

Question 10**(7 marks)**

Ruby Ducks Coffee shops commenced operations in 1992 and had 15 stores open by the end of the year. They have been so successful over the years that the number of stores worldwide has continued to grow exponentially since then. The number of shops operating, T , at the end of 2017 was 22 579 and at the end of 2018 was 30 256.

The number of shops operating at the end of n years can be represented by the recursive rule

$$T_n = 1.34T_{n-1}, T_1 = 15.$$

(a) Show mathematically that the common ratio is approximately 1.34. (1 mark)

(b) Write the rule for the n^{th} term of this sequence. (1 mark)

(c) Determine the first year in which there is likely to be over 200 000 Ruby Ducks Coffee shops. (2 marks)

Typically, each store has twelve employees working during the day across different shifts. Each employee earns, on average, \$114.80 per day.

- (d) Calculate the total daily wages for all stores at the beginning of 2012. (3 marks)