MATHS FIELD GUIDE · GRADE 6

A sequence connects position and value

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 Build a row of matchstick squares
05 Move between a rule, a table and a line
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

Why does a formula starting at the first term use n − 1 jumps?

The first term needs no jump. Term n is reached after one fewer jumps than its position.

MATHS REFERENCE · GRADE 6

A sequence connects position and value

An arithmetic sequence changes by a fixed difference between consecutive terms. A position-to-term rule gives the value directly from its position.

The position is an input; the term is an output. This is a relationship between two quantities.

Four cases to recognise

Situation	What to do and why
5, 9, 13, 17	Start at five and add four. Term n is $5 + 4(n - 1) = 4n + 1$.
Term 10 of that rule	$4 \times 10 + 1 = 41$. There are nine jumps from term one.
Does 62 belong?	$62 - 1 = 61$ is not divisible by four, so no whole position works.
1, 4, 9, 16	Differences grow by odd numbers. Term n is n^2, so a fixed-addition rule fails.

Read the model

Build the idea

For 4, 7, 10, 13, place the positions 1, 2, 3, 4 beneath the terms. Each term is one more than three times its position.

The rule is $3n + 1$, where n is the positive whole-number position. Substitute $n = 4$ to obtain 13.

Each term is three times its position, plus one.

Position (n)	1	2	3	4
3 × n	3	6	9	12
Term (3n + 1)	4	7	10	13

Why it works

There are $n - 1$ jumps from the first term to term n. Starting at 4 and adding $3(n - 1)$ gives $4 + 3(n - 1)$, which equals $3n + 1$.

The direct rule works because it accounts for both the start and the repeated growth.

arithmetic sequence A sequence with constant consecutive difference.
position The index of a term.
direct rule A way to find a term from its position.

2 6 18 54 ?

What single multiplier fits every step?

Multiply by three. The next term is 162.

WORKED INVESTIGATION

Build a row of matchstick squares

> One square uses four sticks. Each new square shares one full side with the previous square, so it adds three sticks.

Look at this part	What it tells you
1 square	4 sticks
2 squares	7 sticks
3 squares	10 sticks

Work it through

Count a row another way. For n squares there are n top sticks, n bottom sticks and n + 1 upright sticks. Together they give 3n + 1.

Catch the mistake

Multiplying four by the number of squares counts each shared edge twice. Subtract one for each of the n − 1 joins.

Compare the cases

Follow an example

The tenth term is 3 × 10 + 1 = 31. A term-to-term method would also reach 31, but require nine jumps from the first term.

Check the rule against early terms before using it for a faraway position.

What changes? What stays true?

A rule is valid for the stated pattern and domain. Here positions are 1, 2, 3, ..., not arbitrary measurements.

Not all sequences are arithmetic. Inspect whether the difference remains constant rather than assuming a linear rule.

Change one condition

For ten squares the rule gives 31 sticks. Check using four for the first square plus nine additions of three.

Stage	0	1	2	3
Pieces	1	3	9	27

If each piece makes three copies, how many after stage four?

81. Four multiplications carry the initial piece to stage four.

ILLUSTRATED PROBLEM SHEET

Move between a rule, a table and a line

For y = mx + b, b sets the vertical intercept and m is the change in y per unit change in x.

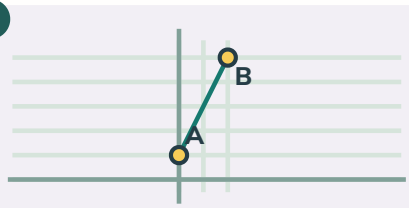
1

x	−1	0	1
y = 2x + 1	−1	1	3

What stays constant?

Each x-step of one raises y by two. The value at zero is one.

2



A (0, 1)
B (2, 5)

Find rise and run between the points.

Rise 4, run 2. Slope = 4/2 = 2.

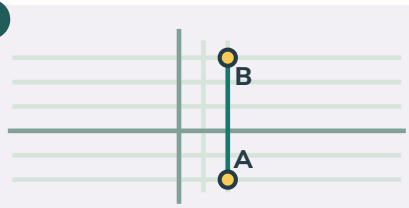
3

$$y = 3x - 2$$
$$\downarrow$$
$$10 = 3x - 2$$
$$\downarrow$$
$$x = 4$$

Which input produces output ten?

Undo subtraction, then divide by three. Check: 3 × 4 − 2 = 10.

4



A (2, -2)
B (2, 3)

Does this vertical line have slope zero?

No. Its run is zero, so rise divided by run is undefined. A horizontal line has slope zero.

y = 4
horizontal, slope zero.

x = 4
vertical, slope undefined.

CHAPTER PROBLEM

Tile pattern 1 uses 5 tiles. Each new pattern adds 3. How many tiles does pattern 8 use?

There are seven increases after pattern 1. So pattern 8 uses 5 + 7 × 3 = 26 tiles.

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 Can a rule give two different outputs for the very same input and still be a function?	No. Each allowed input has one output.
03 Can a complete row use exactly 26 sticks? Explain.	Subtract the fixed one to get 25. Since 25 is not divisible by three, no whole number of joined squares uses exactly 26 sticks.
04 For term n = 5n − 2, which term is 48?	Solve 5n − 2 = 48 to get n = 10.
05 A learner writes 4n for the sequence 4, 7, 10, … . Which term first disproves the rule?	Term one fits. Term two would be eight instead of seven, so term two disproves it.

$$2 \rightarrow -6 \rightarrow 18$$
$$\downarrow$$
$$r = -3$$

Does a negative ratio prevent growth in size?

No. Signs alternate while the magnitudes triple.

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