Algorithms: Steps, Order and Debugging

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A clear, step-by-step set of instructions to solve a problem is an:
   (a) output **(b)** example **(c)** abstraction **(d)** algorithm

2. A number machine does: take away 8 → take away 2 → multiply by 2. What comes out when 30 goes in?
   (a) 41 **(b)** 20 **(c)** 40 **(d)** 39

3. A number machine does: multiply by 2 → multiply by 3 → multiply by 3. 414 came out. What number went in?
   (a) 25 **(b)** 24 **(c)** 22 **(d)** 23

4. Put the steps to plant a seed in the right order (write the letters): (P) Fill a pot with soil (Q) Water the pot (R) Make a small hole in the soil (S) Drop the seed in and cover it
   (a) P, R, S, Q **(b)** P, Q, S, R **(c)** P, S, R, Q **(d)** S, R, P, Q

5. Isha starts with 18 and follows these steps, writing the number after each one:
   Step 1: take away 4 (Isha writes 14)
   Step 2: take away 9 (Isha writes 7)
   Step 3: multiply by 4 (Isha writes 28)
   Step 4: multiply by 4 (Isha writes 112)
   One step was worked out wrongly, and the later steps were done correctly from it. Which step number is wrong?
   (a) 2 **(b)** 3 **(c)** 1 **(d)** 4

6. Start with the row G, E, R, S, A. (1) Swap the letters in places 2 and 4. (2) Move the last letter to the front. (3) Move the first letter to the end. Which letter is now in place 3?
   (a) R **(b)** S **(c)** E **(d)** G

7. For each mark in the list, if mark ≥ 60 print "Pass", otherwise print "Try again". How many times is "Pass" printed? Marks: 75, 73, 65, 81, 94, 14, 47, 50, 68, 22
   (a) 4 **(b)** 6 **(c)** 7 **(d)** 5

8. Start with the row R, T, N, H, B. (1) Move the last letter to the front. (2) Move the first letter to the end. (3) Move the first letter to the end. What is the row now?
   (a) R, B, H, N, T **(b)** N, H, B, R, T **(c)** T, N, H, B, R **(d)** R, T, N, H, B

Section B — Short answer — 8 × 2 = 16 marks

9. What is an algorithm? Give one example.

10. A number machine does: add 2 → add 11 → add 14. What comes out when 25 goes in?

11. A number machine does: multiply by 4 → multiply by 2 → add 7. 159 came out. What number went in?

12. Put the steps to cross a road at a zebra crossing in the right order (write the letters): (P) Look right, left and right again (Q) Stop at the edge of the pavement (R) Wait until the road is clear (S) Walk straight across

13. Sana starts with 8 and follows these steps, writing the number after each one:
Step 1: add 3 (Sana writes 11)
Step 2: add 15 (Sana writes 26)
Step 3: multiply by 4 (Sana writes 107)
Step 4: add 10 (Sana writes 117)
One step was worked out wrongly, and the later steps were done correctly from it. Which step number is wrong?

14. Start with the row T, F, M, E, H. (1) Move the first letter to the end. (2) Swap the letters in places 4 and 5. (3) Move the last letter to the front. What is the row now?

15. Start with the row F, C, K, J, D. (1) Move the first letter to the end. (2) Move the last letter to the front. (3) Move the first letter to the end. Which letter is now in place 4?

16. For each mark in the list, if mark ≥ 33 print "Pass", otherwise print "Try again". How many times is "Pass" printed? Marks: 96, 18, 80, 61, 14, 35, 92, 32

Section C — Word problems — 4 × 4 = 16 marks

17. Write an algorithm (4–5 steps) to find the larger of two numbers, and draw it in words as a flowchart (Start, input, decision, output, Stop).

18. (a) A number machine does: add 9 → add 8 → multiply by 2. What comes out when 22 goes in?
(b) A number machine does: take away 6 → multiply by 4 → add 10. 38 came out. What number went in?

19. (a) Put the steps to find the larger of two numbers in the right order (write the letters): (P) Read the second number (Q) Write down the larger one (R) Read the first number (S) Compare the two numbers
(b) Sana starts with 20 and follows these steps, writing the number after each one:
Step 1: take away 6 (Sana writes 14)
Step 2: multiply by 4 (Sana writes 56)
Step 3: take away 3 (Sana writes 53)
Step 4: multiply by 2 (Sana writes 116)
One step was worked out wrongly, and the later steps were done correctly from it. Which step number is wrong?

20. (a) Start with the row D, M, A, P, F. (1) Move the last letter to the front. (2) Swap the letters in places 1 and 3. (3) Move the first letter to the end. What is the row now?
(b) For each mark in the list, if mark ≥ 60 print "Pass", otherwise print "Try again". How many times is "Pass" printed? Marks: 47, 50, 30, 43, 42, 18, 11

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Answer key

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Q	Answer	Working
1	**(d) algorithm**	—
2	**(c) 40**	30 → 22 → 20 → 40
3	**(d) 23**	undo each step from the end: 414 → 138 → 46 → 23
4	**(a) P, R, S, Q**	Fill a pot with soil → Make a small hole in the soil → Drop the seed in and cover it → Water the pot
5	**(a) 2**	step 2 should give 5, not 7
6	**(a) R**	the row ends as G S R E A
7	**(b) 6**	marks of 60 or more: 75, 73, 65, 81, 94, 68
8	**(c) T, N, H, B, R**	carry out each instruction in order: T N H B R
9	**A step-by-step set of clear instructions to solve a problem, e.g. the steps to brush your teeth.**	—
10	**52**	25 → 27 → 38 → 52
11	**19**	undo each step from the end: 159 → 152 → 76 → 19
12	**Q, P, R, S**	Stop at the edge of the pavement → Look right, left and right again → Wait until the road is clear → Walk straight across
13	**3**	step 3 should give 104, not 107
14	**H, F, M, E, T**	carry out each instruction in order: H F M E T
15	**D**	the row ends as C K J D F
16	**5**	marks of 33 or more: 96, 80, 61, 35, 92
17	**Start → Read A and B → Is A > B? → Yes: print A; No: print B → Stop. The decision is a diamond with two arrows.**	—
18	**(a) 78; (b) 13**	(a) 22 → 31 → 39 → 78; (b) undo each step from the end: 38 → 28 → 7 → 13
19	**(a) R, P, S, Q; (b) 4**	(a) Read the first number → Read the second number → Compare the two numbers → Write down the larger one; (b) step 4 should give 106, not 116
20	**(a) D, F, A, P, M; (b) 0**	(a) carry out each instruction in order: D F A P M; (b) marks of 60 or more: none

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