

## Revision Sheet 4: Patterns & Sequences

### Q1. Linear Patterns - Basics (1<sup>st</sup> Year - After Week 20 and 2<sup>nd</sup> Year - Unit 2)

- a) Explain what is meant by a linear pattern of numbers.
- b) Find the *General Term* of the sequence 4, 11, 18, .....
- c) Use the *General Term* to find the 1000<sup>th</sup> term.
- d) If a particular term is 599, find which term it is.

### Q2. Linear Patterns - Graphing

- a) A fast growing plant is 4cm high when purchased. It grows 2cm per day each day afterwards.
  - i) Write an expression to represent the growth of the plant after  $n$  days. Make sure and explain any variables you use in your expression.
  - ii) Draw a graph showing the height of the plant from Day 1 to Day 7. Put the Days along the x-axis and height of the plant on the y-axis.
  - iii) How many days will it take for the plant to reach a height of 30cm.
  - iv) The plant will stop growing when it reaches a height of 60cm. How many days will this take?
  - v) What is the slope of the line you have drawn?
  - vi) Explain what the slope of the line represents in this context.
- b) A taxi company "Halo" has a fixed charge of €6 and then charges €2 per kilometre. A second taxi company "Uber" has a fixed charge of €4 and then charges €3 per kilometre.
  - i) Write down two expressions to show how much each taxi company charges for  $n$  kilometres.
  - ii) Draw a graph to represent the two companies' charges up to a distance of 6km.
  - iii) Using your graph, how much does Halo charge for a journey of 3.5km?
  - iv) How far would you travel with Uber for €20?
  - v) At what distance do both companies charge the same amount?
  - vi) What does the slope of the two lines you have drawn represent in this context?
  - vii) What advice would you give to someone who is unsure which taxi company to choose?

### Q3. Non-Linear Patterns - Basics (2<sup>nd</sup> Year - 3<sup>rd</sup> Year)

- a) Here are the first three terms of an exponential sequence: 3, 9, 27....
  - i) Write down the next three terms.
  - ii) Investigate if the second difference is a constant.
  - iii) Explain why the sequence is not quadratic.
  - iv) Describe one feature of an exponential graph.
- b) Work out the first four terms of the quadratic sequence  $T_n = 2n^2 - 1$

- c) i) Find the *General Term* of the sequence 2, 7, 14, 23.....  
ii) Use the *General Term* to find the 50<sup>th</sup> term.

Q4. Extra Challenge Questions and Problem Solving:

- a) Show that the *n*th term of the quadratic sequence 8, 15, 26, 41, 60.... is given by  $T_n = 2n^2 + n + 5$
- b) The first two terms of a sequence are 3, 9, .....
- i) If the sequence is linear, write down the next three terms.  
ii) If the sequence is quadratic, write down what the next three terms could be.  
iii) If the sequence is exponential, write down the next three terms.  
iv) Which of the three graphs above would rise the fastest?
- c) 3 terms of a linear sequence are p, q and r. If the common difference between the terms is 3, and the terms sum to 42, find p, q and r.
- d) A sequence of numbers begins 4, 7, 12, 19, 28.....
- i) Draw a graph of this pattern.  
ii) Describe the shape of the graph.
- e) 2, 6, 12, 20..... are the first four terms of a sequence. Find an expression for the *n*<sup>th</sup> term of the sequence.
- f) 3 terms of a quadratic sequence are x, y and 3y. If the second difference between the terms is 2, and the terms sum to 50, find x and y.

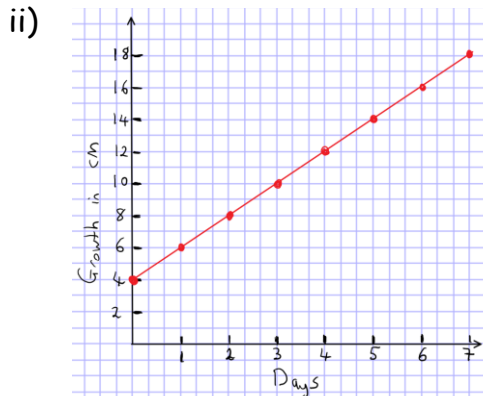
Revision Sheet 4 Solutions:

Q1.

- a) A pattern where the difference between terms is the same.      b)  $T_n = 7n - 3$   
 c) 6997      d) 86<sup>th</sup> term

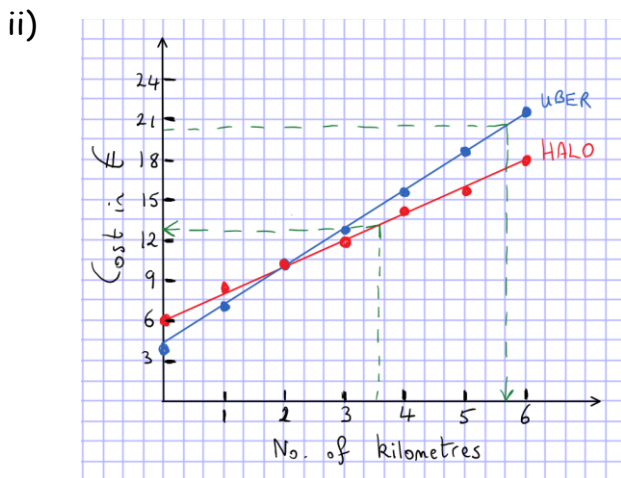
Q2.

- a) i)  $h = 4 + 2n$ , where  $h$  = the height of the plant in cm,  $n$  = number of days



- iii) 13 days      iv) 28 days      v) 2  
 vi) the number of cm the plant grows per day

- b) i) Halo:  $C = 6 + 2n$  Uber:  $C = 4 + 3n$



- iii) €13      iv) 5.75km      v) 2km

- vi) For journeys shorter than 2km it's cheaper to go with Uber but Halo is cheaper for longer journeys over 2km.

Q3.

- a) i) 81, 243, 729    ii) It's not.    iii) Because the 2<sup>nd</sup> difference between the terms is not a constant    iv) It gets steep very quickly.

- b) 1, 7, 17, 31

- c) i)  $T_n = n^2 + 2n - 1$       ii) 2599

Q4.

b) i) 15, 21, 27  
Exponential

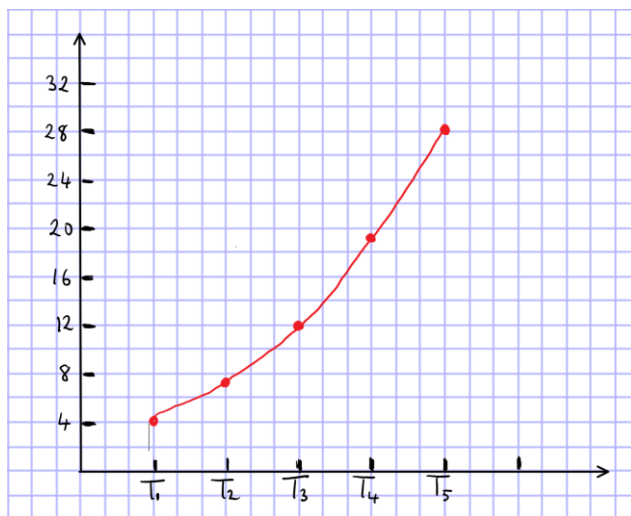
ii) Many answers e.g. 17, 27, 39

iii) 27, 81, 243

iv)

c) 11, 14, 17

d)



A Quadratic graph

e)  $T_n = 2n^2 - 2$

f)  $x = -14, y = 16$