

GRADE 8 MATHEMATICS

Sequences, Patterns & Algebraic Rules

Complete Printable Worksheet Pack

6 Practice Worksheets • 6 Answer Keys

Discover patterns • Build algebraic rules • Apply them to real situations

Name: _____ Date: _____

Worksheet 1 — Number Patterns & Rules

Show your working and explain the rule you use.

1. Continue: 4, 9, 14, 19, __, __.
2. Continue: 72, 64, 56, 48, __, __.
3. Find the rule: 6, 11, 16, 21, 26.
4. Find the rule: 50, 45, 40, 35, 30.
5. Find the next three terms: 3, 7, 11, 15, ...
6. Find the missing terms: 8, __, 20, __, 32.
7. A sequence starts at 5 and increases by 7 each time. Write its first six terms.
8. A sequence starts at 80 and decreases by 6 each time. Find the 8th term.
9. Explain how you know whether an arithmetic sequence is increasing or decreasing.
10. Challenge: Find the next two terms and explain the rule: 2, 6, 12, 20, 30, __, __.

Working space:

Answer Key 1 — Number Patterns & Rules

1. 24, 29
2. 40, 32
3. Add 5
4. Subtract 5
5. 19, 23, 27
6. 14, 26
7. 5, 12, 19, 26, 33, 40
8. 38
9. Compare consecutive differences: positive means increasing, negative means decreasing
10. 42, 56; add consecutive even numbers (+4, +6, +8, +10, +12, +14)

Worksheet 2 — Arithmetic Sequences

Show your working and explain the rule you use.

1. Find the common difference: 7, 13, 19, 25, ...
2. Find the 10th term: 4, 9, 14, 19, ...
3. Find the 12th term: 30, 27, 24, 21, ...
4. Write the first five terms when the first term is 8 and the common difference is 6.
5. Write the first five terms when the first term is 50 and the common difference is -7 .
6. Is 74 a term of the sequence 5, 12, 19, 26, ...? Explain.
7. Is 100 a term of the sequence 8, 14, 20, 26, ...? Explain.
8. Find the missing term: 11, 17, __, 29, 35.
9. The 5th term of an arithmetic sequence is 23 and the common difference is 4. Find the first term.
10. Challenge: The 3rd term is 14 and the 8th term is 39. Find the common difference and the first term.

Working space:

Answer Key 2 — Arithmetic Sequences

1. 6
2. 49
3. -3 difference, 12th term = -3
4. 8, 14, 20, 26, 32
5. 50, 43, 36, 29, 22
6. Yes; $5 + 7 \times 9 = 68$, so no. 74 is not a term.
7. Yes; $8 + 6 \times 15 = 98$, so no. 100 is not a term.
8. 23
9. 7
10. Difference = 5; first term = 4

Worksheet 3 — Finding Algebraic Rules

Show your working and explain the rule you use.

1. Write a rule for the sequence 3, 6, 9, 12, ... using n .
2. Write a rule for 5, 9, 13, 17, ...
3. Write a rule for 20, 17, 14, 11, ...
4. Find the 15th term using the rule $a_n = 4n + 1$.
5. Find the 20th term using $a_n = 7n - 3$.
6. Find the 12th term using $a_n = 30 - 2n$.
7. A sequence follows $a_n = 5n + 2$. Find its first four terms.
8. A sequence follows $a_n = 100 - 6n$. Find its 10th term.
9. Which term of $a_n = 3n + 4$ is equal to 40?
10. Challenge: Find a formula for 7, 12, 17, 22, ... and use it to find the 25th term.

Working space:

Answer Key 3 — Finding Algebraic Rules

1. $a_n = 3n$

2. $a_n = 4n + 1$

3. $a_n = 23 - 3n$

4. 61

5. 137

6. 6

7. 7, 12, 17, 22

8. 40

9. $n = 12$

10. $a_n = 5n + 2$; 25th term = 127

Worksheet 4 — Patterns with Shapes & Tables

Show your working and explain the rule you use.

1. A pattern has 4 matchsticks in Figure 1, 7 in Figure 2, and 10 in Figure 3. How many in Figure 4?
2. Using the pattern above, write a rule for Figure n .
3. A tile pattern has 5 tiles in Figure 1, 9 in Figure 2, 13 in Figure 3. Find Figure 10.
4. A growing pattern has values 2, 5, 8, 11. What value appears at Figure 15?
5. A table shows n : 1, 2, 3, 4 and value: 6, 10, 14, 18. Find the rule.
6. Using the rule from Q5, find the value when $n = 25$.
7. A pattern follows the rule $2n + 3$. Complete the table for $n = 1, 4, 7, 10$.
8. A pattern follows the rule $50 - 4n$. For which positive n is the value 22?
9. A student says a pattern with differences 5, 5, 5, 5 must have rule $5n$. Is that always true? Explain.
10. Challenge: A pattern has 8 tiles in Figure 1 and increases by 6 tiles each figure. Find the number of tiles in Figure 20.

Working space:

Answer Key 4 — Patterns with Shapes & Tables

1. 13

2. $3n + 1$

3. 41

4. 44

5. $4n + 2$

6. 102

7. 5, 11, 17, 23

8. $n = 7$

9. No; the rule could be $5n + c$, depending on the first term

10. 122

Worksheet 5 — Patterns in Real Life

Show your working and explain the rule you use.

1. A savings plan starts with \$20 and adds \$15 each week. Write a rule for the amount after n weeks if \$20 is the amount at week 0.
2. Using the rule from Q1, find the amount after 12 weeks.
3. A theatre has 18 seats in the first row and 2 more seats in each following row. Write a rule for row n .
4. Using the theatre rule, find the number of seats in row 15.
5. A delivery company charges \$10 plus \$4 per kilometre. Write a rule for the cost of k kilometres.
6. Find the cost for 18 km.
7. A plant is 12 cm tall and grows 3 cm each week. Write a rule for its height after n weeks.
8. Find its height after 9 weeks.
9. A staircase pattern uses 6 blocks in Figure 1 and adds 4 blocks per figure. Find the number of blocks in Figure 25.
10. Challenge: A subscription costs \$30 initially and increases by \$5 each month. Write a rule and find the cost after 18 months.

Working space:

Answer Key 5 — Patterns in Real Life

1. $A = 20 + 15n$
2. \$200
3. $S = 18 + 2(n - 1) = 2n + 16$
4. 46 seats
5. $C = 10 + 4k$
6. \$82
7. $H = 12 + 3n$
8. 39 cm
9. 102 blocks
10. $C = 30 + 5n$; after 18 months = \$120

Worksheet 6 — Sequences, Patterns & Algebraic Rules Challenge

Show your working and explain the rule you use.

1. Find the next two terms: 5, 10, 17, 26, 37, __, __.
2. Find the next two terms: 1, 4, 9, 16, 25, __, __.
3. Find a rule for 4, 7, 10, 13, ... and find the 30th term.
4. The sequence has rule $a_n = 6n - 1$. Which term is 71?
5. The 7th term is 31 and the common difference is 4. Find the first term.
6. A sequence has 3rd term 11 and 9th term 35. Find the common difference and first term.
7. Find the missing values: 2, 5, __, 17, __, 29.
8. A pattern follows $a_n = 2n^2 + 1$. Find the first four terms.
9. A student claims that 4, 9, 14, 19 has rule $a_n = 5n$. Identify the error and give the correct rule.
10. Challenge: The first term of an arithmetic sequence is 12 and the 20th term is 107. Find the common difference and the 50th term.

Working space:

Answer Key 6 — Sequences, Patterns & Algebraic Rules Challenge

1. 50, 65
2. 36, 49
3. $a_n = 3n + 1$; 30th = 91
4. $n = 12$
5. 7
6. Difference = 4; first term = 3
7. 8, 20
8. 3, 9, 19, 33
9. The first term would be 5 under $5n$; correct rule is $a_n = 5n - 1$
10. $12 + 19d = 107$, $d = 5$; 50th term = 257