Removing/hiding detail that is not relevant (1); to focus on / represent only what is relevant to the problem (1). (2)	AO1	2
1(b)	Example (1) + a detail it removes (1), e.g. a transit map (1) removes real distances/ geography (1). Accept any reasonable example. (2)	AO2	2
1(c)	Abstraction removes/hides irrelevant detail (1); decomposition breaks a problem into smaller sub-problems (1). (2)	AO1	2

Q	ANSWER	AO	MARKS
2(a)	Up to 3: the real roads are reduced to nodes (junctions) and edges (roads) (1); only the connections and their weight (distance/time) are kept (1); irrelevant physical detail is removed so a routing algorithm can work on it (1). (3)	AO2	3
2(b)	1 mark each, max 2: road surface · scenery/buildings · the exact shape/bends of the road · road width · number of lanes. (2)	AO2	2
2(c)	Any one: simpler/faster to process · a standard routing algorithm can be used · the same model works for any network. (1)	AO2	1

Q	ANSWER	AO	MARKS
3(a)	There is too much data / the problem is too complex to solve directly (1); abstraction removes irrelevant detail until the problem can be represented and solved (1). (2)	AO2	2
3(b)	1 mark each, max 3: which room a subject needs · hours each class requires · which classes must not clash · room capacities · each teacher's subjects/teaching load · class sizes. (General, not specific.) (3)	AO2	3
3(c)	Any one: names of teachers/pupils · wall colour · age of building · cosmetic details. (1)	AO2	1

Q	ANSWER	AO	MARKS
4	1 mark each, max 3: the abstraction omits detail / loses information · it can mislead if you forget what was removed · it only models one purpose well · it relies on assumptions that may be wrong · it cannot capture every real-world factor. (3)	AO1	3

Q	LEVELS-OF-RESPONSE MARK SCHEME (9 MARKS)	AO	MARKS
5	Mark using the levels descriptors below. AO1 (knowledge of abstraction), AO2 (application via examples), AO3 (reasoned discussion of need & purpose). **LEVEL** / **DESCRIPTOR** **Level 3 (7–9)** — Thorough discussion of both the **need** for and **purpose** of abstraction, well supported by **examples**, with a clear line of reasoning and accurate terminology. **Level 2 (4–6)** — Covers need and/or purpose with some development and at least one example; reasoning mostly clear. **Level 1 (1–3)** — Basic points about abstraction with little development or examples. **0** — Nothing creditworthy. **Indicative content** (credit any valid point): • Need: real problems are too complex to solve directly; removing irrelevant detail makes them manageable and solvable. • Purpose: focus on key elements; build a model that can be analysed/tested; produce general, reusable solutions; communicate the problem clearly. • Examples: transit map; graph of a road network; timetabling model; weather/financial simulation. • Awareness that abstraction loses detail, so the model must keep what is relevant to the purpose.	AO1 ×3 AO2 ×3 AO3 ×3	**9**

Total for paper: 30 marks