

Please show all of your working

1. The iterative formula, $u_n = u_{n-1} + 2n - 1$ with $u_1 = 1$, defines a sequence of numbers that arise from a particular pattern of geometric growth.
 - (a) From the the iterative formula write down value of the terms u_2 , u_3 , u_4 , and u_5 .

 - (b) Describe the sequence in words.

 - (c) Describe the sequence using mathematics by write down a general formula for u_n .

2. For the following sequences of numbers write down both an iterative formula and a general formula for the n th term u_n .
 - (a) 3, 7, 11, 15, ...

 - (b) 405, 135, 45, 15, ...

3. A tree grows from a height of 24 m to a height to a height of 33 m in the space of 5 years
 - (a) Find the rate growth per year.

 - (b) Find the growth factor for those 5 years.

 - (c) By what percent has the tree grown in 5 years?

(d) Assuming the tree grows as a linear function of time write down an expression for the height h of the tree as a function of years t since it was measured to be 24 m.

(e) How long will it take the tree to reach a height of 100 m?

4. In the book *Gulliver's Travels*, by Jonathan Swift, the main character, Gulliver, encounters a number of different races of people, including the tiny Lilliputians and the giant Brobdingnagians. In Part II, He describes the people of Brobdingnag as "a comely Race of People" and "very well proportioned", which we can presume means identical in shape to Gulliver, except much taller. Gulliver estimates the farmer to be "as tall as an ordinary Spire-steeple". Assume this is about 60 feet – about 10 times Gulliver's height of 6 feet.

(a) If Gulliver is 160 lbs, how heavy do you expect the farmer to be?

(b) Suppose that Gulliver's thighs are roughly circular with a diameter of about 6 inches. What do you expect the diameter of the farmer's thighs to be?

(c) Human legs are built with a certain safety factor so that together they can support up to 4 times the weight of the human body. How much weight can Gulliver's legs support?

(d) Assuming the strength of the leg (ie the weight it can support) scales in proportion to the cross sectional area of the leg how much weight would the Brobdingnag farmer's legs be able to support?

(e) What would the diameter of the farmer's leg have to be in order to support his weight with the same safety factor as for the human body?