

Name _____

Date _____

9.2 Using the n th term — worked answers

Find the n th term of a linear sequence and use it to find any term, or to test whether a number is in the sequence. · 61 questions

A · Fluency — Substitute, and find the rule.

- 1 The n th term of a sequence is $2n + 1$. What is the 1st term?

Answer: 3

Substitute $n = 1$: $2(1) + 1 = 3$.

- 2 The n th term is $2n + 1$. What is the 10th term?

Answer: 21

Substitute $n = 10$: $2(10) + 1 = 21$.

- 3 The n th term of a sequence is $5n - 4$. What is the 1st term?

Answer: 1

Substitute $n = 1$: $5(1) - 4 = 1$.

- 4 The n th term is $5n - 4$. What is the 10th term?

Answer: 46

Substitute $n = 10$: $5(10) - 4 = 46$.

- 5 The n th term of a sequence is $3n + 2$. What is the 1st term?

Answer: 5

Substitute $n = 1$: $3(1) + 2 = 5$.

- 6 The n th term is $3n + 2$. What is the 10th term?

Answer: 32

Substitute $n = 10$: $3(10) + 2 = 32$.

- 7 The n th term of a sequence is $4n - 2$. What is the 1st term?

Answer: 2

Substitute $n = 1$: $4(1) - 2 = 2$.

- 8 The n th term is $4n - 2$. What is the 10th term?

Answer: 38

Substitute $n = 10$: $4(10) - 2 = 38$.

- 9 The n th term of a sequence is $n + 6$. What is the 1st term?

Answer: 7

Substitute $n = 1$: $(1) + 6 = 7$.

- 10 The n th term is $n + 6$. What is the 10th term?

Answer: 16

Substitute $n = 10$: $(10) + 6 = 16$.

- 11** The n th term of a sequence is $10n - 6$. What is the 1st term?

Answer: 4

Substitute $n = 1$: $10(1) - 6 = 4$.

- 12** The n th term is $10n - 6$. What is the 10th term?

Answer: 94

Substitute $n = 10$: $10(10) - 6 = 94$.

- 13** The n th term of a sequence is $6n$. What is the 1st term?

Answer: 6

Substitute $n = 1$: $6(1) = 6$.

- 14** The n th term is $6n$. What is the 10th term?

Answer: 60

Substitute $n = 10$: $6(10) = 60$.

- 15** The n th term of a sequence is $2n + 8$. What is the 1st term?

Answer: 10

Substitute $n = 1$: $2(1) + 8 = 10$.

- 16** The n th term is $2n + 8$. What is the 10th term?

Answer: 28

Substitute $n = 10$: $2(10) + 8 = 28$.

- 17** The n th term of a sequence is $3n - 3$. What is the 1st term?

Answer: 0

Substitute $n = 1$: $3(1) - 3 = 0$.

- 18** The n th term is $3n - 3$. What is the 10th term?

Answer: 27

Substitute $n = 10$: $3(10) - 3 = 27$.

- 19** The n th term of a sequence is $5n + 3$. What is the 1st term?

Answer: 8

Substitute $n = 1$: $5(1) + 3 = 8$.

- 20** The n th term is $5n + 3$. What is the 10th term?

Answer: 53

Substitute $n = 10$: $5(10) + 3 = 53$.

- 21** The n th term of a sequence is $4n + 8$. What is the 1st term?

Answer: 12

Substitute $n = 1$: $4(1) + 8 = 12$.

- 22** The n th term is $4n + 8$. What is the 10th term?

Answer: 48

Substitute $n = 10$: $4(10) + 8 = 48$.

- 23** The n th term of a sequence is $7n + 2$. What is the 1st term?

Answer: 9

Substitute $n = 1$: $7(1) + 2 = 9$.

- 24 The n th term is $7n + 2$. What is the 10th term?

Answer: 72

Substitute $n = 10$: $7(10) + 2 = 72$.

- 25 Find the n th term of 3, 5, 7, 9, ...

Answer: $2n + 1$

The common difference is 2, so the rule starts $2n$. Then $2 \times 1 = 2$, and the first term is 3, so the constant is 1. The rule is $2n + 1$.

- 26 Find the n th term of 1, 6, 11, 16, ...

Answer: $5n - 4$

The common difference is 5, so the rule starts $5n$. Then $5 \times 1 = 5$, and the first term is 1, so the constant is -4. The rule is $5n - 4$.

- 27 Find the n th term of 5, 8, 11, 14, ...

Answer: $3n + 2$

The common difference is 3, so the rule starts $3n$. Then $3 \times 1 = 3$, and the first term is 5, so the constant is 2. The rule is $3n + 2$.

- 28 Find the n th term of 2, 6, 10, 14, ...

Answer: $4n - 2$

The common difference is 4, so the rule starts $4n$. Then $4 \times 1 = 4$, and the first term is 2, so the constant is -2. The rule is $4n - 2$.

- 29 Find the n th term of 7, 8, 9, 10, ...

Answer: $n + 6$

The common difference is 1, so the rule starts $1n$. Then $1 \times 1 = 1$, and the first term is 7, so the constant is 6. The rule is $n + 6$.

- 30 Find the n th term of 4, 14, 24, 34, ...

Answer: $10n - 6$

The common difference is 10, so the rule starts $10n$. Then $10 \times 1 = 10$, and the first term is 4, so the constant is -6. The rule is $10n - 6$.

- 31 Find the n th term of 6, 12, 18, 24, ...

Answer: $6n$

The common difference is 6, so the rule starts $6n$. Then $6 \times 1 = 6$, and the first term is 6, so the constant is 0. The rule is $6n$.

- 32 Find the n th term of 10, 12, 14, 16, ...

Answer: $2n + 8$

The common difference is 2, so the rule starts $2n$. Then $2 \times 1 = 2$, and the first term is 10, so the constant is 8. The rule is $2n + 8$.

- 33 The n th term is $2n + 1$. What is the 20th term?

Answer: 41

Substitute $n = 20$: $2(20) + 1 = 41$.

- 34 The n th term is $5n - 4$. What is the 15th term?

Answer: 71

Substitute $n = 15$: $5(15) - 4 = 71$.

- 35 The n th term is $3n + 2$. What is the 12th term?

Answer: 38

Substitute $n = 12$: $3(12) + 2 = 38$.

- 36** The n th term is $4n - 2$. What is the 25th term?

Answer: 98

Substitute $n = 25$: $4(25) - 2 = 98$.

- 37** The n th term is $n + 6$. What is the 50th term?

Answer: 56

Substitute $n = 50$: $(50) + 6 = 56$.

- 38** The n th term is $10n - 6$. What is the 30th term?

Answer: 294

Substitute $n = 30$: $10(30) - 6 = 294$.

B · Reasoning — What each part of the rule means.

- 39** What does the **n th term** rule let you do?

- ☐ Find the next term
- ☐ Find any term straight from its position
- ☐ Find the first term only
- ☐ Count the terms

Answer: Find any term straight from its position

That is its advantage over the term-to-term rule: no stepping.

- 40** In the n th term rule $4n + 1$, what does the 4 tell you?

- ☐ The first term
- ☐ The common difference
- ☐ The number of terms
- ☐ The last term

Answer: The common difference

The coefficient of n is always the constant gap.

- 41** In the rule $4n + 1$, how do you get the first term?

- ☐ It is 1
- ☐ It is 4
- ☐ Substitute $n = 1$ to get 5
- ☐ It is $4 + 1 + 1$

Answer: Substitute $n = 1$ to get 5

$4(1) + 1 = 5$. The constant on its own is the “zeroth” term, not the first.

- 42** The n th term of a sequence is $5n - 2$. What is the common difference?

- ☐ 5
- ☐ -2
- ☐ 3
- ☐ 2

Answer: 5

The number in front of n .

- 43** A sequence has common difference 3 and first term 7. What is the n th term?

- ☐ $3n$
☐ $3n + 7$
☐ $3n + 4$
☐ $7n + 3$

Answer: $3n + 4$

$3n$ gives 3, 6, 9, ... but we want 7, 10, 13, ... which is 4 more each time. So $3n + 4$.

- 44** Why does a decreasing sequence have a negative coefficient of n ?

- ☐ It does not
☐ Because the terms go down as the position goes up
☐ Because the first term is negative
☐ Because of the constant

Answer: Because the terms go down as the position goes up

20, 17, 14, ... has difference -3 , so the rule is $-3n + 23$.

- 45** Is $2n + 3$ the same sequence as $3 + 2n$?

- ☐ Yes
☐ No

Answer: Yes

Addition can be written either way round.

- 46** Does the n th term rule $4n + 1$ ever give 22?

- ☐ Yes
☐ No

Answer: No

$4n + 1 = 22$ gives $n = 5.25$, which is not a whole position.

- 47** How do you check an n th-term rule you have found?

- ☐ You cannot
☐ Substitute $n = 1, 2, 3$ and compare with the sequence
☐ Look at the last term only
☐ Ask the teacher

Answer: Substitute $n = 1, 2, 3$ and compare with the sequence

Thirty seconds of checking catches almost every error.

C · Challenge — Positions, and what is not a term.

- 48** Find the n th term of 20, 17, 14, 11, ...

Answer: $-3n + 23$

The difference is -3 , so the rule starts $-3n$. $-3 \times 1 = -3$, and the first term is 20, so the constant is 23.

Check: $-3(1) + 23 = 20$ ✓

- 49** The n th term is $6n - 4$. Which position gives the term 50?

Answer: 9

$6n - 4 = 50$, so $6n = 54$ and $n = 9$.

- 50** The n th term is $3n + 7$. Which position gives the term 40?

Answer: 11

$3n + 7 = 40$, so $3n = 33$ and $n = 11$.

- 51 Is 100 a term of the sequence with n th term $4n + 2$?

☐ Yes
☐ No

Answer: No

$4n + 2 = 100$ gives $n = 24.5$, which is not a whole position.

- 52 Is 62 a term of the sequence with n th term $4n + 2$?

☐ Yes
☐ No

Answer: Yes

$4n + 2 = 62$ gives $n = 15$, a whole position.

- 53 The 1st term is 8 and the 5th is 28. What is the coefficient of n in the n th-term rule?

Answer: 5

Four steps cover $28 - 8 = 20$, so the difference is 5.

D · Word problems — Costs, patterns and growth.

- 54 A taxi costs $2n + 3$ dollars for n kilometres. What does a 12 km trip cost, in dollars?

Answer: 27

$2(12) + 3 = 27$.

- 55 A pattern uses $3n + 1$ sticks for n squares. How many sticks for 15 squares?

Answer: 46

$3(15) + 1 = 46$.

- 56 A plant's height in cm after n weeks is $4n + 6$. How tall after 9 weeks, in cm?

Answer: 42

$4(9) + 6 = 42$ cm.

- 57 A gym charges $5n + 20$ dollars for n months. What is the cost of a year, in dollars?

Answer: 80

$5(12) + 20 = 80$.

- 58 A tank holds $500 - 8n$ litres after n days. How much after 20 days, in litres?

Answer: 340

$500 - 8(20) = 500 - 160 = 340$.

- 59 A pattern uses $3n + 1$ sticks. How many squares can be made with 34 sticks?

Answer: 11

$3n + 1 = 34$, so $3n = 33$ and $n = 11$.

- 60 A taxi costs $2n + 3$ dollars. How far can you go for 25 dollars, in km?

Answer: 11

$2n + 3 = 25$, so $2n = 22$ and $n = 11$.

- 61 Seats in row n number $4n + 8$. Which row has 48 seats?

Answer: 10

$4n + 8 = 48$, so $4n = 40$ and $n = 10$.