THIRD SPACE
LEARNING

Quadratic Sequences - Worksheet

Skill

Group A - Generate terms of quadratic sequences with $a = 1$

Calculate the first five terms for each quadratic sequence.

1) n^2

2) $n^2 + 1$

3) $n^2 - 8$

4) $n^2 + 4n$

5) $n^2 - 3n$

6) $n^2 + 4n + 3$

7) $n^2 - 5n - 8$

8) $n(n + 5)$

9) $n(n - 5) + 10$

Group B - Generate terms of quadratic sequences with $a \neq 1$

Calculate the first five terms for each quadratic sequence:

1) $2n^2$

2) $4n^2 + 3$

3) $5n^2 - 7$

4) $0.5n^2 + 3$

5) $\frac{n^2}{10} + 6$

6) $-3n^2 + 5n$

7) $-2n^2 - 2n - 3$

8) $2n(n + 1)$

9) $-n(n - 4) + 3$

Group C - Find the nth term of quadratic sequences

Find the nth term for the following quadratic sequences:

1) 6, 9, 14, 21, 30

2) 2, 6, 12, 20, 30

3) 4, 9, 16, 25, 36

4) $-9, -10, -9, -6, -1$

5) 8, 14, 24, 38, 56

6) $-1, 4, 15, 32, 55$

7) 13, 31, 57, 91, 133

8) $0.2, 0.8, 1.8, 3.2, 5$

9) 7, 12, 15, 16, 15

Quadratic Sequences - Worksheet

Applied

1)   Work out an expression for the nth term of the quadratic sequence:

$$6, \ 11, \ 18, \ 27, \ 38$$

Give your answer in the form $an^2 + bn + c$ where $a, \ b$, and c are constants.

2)   Below are the first four cuboids in a sequence. Each cuboid is split into $1cm$ cubes. The front face is highlighted in purple.

Pattern 1   Pattern 2   Pattern 3   Pattern 4
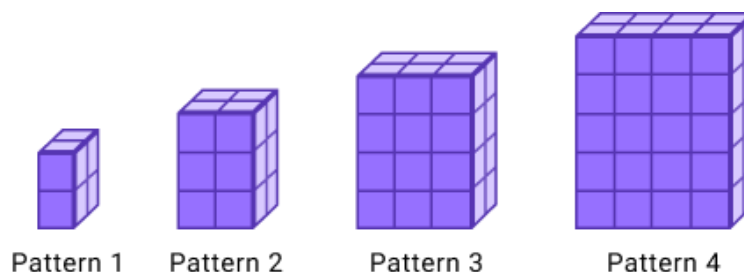
(a)   What is the area of the front face of Pattern 5?

(b)   What is the area of the front face of Pattern n?

3)   Each term in the arithmetic sequence $5, \ 7, \ 9, \ 11, \ 13, \ ...$ is squared.

(a)   Calculate the nth term of the new, quadratic sequence.

(b)   What is the value of the 10th term in this quadratic sequence?

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Quadratic Sequences - Exam Questions

1) **(a)** Write down the next two terms in the following quadratic sequence:

11, 15, 21, 29, ...

....
(1)

(b) By determining the second difference, write an expression for the nth term.

....
(3)
(4 marks)

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2) Which of these sequences is a quadratic sequence. Circle your answer.

$4, 5, 9, 14, 23, ...$ $-6, -11, -16, -21, -26, ...$

$7, 13, 23, 37, 55, ...$ $8, 4, 2, 1, 0.5, ...$

....
(1 mark)

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3) **(a)** The nth term of a sequence is $n^2 + 4n - 1$.
Work out the 8th term of the sequence.

....
(1)

(b) What value for n in the sequence above has a term value of 44?
Do not use trial and improvement.

....
(3)
(4 marks)

Quadratic Sequences - Exam Questions

4)   The nth term of a sequence is $2n - n^2$.

     (a)   Calculate the difference between the 5th and 8th term.

                ....

                (3)

     (b)   Which term of the sequence is equal to -35?

                ....

                (3)

     (c)   Which term of the sequence is equal to 0?

                ....

                (2)

                (8 marks)

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5)   Work out the formula for the nth term of the sequence:

     $19, \ 15, \ 9, \ 1, \ ...$

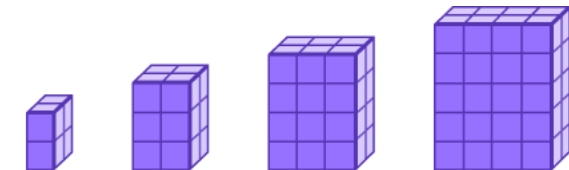   Write your answer in the form $an^2 + bn + c$ where $a, \ b,$ and c are constants.

                ....

                (4 marks)

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Quadratic Sequences - Answers

	Question	Answer
	Skill Questions	
Group A	Calculate the first five terms for each quadratic sequence. **1)** n^2 **2)** $n^2 + 1$ **3)** $n^2 - 8$ **4)** $n^2 + 4n$ **5)** $n^2 - 3n$ **6)** $n^2 + 4n + 3$ **7)** $n^2 - 5n - 8$ **8)** $n(n + 5)$ **9)** $n(n - 5) + 10$	**1)** 1, 4, 9, 16, 25 **2)** 2, 5, 10, 17, 26 **3)** $-7, -4, 1, 8, 17$ **4)** 5, 12, 21, 32, 45 **5)** $-2, -2, 0, 4, 10$ **6)** 8, 15, 24, 35, 48 **7)** $-12, -14, -14, -12, -8$ **8)** 6, 14, 24, 36, 50 **9)** 6, 4, 4, 6, 10
Group B	Calculate the first five terms for each quadratic sequence: **1)** $2n^2$ **2)** $4n^2 + 3$ **3)** $5n^2 - 7$ **4)** $0.5n^2 + 3$ **5)** $\frac{n^2}{10} + 6$ **6)** $-3n^2 + 5n$ **7)** $-2n^2 - 2n - 3$ **8)** $2n(n + 1)$ **9)** $-n(n - 4) + 3$	**1)** 2, 8, 18, 32, 50 **2)** 7, 19, 39, 67, 103 **3)** $-2, 13, 38, 73, 118$ **4)** $3.5, 5, 7.5, 11, 15.5$ **5)** $6.1, 6.4, 6.9, 7.6, 8.5$ **6)** $2, -2, -12, -28, -50$ **7)** $-7, -15, -27, -43, -63$ **8)** 4, 12, 24, 40, 60 **9)** $6, 7, 6, 3, -2$

Quadratic Sequences - Answers

Group C	Find the nth term for the following quadratic sequences:	
	1) 6, 9, 14, 21, 30	**1)** $n^2 + 5$
	2) 2, 6, 12, 20, 30	**2)** $n^2 + n$
	3) 4, 9, 16, 25, 36	**3)** $n^2 + 2n + 1$ or $(n + 1)^2$
	4) $-9, \ -10, \ -9, \ -6, \ -1$	**4)** $n^2 - 4n - 6$
	5) 8, 14, 24, 38, 56	**5)** $2n^2 + 6$
	6) $-1, 4, 15, 32, 55$	**6)** $3n^2 - 4n$
	7) 13, 31, 57, 91, 133	**7)** $4n^2 + 6n + 3$
	8) 0.2, 0.8, 1.8, 3.2, 5	**8)** $\frac{n^2}{5}$
	9) 7, 12, 15, 16, 15	**9)** $n(8 - n)$ or $8n - n^2$

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Quadratic Sequences - Answers

	Question	Answer
	Applied Questions	
1)	Work out an expression for the nth term of the quadratic sequence: 6, 11, 18, 27, 38 Give your answer in the form $an^2 + bn + c$ where a, b, and c are constants.	$n^2 + 2n + 3$
2)	Below are the first four cuboids in a sequence. Each cuboid is split into $1cm$ cubes. The front face is highlighted in purple. Pattern 1 Pattern 2 Pattern 3 Pattern 4 **a)** What is the area of the front face of Pattern 5? **b)** What is the area of the front face of Pattern n?	**a)** $30cm^2$ **b)** $n(n+1) = n^2 + n$
3)	Each term in the arithmetic sequence 5, 7, 9, 11, 13, ... is squared. **a)** Calculate the nth term of the new, quadratic sequence. **b)** What is the value of the 10th term in this quadratic sequence?	**a)** $(2n+3)^2 = 4n^2 + 12n + 9$ **b)** 529

Quadratic Sequences - Mark Scheme

		Question	Answer	
		Exam Questions		
1)	**(a)**	Write down the next two terms in the following quadratic sequence: 11, 15, 21, 29, …	**(a)** 39, 51	**(1)**
	(b)	By determining the second difference, write an expression for the nth term.	**(b)** n^2 $n + 9$ $n^2 + n + 9$	**(1)** **(1)** **(1)**
2)		Which of these sequences is a quadratic sequence. Circle your answer. 4, 5, 9, 14, 23, … $-6, -11, -16,$ $-21, -26, …$ 7, 13, 23, 37, 55, … 8, 4, 2, 1, 0.5, …	7, 13, 23, 37, 55	**(1)**
3)	**(a)**	The nth term of a sequence is $n^2 + 4n - 1$. Work out the 8th term of the sequence.	**(a)** 95	**(1)**
	(b)	What value for n in the sequence above has a term value of 44? Do not use trial and improvement.	**(b)** $n^2 + 4n - 1 = 44$ $n^2 + 4n - 45 = 0$ $(n + 9)(n - 5) = 0$ so $n = 5$ only.	**(1)** **(1)** **(1)**
4)		The nth term of a sequence is $2n - n^2$.		
	(a)	Calculate the difference between the 5th and 8th term.	**(a)** 5th term $= -15$ 8th term $= -48$ 5th term $-$ 8th term $= 33$	**(1)** **(1)** **(1)**
	(b)	Which term of the sequence is equal to -35?	**(b)** $2n - n^2 = -35$ $n^2 - 2n - 35 = 0$ $(n - 7)(n + 5) = 0$ so $n = 7$ only.	**(1)** **(1)** **(1)**
	(c)	Which term of the sequence is equal to 0?	**(c)** $n(2 - n) = 0$ $n = 2$ only. <u>Or</u> using substitution of $n = 1$ <u>and</u> $n = 2$ into the nth term $n = 2$.	**(1)** **(1)** **(1)** **(1)**

Quadratic Sequences - Mark Scheme

5)	Work out the formula for the nth term of the sequence: 19, 15, 9, 1, ... Write your answer in the form $an^2 + bn + c$ where a, b, and c are constants.	Second difference $= -2$ $-n^2 = -1, \; -4, \; -9, \; -16, \; -25,$	**(1)**
		20, 19, 18, 17, 16, $(= 21 - n \text{ or } -n + 21)$	**(1)**
		$n\text{th term} = -n^2 - n + 21$	**(1)**
		$a = -1, \; b = -1, \; c = 21$.	**(1)**