MATHS FIELD GUIDE · GRADE 4

Patterns and rules describe change

OPENING PROBLEM

What is the next term if the rule is add four?

3 7 11 15 ?

02 Track the jump and the starting point
03 Rules and worked cases
04 The two-step ticket machine
05 Read a number path in either direction
06 Check your reasoning

ILLUSTRATED PROBLEM SHEET

Track the jump and the starting point

A position counts terms. From the first to the nth term there are n − 1 gaps.

1

3 7 11 15 ?

What is the next term if the rule is add four?

Nineteen. Each gap is four.

2

Position	1	2	3	4
Term	3	7	11	15

How do you reach term 4 straight from term 1?

Start at 3 and add three jumps of 4. The result is 15.

3

22 17 12 7 ?

Can the jump be negative?

Yes. Subtract five each time. The next term is 2.

4

Input	1	2	3
Output	3	5	7

Which rule doubles then adds one?

Output = 2 × input + 1. Input 6 gives 13.

Rule “add six”, start two
term four is 20.

Rule “multiply by six”, start two
term four is 432.

CHAPTER PROBLEM

Two sequences both add 5 each time. Must their terms match? Explain.

No. Different starting terms produce different sequences even with the same step.

MATHS REFERENCE · GRADE 4

Patterns and rules describe change

A sequence is an ordered list of terms. A rule describes how its terms are produced. A term-to-term rule tells us how to move from one term to the next.

A rule makes a prediction that can be checked, rather than a guess based only on the appearance of the numbers.

Four cases to recognise

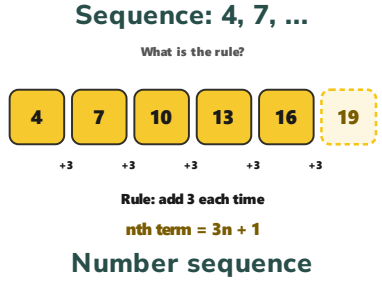
Situation	What to do and why
Input × 3, then − 2, starting at 4	12 − 2 = 10.
Undo that rule from output 19	Add two, then divide by three. Input seven works.
Inputs 2 and 5 under this rule	Outputs 4 and 13. An input gain of three adds nine to the output.
Does "add 6" fit input 4 → 10 too?	Yes. Test input 5: the rules give 11 and 13. One pair cannot decide.

Read the model

Build the idea

For 4, 7, 10, 13, compare neighbouring terms. Each increases by three. Extend the sequence by adding three to 13.

Record a term's position separately from its value. The first term is 4; the fourth term is 13.



Number sequence

Why it works

A constant increase means every step adds the same amount. We can use repeated addition to find later terms.

Knowing the first term is essential. "Add three" can also produce 1, 4, 7, 10, which is a different sequence.

sequence An ordered list.
term One value in a sequence.
rule A relationship used to produce or describe terms.

? + 18 = 43
↓
43 − 18 = 25

What number was hidden?

Twenty-five. Adding eighteen to it returns forty-three.

WORKED INVESTIGATION

The two-step ticket machine

The machine doubles a ticket number and adds three. Run each input through both steps in order.

Look at this part	What it tells you
Input 1	output 5
Input 3	output 9
Input 5	output 13

Work it through

Undo the machine for output 19. Subtract three to get 16, then divide by two to recover input eight.

Catch the mistake

Adding three first and doubling gives 2 × (1 + 3) = 8 for input one, which fails the first row.

Compare the cases

Follow an example

A pattern has two tiles at the start and adds four tiles at each stage. Its first four totals are 2, 6, 10 and 14.

Describe both the starting amount and the change. Then test the next total against the same construction.

What changes? What stays true?

A short list can fit more than one possible rule. State the intended rule or use the way the pattern is built to justify it.

Do not confuse position with value. Later algebra will let us express a direct relationship between them.

Change one condition

When the input increases by one, the output increases by two. The extra three is constant across every row.

? − 16 = 27
↓
27 + 16 = 43

A box lost sixteen and now has twenty-seven. How many at first?

Forty-three. Undo a loss by putting it back.

ILLUSTRATED PROBLEM SHEET

Read a number path in either direction

One step to the right adds one. A jump of ten changes the tens count.

1

27 28 ? 30

Which number comes just before thirty?

Twenty-nine. One more makes three whole tens.

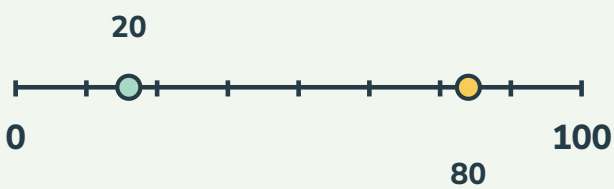
2

52 62 ? 82

The jumps are equal. Fill the gap.

Each jump adds ten. The missing number is 72.

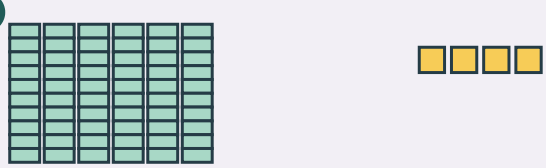
3



Which marked number lies nearer to one hundred?

Eighty. It needs twenty more, while twenty needs eighty more.

4



What numbers come one before and one after this picture?

Six tens and four ones is 64. Its neighbours are 63 and 65.

Ten before 80
70.

One before 80
79.

CHAPTER PROBLEM

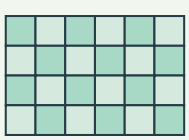
A machine doubles its input and adds 1. What are its outputs for 4 and 5?

$2 \times 4 + 1 = 9$. Then $2 \times 5 + 1 = 11$. Increasing the input by 1 increases the output by 2.

QUESTION BANK · FOLD OR COVER THE RIGHT COLUMN

Check your reasoning

Try the problem	Solution and reasoning
01 Do the first two numbers 2, 4 fix the whole sequence?	No. Adding two gives 6 next. Doubling gives 8 next. A rule is needed.
02 Move ten places back from 71. What stays the same?	You reach 61. The one in the ones place stays.
03 Which input gives output 25? Check it in the original rule.	Subtract three to get 22 and halve it to get 11. Doubling 11 and adding three gives 25.
04 A machine triples and adds one. Which input produces 19?	Undo the steps: 19 − 1 = 18 and 18 ÷ 3 = 6.
05 Give a rule that fits 1 → 3 and 2 → 5. Predict the result for 5 using your rule.	Doubling and adding one fits both. It gives eleven for input five.



Twenty-four counters fill four identical rows. How many per row?

Six. Four times six gives the original total.

BANANALEARN LEARNING LIBRARY

Where will your maths take you next?

GRADE 4 MATHS

Choose your next problem.

Explore more illustrated guides and practise a related topic.

Browse Grade 4 guides →

Keep exploring

GRADE 4 · TOPIC GUIDE

Equivalent fractions rename the same amount

Open guide →

GRADE 4 · TOPIC GUIDE

An angle measures a turn

Open guide →

[Visit bananalearn.com →](#)