

**Exercise 1**

Calc. : ✓

A patient takes some medication at midday. The amount of drug,  $D$  mg, remaining in their bloodstream  $h$  hours after midday is modelled by the formula:

$$D = 0.06 + 0.5h - 0.1h^2 \quad 0 \leq h \leq 5$$

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|---|---------|
| a) <b>Determine</b> the amount of drug that is already naturally occurring in the patient's bloodstream at the moment they take the medication.   | 1 mark  |
| b) <b>Calculate</b> how long it takes for the amount of the drug in the patient's bloodstream to return to its natural level.   | 2 marks |
| c) <b>Determine</b> the time when the amount of drug in the patient's bloodstream will be a maximum.  | 3 marks |
| d) It is safe for the patient to take more medication once the amount of drug in their bloodstream falls below 0.46 mg. <b>Determine</b> the earliest time that a patient can take a second dose of the medication. | 3 marks |
| e) <b>Explain</b> why your answer to (d) should not be 1 PM despite this being a solution to the relevant equation.   | 2 marks |

**Exercise 2**

Calc. : ✓

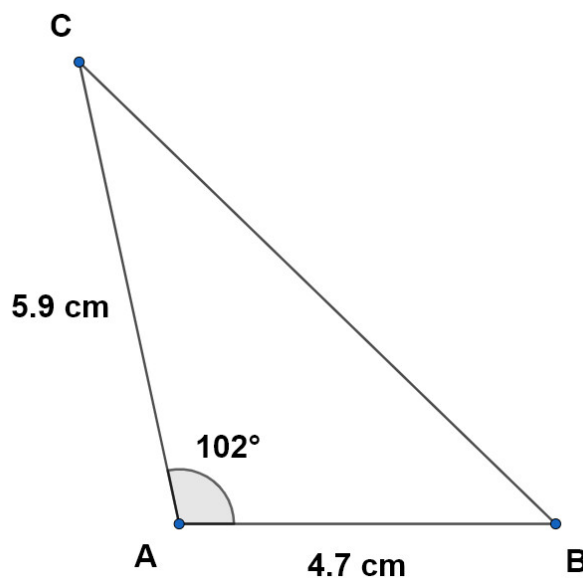
Consider the following equation:  $\log(x - 2) + \log(x + 3) = 2$ .

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|---|---------|
| 1. <b>Solve</b> the equation showing all stages of your working and <b>give</b> the solution(s) as exact value(s).    | 5 marks |
| 2. <b>Write</b> the solution(s) of the equation as a decimal giving your answer(s) to an accuracy of 1 decimal place. | 1 mark  |

**Exercise 3**

Calc. : ✓

Using the data in the picture:



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|--|---------|
| 1. <b>Give</b> the length of the missing side accurate to one decimal place.   | 3 marks |
| 2. <b>Calculate</b> the sizes of the angles of the triangle, giving the results to an accuracy of one decimal place. | 5 marks |
| 3. <b>Calculate</b> the area of this triangle, giving the result to an accuracy of one decimal place.                | 3 marks |

**Exercise 4**

Calc. : ✓

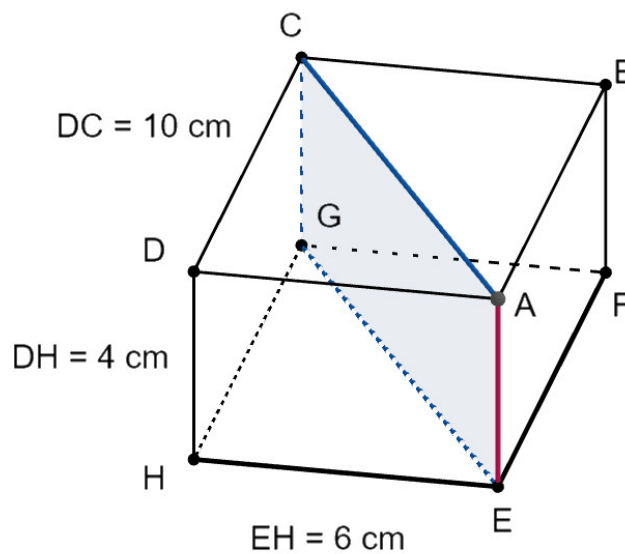
In a 2-dimensional orthogonal coordinate system, the coordinates of the points A, B and C are A(1,4), B(5,5) and C(-1,6) respectively.

1. **Determine** the vector  $\vec{AB}$  and **calculate** its magnitude. 2 marks
2. **Determine** the magnitude of the vector  $\vec{AC}$ . 2 marks
3. **Calculate** the size of the angle between  $\vec{AB}$  and  $\vec{AC}$  giving your answer in degrees to 1 dp. 3 marks
4. **Determine** the value of  $k$  that makes the vector  $\begin{pmatrix} k \\ 1 \end{pmatrix}$  perpendicular to vector  $\vec{BC}$ . 3 marks

**Exercise 5**

Calc. : ✓

Consider the following block of feta cheese with the dimensions 6 cm × 10 cm × 4 cm as shown in the rectangular cuboid below:



To decorate a salad, the cheese is cut in half diagonally from AC vertically downwards.

1. **Show** that the length of the cut  $|AC|$  accurate to two decimal places is 11.66 cm. 2 marks
2. **Determine** the length of the diagonal  $|AG|$  accurate to two decimal places. 2 marks

When the cheese is cut, 0.5% of the volume is lost on the knife.

3. **Calculate** the volume of the cheese after the cut. 3 marks

**Exercise 6**

Calc. : ✓

In a manufacturing company, employee satisfaction is studied in relation to two aspects: working conditions (C) and career opportunities (O). A study shows that 60% of employees are satisfied with their working conditions, 50% are satisfied with their career opportunities and 40% are satisfied with both their working conditions and career opportunities.

1. **Construct** a suitable diagram to summarize the results of the survey. 3 marks
2. **Calculate** the probability that a randomly selected employee is satisfied with their career opportunities given that they are also satisfied with their working conditions. 2 marks
3. **Calculate**  $P(\bar{O})$ . 1 mark
4. The director of the company claims that whether an employee is satisfied with their working conditions is independent from their satisfaction of career opportunities. **Is the director correct? Justify** your answer. 3 marks