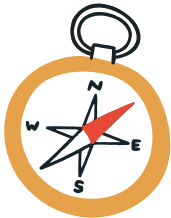


THE MAP

# Pattern Explorer



Five discoveries are hiding in this table. Keep the map beside your journal pages.



1

Always Even?

| ×  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
|----|----|----|----|----|----|----|----|----|----|-----|
| 1  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 2  | 2  | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20  |
| 3  | 3  | 6  | 9  | 12 | 15 | 18 | 21 | 24 | 27 | 30  |
| 4  | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
| 5  | 5  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50  |
| 6  | 6  | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60  |
| 7  | 7  | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70  |
| 8  | 8  | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80  |
| 9  | 9  | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90  |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

3

Mirror Twins

4

A Row Is a Pattern

2

Double It

3

5

Your Own



How to Read Your Map

For 3 × 7, find the 3 row.  
Slide over to the 7 column.

Try it:

6 × 4 = \_\_\_\_\_ 9 × 5 = \_\_\_\_\_

7 × 8 = \_\_\_\_\_

Map Key

1

A stop: a discovery

A row to explore

Twins: two that match

.....

The trail

My Expedition

Stop 1 Always Even?

Stop 2 Double It

Stop 3 Mirror Twins

Stop 4 A Row Is a Pattern

Stop 5 Your Own Discovery

# Pattern Explorer



Stops 1 and 2. Write what you find, and why it works.

1

STOP 1

## Always Even?

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 4 row | 4 | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |

Look at the numbers in the 4 row. Are they odd or even? \_\_\_\_\_

Split each number into two equal parts:  $12 = \underline{\quad} + \underline{\quad}$        $28 = \underline{\quad} + \underline{\quad}$

**Will 4 times any whole number be even? Explain why.**

---



---



---

2

STOP 2

## Double It

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 4 row | 4 | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
| 8 row | 8 | 8  | 16 |    | 32 | 40 |    | 56 | 64 |    | 80  |

Compare the two rows, one column at a time. What do you notice?

---



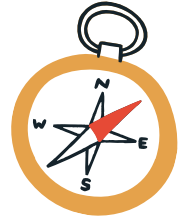
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**Fill in the 3 empty boxes in the 8 row. Why does your pattern work?**

---

Use it past the map:  $4 \times 12 = 48$ , so  $8 \times 12 = \underline{\quad}$

# Pattern Explorer



Stops 3 and 4. Write what you find, and why it works.

3

STOP 3

## Mirror Twins

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 3 row | 3 | 3  | 6  | 9  | 12 | 15 | 18 |    | 24 | 27 | 30  |
| 7 row | 7 | 7  | 14 |    | 28 | 35 | 42 | 49 | 56 | 63 | 70  |

Fill in the two boxes:  $3 \times 7 =$  \_\_\_\_\_ and  $7 \times 3 =$  \_\_\_\_\_ What do you notice?

Why? Look at the dots.



3 rows of 7



7 rows of 3

Another pair: \_\_\_\_\_  $\times$  \_\_\_\_\_ = \_\_\_\_\_ and \_\_\_\_\_  $\times$  \_\_\_\_\_ = \_\_\_\_\_

4

STOP 4

## A Row Is a Pattern

The 6 row is a number pattern. Find it on your map and write its first ten numbers.

|     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 6   | 12  | 18  |     |     |     |     |     |     |      |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |

Rule: \_\_\_\_\_ What do the ones digits do? \_\_\_\_\_

The map stops at the 10th number. What will the 12th number be? \_\_\_\_\_

How do you know? \_\_\_\_\_

Will 50 ever be in this pattern? How do you know?

# Pattern Explorer

Stop 5. This discovery is yours: no one has found it yet.



5

STOP 5

## Your Own Discovery

Pick a row on your map that you have not explored yet. I picked the \_\_\_\_\_ row.

Write its first ten numbers.

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

1st

2nd

3rd

4th

5th

6th

7th

8th

9th

10th

Rule: \_\_\_\_\_

Look closely at your numbers. Write two patterns you see.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

What will the 12th number in your pattern be? \_\_\_\_\_

How do you know? \_\_\_\_\_

Pick one of your patterns. Why do you think it happens?

\_\_\_\_\_



## Expedition Complete!

You found five patterns in the multiplication table and explained why they work. That is what mathematicians do.

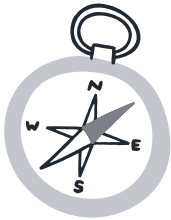
Explorer: \_\_\_\_\_



THE MAP

# Pattern Explorer

Five discoveries are hiding in this table. Keep the map beside your journal pages.



1

Always Even?

4

A Row Is a Pattern

2

Double It

3

Mirror Twins

3

5

Your Own

| x  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
|----|----|----|----|----|----|----|----|----|----|-----|
| 1  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 2  | 2  | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20  |
| 3  | 3  | 6  | 9  | 12 | 15 | 18 | 21 | 24 | 27 | 30  |
| 4  | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
| 5  | 5  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50  |
| 6  | 6  | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60  |
| 7  | 7  | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70  |
| 8  | 8  | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80  |
| 9  | 9  | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90  |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

### How to Read Your Map

For  $3 \times 7$ , find the 3 row.  
Slide over to the 7 column.

Try it:

$6 \times 4 = \underline{\hspace{2cm}}$      $9 \times 5 = \underline{\hspace{2cm}}$

$7 \times 8 = \underline{\hspace{2cm}}$

### Map Key



A stop: a discovery



A row to explore



Twins: two that match



The trail

### My Expedition



Stop 1 Always Even?



Stop 2 Double It



Stop 3 Mirror Twins



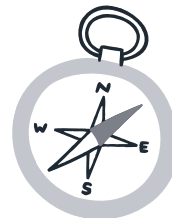
Stop 4 A Row Is a Pattern



Stop 5 Your Own Discovery

# Pattern Explorer

Stops 1 and 2. Write what you find, and why it works.



STOP 1

## Always Even?

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 4 row | 4 | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |

Look at the numbers in the 4 row. Are they odd or even? \_\_\_\_\_

Split each number into two equal parts:  $12 = \underline{\quad} + \underline{\quad}$        $28 = \underline{\quad} + \underline{\quad}$

**Will 4 times any whole number be even? Explain why.**

---



---



---



STOP 2

## Double It

|       |   | x1 | x2 | x3                   | x4 | x5 | x6                   | x7 | x8 | x9                   | x10 |
|-------|---|----|----|----------------------|----|----|----------------------|----|----|----------------------|-----|
| 4 row | 4 | 4  | 8  | 12                   | 16 | 20 | 24                   | 28 | 32 | 36                   | 40  |
| 8 row | 8 | 8  | 16 | <input type="text"/> | 32 | 40 | <input type="text"/> | 56 | 64 | <input type="text"/> | 80  |

Compare the two rows, one column at a time. What do you notice?

---



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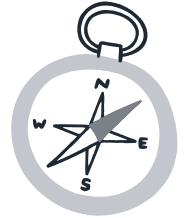
**Fill in the 3 empty boxes in the 8 row. Why does your pattern work?**

---

Use it past the map:  $4 \times 12 = 48$ , so  $8 \times 12 = \underline{\quad}$

# Pattern Explorer

Stops 3 and 4. Write what you find, and why it works.



STOP 3

## Mirror Twins

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 3 row | 3 | 3  | 6  | 9  | 12 | 15 | 18 |    | 24 | 27 | 30  |
| 7 row | 7 | 7  | 14 |    | 28 | 35 | 42 | 49 | 56 | 63 | 70  |

Fill in the two boxes:  $3 \times 7 =$  \_\_\_\_\_ and  $7 \times 3 =$  \_\_\_\_\_ What do you notice?

Why? Look at the dots.



3 rows of 7



7 rows of 3

Another pair: \_\_\_\_\_  $\times$  \_\_\_\_\_ = \_\_\_\_\_ and \_\_\_\_\_  $\times$  \_\_\_\_\_ = \_\_\_\_\_



STOP 4

## A Row Is a Pattern

The 6 row is a number pattern. Find it on your map and write its first ten numbers.

|     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 6   | 12  | 18  |     |     |     |     |     |     |      |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |

Rule: \_\_\_\_\_ What do the ones digits do? \_\_\_\_\_

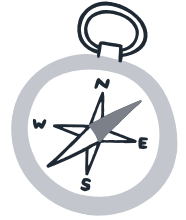
The map stops at the 10th number. What will the 12th number be? \_\_\_\_\_

How do you know? \_\_\_\_\_

Will 50 ever be in this pattern? How do you know?

# Pattern Explorer

Stop 5. This discovery is yours: no one has found it yet.



STOP 5

## Your Own Discovery

Pick a row on your map that you have not explored yet. I picked the \_\_\_\_\_ row.

Write its first ten numbers.

|     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
|     |     |     |     |     |     |     |     |     |      |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |

Rule: \_\_\_\_\_

Look closely at your numbers. Write two patterns you see.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

What will the 12th number in your pattern be? \_\_\_\_\_

How do you know? \_\_\_\_\_

Pick one of your patterns. Why do you think it happens?

\_\_\_\_\_



## Expedition Complete!

You found five patterns in the multiplication table and explained why they work. That is what mathematicians do.

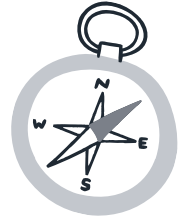
Explorer: \_\_\_\_\_



## THE MAP

# Pattern Explorer

Five discoveries are hiding in this table. Keep the map beside your journal pages.



1

Always  
Even?

4

A Row Is  
a Pattern

2

Double  
It

3

Mirror  
Twins

3

5

Your  
Own

| x  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
|----|----|----|----|----|----|----|----|----|----|-----|
| 1  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 2  | 2  | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20  |
| 3  | 3  | 6  | 9  | 12 | 15 | 18 | 21 | 24 | 27 | 30  |
| 4  | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
| 5  | 5  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50  |
| 6  | 6  | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60  |
| 7  | 7  | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70  |
| 8  | 8  | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80  |
| 9  | 9  | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90  |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

## How to Read Your Map

For  $3 \times 7$ , find the 3 row.  
Slide over to the 7 column.

Try it:

$$6 \times 4 = \underline{24} \quad 9 \times 5 = \underline{45}$$

$$7 \times 8 = \underline{56}$$

## Map Key



A stop: a discovery



A row to explore



Twins: two that match

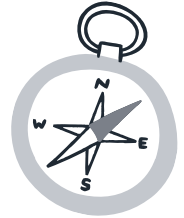
..... The trail

## My Expedition

- ☒ **Stop 1** Always Even?
- ☒ **Stop 2** Double It
- ☒ **Stop 3** Mirror Twins
- ☒ **Stop 4** A Row Is a Pattern
- ☒ **Stop 5** Your Own Discovery

# Pattern Explorer

Stops 1 and 2. Write what you find, and why it works.



1

STOP 1

## Always Even?

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 4 row | 4 | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |

Look at the numbers in the 4 row. Are they odd or even? They are all even.

Split each number into two equal parts:  $12 = \underline{6} + \underline{6}$        $28 = \underline{14} + \underline{14}$

Will 4 times any whole number be even? Explain why.

Yes. 4 times a number can always be split into two equal parts,  
like  $6 + 6$  or  $14 + 14$ . Two equal parts make an even number.

2

STOP 2

## Double It

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 4 row | 4 | 4  | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
| 8 row | 8 | 8  | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80  |

Compare the two rows, one column at a time. What do you notice?

Each number in the 8 row is double the number above it in the 4 row.

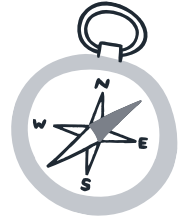
Fill in the 3 empty boxes in the 8 row. Why does your pattern work?

8 is double 4, so 8 times a number is double 4 times that number.

Use it past the map:  $4 \times 12 = 48$ , so  $8 \times 12 = \underline{96}$

# Pattern Explorer

Stops 3 and 4. Write what you find, and why it works.



3

STOP 3

## Mirror Twins

|       |   | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x10 |
|-------|---|----|----|----|----|----|----|----|----|----|-----|
| 3 row | 3 | 3  | 6  | 9  | 12 | 15 | 18 | 21 | 24 | 27 | 30  |
| 7 row | 7 | 7  | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70  |

Fill in the two boxes:  $3 \times 7 = 21$  and  $7 \times 3 = 21$  What do you notice?

*They are the same. Switching the two numbers does not change the product.*

Why? Look at the dots.



*It is the same group of dots, turned on its side.*

Another pair:  $4 \times 9 = 36$  and  $9 \times 4 = 36$

4

STOP 4

## A Row Is a Pattern

The 6 row is a number pattern. Find it on your map and write its first ten numbers.

|     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 6   | 12  | 18  | 24  | 30  | 36  | 42  | 48  | 54  | 60   |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |

Rule: *Add 6* What do the ones digits do? *They repeat: 6, 2, 8, 4, 0.*

The map stops at the 10th number. What will the 12th number be? *72*

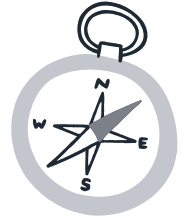
How do you know? *I added 6 two more times: 60, 66, 72.*

Will 50 ever be in this pattern? How do you know?

*No. It goes up by 6, from 48 to 54, so it jumps over 50 and keeps going.*

# Pattern Explorer

Stop 5. This discovery is yours: no one has found it yet.



5

STOP 5

## Your Own Discovery

Answers will vary. This is one example.

Pick a row on your map that you have not explored yet. I picked the 9 row.

Write its first ten numbers.

|     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 9   | 18  | 27  | 36  | 45  | 54  | 63  | 72  | 81  | 90   |
| 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |

Rule: Add 9

Look closely at your numbers. Write two patterns you see.

1. From 18 through 90, the tens digit goes up by 1 and the ones digit goes down by 1.

2. From 18 through 90, the two digits of each number add up to 9.

What will the 12th number in your pattern be? 108

How do you know? I added 9 two more times: 90, 99, 108.

Pick one of your patterns. Why do you think it happens?

Adding 9 is like adding 10 and taking away 1.



## Expedition Complete!

You found five patterns in the multiplication table and explained why they work. That is what mathematicians do.

Explorer: \_\_\_\_\_

