

NWCC

Year 10 Mathematics Advanced

# HALF-YEARLY REVISION BOOKLET

2026

Name: \_\_\_\_\_

| Topic                                                         | Total Marks | Score |
|---------------------------------------------------------------|-------------|-------|
| Section A: Indices and Surds                                  | /30         |       |
| Section B: Equations, Inequalities and Simultaneous Equations | /32         |       |
| Section C: Quadratics                                         | /34         |       |
| Section D: Linear and Non-Linear Relationships                | /30         |       |
| TOTAL                                                         | /126        |       |

**SECTION A: INDICES AND SURDS**  
**[1PT]****A1 – Index Laws****/10****Question A1.1****(1 mark per part)**

Simplify each of the following, leaving answers with positive indices:

1.  $m^7 \times m^3 \div m^4$

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2.  $(3a^2b)^3$

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3.  $(4x^3y^{-2}) \div (2x^{-1}y^3)$

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**Question A1.2****(2 marks)**

Simplify, expressing with positive indices:

$$(5m^3n)^2 \times (2mn^2)^3 \div (10m^4n^5)$$

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**Question A1.3****(3 marks)**Solve for  $x$ :

$$2^{x-1} = 2^{2x-6}$$

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**Question A1.4****(2 marks)**

Simplify, expressing with positive indices:

$$(x^{-1})(x^{-2} - 1)^{-1}$$

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**A2 – Surds****/20****Question A2.1****(6 marks — 2 marks each)**

Simplify each of the following:

1.  $\sqrt{200} - 3\sqrt{8} + \sqrt{50}$

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2.  $\sqrt{m^5} + 4m^2\sqrt{m}$

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3.  $\sqrt{75} \times \sqrt{12}$

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**Question A2.2****(3 marks)**Find the values of  $x$  and  $y$  given that:

$$(3\sqrt{5} - 2\sqrt{3})^2 = x + y\sqrt{15}$$

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**Question A2.3**

**(8 marks — (1, 2: 2 marks, 3: 4 marks))**

Simplify by rationalising the denominator:

1.  $\frac{10}{\sqrt{5}}$

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2.  $\frac{1}{5 - 2\sqrt{3}}$

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3.  $\frac{\sqrt{5} + \sqrt{2}}{\sqrt{5} - \sqrt{2}} + \frac{\sqrt{5} - \sqrt{2}}{\sqrt{5} + \sqrt{2}}$

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**Question A2.4**

**(4 marks — 2 marks each)**

Express the following in index form:

1.  $\frac{4p^5}{\sqrt{y^3}}$

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2.  $5\sqrt{7}$

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**Question A2.5**

**(3 marks)**

Expand and simplify  $(\sqrt{5} - 1)^4$ . Show all working.

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**SECTION B: EQUATIONS, INEQUALITIES AND SIMULTANEOUS EQUATIONS**  
**[1PT]****B1 – Linear Equations****/8****Question B1.1****(5 marks)**

Solve each equation:

1.  $7x - 4 = 3x + 12$

(1 mark)

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2.  $\frac{4x + 3}{5} = 3$

(2 marks)

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3. 5 times the sum of a number and 3 equals 3 more than the number. Find the number.  
(2 marks)

(2 marks)

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**Question B1.2****(3 marks)**

Solve the equation:

$$4^x \cdot 8^{-x} = 2^{3x-5}$$

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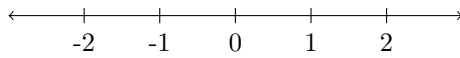
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**B2 – Inequalities****/8****Question B2.1****(4 marks)**

Solve and graph each inequality on the number line provided:

1.  $3x + 7 \geq -2$



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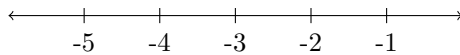
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2.  $-5x < 20$



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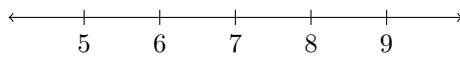
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3.  $2(x - 1) \leq x + 5$



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**Question B2.2****(4 marks — 2 marks each)**

Solve the following:

1. Find all integers  $n$  satisfying  $-3 < 2n - 1 \leq 9$ .

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2. A student needs at least 240 points across four equal tests to pass. They scored 55, 63, and 58 on the first three. What is the minimum score needed on the fourth test?

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**B3 – Simultaneous Equations****/16****Question B3.1****(4 marks — 2 marks each)**

Solve simultaneously using substitution or elimination:

1.  $3x + y = 11$     and     $x - 2y = 2$

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2.  $5x + 3y = 16$     and     $2x - y = 1$

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**Question B3.2****(5 marks)**

Solve the following pairs of simultaneous equations:

1.  $y = 2x - 3$     and     $3x - 2y = 8$

**(2 marks)**

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2.  $\frac{x}{2} - \frac{y}{3} = 1$     and     $\frac{x}{3} + \frac{y}{2} = 2$

**(3 marks)**

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**Question B3.3** **(3 marks)**  
A store sells pens at \$3 each and notebooks at \$5 each. Jake bought a total of 12 items and spent \$46. How many of each item did he buy? Set up and solve a pair of simultaneous equations.

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**SECTION C: QUADRATICS**  
**[1PT]****C1 – Solving Quadratic Equations****/18****Question C1.1****(5 marks)**

Solve by factorising:

1.  $x^2 - 7x + 12 = 0$

(1 mark)

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2.  $2x^2 - 7x - 15 = 0$

(2 marks)

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3.  $5x^2 - 20 = 0$

(2 marks)

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**Question C1.2****(5 marks)**

Solve by completing the square (leave answers as exact values):

1.  $x^2 + 8x - 5 = 0$

(2 marks)

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2.  $3x^2 + 12x - 9 = 0$

(3 marks)

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**Question C1.3****(4 marks — 2 marks each)**

Use the quadratic formula. Leave answers as exact values:

1.  $3x^2 - 5x - 7 = 0$

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2.  $5x^2 = 9x - 2$

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**Question C1.4****(6 marks — 3 marks each)**

Harder solving:

1. Solve  $3(x + 2)^2 - 4(x + 2) - 15 = 0$  by using the substitution  $u = x + 2$ .

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2. Solve  $\frac{1}{x+2} + \frac{1}{x+3} = 1$

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**C2 – The Discriminant****/8****Question C2.1****(6 marks — 2 marks each)**

1. Show that  $x^2 + 6x + 14 = 0$  has no real roots.

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2. Find the value(s) of  $k$  for which  $kx^2 - 4x + 1 = 0$  has exactly one solution.

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3. Determine the number of real solutions of  $\frac{3}{5}x^2 - \frac{3x}{4} + \frac{9}{20} = 0$ . Justify your answer.

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**Question C2.2****(2 marks)**

For the quadratic  $y = 2x^2 - kx + 8$ , find the values of  $k$  for which the parabola has no  $x$ -intercepts.

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**C3 – Parabola Features and Sketching**

**/8**

**Question C3.1**

**(4 marks — 2 marks each)**

For each parabola, find the vertex:

1.  $y = 3x^2 - 12x + 7$  (by completing the square)

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2.  $y = (3x - 2)(x + 5)$

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**Question C3.2****(8 marks)**

For the parabola  $y = -2x^2 + 4x + 6$ :

1. Express the equation in vertex form by completing the square.

(2 marks)

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2. State the vertex and axis of symmetry.

(1 mark)

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3. Find the  $x$ - and  $y$ -intercepts.

(2 marks)

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4. Sketch the parabola, showing all important features. (Use the space below.)

(3 marks)

**C4 – Applications of Quadratics****/8****Question C4.1****(6 marks — 2 marks each)**

A ball is launched vertically upward. Its height  $h$  metres after  $t$  seconds is given by  $h = 30t - 5t^2$ .

1. At what time(s) is the ball 40 metres above the ground?

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2. After how many seconds does the ball hit the ground?

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3. Can the ball reach a height of 50 metres? Justify using the discriminant.

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**Question C4.2****(2 marks)**

The combined area of a rectangle and a square is  $50 \text{ cm}^2$ . The square has side length  $x \text{ cm}$ . The rectangle has the same width  $x \text{ cm}$  but its length is 3 cm longer than  $x$ . Write an equation in  $x$  and solve it to find  $x$ .

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**SECTION D: LINEAR AND NON-LINEAR RELATIONSHIPS**  
**[1PT]****D1 – Parabolas****/8****Question D1.1****(4 marks)**

For the parabola  $y = (x - 3)(x + 1)$ :

1. State the  $x$ -intercepts and  $y$ -intercept.

**(1 mark)**

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2. Find the vertex.

**(1 mark)**

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3. Sketch the parabola, labelling all key features.

**(2 marks)**

**Question D1.2****(4 marks — 2 marks each)**

Describe the transformations applied to  $y = x^2$  to obtain each of the following, then sketch:

1.  $y = -(x + 2)^2 + 5$

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2.  $y = 3(x - 1)^2 - 4$

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**D2 – Hyperbolas****/8****Question D2.1****(4 marks)**

For the hyperbola  $y = \frac{4}{x}$ :

1. State the domain and range. (1 mark)

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2. State the equations of the asymptotes. (1 mark)

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3. Sketch the graph, labelling key features. (2 marks)

**Question D2.2****(4 marks)**

Describe how  $y = -\frac{2}{x-3} + 1$  differs from  $y = \frac{1}{x}$ , and sketch it showing asymptotes and any intercepts.

1. State the equations of the asymptotes. (1 mark)

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2. Find the  $x$ - and  $y$ -intercepts. (1 mark)

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3. Sketch the graph. (2 marks)

D3 – Exponential Functions

/6

Question D3.1

(4 marks)

Consider the function  $y = 3 \times 2^x$ :

1. Complete the table of values below:
- (1 mark)

|     |      |      |     |     |     |
|-----|------|------|-----|-----|-----|
| $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ |
| $y$ |      |      |     |     |     |

2. Sketch the graph, labelling the  $y$ -intercept and at least one other point.
- (2 marks)
3. State the equation of the asymptote.
- (1 mark)

**Question D3.2****(2 marks)**

Describe the transformations from  $y = 2^x$  to  $y = -2^{-x} + 4$  and sketch, showing the asymptote and  $y$ -intercept.

1. Describe the transformations.

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2. Sketch the graph.

**D4 – Circles****/8****Question D4.1****(3 marks — 1 mark each)**

1. Write the equation of a circle with centre  $(0, 0)$  and radius 7.

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2. Write the equation of a circle with centre  $(-2, 5)$  and radius 4.

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3. Determine whether the point  $A(-3, 6)$  lies on, inside, or outside the circle  $(x+1)^2 + (y-2)^2 = 20$ . Show working.

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**Question D4.2****(5 marks)**

For the circle  $(x-2)^2 + (y+3)^2 = 36$ :

1. State the centre and radius.

**(1 mark)**

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2. Sketch the circle on the Cartesian plane below.

**(2 marks)**

3. Find the  $y$ -coordinates of the points on the circle where  $x = 6$ . (2 marks)

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**D5 – Mixed Non-Linear (Challenge)****/8****Question D5.1****(8 marks)**

Consider the parabola  $y = (4 - x)(x + 2)$  and the line  $y = 6$ .

1. Find the coordinates of the vertex of the parabola. (2 marks)

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2. Find the points of intersection of the parabola and the line. (3 marks)

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3. Sketch both curves on the same set of axes, clearly indicating all important features and the region where  $(4 - x)(x + 2) \leq 6$ . (3 marks)

— End of Revision Booklet —