

Name _____

Date _____

9.1 Generating sequences — worked answers

Generate a sequence from its first term and a term-to-term rule, and describe the rule of a given sequence. · 64 questions

A · Fluency — Continue the sequence, name the rule.

- 1 The sequence is 3, 7, 11, 15, 19, ... What is the next term?
Answer: 23
Each term is 4 more than the one before: $19 + 4 = 23$.
- 2 The sequence is 5, 8, 11, 14, 17, ... What is the next term?
Answer: 20
Each term is 3 more than the one before: $17 + 3 = 20$.
- 3 The sequence is 2, 9, 16, 23, 30, ... What is the next term?
Answer: 37
Each term is 7 more than the one before: $30 + 7 = 37$.
- 4 The sequence is 10, 15, 20, 25, 30, ... What is the next term?
Answer: 35
Each term is 5 more than the one before: $30 + 5 = 35$.
- 5 The sequence is 1, 7, 13, 19, 25, ... What is the next term?
Answer: 31
Each term is 6 more than the one before: $25 + 6 = 31$.
- 6 The sequence is 8, 10, 12, 14, 16, ... What is the next term?
Answer: 18
Each term is 2 more than the one before: $16 + 2 = 18$.
- 7 The sequence is 12, 22, 32, 42, 52, ... What is the next term?
Answer: 62
Each term is 10 more than the one before: $52 + 10 = 62$.
- 8 The sequence is 7, 16, 25, 34, 43, ... What is the next term?
Answer: 52
Each term is 9 more than the one before: $43 + 9 = 52$.
- 9 The sequence is 4, 15, 26, 37, 48, ... What is the next term?
Answer: 59
Each term is 11 more than the one before: $48 + 11 = 59$.
- 10 The sequence is 20, 35, 50, 65, 80, ... What is the next term?
Answer: 95
Each term is 15 more than the one before: $80 + 15 = 95$.

- 11 The sequence is 6, 18, 30, 42, 54, ... What is the next term?

Answer: 66

Each term is 12 more than the one before: $54 + 12 = 66$.

- 12 The sequence is 9, 17, 25, 33, 41, ... What is the next term?

Answer: 49

Each term is 8 more than the one before: $41 + 8 = 49$.

- 13 The sequence is 30, 26, 22, 18, 14, ... What is the next term?

Answer: 10

Each term is 4 less than the one before: $14 - 4 = 10$.

- 14 The sequence is 25, 22, 19, 16, 13, ... What is the next term?

Answer: 10

Each term is 3 less than the one before: $13 - 3 = 10$.

- 15 The sequence is 50, 43, 36, 29, 22, ... What is the next term?

Answer: 15

Each term is 7 less than the one before: $22 - 7 = 15$.

- 16 The sequence is 18, 16, 14, 12, 10, ... What is the next term?

Answer: 8

Each term is 2 less than the one before: $10 - 2 = 8$.

- 17 The sequence is 40, 34, 28, 22, 16, ... What is the next term?

Answer: 10

Each term is 6 less than the one before: $16 - 6 = 10$.

- 18 The sequence is 100, 88, 76, 64, 52, ... What is the next term?

Answer: 40

Each term is 12 less than the one before: $52 - 12 = 40$.

- 19 The sequence is 14, 9, 4, -1, -6, ... What is the next term?

Answer: -11

Each term is 5 less than the one before: $-6 - 5 = -11$.

- 20 The sequence is 36, 27, 18, 9, 0, ... What is the next term?

Answer: -9

Each term is 9 less than the one before: $0 - 9 = -9$.

- 21 The sequence is 3, 7, 11, 15, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 4

$7 - 3 = 4$, and the same gap appears every time, so the rule is "add 4".

- 22 The sequence is 5, 8, 11, 14, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 3

$8 - 5 = 3$, and the same gap appears every time, so the rule is "add 3".

- 23 The sequence is 2, 9, 16, 23, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 7

$9 - 2 = 7$, and the same gap appears every time, so the rule is "add 7".

- 24** The sequence is 10, 15, 20, 25, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 5

$15 - 10 = 5$, and the same gap appears every time, so the rule is "add 5".

- 25** The sequence is 1, 7, 13, 19, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 6

$7 - 1 = 6$, and the same gap appears every time, so the rule is "add 6".

- 26** The sequence is 8, 10, 12, 14, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 2

$10 - 8 = 2$, and the same gap appears every time, so the rule is "add 2".

- 27** The sequence is 12, 22, 32, 42, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 10

$22 - 12 = 10$, and the same gap appears every time, so the rule is "add 10".

- 28** The sequence is 7, 16, 25, 34, ... What is the **term-to-term rule**? Give the number you add each time.

Answer: 9

$16 - 7 = 9$, and the same gap appears every time, so the rule is "add 9".

- 29** The sequence is 2, 4, 8, 16, ... What is the next term?

Answer: 32

Each term is 2 times the one before: $16 \times 2 = 32$.

- 30** The sequence is 3, 9, 27, 81, ... What is the next term?

Answer: 243

Each term is 3 times the one before: $81 \times 3 = 243$.

- 31** The sequence is 1, 5, 25, 125, ... What is the next term?

Answer: 625

Each term is 5 times the one before: $125 \times 5 = 625$.

- 32** The sequence is 4, 8, 16, 32, ... What is the next term?

Answer: 64

Each term is 2 times the one before: $32 \times 2 = 64$.

- 33** The sequence is 2, 20, 200, 2000, ... What is the next term?

Answer: 20000

Each term is 10 times the one before: $2000 \times 10 = 20000$.

- 34** The sequence is 5, 10, 20, 40, ... What is the next term?

Answer: 80

Each term is 2 times the one before: $40 \times 2 = 80$.

- 35** These are the square numbers: 1, 4, 9, 16, 25, ... What is the next one?

Answer: 36

The next term is $36 - 6^2 = 36$.

- 36** These are the cube numbers: 1, 8, 27, 64, ... What is the next one?

Answer: 125

The next term is $125 - 5^3 = 125$.

- 37** These are the triangular numbers: 1, 3, 6, 10, 15, ... What is the next one?

Answer: 21

The next term is 21 — add 6 this time.

- 38** These are the even numbers: 2, 4, 6, 8, 10, ... What is the next one?

Answer: 12

The next term is 12 — add 2.

- 39** These are the odd numbers: 1, 3, 5, 7, 9, ... What is the next one?

Answer: 11

The next term is 11 — add 2.

- 40** These are the multiples of 5: 5, 10, 15, 20, ... What is the next one?

Answer: 25

The next term is 25 — add 5.

B · Reasoning — What a rule does and does not say.

- 41** What is a **term** of a sequence?

- ☐ The rule
- ☐ One of the numbers in it
- ☐ The first number only
- ☐ The gap between numbers

Answer: One of the numbers in it

The 1st term, the 2nd term, and so on.

- 42** What does a **term-to-term rule** tell you?

- ☐ Any term directly from its position
- ☐ How to get from one term to the next
- ☐ The first term
- ☐ How many terms there are

Answer: How to get from one term to the next

It is a stepping rule: to use it you must already know the previous term.

- 43** To use a term-to-term rule you always need ...

- ☐ only the rule
- ☐ the rule and the first term
- ☐ the position
- ☐ nothing else

Answer: the rule and the first term

“Add 4” describes infinitely many sequences until you say where to start.

44 In the sequence 3, 7, 11, 15, ... what is the term-to-term rule?

- ☐ add 3
- ☐ add 4
- ☐ multiply by 2
- ☐ add 5

Answer: add 4

$7 - 3 = 4$, $11 - 7 = 4$, and so on.

45 A sequence goes 2, 6, 18, 54, ... What kind of rule is it?

- ☐ add 4
- ☐ add a growing amount
- ☐ multiply by 3
- ☐ subtract 4

Answer: multiply by 3

The gaps are 4, 12, 36 — not constant. But each term is 3 times the one before.

46 How can you tell a sequence is **linear**?

- ☐ It starts at 1
- ☐ The gap between terms is always the same
- ☐ It grows quickly
- ☐ The terms are all whole numbers

Answer: The gap between terms is always the same

A constant difference is exactly what makes a sequence linear.

47 Is 1, 4, 9, 16, 25 a linear sequence?

- ☐ Yes
- ☐ No

Answer: No

The gaps are 3, 5, 7, 9 — they change. These are the square numbers.

48 Is 5, 9, 13, 17 a linear sequence?

- ☐ Yes
- ☐ No

Answer: Yes

The gap is 4 every time.

49 The first term of a sequence is 6 and the rule is “subtract 2”. What is the 4th term?

- ☐ 0
- ☐ 2
- ☐ 4
- ☐ -2

Answer: 0

6, 4, 2, 0 — the 4th term is 0.

50 Why is “add 4” not enough to describe a sequence?

- ☐ It is enough
- ☐ Different starting numbers give different sequences
- ☐ 4 is too small
- ☐ You also need the last term

Answer: Different starting numbers give different sequences

1, 5, 9, ... and 3, 7, 11, ... both follow “add 4”.

C · Challenge — Jumping ahead and working back.

- 51** A sequence starts at 4 and the rule is “add 6”. What is the 10th term?

Answer: 58

The 10th term is $4 + 9 \times 6 = 4 + 54 = 58$. Nine steps, not ten — the first term takes no step.

- 52** A sequence starts at 100 and the rule is “subtract 7”. What is the 8th term?

Answer: 51

$100 - 7 \times 7 = 100 - 49 = 51$.

- 53** The 3rd term of a linear sequence is 11 and the 4th is 15. What is the 1st term?

Answer: 3

The gap is 4, so step back twice: $11 - 4 - 4 = 3$.

- 54** The 2nd term of a linear sequence is 9 and the 5th is 21. What is the term-to-term rule? Give the number added each time.

Answer: 4

Three steps take you from 9 to 21, so each step is $(21 - 9) \div 3 = 4$.

- 55** A sequence starts at 2 and doubles each time. What is the 7th term?

Answer: 128

2, 4, 8, 16, 32, 64, 128.

- 56** The 1st term is 5 and the 6th term is 30. If the sequence is linear, what is the common difference?

Answer: 5

Five steps cover $30 - 5 = 25$, so each step is 5.

D · Word problems — Growth, costs and patterns.

- 57** A plant is 8 cm tall and grows 3 cm a week. How tall is it after 5 weeks, in cm?

Answer: 23

$8 + 5 \times 3 = 23$ cm.

- 58** A tank holds 200 litres and loses 15 litres a day. How much is left after 6 days, in litres?

Answer: 110

$200 - 6 \times 15 = 200 - 90 = 110$ litres.

- 59** A taxi charges \$3 to start and \$2 a kilometre. What is the cost of a 7 km trip, in dollars?

Answer: 17

$3 + 7 \times 2 = 17$.

- 60** Chairs are set out in rows: 6 in row 1, 9 in row 2, 12 in row 3. How many in row 6?

Answer: 21

The rule is add 3: $6 + 5 \times 3 = 21$.

- 61** A savings account starts with \$40 and \$12 is added each month. How much after 9 months, in dollars?

Answer: 148

$40 + 9 \times 12 = 148$.

- 62** A pattern uses 4 sticks for 1 square, 7 for 2 squares, 10 for 3. How many sticks for 8 squares?

Answer: 25

The rule is add 3: $4 + 7 \times 3 = 25$.

- 63** A bacteria colony doubles every hour, starting at 3. How many after 5 hours?

Answer: 96

3, 6, 12, 24, 48, 96.

- 64** A ladder has rungs 25 cm apart, the first 30 cm off the ground. How high is the 6th rung, in cm?

Answer: 155

$30 + 5 \times 25 = 155$ cm.