EXAM-STYLE CLASS TEST

MARKS	DURATION	QUESTIONS
31	50 minutes	3

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

Date: .....

MARK ____ / 31

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 To MAXIMISE or MINIMISE a quantity, you ... (1)

A) set the expression itself equal to 0
B) differentiate the expression and set the derivative equal to 0
C) substitute the largest allowed value
D) set the second derivative equal to 0

1.2 A rectangle has a perimeter of 40 m. Its greatest possible AREA is ... (1)

A) 400 m^2
B) 100 m^2
C) 40 m^2
D) 200 m^2

1.3 A closed box has a square base of side x and a volume of 500 cm^3. Its height is ... (1)

A) $\frac{500}{x}$
B) $500x^2$
C) $\frac{x^2}{500}$
D) $\frac{500}{x^2}$

1.4 If $s(t) = 5t^2 + 2t$ metres, the VELOCITY at $t = 3$ seconds is ... (1)

A) 30 m per second
B) 51 m per second
C) 10 m per second
D) 32 m per second

1.5 ACCELERATION is the derivative of ... (1)

A) velocity with respect to time
B) velocity with respect to distance
C) time with respect to velocity
D) distance with respect to time

1.6 The sum of two positive numbers is 30. Their product is largest when the numbers are ... (1)

A) 15 and 15 **B)** 1 and 29

C) 0 and 30 **D)** 10 and 20

1.7 A cylinder of volume $1\,000$ cm^3 has radius r. Its height is ... (1)

A) $\frac{1\,000}{\pi r}$ **B)** $1\,000\pi r^2$

C) $\frac{1\,000}{\pi r^2}$ **D)** $\frac{1\,000}{r^2}$

1.8 At a MAXIMUM turning point, $f'(x)$ is ... (1)

A) undefined **B)** positive

C) negative **D)** zero

1.9 A stone's height is $h = 30t - 5t^2$ metres after t seconds. Its greatest height is ... (1)

A) 30 m **B)** 3 m

C) 90 m **D)** 45 m

1.10 In an optimisation problem, the CONSTRAINT is used to ... (1)

A) write the quantity in terms of a single variable **B)** avoid using calculus at all

C) find the derivative directly **D)** check the answer at the very end only

ANSWER GRID — CIRCLE YOUR ANSWERS FOR QUESTION 1

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 [13 MARKS]

Given $f(x) = x^2$. Determine the MINIMUM distance between the point $(10\ ;\ 2)$ and a point on f.

2.1 Write down an expression for the square of the distance d between $(10\ ;\ 2)$ and the point $(x\ ;\ x^2)$ on f. (3)

2.2 Explain why minimising d^2 gives the same answer as minimising d. **(2)**

2.3 Determine the value of x for which the distance is a minimum. **(5)**

2.4 Hence calculate the minimum distance, in simplest surd form. **(3)**

QUESTION 3 [8 MARKS]

A container is being filled with water. After t seconds the volume, in litres, is given by $V(t) = 3t^2 + 2t$.

3.1 Determine the AVERAGE rate at which the volume increases over the first 5 seconds. **(3)**

3.2 Determine the rate at which the volume is increasing AT $t = 5$ seconds. **(3)**

3.3 Explain why the two answers differ. **(2)**

TOTAL: 31 marks

This question paper consists of 3 questions.

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