MARKING GUIDELINE

MARKS	DURATION	QUESTIONS
29	45 minutes	3

Name: ..... Class: .....

Date: .....

MARK ____ / 29

INSTRUCTIONS AND INFORMATION

1. Answer **ALL** the questions in this question paper.
2. Answer QUESTION 1 by **circling** the letter (A–D) in the answer grid at the end of that section.
3. Show **ALL** calculations clearly.
4. Show all units where applicable.
5. Number the answers correctly according to the numbering system used in this question paper.
6. A non-programmable calculator may be used, unless stated otherwise.
7. Write neatly and legibly.

QUESTION 1 [10 MARKS]

Four options are given as possible answers to the following questions. Choose the correct answer and circle the letter (A–D) in the grid at the end of this section. If you want to change your choice, put a cross through the wrong letter and circle your new choice.

1.1 For the pattern 5 ; 8 ; 11 ; 14 ; ... the rule is $T_n =$ ... (1)

A) $5n + 3$ **B)** $3n + 5$

C) $n + 3$ **D)** $\mathbf{3n + 2}$ ✓

> **Answer: D** — $d = 3$, and $3(1) + c = 5$ gives $c = 2$.
> - **A** — swapped the first term and the difference
> - **B** — used the first term as the constant without checking
> - **C** — left out the difference

1.2 For $T_n = 3n + 2$, the 20th term is ... (1)

A) 23 **B)** 60

C) $\mathbf{62}$ ✓ **D)** 25

> **Answer: C** — $3(20) + 2 = 62$.
> - **A** — used $n = 7$
> - **B** — forgot to add the 2
> - **D** — added 20 to 5

1.3 For $T_n = 3n + 2$, which term is equal to 92? (1)

A) 31 **B)** $\mathbf{30}$ ✓

C) 92 **D)** 29

> **Answer: B** — $3n = 90$, so $n = 30$.
> - **A** — did not subtract the 2 before dividing
> - **C** — read the value as the position
> - **D** — subtracted 2 twice

1.4 The pattern 2 ; 4 ; 8 ; 16 ; ... is ... (1)

A) geometric, with a ratio of 2 ✓ **B)** linear, with a difference of 2

C) linear, with a difference of 4 **D)** neither

> **Answer: A** — Each term is DOUBLE the one before — a constant ratio.
> - **B** — the differences are 2, 4 and 8 — not constant
> - **C** — only the second difference is 4
> - **D** — a constant ratio makes it geometric

1.5 The next term of 1 ; 4 ; 9 ; 16 ; ... is ... (1)

A) 32 **B)** 24

C) 25 ✓ **D)** 20

> **Answer: C** — These are the SQUARE numbers, so the next is 5^2.
> - **A** — doubled 16
> - **B** — added 8 to 16
> - **D** — added 4 to 16

1.6 A pattern has $T_n = -2n + 20$. The FIRST term is ... (1)

A) 18 ✓ **B)** 22

C) 20 **D)** -2

> **Answer: A** — $-2(1) + 20 = 18$.
> - **B** — added instead of subtracting
> - **C** — that is the value at $n = 0$
> - **D** — used the coefficient as the term

1.7 For $T_n = -2n + 20$, which is the FIRST term that is negative? (1)

A) the 11th ✓ **B)** the 9th

C) the 10th **D)** the 20th

> **Answer: A** — $T_{10} = 0$ and $T_{11} = -2$, so the 11th is the first below zero.
> - **B** — $T_9 = 2$, still positive
> - **C** — $T_{10} = 0$, which is not negative
> - **D** — far past the first one

1.8 A tile pattern is 3 ; 7 ; 11 ; 15 ; ... The number of tiles in the 25th pattern is ... (1)

A) 75 **B)** 103

C) 100 **D) 99 ✓**

> **Answer: D** — $T_n = 4n - 1$, so $T_{25} = 100 - 1 = 99$.
> - **A** — multiplied 25 by 3
> - **B** — added 1 instead of subtracting
> - **C** — forgot to subtract the 1

1.9 The constant difference of a linear pattern tells you ... (1)

A) the first term
B) the number of terms
C) the coefficient of n in the rule ✓
D) the constant in the rule

> **Answer: C** — Each step of 1 in n changes the term by that difference.
> - **A** — the first term is found afterwards
> - **B** — the difference says nothing about how many terms there are
> - **D** — the constant is what is left once the coefficient is used

1.10 Which pattern has the rule $T_n = n^2 + 1$? (1)

A) 1 ; 4 ; 9 ; 16
B) 2 ; 5 ; 10 ; 17 ✓
C) 1 ; 2 ; 3 ; 4
D) 2 ; 4 ; 6 ; 8

> **Answer: B** — $1^2 + 1 = 2$, $2^2 + 1 = 5$, $3^2 + 1 = 10$, $4^2 + 1 = 17$.
> - **A** — that is $T_n = n^2$
> - **C** — that is $T_n = n$
> - **D** — that is $T_n = 2n$

ANSWER GRID — MARKING GUIDELINE

1.1	A	B	C	(D)
1.2	A	B	(C)	D
1.3	A	(B)	C	D
1.4	(A)	B	C	D
1.5	A	B	(C)	D
1.6	(A)	B	C	D
1.7	(A)	B	C	D
1.8	A	B	C	(D)
1.9	A	B	(C)	D
1.10	A	(B)	C	D

QUESTION 2 [9 MARKS]

Answer the questions below on numeric patterns. Show ALL your working.

2.1 Determine the general rule for the pattern 7; 10; 13; 16; ... (3)

> $d = 3$, so $T_n = 3n + c$ *(1)*
> $3(1) + c = 7$, so $c = 4$ *(1)*
> **$T_n = 3n + 4$** *(1)*

2.2 Determine the 100th term of the pattern 4; 7; 10; ... (3)

> $T_n = 3n + 1$ *(2)*
> $T_{100} = 3(100) + 1 =$ **301** *(1)*

2.3 Which term of the pattern 5; 9; 13; ... is equal to 81? (3)

> $T_n = 4n + 1$ *(1)*
> $4n + 1 = 81$, so $4n = 80$ *(1)*
> $n =$ **20**, the 20th term *(1)*

QUESTION 3 [10 MARKS]

Study the pattern of tiles below and answer the questions that follow.



Term 1 4 tiles | **Term 2** 7 tiles | **Term 3** 10 tiles

3.1 Write down the number of tiles in the first three patterns, and the constant difference. **(2)**

> 4; 7; 10 *(1)*, and the constant difference is 3 *(1)*

3.2 Determine the general rule in the form $T_n = \ldots$ **(3)**

> $T_n = 3n + c$ *(1)*
> $3(1) + c = 4$, so $c = 1$ *(1)*
> **$T_n = 3n + 1$** *(1)*

3.3 Without drawing the figures, determine the number of tiles in the 20th pattern. **(2)**

> $T_{20} = 3(20) + 1$ *(1)* $=$ **61 tiles** *(1)*

3.4 If the terms of this pattern are plotted on a Cartesian plane, the points lie in a straight line. Explain why, and state why the points must NOT be joined. **(3)**

> The difference is constant, so the rule is linear *(1)*, which plots as a straight line *(1)*
> The term numbers are counting numbers only, so the data is discrete — there is no "term 1½" *(1)*

TOTAL: 29 marks

This question paper consists of 3 questions.

© Danemathics — free to print and share for classroom use.