As a guideline, this paper should be completed in 1 hour.

You will need a Graphics Display Calculator (GDC) for this examination.

Section A [29 marks]

1. *[Maximum 4 marks]*

Solve the following equations for $0° \leq x \leq 180°$.

a) $3\sin\theta + \cos\theta = 0$

b) $4\cos^2\theta - 1 = 0$

2. *[Maximum 6 marks]*

The following table shows the number of people in a car on the Golden Gate Bridge for a one-hour period on a morning in September.

Number of people (x)	1	2	3	4	5	6
Frequency (f)	357	251	165	123	66	38

Find,

a) the median,

b) the standard deviation of the distribution,

c) the mean.

3. *[Maximum 6 marks]*

a) Find $\int (3x-1)^4 \, dx$

b) Find $\int_1^5 \left(5\sqrt{x}\right) dx$

4. *[Maximum 7 marks]*

The population of Mali has increasing since 1981 at an exponential rate that satisfies the equation,

$$N = 7e^{kt}.$$

where N = the population at t years.

After 20 years, the population of Mali is known to be 11.54 million.

a) Show that the value of k correct to 2 significant figures is 0.025.

b) If the initial year is 1981 ($t = 0$), determine in what year the population of Mali was 10 million.

5. *[Maximum 6 marks]*

The 4^{th} term of an arithmetic sequence is -64 and the 10^{th} term is 8.

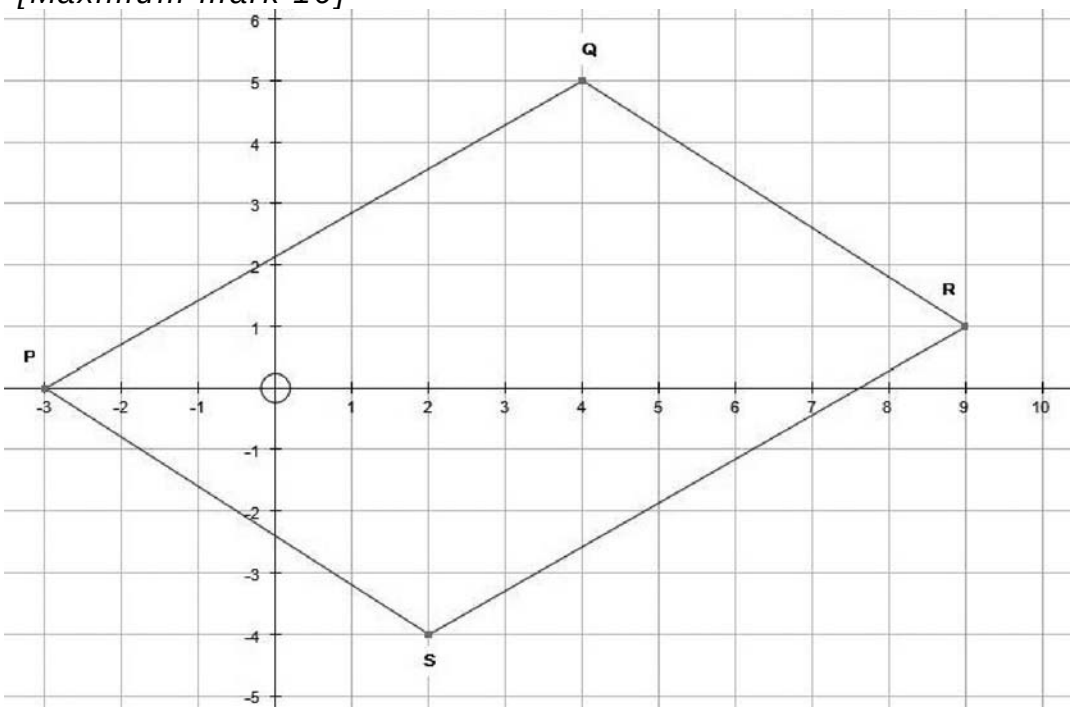
a) Find the first term of the sequence,

b) Find the common difference of the sequence,

c) Find the sum of the first 50 terms of the sequence.

Section B [31 marks]

6. *[Maximum mark 16]*



i) The diagram above shows a parallelogram *PQRS*.
Find the length of,
a) *PQ*,
b) *QR*,
c) *QS*. *[4 marks]*

ii) Find the angle QPS. *[4 marks]*

iii) Find the area of the triangle *QPS*, and hence find the area of the parallelogram. *[4 marks]*

iv) *Q* has the coordinates (4,5) and *R* has the coordinate (9,1).
Write down the equation of the line passing through both *Q* and *R* as a vector equation in the form $r = \begin{pmatrix} x \\ y \end{pmatrix} + t\begin{pmatrix} a \\ b \end{pmatrix}$. *[4 marks]*

7. *[Maximum mark 15]*

i) A company manufactors electronic calculators. The batteries of the calculator are normally distributed with a lifespan of 220 hours and standard deviation of 15 hours.

a) What proportion of calculator batteries stop working after 195 hours? *[2 marks]*

b) By use of a normal distribution diagram illustrate the proportion of batteries that have a lifespan of between 210 and 235 hours.

Find this proportion. *[4 marks]*

c) The company produces 3000 calculators in a month. It makes a profit of $35 on each calculator not returned, and loses $25 for each calculator that is returned to the factory.

The condition for a calculator being returned is having a battery life of less than 190 hours.

Find the projected profit that that company will make in one month. *[6 marks]*

ii) A second factory produces a similar brand of calculator, such that the battery life is normally distributed with a mean of 230 hours and a standard deviation of 18.

Given that 90% of the batteries produced are between a and b, and that the values of a and b are such that they are symmetrically about the mean and $a < b$, find the values of a and b. *[5 marks]*

1. a) 162° b) 60°,120°

2. a) 2 b) $\sigma = 1.43$ c) $\overline{x} = 2.4$

3. a) $\frac{(3x-1)^5}{15} + c$ b) 33.9 units^2

4. b) 1995 or 1996

5. a) -100 b) 12 c) 247000

6. i) a) 8.6 b) 6.4 c) 9.22

   ii) 74.2°

   iii) Triangle = 26.5 units^2 and parallelogram = 53 units^2

   iv) $r = \begin{pmatrix} 4 \\ 5 \end{pmatrix} + t\begin{pmatrix} 5 \\ -4 \end{pmatrix}$ or $r = \begin{pmatrix} 9 \\ 1 \end{pmatrix} + t\begin{pmatrix} -5 \\ 4 \end{pmatrix}$

7. i) a) 0.9522 b) 0.589 c) $100217

   ii) $a = 194.7, b = 265.3$