

Number Sequences

A GUIDE

Every string of numbers hides a secret rule. Learn to find the jump between terms — and you can crack any sequence.

Numbers That Follow a Rule

Look at this line of numbers: 3, 7, 11, 15, 19. They are not random. Someone made them with a rule, and your job is to figure out what it is.

Here is the detective move: subtract each number from the one after it. That gap is called the jump. $7 - 3 = 4$, and $11 - 7 = 4$, and $15 - 11 = 4$. The jump is 4 every single time — that is the secret rule.

3	7	11	15	19
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Rule: + 4 each time

The Steady Jump

When the jump is the same between every pair of neighbors, you have an add pattern. To find the next number, just add the jump one more time.

Watch out for one trick: sequences can go down, too. In 20, 17, 14, 11, the jump is -3 each time. Subtracting the same amount is still a steady jump, so it is still an add-style pattern.

Worked example What comes next: 5, 12, 19, 26, ?

1. Find the first jump: $12 - 5 = 7$.
2. Check the others: $19 - 12 = 7$ and $26 - 19 = 7$, so the jump is steady.
3. The rule is + 7 each time, so add 7 to the last number.
4. $26 + 7 = 33$.

Answer: 33

When the Jumps Keep Growing

Sometimes you subtract neighbors and the jumps are not steady at all — they get bigger and bigger, fast. In 2, 6, 18, 54, the jumps are 4, then 12, then 36. That is your clue to switch tools.

Instead of subtracting, try dividing each number by the one before it. $6 \div 2 = 3$, and $18 \div 6 = 3$, and $54 \div 18 = 3$. Same answer every time means it is a multiply pattern: each number is 3 times the last.

2	6	18	54
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Rule: $\times 3$ each time

Worked example What comes next: 2, 8, 32, 128, ?

1. Subtract neighbors: the jumps are 6, 24, 96 — not steady, and growing fast.
2. So try dividing: $8 \div 2 = 4$, $32 \div 8 = 4$, $128 \div 32 = 4$.
3. The rule is $\times 4$ each time, so multiply the last number by 4.
4. $128 \times 4 = 512$.

Answer: 512

Add the Two Before

There is one more famous pattern, and it is sneaky. Look at 1, 1, 2, 3, 5, 8. The jumps are not steady, and dividing does not give the same answer either. But check this: $1 + 1 = 2$, then $1 + 2 = 3$, then $2 + 3 = 5$, then $3 + 5 = 8$.

Each number is the sum of the two numbers before it. This is called a Fibonacci-style pattern, and it shows up in real life — in pinecones, sunflower spirals, and seashells. Once you know to look for it, you will spot it everywhere.

1	1	2	3	5	8
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Rule: **add the two before**

Worked example What comes next: 1, 3, 4, 7, 11, ?

1. Subtract neighbors: the jumps are 2, 1, 3, 4 — not steady, so it is not an add pattern.
2. Dividing neighbors does not give the same answer either, so it is not a multiply pattern.
3. Test the two-before trick: $1 + 3 = 4$, and $3 + 4 = 7$, and $4 + 7 = 11$. It works!
4. Add the last two numbers: $7 + 11 = 18$.

Answer: **18**

Your Detective Plan

Now you have a full toolkit. Step one: subtract neighbors to find the jumps. If the jumps are steady, it is an add pattern. If the jumps grow fast, try dividing — it is probably a multiply pattern. If neither works, test whether each number is the sum of the two before it.

The same plan even helps when a number is missing from the middle. Find the jump from the numbers you can see, then fill the gap.

Worked example The pattern has the same jump each time: 4, 10, X, 22. Find X.

1. Find one jump you can see: $10 - 4 = 6$.
2. Check it fits the whole line: three jumps of 6 take you $4 \rightarrow 10 \rightarrow 16 \rightarrow 22$, and 22 is correct.
3. So X is $10 + 6 = 16$.

Answer: **X = 16**

Remember

- ★ Always subtract neighbors first — the jumps are the sequence's fingerprint.
- ★ Jumps growing fast? Stop subtracting and try dividing neighbors instead.
- ★ If adding and multiplying both fail, check whether each number is the sum of the two before it.
- ★ Test your rule on every pair of neighbors, not just the first one — a real rule works everywhere.

Now you try

- 1) What comes next: 2, 4, 6, 8, ?

Answer: _____

- 2) What is the rule for this sequence: 5, 11, 17, 23?

Answer: _____

- 3) What comes next: 30, 26, 22, 18, ?

Answer: _____

- 4) What comes next: 3, 6, 12, 24, ?

Answer: _____

- 5) This pattern has the same jump each time: 7, 13, X, 25. What is X?

Answer: _____

- 6) Each number is the sum of the two before it: 2, 3, 5, 8, 13, ? What comes next?

Answer: _____

- 7) What comes next: 400, 200, 100, 50, ?

Answer: _____

8) A sequence starts 1, 4, and every number after that is the sum of the two before it. What is the 7th number?

Answer: _____

Answers — check yourself

1. 10
2. + 6 each time
3. 14
4. 48
5. $X = 19$
6. 21
7. 25
8. 37