Name _____ Date _____

Linear or Quadratic?

Example

Ana saves 5 € every week. The side of a square grows by 1 cm. Compare the differences:

Savings (€) after x weeks

x	0	1	2	3	4
y	0	5	10	15	20
1.		5	5	5	5

first differences constant → linear

Area of a square (cm²) with side x

x	0	1	2	3	4
y	0	1	4	9	16
1.		1	3	5	7
2.			2	2	2

second differences constant → quadratic

Remember

To decide between linear and quadratic growth, look at the differences for **equal steps** in x. The graph of a linear function is a straight line; the graph of a quadratic function is a **parabola**.

1 ON YOUR OWN Work out the differences, circle the kind of growth and write the next value.

a)

x	0	1	2	3	4	5
y	5	8	11	14	17	☐
1st diff.	☐	☐	☐	☐	☐	
2nd diff.		☐	☐	☐	☐	

linear / **quadratic** / **neither**

b)

x	0	1	2	3	4	5
y	0	3	12	27	48	☐
1st diff.	☐	☐	☐	☐	☐	
2nd diff.		☐	☐	☐	☐	

linear / **quadratic** / **neither**

c)

x	0	1	2	3	4	5
y	1	2	5	10	17	☐
1st diff.	☐	☐	☐	☐	☐	
2nd diff.		☐	☐	☐	☐	

linear / **quadratic** / **neither**

d)

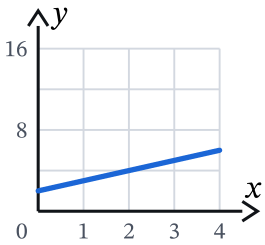
x	0	1	2	3	4	5
y	20	16	12	8	4	☐
1st diff.	☐	☐	☐	☐	☐	
2nd diff.		☐	☐	☐	☐	

linear / **quadratic** / **neither**

Names (group) _____ Date _____

2 IN A GROUP **Sort the cards.** Cut out the 12 cards. Make three groups of four cards that describe the same relationship: a story, a table, a graph and a formula. Name each group: linear, quadratic or neither. Each member of the group explains one group using differences.

x	0	1	2	3	4
y	0	1	4	9	16



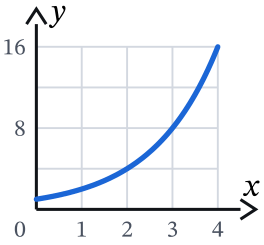
$y = 2^x$

A taxi ride: 2 € to get in and 1 € per kilometre.

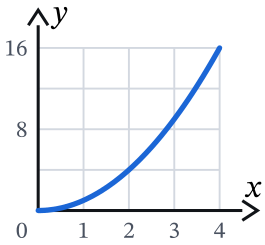
$y = x^2$

x	0	1	2	3	4
y	1	2	4	8	16

The area of a square with side x cm.



x	0	1	2	3	4
y	2	3	4	5	6

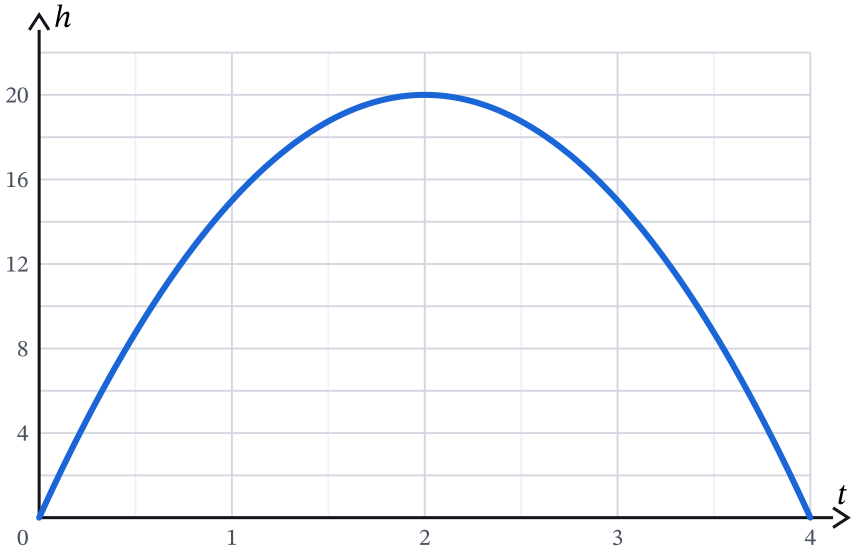


$y = x + 2$

The number of bacteria doubles every hour. There is one at the start.

Names (pair) _____ Date _____

3 IN PAIRS **A graph is not a picture of the path.** A ball is thrown upwards. The graph shows the **height** of the ball h (in metres) **over time** t (in seconds).



a) What is the greatest height of the ball, and when does it reach it?

Answer: _____

b) When does the ball hit the ground?

Answer: _____

c) At which moments is the ball at a height of 15 m?

Answer: _____

d) Marko says: "The ball flew in an arc, just like in the graph." Is he right? **yes** / **no**

Why? _____

★ ON YOUR OWN **Exit card.** What kind of growth is $3, 7, 13, 21, 31, \ldots$?

linear / **quadratic** / **neither**