1. The stem and leaf diagram below shows the lengths of 22 metal components in cm.

Stem	Leaf
1	2, 2, 3, 7
2	4, 4, 4, 8, 9, 9
3	6, 7, 7
4	1, 1, 1, 1, 3, 5, 6
5	0, 1

Key: 1 | 2 means 1.2 cm

(a) Write down the modal length of the metal components.

(1)

(b) Find the median length of the metal components.

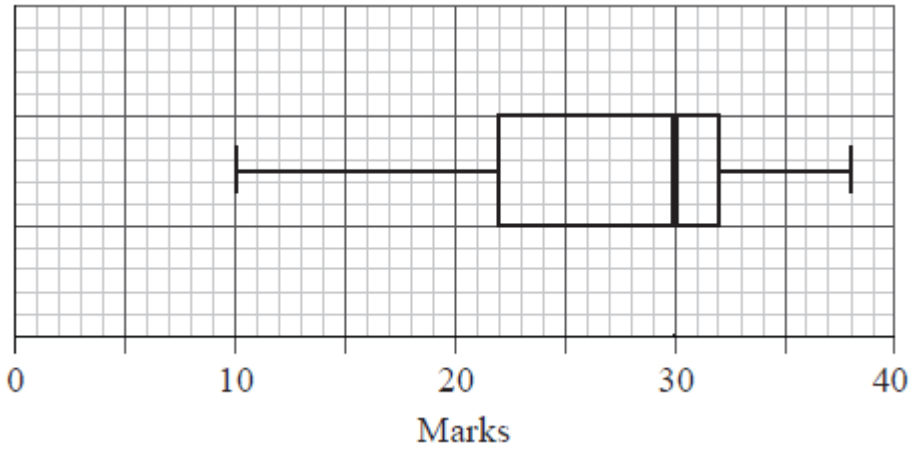
(2)

(c) Calculate the interquartile range of the lengths of the metal components.

(3)

(Total 6 marks)

2. 56 students were given a test out of 40 marks. The teacher used the following box and whisker plot to represent the marks of the students.



(a) Write down

(i) the median mark;

(ii) the 75^{th} percentile mark;

(iii) the range of marks.

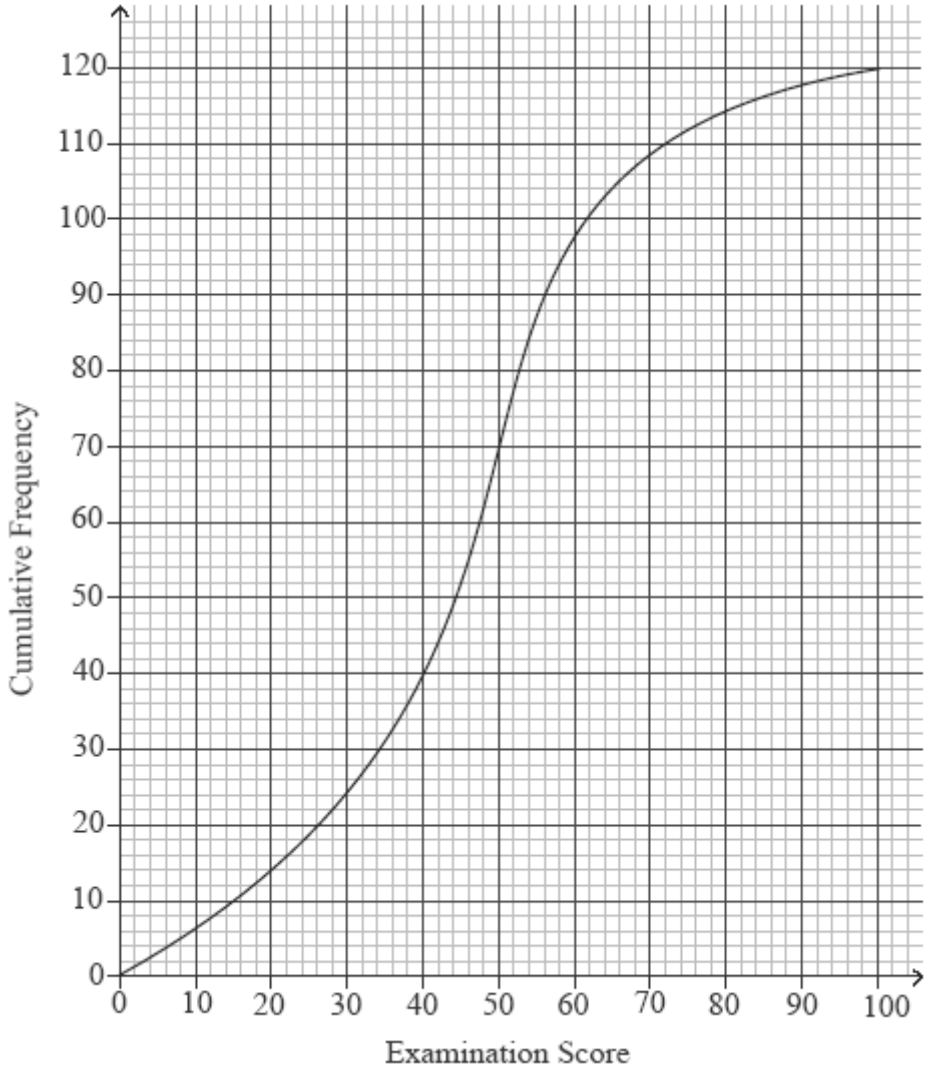
(4)

(b) Estimate the number of students who achieved a mark greater than 32.

(2)

(Total 6 marks)

3. 120 Mathematics students in a school sat an examination. Their scores (given as a percentage) were summarized on a cumulative frequency diagram. This diagram is given below.



(a) Complete the grouped frequency table for the students.

Examination Score x (%)	$0 \leq x \leq 20$	$20 < x \leq 40$	$40 < x \leq 60$	$60 < x \leq 80$	$80 < x \leq 100$
Frequency	14	26			

(3)

(b) Write down the mid-interval value of the $40 < x \leq 60$ interval.

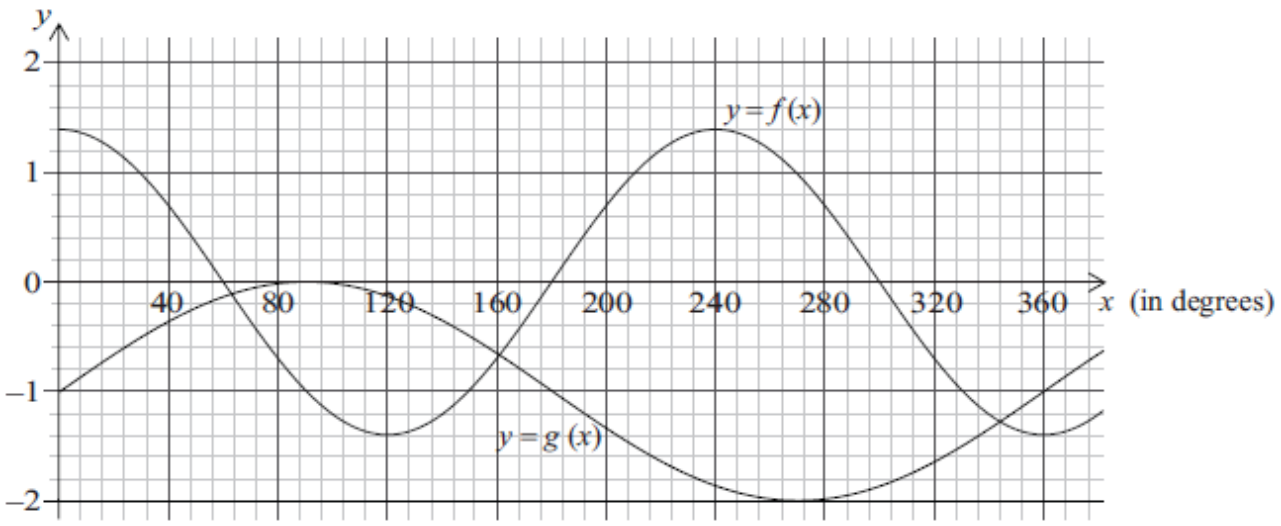
(1)

(c) Calculate an estimate of the mean examination score of the students.

(2)
(Total 6 marks)

4. The diagram below shows the graph of the functions:

$$f(x) = p\cos(qx), \text{ where } p, q \in \mathbb{Q} \text{ and } g(x) = \sin(x) - 1.$$



(a) Write down the period of $f(x)$.

(1)

(b) Write down the value of p.

(1)

(c) Calculate the value of q.

(2)

(d) Use your graphic display calculator to find any solutions to the equation $f(x) = g(x)$ in the interval $180° \leq x \leq 360°$.

(2)

(Total 6 marks)

5. José stands 1.38 kilometres from a vertical cliff.

(a) Express this distance in metres.

(1)

José estimates the angle between the horizontal and the top of the cliff as 28.3° and uses it to find the height of the cliff.

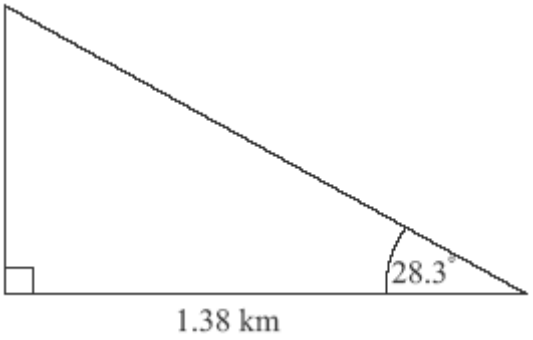


diagram not to scale

(b) Find the height of the cliff according to José's calculation. **Express your answer in metres, to the nearest whole metre.**

(3)

(c) The actual height of the cliff is 718 metres. Calculate the percentage error made by José when calculating the height of the cliff.

(2)
(Total 6 marks)

6. Astrid invests 1200 euros for five years at a nominal annual interest rate of 7.2 %, **compounded monthly**.

(a) Find the interest Astrid has earned during the five years of her investment.
Give your answer correct to two decimal places.

(3)

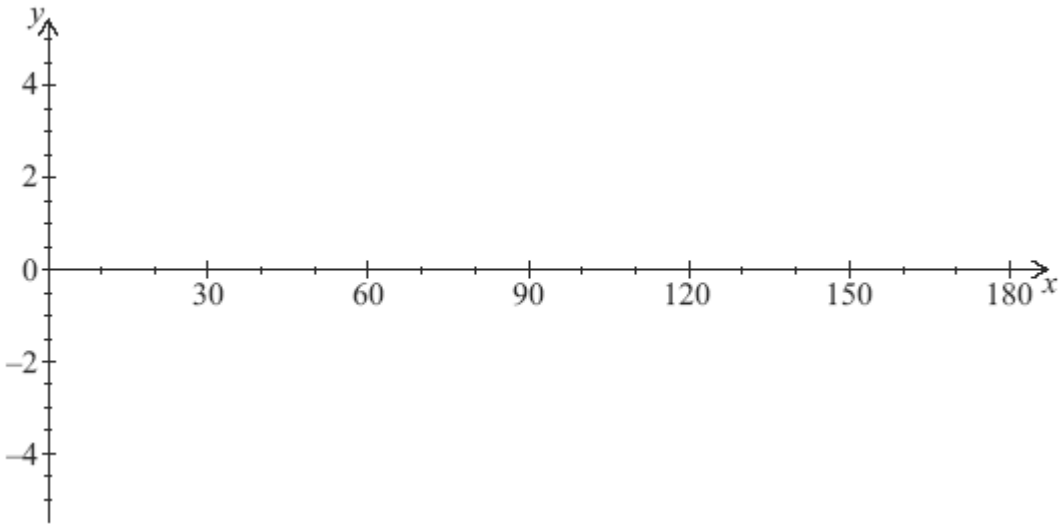
Helen invests 1200 euros in an annual **simple interest** scheme for five years.
She earns **the same** interest as Astrid.

(b) Find the simple interest rate of this scheme.

(3)
(Total 6 marks)

7. Consider the function $y = 3\cos(2x) + 1$.

(a) Sketch the graph of this function for $0 \leq x \leq 180°$.



(3)

(b) Write down the period of the function.

(1)

(c) Using your graphic display calculator find the **smallest** possible value of x, $0 \leq x \leq 180°$, for which $3\cos(2x) + 1 = 2$.

(2)
(Total 6 marks)

8. The first term of an arithmetic sequence is 3 and the sum of the first two terms is 11.

(a) Write down the second term of this sequence.

(1)

(b) Write down the common difference of this sequence.

(1)

(c) Write down the fourth term of this sequence.

(1)

(d) The n^{th} term is the first term in this sequence greater than 1000. Find the value of n.

(3)
(Total 6 marks)

9. Consider the geometric sequence 16, 8, *a*, 2, *b*, …

(a) Write down the common ratio.

(1)

(b) Write down the value of

(i) *a*;

(ii) *b*.

(2)

(c) The sum of the first *n* terms is 31.9375. Find the value of *n*.

(3)
(Total 6 marks)

10. The diagram shows a triangle ABC in which AC = 17 cm. M is the midpoint of AC. Triangle ABM is equilateral.

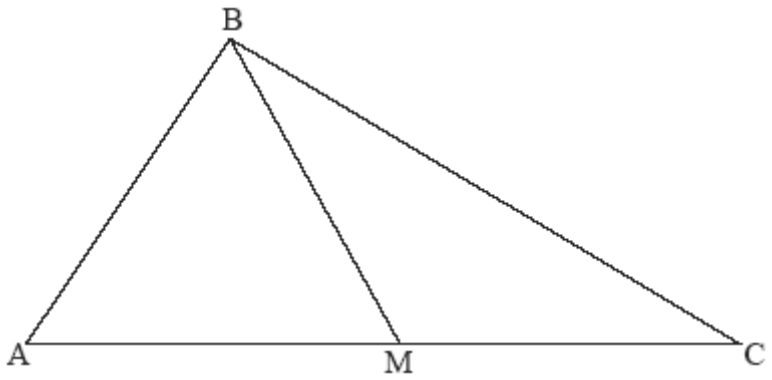


diagram not to scale

(a) Write down

(i) the length of BM in cm;

(ii) the size of angle BMC;

(iii) the size of angle MCB.

(3)

(b) Calculate the length of BC in cm.

(3)
(Total 6 marks)