

Name:

1. (5 points) An arithmetic sequence has the first term 5 and the eighth term 26.
  - (a) Find the common difference.
  - (b) Determine the least value of  $n$  for which the sum of the first  $n$  terms of this sequence exceeds 1000.

2. (10 points) Maria is training for a triathlon. In her first week of training she swims 1km, runs 5km and cycles 20km. In each of the following weeks she swims the same amount, runs 0.5km more than the previous week and cycles 5% more than the previous week.
- (a) Calculate how much she runs in her 7th week of training.
  - (b) Calculate how much she cycled in total in the first 5 weeks.
  - (c) In which week the number of kilometres she swam, run and cycled that week first exceeds 45km?
  - (d) In which week the number of kilometres she swam, run and cycled up to and including that week first exceeds 800km?

3. (8 points) Ann invests 10000PLN into savings account that pays 6% of annual **simple interest**. Ben invests 9000PLN into a different savings account that offers 6% annual **compound interest** compounded **monthly**.
- (a) Calculate the value of Ann's investment after 5 years.
  - (b) Calculate the value of Ben's investment after 2.5 years.
  - (c) Calculate how long it would take for the Ben's investment to double in value. Give your answer in months.
  - (d) Calculate how long it would take for the Ben's investment to be worth more than Ann's investment.

4. (6 points) An 81 metre rope is cut into  $n$  pieces of increasing lengths that form an arithmetic sequence with a common difference of  $d$  metres. Given that the lengths of the shortest and longest pieces are 1.5 metres and 7.5 metres respectively, find the values of  $n$  and  $d$ .

5. (6 points) A sum of \$5000 is invested at a compound interest rate of 6.3% per annum (compounded yearly).
- (a) Write down an expression for the value of the investment after  $n$  full years.
  - (b) What will be the value of the investment at the end of five years?
  - (c) The value of the investment will exceed \$10000 after  $n$  full years.
    - (i) Write an inequality to represent this information.
    - (ii) Calculate the minimum value of  $n$ .

6. (10 points) The average score of students at a certain IB school are shown below:

year	2016	2017	2018	2019
score	38.2	37.5	36.5	36.1

- (a) Show that the scores follow neither an arithmetic nor a geometric progression.
- (b) Calculate:
- (i) the average difference between scores in consecutive years,
  - (ii) the average ratio between scores in consecutive years;
- (c) Use your answers to part (b) to predict the average score at that school in 2020.
- (d) Comment on reliability and limitations of your predictions.