MODULE K ALGORITHM DESIGN · K6

Flowcharts: mark scheme

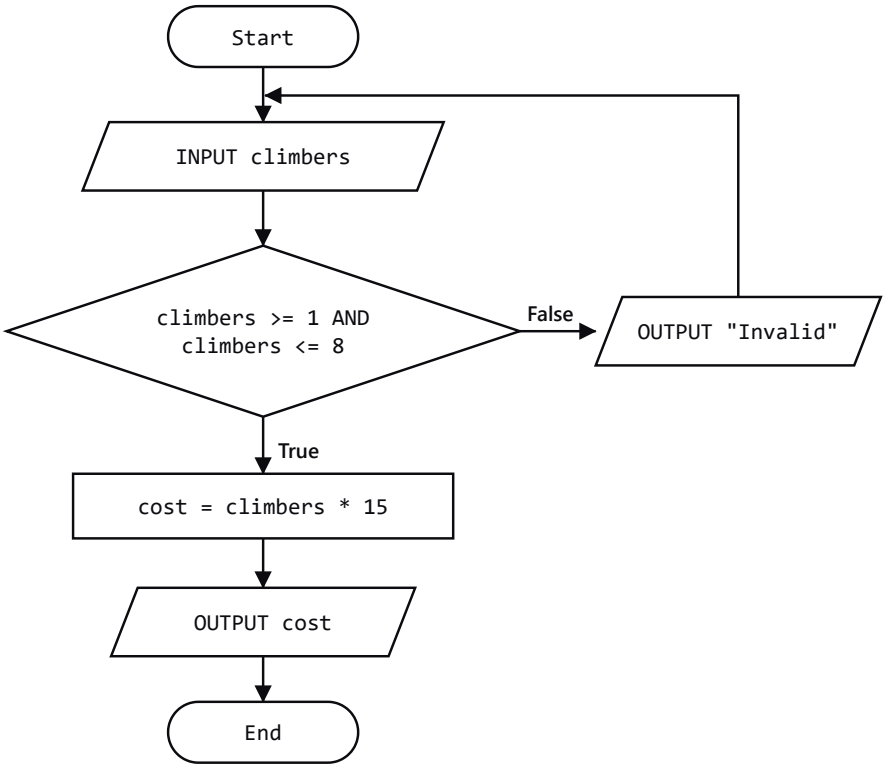
21 marks · OCR J277 spec 2.1.2: create, interpret, correct, complete and refine algorithms using flowcharts; flowchart symbols (Line, Input/Output, Process, Decision, Sub program, Terminal); trace tables

How to use. 1 mark per bullet up to the maximum shown. **/** separates alternative answers. Words in (brackets) are not needed for the mark. Credit any other valid answer that shows the same understanding. Flowchart answers are marked for logic, not exact syntax: lines without arrowheads are accepted, and minor syntax slips (missing quotes, = for == in a decision) are not penalised.

<table>
<tr><th>QUESTION</th><th>ANSWER</th><th>MARKS</th><th>GUIDANCE</th></tr>
<tr><td>1(a)
J277 2.1.2</td><td>A: Decision
B: Sub program
C: Terminal
D: Input/Output</td><td>4</td><td>1 mark per correct row. Accept subroutine / procedure / function / predefined process for B. Accept terminator / Start/End for C. Accept input or output alone for D. Do not accept process for B or D.</td></tr>
<tr><td>2(a)
J277 2.1.2</td><td>height: 100, 50, 25, 12.5, 6.25
bounces: 0, 1, 2, 3, 4
Output: 4 (once, at the end)
<table><tr><th>HEIGHT</th><th>BOUNCES</th><th>OUTPUT</th></tr><tr><td>100</td><td>0</td><td></td></tr><tr><td>50</td><td>1</td><td></td></tr><tr><td>25</td><td>2</td><td></td></tr><tr><td>12.5</td><td>3</td><td></td></tr><tr><td>6.25</td><td>4</td><td></td></tr><tr><td></td><td></td><td>4</td></tr></table></td><td>3</td><td>1 mark per correct column (all values in order). Values may be on different rows or repeated on later rows. Accept 12½ and 6¼. Do not award the output mark if any other value appears in the Output column.</td></tr>
<tr><td>2(b)
J277 2.1.2</td><td>0</td><td>1</td><td>The decision is False on the first check, so the loop is never entered.</td></tr>
</table>

QUESTION	ANSWER	MARKS	GUIDANCE
3(a) J277 2.1.2	A: `INPUT temperature` / `temperature = input()` B: `temperature < 27` C: `heater = "On"` D: `heater = "Off"`	**4**	1 mark per box. Any sensible variable name, used consistently. Do not accept `temperature <= 26` (the temperature may not be a whole number). Allow a reversed condition (e.g. `temperature >= 27`) only if C and D are swapped to match. B: do not accept a condition in English with no comparison (e.g. "is it cold?"). Do not accept OUTPUT in C or D.
4(a) J277 2.1.2	**Error 1:** `INPUT battery` is in a process symbol / rectangle (1) **Correction:** use the input/output symbol / parallelogram (1) **Error 2:** the condition `battery < 20` is wrong / a battery level of 20 outputs "Ready" (1) **Correction:** change the condition to `battery <= 20` / `battery < 21` (1)	**4**	Errors may be given in either order. For the second correction also accept `battery > 20` with the True and False branches (or the two outputs) swapped. A correction mark may be given without the matching error mark only if the correction makes the error clear. Do not accept "wrong shape" alone for error 1.
5(a) J277 2.1.2 (input validation 2.3.1)	1 mark each to max 5: Start and End terminal symbols used input of the number of climbers in an input/output symbol decision (diamond) that checks **both** limits: `climbers >= 1 AND climbers <= 8` / two decisions / equivalent ...if invalid, `"Invalid"` is output and a line goes back to the input (so the number is input again) cost calculated as `climbers * 15` in a process symbol cost output in an input/output symbol, on the valid path, before End decision branches labelled True/False or Yes/No the right way round *An example answer is drawn below the table.*	**5**	Allow any logically valid flowchart. Allow the checks in English, e.g. "is climbers between 1 and 8?", as this is a design task. Do not award the decision mark if only one limit is checked or the limits are wrong (e.g. > 1). A process box used for input or output loses that mark only. Lines without arrowheads are accepted. Ignore the £ sign in the output.

Example answer for 5(a)



Total: 21 marks