

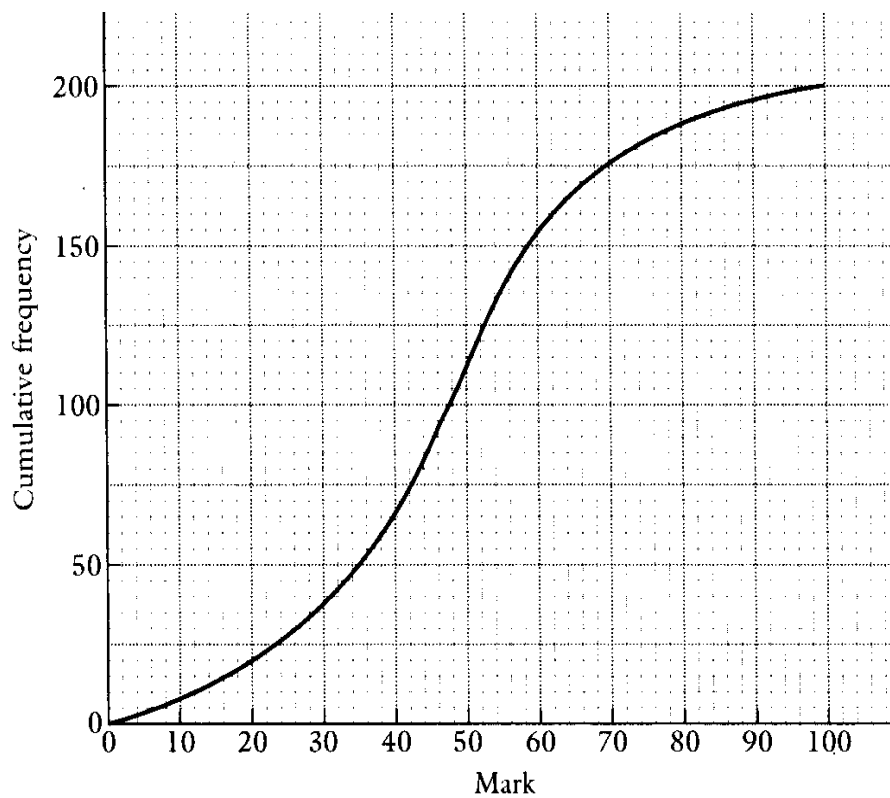
As a guideline this paper should be completed in 1 hour.

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

Section A [37 marks]

1. [Maximum mark 6]

The diagram below shows the marks of 200 students who sat an IB maths examination.



Use your diagram to find,

- find the median,
- find an estimate of the mean mark.

2. [Maximum mark 6]

The number of accidents per week on a certain road is be modelled by a Poisson distribution with a mean of 1.5

Calculate:

- a) the probability that at least two accidents occur in a week,
- b) the probability that no more than 4 accidents occur in a week, given that at least 2 accidents have occurred.

3. [Maximum mark 5]

Students sitting a Maths HL paper have marks that are normally distributed with a mean of 58 marks and a standard deviation of 16. The highest mark is a grade 7, which is set so that only 5% of the students can achieve a 7.

Calculate, to the nearest integer, the mark required to achieve a 7.

4. [Maximum mark 4]

A geometric series has first term 400, ten terms and a sum of 1295.67.

Find the common ratio, r , of the series.

5. [Maximum mark 6]

- a) Find the unique set of solutions for the following set of simultaneous equations.

$$3x + 5y + z = 0$$

$$2x - y + 8z = 3$$

$$x + 10y - z = 7$$

- b) Find the angle created when the planes $3x - y + 4z = 2$ and $x - 7y + 10z = 1$ intersect.

6. [Maximum mark 5]

\$3000 is invested at an annual interest rate of 6%, compounded yearly.

- a) Write down an expression for the value of the investment at the end of n years.
- b) Evaluate the value of the investment at the end of 5 years.
- c) In what year will the value exceed \$10000?

7. [Maximum mark 5]

A triangle has vertices $A(0,1,4)$ $B(1,-3,4)$ and $C(-3,4,2)$.

Find the angle ABC in degrees to the nearest degree.

Section B [23 marks]

8. [Maximum mark 23]

i) The function $f(x)$, where $x > 0$, passes through $(1,1)$ and has the differential that is defined as $f'(x) = \frac{(\ln x)^2}{x}$.

a) Find the function $f(x)$. [4 marks]

b) The function $f(x)$ has two points of inflection. Give the coordinates of these points. [5 marks]

ii) The function $g(x) = x \sin 5x$.

a) Use integration to show that

$$\int g(x) dx = \frac{1}{25} \sin x - \frac{1}{5} x \cos x + c.$$

[4 marks]

b) Sketch $g(x)$ for $0 \leq x \leq \pi$. [2 marks]

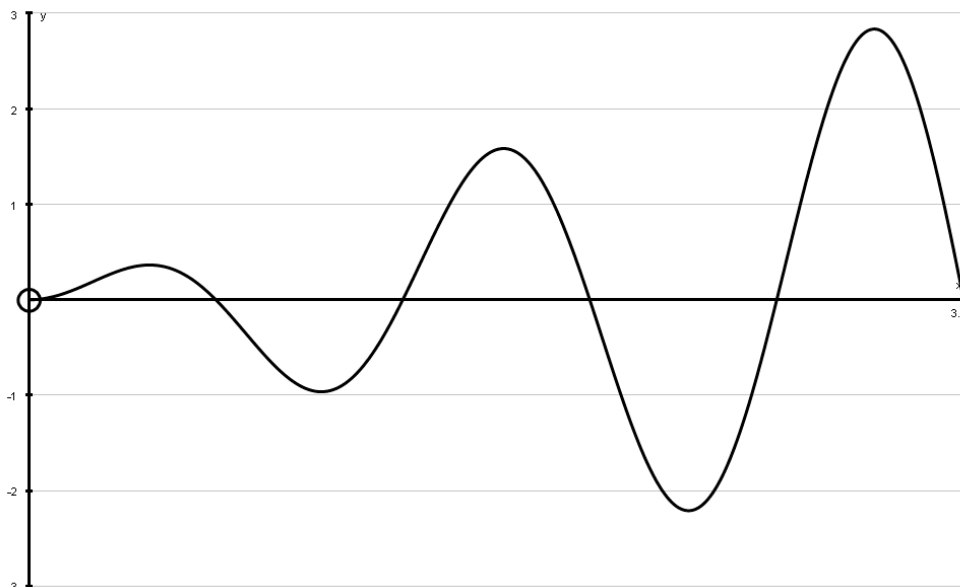
c) Give the exact answers for $g(x) = 0$, for $0 \leq x \leq \pi$. [2 marks]

d) Find the area enclosed above the x -axis and the curve $g(x)$ between $0 \leq x \leq \pi$, giving your answer as a multiple of π . [6 marks]

Answers

- 1. a) 48 b) $\bar{x} \approx 47(45 - 49)$
- 2. a) 0.442 b) 0.759
- 3. $x = 64, x = 65$
- 4. $r = 0.7$
- 5. a) $x = -2, y = 1, z = 1$ b) $\theta = 36.8^\circ$
- 6. a) $3000(1.06^n)$ b) \$4014.68 c) 18 or 19
- 7. $\theta = 21^\circ$
- 8. i) a) $f(x) = \frac{(\ln x)^3}{3} + 1$ b) $(1, 1)$ and $\left(e^2, \frac{11}{3}\right)$

ii) b)



- c) 0, 0.638, 1.26, 1.88, 2.51
- d) 2.066