Pattern Recognition

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. Spotting what stays the same and what changes in a set of things is called:
   (a) debugging **(b)** abstraction
   (c) decomposition **(d)** pattern recognition

2. What comes next? 20, 25, 33, 44, 58, ?
   (a) 75 **(b)** 72 **(c)** 76 **(d)** 74

3. One number in this sequence is wrong. Which one? 26, 35, 42, 53, 62, 71, 80
   (a) 80 **(b)** 53 **(c)** 35 **(d)** 42

4. What letter comes next? F, J, N, R, V, ?
   (a) X **(b)** Y **(c)** Z **(d)** W

5. A pattern repeats: snap, jump, clap, snap, snap, jump, clap, snap, snap, jump, … What is the 31st item?
   (a) clap **(b)** jump **(c)** stamp **(d)** snap

6. A pattern uses 8, 11, 14, 17 sticks for terms 1, 2, 3, 4. How many sticks does term 17 use?
   (a) 51 **(b)** 53 **(c)** 59 **(d)** 56

7. In the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, … each number k appears k times. Which number is in position 58?
   (a) 12 **(b)** 11 **(c)** 10 **(d)** 13

8. In a code, BOOK is written as ERRN. How is GOAT written in the same code?
   (a) IQCV **(b)** KSEX **(c)** JRDW **(d)** WDRJ

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

9. What is pattern recognition?

10. What comes next? 26, 88, 35, 80, 44, 72, ?

11. One term of this sequence is wrong: 18, 24, 33, 45, 60, 76, 99. (a) Which number is wrong? (b) What should it be?

12. What letter comes next? S, T, U, V, W, ?

13. A pattern repeats: circle, circle, star, circle, circle, star, circle, circle, … What is the 80th item?

14. A pattern uses 7, 10, 13, 16 sticks for terms 1, 2, 3, 4. Which is the first term to use more than 143 sticks?

15. If A = 1, B = 2, C = 3 and so on, HEN = 27 (the sum of its letters). What is STAR?

16. In a code, BAG is written as EDJ. How is DRUM written in the same code?

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

17. A pattern of matchstick squares in a row uses 4, 7, 10, 13 sticks. (a) What is the rule? (b) How many sticks for 10 squares? (c) Explain why the rule works.

18. A pattern uses 10, 16, 22, 28 sticks for terms 1, 2, 3, 4. (a) How many sticks does term 34 use? (b) Which is the first term to use more than 199 sticks? (c) Write the rule in words.

19. (a) What comes next? 5, 15, 45, 135, ?
(b) In the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, … each number k appears k times. Which number is in position 51?

20. (a) A pattern repeats: right, right, down, left, right, right, down, left, right, right, … What is the 54th item?
(b) In a code, CAT is written as DBU. How is DOG written in the same code?

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Answer key

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Q	Answer	Working
1	**(d) pattern recognition**	—
2	**(a) 75**	the gaps grow by 3: +5, +8, +11, …
3	**(d) 42**	add 9 each time; it should be 44
4	**(c) Z**	jump 4 letters forward each time
5	**(a) clap**	the block of 4 repeats; 31 = 4 × 7 + 3, so it is item 3 of the block
6	**(d) 56**	term n uses 3 × n + 5 sticks: 3 × 17 + 5 = 56
7	**(b) 11**	the last 10 is at position 55 and the last 11 at 66
8	**(c) JRDW**	each letter moves 3 places forward in the alphabet (Z goes round to A)
9	**Finding what is the same, what repeats or what changes in a regular way, so we can predict what comes next.**	—
10	**53**	two sequences take turns: 26, 35, … (add 9) and 88, 80, … (take away 8)
11	**(a) 76; (b) 78**	the gaps grow by 3: +6, +9, +12, …
12	**X**	jump 1 letter forward each time
13	**circle**	the block of 3 repeats; 80 = 3 × 26 + 2, so it is item 2 of the block
14	**47**	term n uses 3 × n + 4 sticks; term 46 uses 142, term 47 uses 145
15	**58**	19 + 20 + 1 + 18
16	**GUXP**	each letter moves 3 places forward in the alphabet (Z goes round to A)
17	**(a) Add 3 each time: sticks = 3 × squares + 1. (b) 31. (c) The first square needs 4 sticks; each new square shares one side, so it needs only 3 more.**	—
18	**(a) 208; (b) 33; (c) Multiply the term number by 6 and add 4.**	term n uses 6 × n + 4 sticks; term 32 uses 196
19	**(a) 405; (b) 10**	(a) multiply by 3 each time; (b) the last 9 is at position 45 and the last 10 at 55
20	**(a) right; (b) EPH**	(a) the block of 4 repeats; 54 = 4 × 13 + 2, so it is item 2 of the block; (b) each letter moves 1 place forward in the alphabet (Z goes round to A)