

1. (a) Calculate exactly $\frac{(3 \times 2.1)^3}{7 \times 1.2}$. (1)
- (b) Write the answer to part (a) correct to 2 significant figures. (1)
- (c) Calculate the percentage error when the answer to part (a) is written correct to 2 significant figures. (2)
- (d) Write your answer to **part (c)** in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. (2)
- (Total 6 marks)**

2. A teacher earns an annual salary of 45 000 USD for the first year of her employment. Her annual salary increases by 1750 USD each year.

(a) Calculate the annual salary for the fifth year of her employment.

(3)

She remains in this employment for 10 years.

(b) Calculate the **total** salary she earns in this employment during these 10 years.

(3)

(Total 6 marks)

3. (a) Complete the truth table shown below.

p	q	$p \wedge q$	$p \vee (p \wedge q)$	$(p \vee (p \wedge q)) \Rightarrow p$
T	T			
T	F			
F	T			
F	F			

(3)

- (b) State whether the compound proposition $(p \vee (p \wedge q)) \Rightarrow p$ is a contradiction, a tautology or neither.

(1)

Consider the following propositions.

p : Feng finishes his homework
 q : Feng goes to the football match

- (c) Write in symbolic form the following proposition.

If Feng does not go to the football match then Feng finishes his homework.

(2)

(Total 6 marks)

4. The straight line L passes through the points $A(-1, 4)$ and $B(5, 8)$.

(a) Calculate the gradient of L .

(2)

(b) Find the equation of L .

(2)

The line L also passes through the point $P(8, y)$.

(c) Find the value of y .

(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.

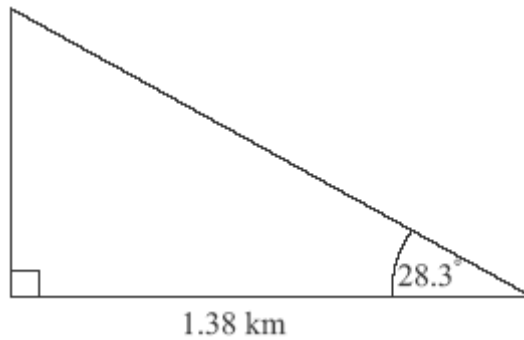


diagram not to scale

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

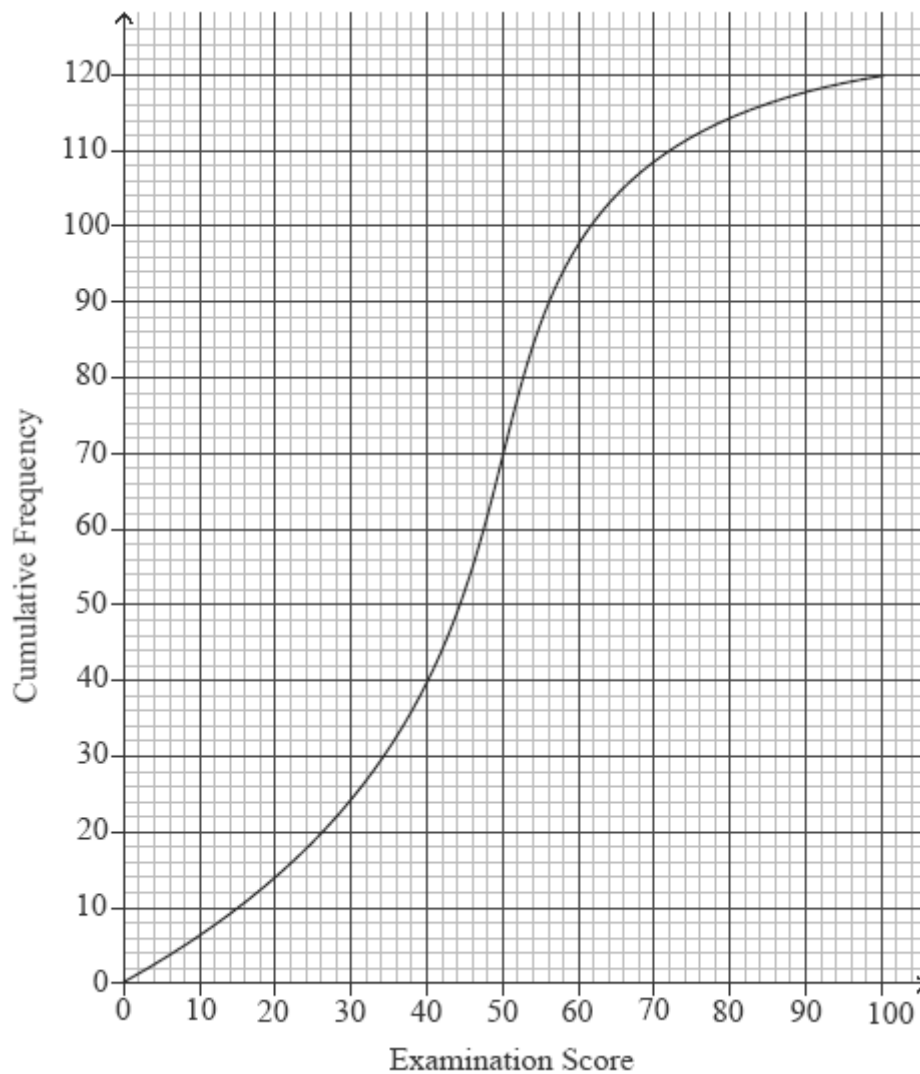
(3)

(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. 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)

7. Emma places €8000 in a bank account that pays a nominal interest rate of 5% per annum, compounded quarterly.

(a) Calculate the amount of money that Emma would have in her account after 15 years. Give your answer correct to the nearest Euro.

(3)

(b) After a period of time she decides to withdraw the money from this bank. There is €9058.17 in her account. Find the number of months that Emma had left her money in the account.

(3)

(Total 6 marks)

8. The marks obtained by 8 candidates in Physics and Chemistry tests are given below.

Physics (x)	6	8	10	11	10	5	4	12
Chemistry (y)	8	11	14	13	11	7	5	15

(a) Write down the product moment correlation coefficient, r . (1)

(b) Write down, in the form $y = mx + c$, the equation of the regression line y on x for the 8 candidates. (2)

A ninth candidate obtained a score of 7 in the Physics test but was absent for the Chemistry test.

(c) Use your answer to (b) to estimate the score he would have obtained on the Chemistry test. (2)

(d) Give a reason why it is valid to use this regression line to estimate the score on the Chemistry test. (1)

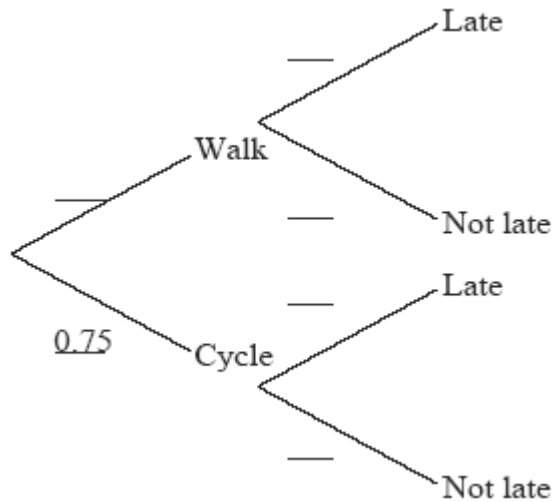
(Total 6 marks)

9. Maria travels to school either by walking or by bicycle. The probability she cycles to school is 0.75.

If she walks, the probability that she is late for school is 0.1.

If she cycles, the probability that she is late for school is 0.05.

- (a) Complete the tree diagram below, showing the appropriate probabilities.



(3)

- (b) Find the probability that Maria is late for school.

(3)

(Total 6 marks)

10. In a research project on the relation between the gender of 150 science students at college and their degree subject, the following set of data is collected.

		Degree Subject		
		Biology	Physics	Chemistry
Gender	Male	40	16	35
	Female	15	24	20

Find the probability that a student chosen at random

- (a) is male; (2)
- (b) is either male or studies Chemistry; (2)
- (c) studies Physics, given that the student is male. (2)

(Total 6 marks)

11. 10 000 people attended a sports match. Let x be the number of adults attending the sports match and y be the number of children attending the sports match.

(a) Write down an equation in x and y .

(1)

The cost of an adult ticket was 12 AUD. The cost of a child ticket was 5 AUD.

(b) Find the total cost for a family of 2 adults and 3 children.

(2)

The total cost of tickets sold for the sports match was 108 800 AUD.

(c) Write down a second equation in x and y .

(1)

(d) Write down the value of x and the value of y .

(2)

(Total 6 marks)

12. A room is in the shape of a cuboid. Its floor measures 7.2 m by 9.6 m and its height is 3.5 m.

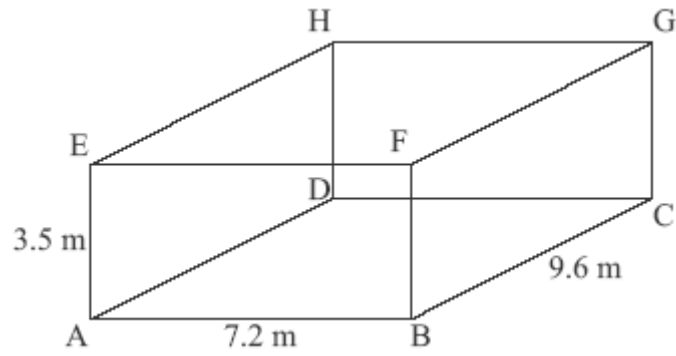
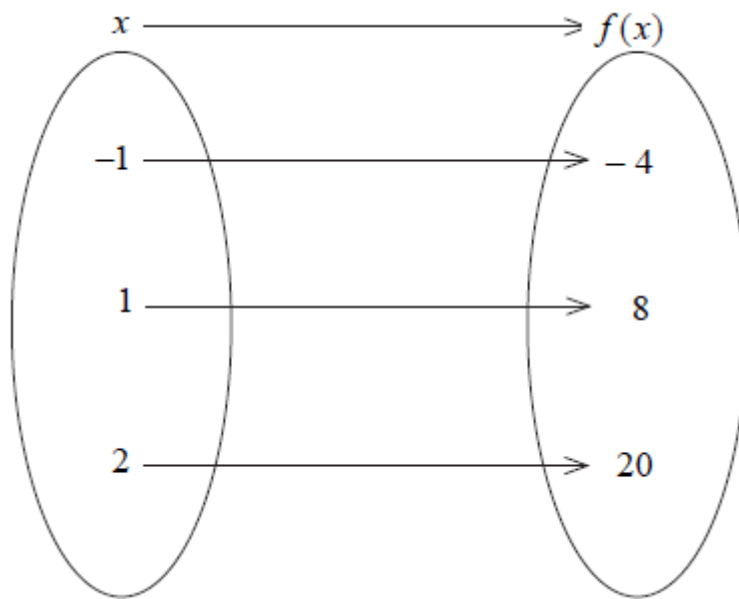


diagram not to scale

- (a) Calculate the length of AC. (2)
- (b) Calculate the length of AG. (2)
- (c) Calculate the angle that AG makes with the floor. (2)

(Total 6 marks)

13. A quadratic function, $f(x) = ax^2 + bx$, is represented by the mapping diagram below.



- (a) Use the mapping diagram to write down **two** equations in terms of a and b .

(2)

- (b) Find the value of

(i) a ;

(ii) b .

(2)

- (c) Calculate the x -coordinate of the vertex of the graph of $f(x)$.

(2)

(Total 6 marks)

14. In the diagram, $\hat{BAC} = 90^\circ$. The length of the three sides are x cm, $(x + 7)$ cm and $(x + 8)$ cm.

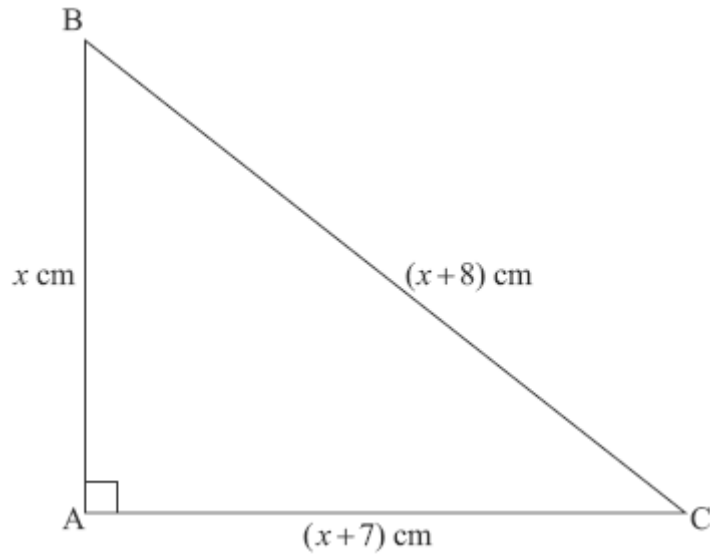


diagram not to scale

- (a) Write down and **simplify** a quadratic equation in x that links the three sides of the triangle. (3)
- (b) Solve the quadratic equation found in part (a). (2)
- (c) Write down the value of the perimeter of the triangle. (1)

(Total 6 marks)

15. The straight line, L , has equation $2y - 27x - 9 = 0$.

(a) Find the gradient of L .

(2)

Sarah wishes to draw the tangent to $f(x) = x^4$ parallel to L .

(b) Write down $f'(x)$.

(1)

(c) (i) Find the x -coordinate of the point at which the tangent must be drawn.

(ii) Write down the value of $f(x)$ at this point.

(3)

(Total 6 marks)