Patterns and rules

Free Extra Maths Class · Grade 7

Name: _____

Remember: Look at what is added or multiplied each time. If the difference is 3 every time, the rule starts with 3n.
Why? With a rule you get any term straight away, without counting all the terms. Always test it with term 1.

1. Write the next two terms: 3; 7; 11; 15; ...

2. Write the next term: 2; 6; 18; 54; ...

3. Write the next term: 50; 44; 38; 32; ...

4. Give the rule for the n^{th} term: 5; 10; 15; 20; ...

5. Give the rule for the n^{th} term: 4; 7; 10; 13; ...

6. The rule is $T_n = 2n + 5$. Calculate the 10^{th} term.

7. The rule is $T_n = 6n - 2$. Which term is equal to 58?

8. Flow diagram: input 7 → × 3 → − 4 → output. What is the output?

9. Look at the matchstick pattern. How many matchsticks are in pattern 4?



Pattern 1 Pattern 2 Pattern 3

10. How many matchsticks are in pattern 5 and in pattern 10?

11. Write the rule for the number of matchsticks in pattern n.

12. Which pattern has 61 matchsticks?

13. The dots form triangles: 1; 3; 6; 10; ... How many dots are in the 5^{th} triangle?

14. Find the rule and the missing number.

x	1	2	3	4	10
y	5	9	13	17	?

15. Square tables are pushed together in a row. 1 table seats 4 people, 2 tables seat 6 and 3 tables seat 8. How many people can sit at 15 tables?

I got _____ **out of 15** ☆ ☆ ☆

Memorandum

Patterns and rules

Other correct methods are also right.

1. **19; 23**
   +4 each time: 15 + 4 = 19; 19 + 4 = 23

2. **162**
   × 3 each time: 54 × 3 = 162

3. **26**
   − 6 each time: 32 − 6 = 26

4. **$T_n = 5n$**
   difference 5, so 5n; 5 × 1 = 5 ✓

5. **$T_n = 3n + 1$**
   difference 3, so 3n; 3 × 1 + 1 = 4 ✓

6. **25**
   2 × 10 + 5 = 25

7. **the 10^{th} term**
   6n − 2 = 58; 6n = 60; n = 10

8. **17**
   7 × 3 = 21; 21 − 4 = 17

9. **13**
   4; 7; 10: each new square + 3, so 10 + 3 = 13

10. **pattern 5: 16; pattern 10: 31**
    3 × 5 + 1 = 16; 3 × 10 + 1 = 31

11. **$T_n = 3n + 1$**
    3 more per square, plus 1 for the first side:
    3 × 1 + 1 = 4 ✓

12. **pattern 20**
    3n + 1 = 61; 3n = 60; n = 20

13. **15**
    +2; +3; +4; next +5: 10 + 5 = 15

14. **y = 4x + 1; ? = 41**
    y goes up by 4 each time, so 4x; 4 × 1 + 1 = 5 ✓; 4 × 10 + 1 = 41

15. **32**
    2 more per table, so 2n; 2 × 1 + 2 = 4 ✓; $T_n = 2n + 2$; 2 × 15 + 2 = 32