MARKING GUIDELINE

MARKS	DURATION	QUESTIONS
39	1 hour	4

Name: _____ Class: _____

Date: _____

MARK ____ / 39

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 $x^5 \times x^3 = \ldots$ (1)

A) x^{15} **B)** $2x^8$

C) x^8 ✓ **D)** x^2

Answer: C — When the bases are the same and you MULTIPLY, you ADD the exponents.

- **A** — multiplied the exponents instead of adding them
- **B** — the bases are not added
- **D** — subtracted the exponents

1.2 $x^{10} \div x^4 = \ldots$ (1)

A) x^{14} **B)** x^{40}

C) $x^{2,5}$ **D)** x^6 ✓

Answer: D — When you DIVIDE, you SUBTRACT the exponents.

- **A** — added the exponents
- **B** — multiplied the exponents
- **C** — divided the exponents

1.3 $(x^3)^4 = \ldots$ (1)

A) x^{12} ✓ **B)** x^7

C) x^{81} **D)** $4x^3$

Answer: A — A power raised to a power MULTIPLIES the exponents.

- **B** — added them
- **C** — raised 3 to the 4th power
- **D** — multiplied the base by the outer exponent

1.4 $7^0 = \ldots$ (1)

A) 1 ✓ **B)** 0

C) undefined **D)** 7

> **Answer: A** — Any non-zero number to the power 0 is 1.
> - **B** — that would be 0^7
> - **C** — only 0^0 is problematic
> - **D** — that is 7^1

1.5 $(2x)^3 = \ldots$ (1)

A) $8x$ **B)** $6x^3$

C) $8x^3$ ✓ **D)** $2x^3$

> **Answer: C** — EVERYTHING inside the bracket is cubed, including the 2.
> - **A** — forgot to cube the x
> - **B** — multiplied 2 by 3 instead of cubing it
> - **D** — cubed only the x

1.6 $\dfrac{x^6 \times x^2}{x^3} = \ldots$ (1)

A) x^4 **B)** x^{36}

C) x^{11} **D)** x^5 ✓

> **Answer: D** — $6 + 2 - 3 = 5$.
> - **A** — multiplied 6×2 and divided by 3
> - **B** — multiplied the exponents
> - **C** — added all three exponents

1.7 $3x^2 \times 4x^5 = \ldots$ (1)

A) $12x^{10}$ **B)** $7x^{10}$

C) $12x^7$ ✓ **D)** $7x^7$

> **Answer: C** — Multiply the coefficients and ADD the exponents.
> - **A** — multiplied the exponents
> - **B** — added the coefficients and multiplied the exponents
> - **D** — ADDED the coefficients

1.8 Which one of the following is EQUAL to 2^6? (1)

A) $2^3 + 2^3$ **B)** $2^2 \times 2^4$ ✓

C) $(2^2)^2$ **D)** $2^2 \times 2^3$

> **Answer: B** — $2 + 4 = 6$.
> - **A** — adding powers does not multiply them — this gives 16
> - **C** — that is 2^4
> - **D** — that is 2^5

1.9 $x^4 + x^4 = \ldots$ (1)

A) $2x^4$ ✓ **B)** x^{16}

C) x^8 **D)** $2x^8$

> **Answer: A** — These are LIKE terms, so they are counted, not multiplied — the exponent does not change.
> - **B** — multiplied the exponents
> - **C** — that is $x^4 \times x^4$
> - **D** — did both errors at once

1.10 $(3x^2y)^2 = \ldots$ (1)

A) $9x^2y^2$ **B)** $9x^4y^2$ ✓

C) $6x^4y^2$ **D)** $3x^4y^2$

> **Answer: B** — Square each factor: $3^2 = 9$, $(x^2)^2 = x^4$ and y^2.
> - **A** — forgot to square the exponent of x
> - **C** — multiplied 3 by 2 instead of squaring it
> - **D** — did not square the 3

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 [10 MARKS]

Simplify the following. Leave your answers in exponential form.

2.1 $(3x^2)^3 \times 2x^4$ (4)

> $= 27x^6 \times 2x^4$ *(2)*
> $= 54x^{6+4}$ *(1)*
> $= \mathbf{54x^{10}}$ *(1)*

2.2 $\dfrac{16a^6b^5}{2a^2b^2}$ (3)

> $16 \div 2 = 8$ *(1)*
> $a^{6-2} = a^4$ and $b^{5-2} = b^3$ *(1)*
> $= \mathbf{8a^4b^3}$ *(1)*

2.3 $(2x^3)^2 + 3x^6$ **(3)**

> $(2x^3)^2 = 4x^6$ *(1)*
> $4x^6 + 3x^6$ are like terms *(1)*
> $= \mathbf{7x^6}$ *(1)*

QUESTION 3 [10 MARKS]

Calculate the following WITHOUT using a calculator.

3.1 $2^4 \times 2^3 \div 2^5$ **(3)**

> $= 2^{4+3-5}$ *(2)*
> $= 2^2 = \mathbf{4}$ *(1)*

3.2 A learner writes $3^2 + 3^2 = 3^4$. Show by calculation that the learner is wrong, and write down the correct answer. **(4)**

> $3^2 + 3^2 = 9 + 9 = 18$ *(2)*
> $3^4 = 81$, and $18 \neq 81$ *(1)*
> You may only add EXPONENTS when you MULTIPLY powers; here the answer is **18** *(1)*

3.3 Solve for x: $2^x = 32$ **(3)**

> $32 = 2^5$ *(1)*
> $2^x = 2^5$, so the bases are the same *(1)*
> $x = \mathbf{5}$ *(1)*

QUESTION 4 [9 MARKS]

Solve for x in each of the following.

4.1 $\dfrac{2^x \times 2^{x+1}}{16} - 1 = 7$ **(5)**

> $\dfrac{2^x \times 2^{x+1}}{16} = 8$ *(1)*
> $2^{2x+1} = 8 \times 16 = 128$ *(2)*
> $2^{2x+1} = 2^7$ *(1)*
> $2x + 1 = 7$, so $x = \mathbf{3}$ *(1)*

4.2 $\dfrac{3^{x+2}}{3} = 27$ **(4)**

> $3^{x+2-1} = 27$ *(1)*
> $3^{x+1} = 3^3$ *(2)*
> $x + 1 = 3$, so $x = \mathbf{2}$ *(1)*

TOTAL: 39 marks

This question paper consists of 4 questions.

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