

## EDEXCEL IGCSE MATHS (4MA1) — EXAM PRACTICE WORKBOOK

# Edexcel IGCSE (4MA1) Higher Extension — Practice Workbook

(Higher Tier • Grades 6–9 Extension)

42 Exam-Style IGCSE Practice Questions, Working Spaces & Complete Answer  
Key

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- 1-Page Syllabus Cross-Reference Guide (which UK GCSE topics to skip)
- 42 Exam-Style IGCSE Questions (6 progressive questions per topic)
- Structured Working Spaces & Mark Allocations on every question
- Complete Answer Key Appendix at the back

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

School / Class: \_\_\_\_\_

Target Grade: \_\_\_\_\_



SCAN FOR INTERACTIVE IGCSE PRACTICE & WORKED SOLUTIONS

**BreakingDownMaths.com**

Select "Edexcel IGCSE (4MA1)" on the Home Page

# Table of Contents

Complete PEARSON EDEXCEL IGCSE (4MA1) extension syllabus overview and cross-reference guide.

|                                                                     |         |                                 |
|---------------------------------------------------------------------|---------|---------------------------------|
| Syllabus Cross-Reference Guide (What to Skip in Main GCSE Booklets) |         | Page 3                          |
| PROBABILITY                                                         |         |                                 |
| Formal Set-Builder & Subset Notation                                |         | Page 4                          |
| ALGEBRA                                                             |         |                                 |
| Arithmetic Sequences & Series                                       | Page 6  | Functions: Domain & Range       |
| Differentiation & Turning Points                                    | Page 16 |                                 |
| GEOMETRY AND MEASURES                                               |         |                                 |
| Intersecting Chords, Secants & Tangents                             | Page 10 | Magnitude (Modulus) of a Vector |
|                                                                     |         | Page 14                         |
| RATIO, PROPORTION AND RATES OF CHANGE                               |         |                                 |
| Negative Powers & Calculus Kinematics                               |         | Page 18                         |
| Appendix: Answers & Mark Schemes                                    |         | Page 20                         |

## CROSS-REF CHECKLIST — SYLLABUS BRIDGE

# Edexcel IGCSE (4MA1) Cross-Reference Guide

Roughly 90% of Pearson Edexcel International GCSE Mathematics A (4MA1) is identical to UK GCSE (9–1) and is covered in our main Grades 1–9 Booklets. Use this slim Higher Extension Booklet alongside Grades 4–9 to master all 7 extra 4MA1 Higher topics — and skip the 8 UK-GCSE-only topics below.

## 1. UK-GCSE-ONLY TOPICS TO SKIP IN THE MAIN GRADES 3–9 BOOKLETS

| Topic in Main Booklet         | Booklet | IGCSE Guidance                                                       |
|-------------------------------|---------|----------------------------------------------------------------------|
| 3D Solids, Plans & Elevations | Grade 3 | Keep 3D faces/edges/vertices & nets; skip front/side/plan elevations |
| Frequency Trees               | Grade 3 | UK GCSE only — not examined on Edexcel 4MA1                          |
| Product Rule for Counting     | Grade 6 | UK GCSE only — not examined on Edexcel 4MA1                          |
| Box Plots                     | Grade 6 | Skip box plots (keep Cumulative Frequency & IQR!)                    |
| Stratified Sampling           | Grade 6 | UK GCSE only — not examined on Edexcel 4MA1                          |
| Capture-Recapture             | Grade 6 | UK GCSE only — not examined on Edexcel 4MA1                          |
| Iteration                     | Grade 8 | Fixed-point iteration $x_{n+1} = g(x_n)$ is not on 4MA1              |
| Equation of a Circle          | Grade 9 | $x^2 + y^2 = r^2$ tangent equations are not on 4MA1                  |

## 2. YOUR 7 EXTRA IGCSE TOPICS MASTERED IN THIS BOOKLET

| IGCSE Extension Topic                      | Syllabus Area                         | Notes                    | Practice                 |
|--------------------------------------------|---------------------------------------|--------------------------|--------------------------|
| 1. Formal Set-Builder & Subset Notation    | Probability                           | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Arithmetic Sequences & Series           | Algebra                               | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Functions: Domain & Range               | Algebra                               | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Intersecting Chords, Secants & Tangents | Geometry and Measures                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Magnitude (Modulus) of a Vector         | Geometry and Measures                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Differentiation & Turning Points        | Algebra                               | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Negative Powers & Calculus Kinematics   | Ratio, Proportion and Rates of Change | <input type="checkbox"/> | <input type="checkbox"/> |

## 3. BONUS 4MA1 EXAM-FORMAT & TIME-SAVING TIPS

- **100% Calculator Exam (Papers 1H & 2H):** Both 4MA1 papers allow a scientific calculator — no need to memorise exact trig values ( $\sin 30^\circ$ ,  $\cos 45^\circ$ ,  $\tan 60^\circ$ ) or drill long non-calculator arithmetic.
- **Sequences & Speed–Time Graphs:** Skip quadratic  $n$ th term ( $an^2 + bn + c$ ), geometric progressions, and curved velocity–time trapezia — 4MA1 tests **Arithmetic Series** ( $u_n, S_n$ ) (Topic 2) and **Calculus Kinematics** (Topic 7) instead.
- **Graphical Equations** ( $f(x) = mx + c$ ): To solve e.g.  $x^2 - 5x - 1 = 0$  from a plotted curve  $y = x^2 - 4x + 1$ , rearrange to  $x^2 - 4x + 1 = x + 2$  and draw the straight line  $y = x + 2$ .

## Formal Set-Builder & Subset Notation

**EDEXCEL IGCSE (4MA1) EXAM PRACTICE****Total: 11 marks**

### Formal Set-Builder & Subset Notation — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(1 mark)**

Given the set  $B = \{\text{positive factors of } 36\}$ , write down the value of  $n(B)$ .

WORKING OUT SPACE

**Answer:** .....**Question 2****(1 mark)**

Let  $M = \{x : x \text{ is a factor of } 24\}$ . How many integers  $k$  satisfy BOTH  $k \in M$  and  $k > 7$ ?

WORKING OUT SPACE

**Answer:** .....**Question 3****(2 marks)**

Sets  $P$  and  $Q$  satisfy  $P \subseteq Q$ , with  $n(\mathcal{E}) = 30$ ,  $n(P) = 8$  and  $n(Q) = 21$ .

Work out  $n(P' \cap Q)$ .

WORKING OUT SPACE

**Answer:** .....

**Question 4****(2 marks)**

$A = \{1, 4, 9, 16\}$ ,  $B = \{2, 4, 8, 16\}$  and  $C = \{4, 6, 8, 10\}$  (within universal set  $\mathcal{E} = \{1, 2, \dots, 20\}$ ).  
List the elements of  $A \cap B \cap C$ .

WORKING OUT SPACE

Answer: .....

**Question 5****(2 marks)**

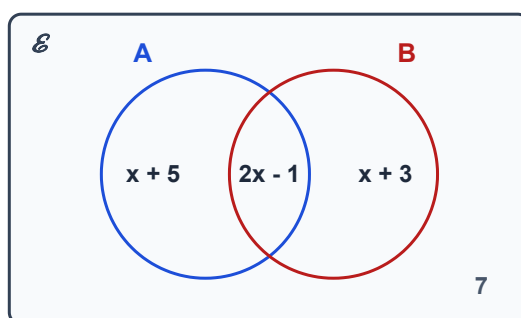
$\mathcal{E} = \{\text{integers}\}$ ,  $A = \{x : 3x + 2 > -4\}$  and  $B = \{x : 2x + 1 \leq 9\}$ .  
List all the elements of  $A \cap B$ .

WORKING OUT SPACE

Answer: .....

**Question 6****(3 marks)**

The Venn diagram shows the number of elements in each region of  $\mathcal{E}$ .



Given that  $n(\mathcal{E}) = 30$ , find  $n(A \cup B)$ .

WORKING OUT SPACE

Answer: .....

# Arithmetic Sequences & Series

**EDEXCEL IGCSE (4MA1) EXAM PRACTICE****Total: 14 marks**

## Arithmetic Sequences & Series — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(2 marks)**

Here are the first four terms of an arithmetic sequence:

$$85, 82, 79, 76, \dots$$

Work out the 25<sup>th</sup> term of this sequence.

WORKING OUT SPACE

**Answer:** .....**Question 2****(3 marks)**

In an arithmetic sequence, the 3<sup>rd</sup> term is 5 and the 9<sup>th</sup> term is 41.

Work out the 15<sup>th</sup> term of the sequence.

WORKING OUT SPACE

**Answer:** .....**Question 3****(2 marks)**

Find the sum of the first 25 terms of the arithmetic series:

$$8 + 12 + 16 + 20 + \dots$$

WORKING OUT SPACE

**Answer:** .....

**Question 4****(2 marks)**

Evaluate:

$$\sum_{r=1}^{18} (5r + 3)$$

WORKING OUT SPACE

**Answer:** .....**Question 5****(3 marks)**The sum of the first  $n$  terms of the arithmetic series  $5 + 9 + 13 + 17 + \dots$  is 275.Form and solve a quadratic equation to find the value of  $n$ .

WORKING OUT SPACE

**Answer:** .....**Question 6****(2 marks)**The sum of the first  $n$  terms of an arithmetic series is given by  $S_n = 4n^2 - n$ .

Work out the 6th term of the series.

WORKING OUT SPACE

**Answer:** .....

# Functions: Domain & Range

**EDEXCEL IGCSE (4MA1) EXAM PRACTICE****Total: 13 marks**

## Functions: Domain & Range — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(2 marks)**

The function  $f$  is defined by  $f(x) = \frac{4x + 1}{2x + 6}$ .

State the value of  $x$  that must be **excluded** from any domain of  $f$ .

WORKING OUT SPACE

**Answer:** .....**Question 2****(2 marks)**

The real-valued function  $h$  is defined by  $h(x) = \sqrt{15 - 3x}$ .

Write down an inequality in  $x$  for the largest possible domain of  $h$ .

WORKING OUT SPACE

**Answer:** .....**Question 3****(2 marks)**

Find the range of the function  $f(x) = 5x + 1$  for the domain  $x > -1$ .

Write your answer as an inequality in  $f(x)$  or  $y$  (e.g.  $f(x) \geq 2$ ).

WORKING OUT SPACE

**Answer:** .....

**Question 4****(2 marks)**

The function  $f$  is defined by  $f(x) = (x - 1)^2 + 2$  for the domain  $-3 \leq x \leq 3$ .

The range of  $f$  is  $a \leq f(x) \leq b$ . Work out the values of  $a$  and  $b$ .

WORKING OUT SPACE

Answer: .....

**Question 5****(3 marks)**

The one-to-one function  $f$  is defined by  $f(x) = x^2 + 4x - 3$  for  $x \geq -2$ .

Complete the square to find the range of  $f$ , and hence state the **domain of the inverse function**  $f^{-1}(x)$ .

WORKING OUT SPACE

Answer: .....

**Question 6****(2 marks)**

The function  $f$  is defined by  $f(x) = (x - 4)^2 - 1$  for the domain  $x \geq 4$ .

Work out the value of  $f^{-1}(35)$ .

WORKING OUT SPACE

Answer: .....

# Intersecting Chords, Secants & Tangents

**EDEXCEL IGCSE (4MA1) EXAM PRACTICE**

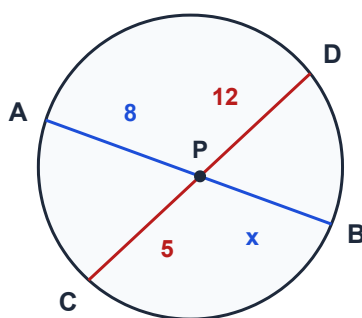
## Intersecting Chords, Secants & Tangents — Practice Questions

**Total: 16  
marks**

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(2 marks)**

Chords  $AB$  and  $CD$  intersect at  $P$  inside the circle.



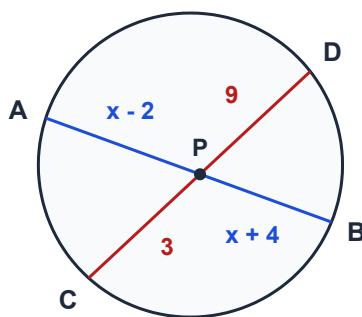
Work out the value of  $x$ .

WORKING OUT SPACE

Answer: .....

**Question 2****(3 marks)**

Chords  $AB$  and  $CD$  intersect at  $P$  inside a circle.



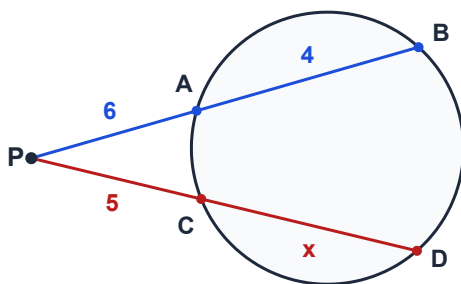
Form an equation and find the value of  $x$ .

WORKING OUT SPACE

Answer: .....

**Question 3****(3 marks)**

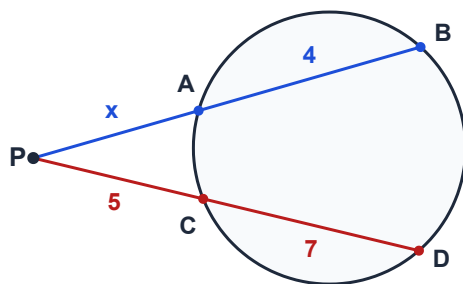
$PAB$  and  $PCD$  are two secants to a circle from an external point  $P$ .



Work out the value of  $x$  (the length of chord  $CD$ ).

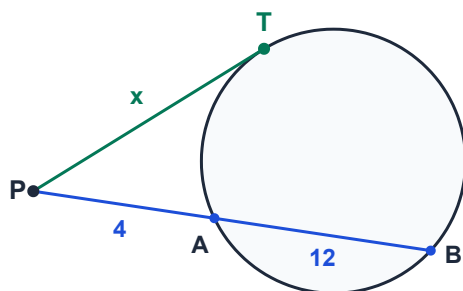
WORKING OUT SPACE

Answer: .....

**Question 4****(3 marks)** $PAB$  and  $PCD$  are secants to a circle.Form and solve a quadratic equation to find the value of  $x$ .

WORKING OUT SPACE

Answer: .....

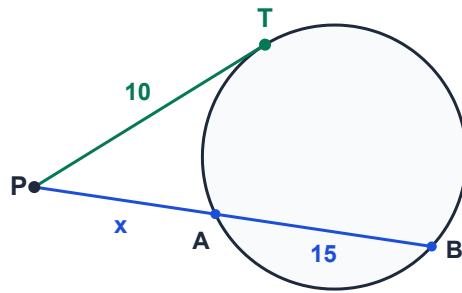
**Question 5****(2 marks)** $PT$  is the tangent to the circle at  $T$ , and  $PAB$  is a secant.Work out the length  $PT = x$ .

WORKING OUT SPACE

Answer: .....

**Question 6****(3 marks)**

$PT$  is a tangent of length 10 cm and  $AB$  is a chord of length 15 cm.



Find the length  $PA = x$ .

WORKING OUT SPACE

Answer: .....

# Magnitude (Modulus) of a Vector

## EDEXCEL IGCSE (4MA1) EXAM PRACTICE

Total: 13 marks

## Magnitude (Modulus) of a Vector — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(2 marks)**

Given that  $\mathbf{a} = \begin{pmatrix} -5 \\ 12 \end{pmatrix}$ , work out  $|\mathbf{a}|$ .

WORKING OUT SPACE

Answer: .....

**Question 2****(2 marks)**

A vector is given in component form as  $\mathbf{p} = -10\mathbf{i} + 24\mathbf{j}$ .  
Calculate the magnitude  $|\mathbf{p}|$ .

WORKING OUT SPACE

Answer: .....

**Question 3****(2 marks)**

Given that  $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ , work out  $|3\mathbf{a} - \mathbf{b}|$ .

WORKING OUT SPACE

Answer: .....

**Question 4****(2 marks)**

Given that  $\overrightarrow{AB} = \begin{pmatrix} 11 \\ -3 \end{pmatrix}$  and  $\overrightarrow{BC} = \begin{pmatrix} -3 \\ -12 \end{pmatrix}$ , work out  $|\overrightarrow{AC}|$ .

WORKING OUT SPACE

**Answer:** .....**Question 5****(2 marks)**

Given that  $\mathbf{a} = \begin{pmatrix} k \\ -12 \end{pmatrix}$  where  $k < 0$ , and  $|\mathbf{a}| = 13$ , find the value of  $k$ .

WORKING OUT SPACE

**Answer:** .....**Question 6****(3 marks)**

Let  $\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ .

Given that  $k > 0$  and  $|\mathbf{a} + k\mathbf{b}| = 13$ , find the value of  $k$ .

WORKING OUT SPACE

**Answer:** .....

# Differentiation & Turning Points

## EDEXCEL IGCSE (4MA1) EXAM PRACTICE

Total: 17 marks

## Differentiation & Turning Points — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1**

(2 marks)

Given that  $y = 2x^3 + 6x^2 - 3x + 11$ , find  $\frac{dy}{dx}$ .

WORKING OUT SPACE

Answer: .....

**Question 2**

(2 marks)

Expand and simplify first to find  $\frac{dy}{dx}$  when  $y = (2x + 3)(x - 4)$ .

WORKING OUT SPACE

Answer: .....

**Question 3**

(2 marks)

Find the gradient of the curve  $y = x^3 + 4x^2 - 5x + 7$  at the point where  $x = -2$ .

WORKING OUT SPACE

Answer: .....

**Question 4****(3 marks)**

Find the equation of the tangent to the curve  $y = x^3 - 2x^2 + x$  at the point  $(2, 2)$ .

Give your answer in the form  $y = mx + c$ .

WORKING OUT SPACE

**Answer:** .....**Question 5****(4 marks)**

A curve has equation  $y = x^3 - 3x^2 - 9x + 7$ .

Use differentiation to find the coordinates of its two stationary points, and state which is the local maximum.

WORKING OUT SPACE

**Answer:** .....**Question 6****(4 marks)**

A rectangular paddock against a long hedge is divided into two equal pens by an internal fence parallel to the ends of length  $x$  m (so three sides have length  $x$  m). Given that 120 m of fencing is used in total, form an expression in terms of  $x$  for the total area  $A$ , and use differentiation to find the maximum total area of the paddock (in  $\text{m}^2$ ).

WORKING OUT SPACE

**Answer:** .....

## Negative Powers & Calculus Kinematics

**EDEXCEL IGCSE (4MA1) EXAM PRACTICE****Total: 16 marks**

### Negative Powers & Calculus Kinematics — Practice Questions

Answer all 6 questions. Show clear algebraic working in the spaces provided.

**Question 1****(2 marks)**

Given that  $y = 5x^2 - 2x^{-3}$ , find  $\frac{dy}{dx}$ .

You may leave your answer with negative indices or as a fraction.

WORKING OUT SPACE

**Answer:** .....**Question 2****(4 marks)**

An open-top rectangular water tank has a square base of side  $x$  m and a volume of  $32 \text{ m}^3$ , so its total outer surface area is given by  $S = x^2 + \frac{128}{x} \text{ m}^2$  ( $x > 0$ ).

Use differentiation to find the **minimum possible outer surface area** of the tank (in  $\text{m}^2$ ).

WORKING OUT SPACE

**Answer:** .....**Question 3****(2 marks)**

A particle moves along a straight line so that its displacement,  $s$  m, from a fixed point  $O$  at time  $t$  s is given by  $s = t^3 - 9t^2 + 24t - 3$ .

Find an expression for the velocity,  $v$  m/s, of the particle at time  $t$ .

WORKING OUT SPACE

**Answer:** .....

**Question 4****(3 marks)**

The displacement of a particle from  $O$  at time  $t$  s is  $s = 3t^3 - 12t^2 + 7t$  metres.

Work out the **acceleration** (in  $\text{m/s}^2$ ) of the particle when  $t = 2$ .

WORKING OUT SPACE

Answer: .....

**Question 5****(2 marks)**

For  $t > 0$ , a particle has displacement  $s = t^3 - 27t + 10$  metres from  $O$ .

Find the value of  $t$  when the particle is instantaneously at rest.

WORKING OUT SPACE

Answer: .....

**Question 6****(3 marks)**

A particle moves along a straight line with displacement  $s = t^3 - 9t^2 + 15t + 4$  metres at time  $t$  s ( $t \geq 0$ ).

Find the two values of  $t$  for which the particle is instantaneously at rest.

WORKING OUT SPACE

Answer: .....

## APPENDIX

## Answers & Mark Schemes

Final answers and mark allocations for all 42 PEARSON EDEXCEL IGCSE (4MA1) practice questions. Scan the cover QR code for interactive step-by-step worked solutions online.

### Topic 1: Formal Set-Builder & Subset Notation

|     |                     |      |
|-----|---------------------|------|
| Q1: | 9                   | [1m] |
| Q2: | 3                   | [1m] |
| Q3: | 13                  | [2m] |
| Q4: | {4}                 | [2m] |
| Q5: | {-1, 0, 1, 2, 3, 4} | [2m] |
| Q6: | 23                  | [3m] |

### Topic 2: Arithmetic Sequences & Series

|     |      |      |
|-----|------|------|
| Q1: | 13   | [2m] |
| Q2: | 77   | [3m] |
| Q3: | 1400 | [2m] |
| Q4: | 909  | [2m] |
| Q5: | 11   | [3m] |
| Q6: | 43   | [2m] |

### Topic 3: Functions: Domain & Range

|     |                 |      |
|-----|-----------------|------|
| Q1: | -3              | [2m] |
| Q2: | $x \leq 5$      | [2m] |
| Q3: | $f(x) > -4$     | [2m] |
| Q4: | $a = 2, b = 18$ | [2m] |
| Q5: | $x \geq -7$     | [3m] |
| Q6: | 10              | [2m] |

### Topic 4: Intersecting Chords, Secants & Tangents

|     |     |      |
|-----|-----|------|
| Q1: | 7.5 | [2m] |
| Q2: | 5   | [3m] |
| Q3: | 7   | [3m] |
| Q4: | 6   | [3m] |
| Q5: | 8   | [2m] |
| Q6: | 5   | [3m] |

### Topic 5: Magnitude (Modulus) of a Vector

|     |    |      |
|-----|----|------|
| Q1: | 13 | [2m] |
| Q2: | 26 | [2m] |
| Q3: | 13 | [2m] |
| Q4: | 17 | [2m] |
| Q5: | -5 | [2m] |
| Q6: | 2  | [3m] |

### Topic 6: Differentiation & Turning Points

|     |                            |      |
|-----|----------------------------|------|
| Q1: | $6x^2 + 12x - 3$           | [2m] |
| Q2: | $4x - 5$                   | [2m] |
| Q3: | -9                         | [2m] |
| Q4: | $y = 5x - 8$               | [3m] |
| Q5: | Max (-1, 12), Min (3, -20) | [4m] |
| Q6: | $A = 120x - 3x^2; 1200$    | [4m] |

### Topic 7: Negative Powers & Calculus Kinematics

|     |                   |      |
|-----|-------------------|------|
| Q1: | $10x + 6x^{-4}$   | [2m] |
| Q2: | 48                | [4m] |
| Q3: | $3t^2 - 18t + 24$ | [2m] |
| Q4: | 12                | [3m] |
| Q5: | 3                 | [2m] |
| Q6: | $t = 1, 5$        | [3m] |