Name & Surname: _____ Class: _____ Date: _____

Patterns in Numbers

Recognise arithmetic sequences and find the nth term

About 30 minutes Level ★★★☆☆



Arithmetic sequences

An **arithmetic sequence** goes up or down by the same amount each time.

- Find the common difference by subtracting: 9 − 4 = 5
- The rule 3n means 3, 6, 9... For 4, 7, 10... add 1 more, so 3n + 1
- Check your nth term with n = 1 and n = 2

Task A

Example done for you

/4

Match each word to its meaning by writing the number in the circle.

1	arithmetic sequence	◯	where a term is in the list: 1st, 2nd, 3rd...
2	common difference	◯	one number in a sequence
3	term	◯	the amount added each time in an arithmetic sequence
4	nth term	(1)	a list that goes up or down by the same amount each time
5	position	◯	a rule for working out any term from its position

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Find the Difference

Practise spotting arithmetic sequences and writing simple nth terms.

Task B /12

Work through the sequence problems. Show your working.

WARM UP

1 Find the **difference** in 4, 9, 14, 19, ...

Answer: _____

2 What is the next **term** in 4, 9, 14, 19, ...?

Answer: _____

3 Find the **difference** in 20, 17, 14, 11, ...

Answer: _____

4 What is the next **term** in 20, 17, 14, 11, ...?

Answer: _____

PRACTISE

5 Find the 6th **term** in 2, 6, 10, 14, ...

Answer: _____

6 Find the 10th **term** in 5, 9, 13, 17, ...

Answer: _____

7 Find the **nth term** of 3, 7, 11, 15, ...

Answer: _____

8 Find the **nth term** of 6, 10, 14, 18, ...

Answer: _____

PROBLEM SOLVING

9 Stamps after 1, 2, 3 visits are 7, 9, 11, ... How many **stamps** after 8 visits?

Answer: _____

10 Explain how you know 4, 7, 10, 13, ... is **arithmetic**. Start with: It is arithmetic because...

Answer: _____

11 Is 3, 6, 12, 24, ... **arithmetic**? Explain how you know.

Answer: _____

12 Find the 20th **term** of 1, 4, 7, 10, ...

Answer: _____

Key words

sequence: a list of numbers in order

term: one number in a sequence

arithmetic: going up or down by the same amount

difference: the amount added each time

position: the place of a term: 1st, 2nd, 3rd

nth term: rule for any term from its position

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Use the Rule

Go further with harder differences and using the nth term.

Task C /12

Solve each sequence question. Check the nth term with n = 1.

WARM UP

1. Find the **difference** in 12, 19, 26, 33, ...

Answer: _____

2. What is the 5th **term** in 12, 19, 26, 33, ...?

Answer: _____

3. Find the **difference** in 30, 26, 22, 18, ...

Answer: _____

4. Find the **nth term** of 5, 10, 15, 20, ...

Answer: _____

PRACTISE

5. Find the **nth term** of 8, 12, 16, 20, ...

Answer: _____

6. Find the **nth term** of 25, 21, 17, 13, ...

Answer: _____

7. Use the **nth term** 6n + 1 to find the 9th term.

Answer: _____

8. Use the **nth term** 20 – 3n to find the 7th term.

Answer: _____

PROBLEM SOLVING

9. Row 1 has 6 seats, row 2 has 9 seats, row 3 has 12 seats. How many **seats** in row 10?

Answer: _____

10. A plant is 10 cm tall and grows 2 cm each week. How tall (cm) after 12 **weeks**?

Answer: _____

11. The **nth term** is 2n + 5. Explain how you know the sequence is arithmetic.

Answer: _____

12. Find the 15th **term** of 50, 45, 40, 35, ...

Answer: _____

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Clear the Confusion

Sort out easy mix-ups, then fill in the missing terms.

Task D

/6

Explain the difference between each pair in one or two sentences.

term vs **nth term**

The difference is…

4n + 1 vs **4n**

The difference is…

2, 5, 8, 11, … vs **2, 4, 8, 16, …**

The difference is…

Task E

/11

Fill in the missing terms. Then write the nth term where asked.

1. 4, 7, 10, 13, ____, ____

   nth term: _____

2. 32, 28, 24, 20, ____, ____

   nth term: _____

3. 2, 6, 18, 54, ____, ____

4. 10, 15, ____, 25, ____, 35

   nth term: _____

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Check Your Understanding

Follow the worked methods, then spot the common mistakes.

Task F

/2

Study the method in each example, then try the next question the same way.

WORKED EXAMPLE

Find the nth term of 6, 9, 12, 15, …

1. Find the **difference**: 9 − 6 = 3
2. Start with 3n: 3, 6, 9, 12…
3. Add 3 to reach 6, 9, 12… so 3n + 3

Answer: 3n + 3

YOUR TURN

Find the nth term of 5, 8, 11, 14, …

Answer: _____

WORKED EXAMPLE

The nth term is 5n − 2. Find the 10th term.

1. Put n = 10 into the **rule**: 5 × 10 − 2
2. Multiply first: 5 × 10 = 50
3. Subtract: 50 − 2 = 48

Answer: 48

YOUR TURN

The nth term is 7n − 3. Find the 8th term.

Answer: _____

Task G

Example done for you

/5

Tick true or false. Watch for common mistakes.

Statement	True	False
5, 9, 13, 17, … is arithmetic.	✓	
The nth term of 2, 4, 6, 8, … is n + 2.		
The nth term of 7, 11, 15, 19, … is 4n + 3.		
3, 6, 12, 24, … is arithmetic.		
If the nth term is 10 − 2n, the 5th term is 0.		
In 20, 17, 14, 11, … the common difference is 3.		

How did I do?

Circle a face for each line.

I can spot an arithmetic sequence and find its difference ☹ 😐 ☺

I can find the nth term of an arithmetic sequence ☹ 😐 ☺

I can use the nth term to find any term ☹ 😐 ☺

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Answer sheet: Patterns in Numbers

Task A

1. arithmetic sequence → a list that goes up or down by the same amount each time
2. common difference → the amount added each time in an arithmetic sequence
3. term → one number in a sequence
4. nth term → a rule for working out any term from its position
5. position → where a term is in the list: 1st, 2nd, 3rd...

Task B

1. 5
2. 24
3. -3
4. 8
5. 22
6. 41
7. 4n - 1
8. 4n + 2
9. 21
10. It is arithmetic because it goes up by 3 each time.
11. No, it multiplies by 2 each time so the difference is not the same.
12. 58

Task C

1. 7
2. 40
3. -4
4. 5n
5. 4n + 4
6. -4n + 29
7. 55
8. -1
9. 33
10. 34
11. It goes up by 2 each time because n is multiplied by 2.
12. -20

Task D

1. A term is one number in the list. The nth term is the rule that gives any term from its position.
2. Both go up in 4s, but 4n + 1 gives 5, 9, 13... while 4n gives 4, 8, 12...
3. The first adds 3 each time so it is arithmetic. The second multiplies by 2 each time so it is not arithmetic.

Task E

1. 16, 19; nth term 3n + 1
2. 16, 12; nth term −4n + 36
3. 162, 486
4. 20, 30; nth term 5n + 5

Task F

1. 3n + 2
2. 53

Task G

1. True
2. False
3. True
4. False
5. True
6. False

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