

Order Before Meaning

BOOK ONE

Order Before Mean- ing

Reader Circle Edition

Grand Theorem Watermark Place-
holder



Order Before Meaning

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Preface

If you're holding this book, thank you.

Whether you found it through mathematics, engineering, curiosity, or simply because someone placed it in your hands, I'm grateful you've decided to spend some of your time here.

This book began with a question.

Not a mathematical question.

A human one.

How do we recognize meaning?

Most of us are taught to search for meaning first. We naturally ask what something represents, what it implies, or why it matters. But throughout my own journey—in mathematics, engineering, software, and everyday life—I kept encountering the same surprising pattern.

Before meaning, there is order.

Before we recognize a melody, we hear individual notes.

Before we understand a sentence, we recognize letters and words.

Before a scientist proposes a theory, they observe patterns.

Again and again, structure appears before interpretation.

This observation became the foundation for the ideas explored throughout this series.

Although some examples come from mathematics, this is not intended to be a textbook in the traditional sense. You do not need an advanced mathematical background to benefit from the ideas presented here. Mathematics serves as one language for exploring patterns, but the underlying philosophy reaches much further.

As you read, I encourage you not to worry about understanding every detail immediately.

Instead, pay attention to the relationships between ideas.

Allow yourself to notice patterns.

Pause when something resonates with you.

If a chapter raises more questions than it answers, that is not a failure. Curiosity is often the beginning of genuine understanding.

This first book is intentionally modest in its ambition.

It does not attempt to answer every question or build a complete philosophy. Instead, it lays a foundation upon which later books may build. My hope is that, by the time you reach the final page, you will find yourself looking at familiar ideas with slightly different eyes.

This edition also represents something special to me.

It is the first English Reader Circle Edition shared with others.

Rather than waiting until I believed the work was finished, I chose to invite readers into the process. Their questions, suggestions, and perspectives will help shape future editions. In that sense, you are not simply reading this book—you are helping build it.

Thank you for joining me at the beginning of that journey.

I hope you enjoy discovering what can emerge when we choose to look for order before meaning.

— Karl Schultze

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CHAPTER ONE

Noticing Difference



These things are different.

Imagine placing four objects on a table.

Perhaps one is a circle.

One is a square.

One is a triangle.

One is a star.

Before we say anything about them, before we give them names, before we decide what they represent, there is already something we can notice.

They are different.

That may seem almost too obvious to mention.

After all, we recognize difference every day without thinking about it. We tell one face from another. We choose one book instead of another. We know which mug is ours without measuring it or proving it.

Difference feels so natural that we rarely stop to ask where it comes from.

But suppose we did.

Suppose we tried to forget everything we knew about these objects.

Forget that one is called a circle.

Forget that another is called a star.

Forget colours, measurements, and meanings.

What remains?

Only this:

They are not the same.

That single observation is enough to begin building mathematics.

This may sound surprising.

Many people think mathematics begins with numbers.

Others believe it begins with counting.

Some might even say it begins with geometry.

Yet before any of those things are possible, we must first be able to distinguish one thing from another.

If every object were identical in every possible way, there would be nothing to compare, nothing to arrange, and nothing to study.

Difference comes first.

At this stage, we are not interested in what these objects mean.

A circle could represent a planet, a button, or nothing at all.

It does not matter.

The mathematics we are about to build does not depend on interpretation.

It depends only on our ability to recognize that one object is different from another.

Later, the Mathematical Edition will give a formal name to a collection of distinguishable objects.

For now, there is no need for that language.

It is enough to notice something that you have probably noticed thousands of times throughout your life without ever thinking about it.

Things can be different.

That simple observation will become the first building block of everything that follows.

Before we can ask how things change...

Before we can ask how they relate...

Before we can ask whether they can be transformed...

We must first recognize that they are distinct.

In the next chapter, we will keep the very same objects.

We will not change the objects themselves.

Instead, we will ask a different question.

What happens if we change only their order?

CHAPTER TWO

The Same Things, A Different Story



The same things can be arranged differently.

In the previous chapter, we noticed something remarkably simple.

Things can be different.

Now let's keep exactly the same objects.

Do not replace them.

Do not remove any.

Do not add new ones.

Instead, try something much smaller.

Move them.

Suppose you place the circle first, followed by the square, then the triangle, and finally the star.

Now pick them up and arrange them again.

The star comes first.

The triangle comes second.

The circle moves to third.

The square finishes the line.

Have you created new objects?

No.

Every object is still there.

Nothing has been added.

Nothing has disappeared.

Yet something feels different.

What changed?

Not the objects.

Only their positions.

That observation is so familiar that we often overlook it.

Every time you alphabetize books on a shelf, shuffle a deck of cards, arrange photographs on a wall, or organize tools in a toolbox, you are changing order without changing the objects themselves.

Order is strangely powerful.

The same pieces can tell entirely different stories depending on how they are arranged.

Think about the letters in the words:

STOP

and

POTS

The letters are identical.

Only their order has changed.

Yet the result feels completely different.

This idea reaches far beyond words.

Musicians rearrange notes to create different melodies.

Chefs rearrange ingredients and cooking steps to create different meals.

Engineers rearrange components to build different machines.

The pieces matter.

But so does the order.

In fact, there are times when order matters more than the individual pieces.

Imagine trying to assemble a chair.

You have every bolt, every screw, every piece of wood.

If all the parts are present but assembled in the wrong order, the chair may never come together.

Nothing is missing.

Everything is simply arranged incorrectly.

This raises an interesting question.

If one arrangement can become another simply by changing order...

How many different arrangements are possible?

Is there only one?

A handful?

Hundreds?

Millions?

Rather than studying one arrangement at a time, perhaps we should step back and look at all of them together.

Instead of asking what a single arrangement can do, we might ask what they all have in common.

That change in perspective will lead us to the next step in our journey.

In the next chapter, we stop looking at individual arrangements and begin looking at the collection they naturally form.

Stepping Back



Many arrangements begin to reveal a landscape.

Imagine writing every possible arrangement of the same four objects on a large sheet of paper.

At first, it sounds like a simple task.

You write one arrangement.

Then another.

Then another.

After a while, something interesting begins to happen.

You stop paying attention to any single arrangement.

Instead, you begin noticing the collection itself.

It's a strange change in perspective.

Earlier, each arrangement felt like its own little world.

Now, they start to feel like neighbors living in the same city.

Some look familiar.

Some seem completely different.

Some are only a tiny change apart.

Others appear almost unrelated.

Yet they all share something important.

They are built from exactly the same objects.

Nothing new has been added.

Nothing has been taken away.

Only the order changes.

When we look at one arrangement, our attention naturally goes to its details.

When we look at all of them together, a different kind of question appears.

What patterns exist across the entire collection?

This is a question that appears throughout mathematics and science.

A biologist can study one tree.

Or they can study the entire forest.

An astronomer can study one star.

Or they can study an entire galaxy.

Neither perspective is better than the other.

Each reveals things the other cannot.

The same is true here.

Studying one arrangement teaches us about that arrangement.

Studying the collection teaches us about the structure they all share.

This change in perspective is surprisingly powerful.

Once we begin thinking about collections instead of individuals, we start asking different questions.

Which arrangements are similar?

Which are completely different?

Can they be grouped?

Can they be organized?

Can moving from one arrangement to another reveal something about the collection itself?

These questions are difficult to answer if every arrangement is treated as an isolated object.

But once they are viewed as members of a larger family, entirely new possibilities emerge.

Perhaps the collection itself has a structure.

Perhaps it contains patterns that no single arrangement can reveal.

And perhaps the most interesting questions are no longer about the arrangements themselves.

Perhaps they are about the relationships between them.

Imagine drawing lines between arrangements whenever one can be changed into another by following a particular rule.

Suddenly the collection is no longer just a list.

It begins to resemble a map.

Every arrangement becomes a place.

Every rule becomes a path.

Instead of asking,

"What is this arrangement?"

we begin asking,

"Where can I go from here?"

That question changes everything.

Because once we start thinking about rules that move us through the collection, we are no longer studying arrangements alone.

We are studying change.

And that is where our journey goes next.

In the next chapter, we will introduce the idea that one simple rule can transform one arrangement into another—and that by studying the rule itself, we can begin to understand the entire landscape.

Following the Rules



A rule gives change a direction.

In the last chapter, we stepped back and looked at an entire collection of arrangements.

It was like looking at a map instead of a single location.

Now imagine standing somewhere on that map.

You are looking at one arrangement.

How do you get to another?

One answer is simple.

You could move the objects however you like.

Swap two of them.

Rotate them.

Shuffle them.

Start over.

There are countless ways to change one arrangement into another.

But suppose someone gave you a single instruction.

Not a long list of instructions.

Just one.

And suppose you agreed to follow that instruction every single time.

Now something interesting begins to happen.

You are no longer making random changes.

You are following a rule.

Think about everyday life.

A recipe is a rule for transforming ingredients into a meal.

A dance routine is a rule for transforming one position into the next.

The rules of a board game tell every player how the game is allowed to change.

Even traffic lights are part of a system of rules that transform the flow of cars through an intersection.

Rules are everywhere.

They do something remarkable.

They bring consistency.

If two people follow the same rule under the same conditions, they should arrive at the same result.

That consistency is what makes rules worth studying.

Imagine that every arrangement is a place on the map we explored in the previous chapter.

A rule is no longer just an instruction.

It becomes a path connecting one place to another.

Some rules make only small changes.

Others create dramatic ones.

Some rules are complicated enough that you might need several pages to describe them.

Others can be explained in a single sentence.

As we begin exploring these rules, a natural question appears.

Are some rules more interesting than others?

Perhaps.

A complicated rule can certainly produce interesting results.

But sometimes the most interesting discoveries begin with the simplest possible idea.

Consider a rule that doesn't add anything.

It doesn't remove anything.

It doesn't replace one object with another.

It simply changes the order.

Could such a simple rule reveal an unexpected structure?

At first glance, it seems unlikely.

After all, how much can we really learn by rearranging things we already have?

Yet mathematics has a habit of rewarding simple questions.

A child might ask,

"What happens if I turn this around?"

A scientist might ask,

"What happens if I repeat the same process over and over?"

An engineer might ask,

"Which parts of the system stay the same while everything else changes?"

These questions look different.

But they all begin the same way.

They begin with a rule.

Before we study complicated rules, it makes sense to start with one that is easy to understand and impossible to misunderstand.

A rule that anyone can perform.

A rule that changes something obvious while leaving everything else untouched.

In the next chapter, we will meet that rule.

It has no hidden steps.

No exceptions.

No tricks.

It simply turns every arrangement around.

And as we will soon discover, that simple act is enough to uncover an entire mathematical landscape.

Turning Things Around



Reversal changes order while preserving what is there.

Imagine laying four objects in a row.

A circle.

A square.

A triangle.

A star.

Now imagine standing at the other end of the table.

Nothing about the objects has changed.

The circle is still a circle.

The square is still a square.

The triangle is still a triangle.

The star is still a star.

What has changed is the way you see their order.

Now try something even simpler.

Without adding anything...

Without removing anything...

Without replacing a single object...

Turn the entire arrangement around.

The object that was first is now last.

The object that was last is now first.

Everything in between changes position as well.

It feels like a dramatic transformation.

And yet, if we look carefully, something curious appears.

What changed?

The order.

What did not change?

The objects themselves.

There are still four objects.

They are still the same four objects.

Nothing has been created.

Nothing has disappeared.

Only their positions have changed.

This is surprisingly easy to overlook.

When we see something transformed, our first instinct is often to think that everything has changed.

But many transformations are more selective than that.

A book turned upside down is still the same book.

A melody played in a different key is still recognizable.

A photograph viewed in a mirror is still the same photograph, even though left and right have exchanged places.

The transformation changes something.

It preserves something else.

Recognizing both is important.

If we pay attention only to what changed, we miss the hidden structure.

If we pay attention only to what stayed the same, we miss the transformation itself.

The interesting mathematics lives in the conversation between the two.

Let's try another experiment.

Arrange the same four objects again.

Now reverse them.

Then reverse them once more.

Look carefully.

Where did you end up?

Back where you started.

That feels almost magical the first time you notice it.

A rule that changes the arrangement...

Yet applying it twice restores everything.

Some rules wander farther and farther away from where they began.

This one comes home.

That simple observation is worth remembering.

It suggests that this rule has an internal structure that we have not yet fully understood.

And if one simple rule can hide this much structure...

What else might it reveal?

Before answering that question, we need to look more closely at what happens when the same rule is applied again...

...and again...

...and again.

In the next chapter, we will discover that repeating this simple transformation uncovers an elegant pattern that was hidden in plain sight all along.

CHAPTER SIX

Coming Home Again



Repeating a simple rule can reveal a journey.

In the last chapter, we discovered a simple rule.

Take an arrangement.

Turn it around.

Then notice what changed—and what did not.

Now let's ask a different question.

What happens if we never stop?

Take an arrangement and reverse it.

Now reverse it again.

Then again.

Then again.

At first, it sounds like something that could continue forever.

After all, many processes do.

A clock keeps ticking.

The Earth keeps orbiting the Sun.

The seasons repeat year after year.

Some patterns seem to have no obvious end.

But our little reversal rule behaves differently.

Let's follow it together.

Start with an arrangement.

Reverse it once.

You arrive somewhere new.

Reverse it again.

You're back where you started.

Reverse it a third time.

You're back at the second arrangement.

Reverse it a fourth time.

You're home again.

Instead of wandering farther and farther away, the process begins to bounce between familiar places.

It is almost as though the rule has discovered a tiny path and refuses to leave it.

That is worth thinking about.

Imagine walking through a forest.

At every fork in the trail, you always choose the same direction.

You might expect to keep exploring new ground.

Instead, after a while, you find yourself standing where you began.

You continue walking.

Soon you return to the same place again.

The forest has not trapped you.

Your rule has.

Our reversal rule behaves in much the same way.

Once an arrangement begins its journey, it follows a path determined entirely by the rule.

There is no guessing.

No randomness.

No decisions to make along the way.

The next step is always known.

And because the rule is so simple, the journey is surprisingly short.

Sometimes something even stranger happens.

Reverse an arrangement like:

Circle – Square – Square – Circle.

Nothing changes.

The beginning becomes the end.

The end becomes the beginning.
Yet everything already matched.
The arrangement seems perfectly comfortable facing either direction.
If you continue applying the rule, you never leave.
The journey begins and ends in the same place.
Some arrangements travel between two places.
Others never need to move at all.
Without trying to, we've uncovered two kinds of behaviour.
One kind alternates.
The other remains perfectly still.
Neither behaviour was built into the objects themselves.
It emerged from the interaction between the arrangement and the rule.
This is an important lesson.
Sometimes the most interesting patterns are not hidden inside the things we study.
They appear only when those things begin to change.
As we watched the reversal rule repeat, we stopped thinking about individual steps.
Instead, we started thinking about the entire journey.
Every arrangement has its own journey.
Some are short.
Some return immediately.
Others visit another arrangement before coming home.
The journey itself has become something worth studying.
In the next chapter, we'll look more closely at these journeys and ask a different question.
Even though the arrangement may move from place to place...

Is there something that never changes at all?

What Never Changes?

{ ○ □ △ ★ } remains

Some things remain even as the arrangement moves.

So far, we've spent most of our time watching things change.

Objects became arrangements.

Arrangements were reordered.

Rules transformed one arrangement into another.

Some journeys moved between two places.

Others stayed exactly where they began.

There has been a lot of motion.

But suppose we stop asking,

"What changed?"

and instead ask,

"What stayed the same?"

At first, that might seem like a strange question.

When something changes, our attention is naturally drawn to the difference.

It's easy to overlook the parts that quietly remain unchanged.

Yet those quiet parts often tell us the most.

Imagine watching a magician perform a card trick.

Your eyes follow the moving cards.

Your attention is captured by what seems to change.

But the secret often lies in something that never changed at all.

The same idea appears throughout everyday life.

Think about moving to a new home.

Your furniture may end up in different rooms.

Books may be placed on different shelves.

Pictures may hang on different walls.

The arrangement has changed.

But you still own the same belongings.

Or imagine reading a sentence aloud.

You might speak quickly one day and slowly the next.

The pace changes.

The words do not.

In each example, something changes while something else remains constant.

Our reversal rule behaves in exactly the same way.

When we reverse an arrangement, the order changes.

That much is obvious.

But look more carefully.

The same objects are still present.

No new object appears.

No existing object disappears.

The arrangement may look different.

Its ingredients have not changed.

This is an important moment.

Until now, we have been following the journey.

Now we begin studying the traveller.

The journey tells us how things move.

The traveller reminds us what remains.

Once you begin looking for things that never change, you start seeing them everywhere.

A melody can be played in a different room.

A story can be printed in a different font.

A photograph can be displayed on a different screen.

Many details may change.

Yet something essential remains recognizable.

That is why your friend can recognize your voice over the phone.

That is why you can identify your favourite song after hearing only a few notes.

That is why you can recognize a familiar face even after many years.

Some characteristics survive change.

Those surviving characteristics are often more important than the changes themselves.

As we studied reversal, we discovered that the order can change.

But the collection of objects remains the same.

The number of objects remains the same.

These observations may seem simple.

In fact, they are powerful.

They allow us to separate what belongs to the transformation from what belongs to the arrangement itself.

Once we learn to make that distinction, we begin to see structure where previously we saw only motion.

It is like learning to hear the rhythm beneath the melody.

Or noticing the shape of a river instead of following every ripple on its surface.

The more carefully we look, the more we realize that change and constancy are partners.

One helps us understand the other.

As mathematicians, scientists, engineers, and curious people in general, we learn not only by asking,

"What happened?"

but also,

"What remained true while it happened?"

That question will carry us to the final chapter of this book.

We have discovered differences.

We have explored order.

We have followed rules.

We have watched journeys.

We have found things that never change.

Now we are ready to step back one last time and ask the biggest question of all.

What does this entire journey tell us about the rule itself?

Seeing the Whole Picture

○ □ △ ★ connected

The structure appears when the observations connect.

When we began this journey, we did not start with numbers.

We did not begin with equations.

We did not even begin with mathematics in the way most people imagine it.

We began by noticing something so ordinary that it almost seemed unworthy of attention.

Things can be different.

That simple observation carried us farther than we might have expected.

We discovered that once things are different, they can be arranged.

The objects themselves may stay exactly the same, yet changing their order creates something new to explore.

Then we stepped back.

Instead of studying one arrangement at a time, we looked at the entire landscape of possibilities.

We learned that changing our perspective often reveals patterns that cannot be seen from up close.

After that, we introduced a rule.

Not a complicated rule.

Just one simple instruction.

Turn the arrangement around.

At first, it seemed almost too simple to matter.

But by following that rule again and again, we discovered something remarkable.

The journey was not endless.

It was structured.

Some arrangements alternated between two familiar places.

Others seemed perfectly balanced, returning to themselves immediately.

The rule was simple.

Its behaviour was not.

Finally, we asked a different kind of question.

Instead of asking what changed, we asked what remained.

That question transformed the entire discussion.

The order changed.

The objects did not.

The journey changed.

Its essential ingredients remained.

And suddenly, the rule became easier to understand.

Not because we had memorized it.

Because we had learned to look at it from more than one point of view.

If there is one idea I hope you carry away from this book, it is this:

Understanding rarely comes from looking harder at a single object.

It often comes from changing the questions we ask.

Sometimes we look at individual things.

Sometimes we look at collections.

Sometimes we study change.

Sometimes we study what survives change.

Each perspective reveals something different.

None is complete on its own.

Together, they form a richer way of thinking.

This way of thinking extends far beyond the reversal rule.

Scientists use it when they search for laws that remain true despite changing experiments.

Engineers use it when they design systems that continue working under different conditions.

Programmers use it when they write rules that transform information while preserving its integrity.

Artists use it when they explore how composition changes meaning without changing the materials.

In every case, the same habit appears:

Look closely.

Step back.

Ask what changes.

Ask what remains.

Then look again.

You may have noticed something else as you read this book.

Although we often spoke about arrangements and reversal, the book was quietly teaching another skill.

It was teaching how to observe.

Not how to memorize.

Not how to accept.

But how to notice.

That skill will become increasingly important as the ideas grow more sophisticated.

The mathematics in later books will become richer.

The structures will become deeper.

The language will become more precise.

But the habit of observation you have practiced here will remain the same.

Every future idea will begin exactly where this book began:

With a careful observation.

Book 1 was never intended to answer every question.

Its purpose was to build a foundation.

You now know how to think about distinguishable objects, arrangements, simple transformations, repeating behaviour, and properties that survive change.

Those ideas will become the tools we use in the books ahead.

In Book 2, we will begin asking a new question.

If one simple transformation can reveal this much structure...

What happens when we study transformations themselves?

That journey begins next.

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Closing Note

Thank you for reading this first Reader Circle edition.

If something was clear, confusing, exciting, slow, surprising, or memorable, your feedback will help shape the next draft.

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Version Information

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