Grade 6 Computing

Unit 3 · Algorithms: Step by Step

ANSWER KEY · FOR TEACHERS

Full marks 31

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. algorithm
2. instruction
3. sequence
4. repetition
5. condition
6. variable
7. tracing
8. debugging

Each carries 0.5 mark. **K · 4**

2 Multiple choice

i. **c.** Add 2 spoons of sugar. **U · 1**

"2 spoons of sugar" has only one meaning. "A little", "a while" and "enough" each make the reader guess, and a robot can't guess.

ii. **c.** Repeat 20 times: fold a momo. **K · 1**

"Repeat 20 times" does the folding 20 times. The choice about the umbrella happens at most once, and the other two are single steps.

iii. **b.** "Is the milk boiling?" **U · 1**

A condition is a question with only two answers, yes or no. "Is the milk boiling?" is one. The others are instructions or pieces of instructions, not questions.

iv. **b.** text **K · 1**

A name is made of letters and isn't calculated with, so it is text.

v. **b.** The repeat never ends, because the bucket never fills. **A · 1**

"Repeat until" stops only when its condition comes true. Here it never does, so the algorithm never ends. That is a bug.

3 Sequence

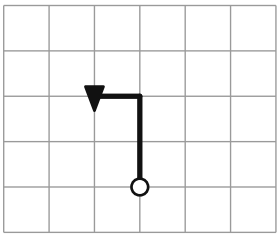
MARKING SCHEME **A · 3**

- ✓ c and e first (in either order), then d.
- ✓ b, then a: boil before straining.
- ✓ The missing step: turn the stove off, after the boiling.

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4 Directions on squared paper

a. ANSWER A · 2



One square is one block. ○ is where you start; the black arrowhead is where you end, pointing the way you face.

Turn left: north. Forward 2 blocks north, turn left: west. Forward 1 block west, turn left: south.

MARKING SCHEME

- ✓ The path: 2 blocks up (north), then 1 block left (west).
- ✓ Facing south at the end.

b. MARKING SCHEME A · 3

- ✓ Forward 3 times, then turn right.
- ✓ Forward 2 times.
- ✓ Turn left, then forward 1 time.

5 Trace the algorithm

ANSWER A · 3

Step	name	cups	milk	price	bill
1	Gita				
2		3			
3			no		
4				20	
5					60

At step 6 it says: “Gita, please pay Rs 60.”

MARKING SCHEME

- ✓ name Gita, cups 3 and milk no, in steps 1 to 3.
- ✓ price 20 at step 4 (black tea).
- ✓ bill 60 at step 5, and “Gita, please pay Rs 60.”

6 Find and fix the bug

MARKING SCHEME A · 3

- ✓ 92 gives “Prize!” and 45 gives “Well done.”: both right.
- ✓ 80 gives “Well done.”, which is wrong (80 or more should get a prize): this test, at the edge of the rule, finds the bug.
- ✓ The fix: “If **marks** is 80 or more, say ‘Prize!’. Otherwise, say ‘Well done.’”

7 Data types

MARKING SCHEME U · 2

- ✓ marks and students: number.
- ✓ city: text; passed: yes/no.

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8 Long answer

ANSWER **A · 4**

1. Ask the passenger's age. Keep it in **age** (number).
2. Ask "Are you a student?" Keep the answer in **student** (yes/no).
3. If **age** is less than 5, **fare** = 0.
4. Otherwise, if **student** is yes, **fare** = 15.
5. Otherwise, **fare** = 30.
6. Say: "Please pay Rs **fare**."

Tests: age 3, student no: Rs 0. Age 12, student yes: Rs 15. Age 40, student no: Rs 30. A good set of tests also tries age 5 exactly (it should pay). Other algorithms are right too, if every step is exact and they give these fares.

MARKING SCHEME

- ✓ Variables for the age (number) and whether a student (yes/no), each asked for.
- ✓ A choice that makes the fare 0 for an age under 5, checked first.
- ✓ Otherwise 15 for a student and 30 for anyone else.
- ✓ Three tests with the right fare for each.

9 Think

ANSWER **HA · 2**

A test with exactly 5 cups. The algorithm said "more than 5", which leaves out 5 itself, so 5 cups got no discount. 2 cups and 6 cups are far from the edge of the rule, so they pass either way. Tests right at the edge of a rule (5 cups here) are where "more than" and "5 or more" give different answers, so they find this kind of bug.

MARKING SCHEME

- ✓ A test with exactly 5 cups.
- ✓ It is right at the edge of the rule, where "more than 5" and "5 or more" give different answers; 2 and 6 cups pass either way.

10 Activity: Be the robot

(not marked)

WHAT STUDENTS SHOULD FIND

The first drawings usually come out very different: words like "a bit", "there", "a small circle" and "next to it" mean different things to different people. The second try is better, because the speaker starts saying exactly where, how long and which way ("a line 5 cm straight up from the middle of the page"). That is what writing an algorithm for a computer feels like.

Marks by level	Knowledge	Understanding	Application	Higher ability	**Total**
Marks	6	4	19	2	**31**

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