

Year 11 Mathematics Specialist Units 1, 2
Test 1 2020

Section 1 Calculator Free
Combinatorics and Vector Introduction

STUDENT'S NAME _____

DATE: Wednesday 4 March

TIME: 11 minutes

MARKS: 11

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

1. (6 marks)

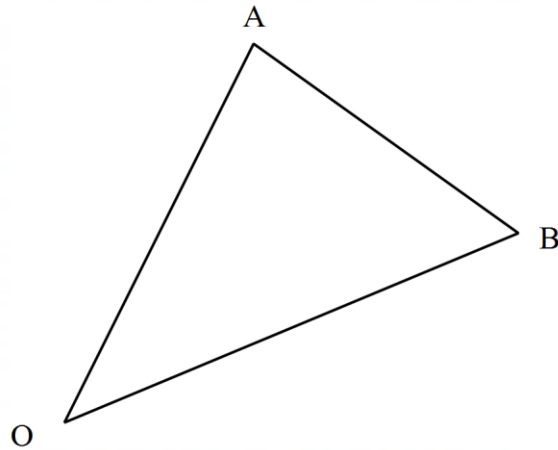
(a) Calculate the number arrangements for the five letters; S W E E T [2]

(b) Rewrite using factorial notation $n(n-1)(n-2)(n-3)$ [2]

(c) Evaluate ${}^{20}C_{18}$ [2]

2. (5 marks)

Triangle OAB has $\overrightarrow{OA} = \underline{a}$ and $\overrightarrow{OB} = \underline{b}$.



(a) Determine a vector expression for \overrightarrow{AB} [2]

Point P and point Q divide \overrightarrow{OA} and \overrightarrow{OB} in half respectively.

(b) Determine a vector expression for \overrightarrow{PQ} [2]

(c) What conclusion can be drawn from your answers to part (a) and part (b) above? [1]

**Year 11 Mathematics Specialist Units 1, 2
Test 1 2020**

**Section 2 Calculator Assumed
Combinatorics and Vector Introduction**

STUDENT'S NAME _____

DATE: Wednesday 4 March

TIME: 39 minutes

MARKS: 39

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

3. (5 marks)

Nathan sets off on an orienteering event. He walks 5 km on a bearing of $060^\circ T$ and then 8 km on a bearing of $200^\circ T$. Determine the vector Nathan must set to return to his starting position.

4. (9 marks)

A group of four males and three females are selected from a group of 10 males and a group of 8 females, and arranged for a photograph. Determine the number of ways they can be arranged if:

(a) there are no restrictions. [1]

(b) three males, John, Paul and Patrick, must be next to each other. [3]

(c) two females, Amanda and Betty, must not be next to each other. [3]

(d) no two males are to be together. [2]

5. (8 marks)

Four digit PINs are to be formed using the digits 0 to 9 inclusive. Determine how many four digit PINs are possible if:

(a) digits can be repeated. [1]

(b) digits cannot be repeated and the PIN must be greater than 4000. [2]

(c) digits cannot be repeated and the PIN must be even. [2]

(d) digits cannot be repeated and the PIN must be greater than 4000 or even. [3]

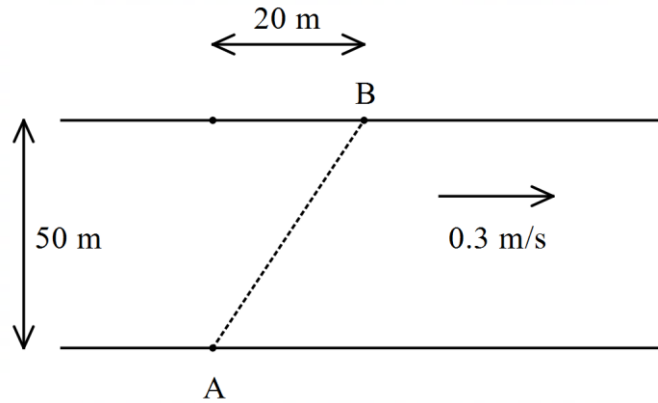
6. (8 marks)

(a) Determine how many integers between 1 and 10 000 inclusive are divisible by 2, 3 or 5. [5]

(b) 51 different integers are chosen from the integers between 1 and 100 inclusive. Prove that two of the chosen integers are consecutive. [3]

7. (9 marks)

Anthony wishes to paddle his canoe across a river that is 50 m, from point A to point B which is 20 m downstream. Anthony can maintain a constant 0.5 m/s in still water. However, the river is flowing at 0.3 m/s.



(a) Determine the direction Anthony must paddle to reach B directly from A. [3]

(b) Determine the resultant velocity. [2]

(c) Determine the time it takes Anthony to reach B. [2]

(d) Anthony now wishes to return directly to A from B. Will the return trip take more time, the same time, or less time than your answer in part (b)? Explain. [2]