**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:

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

a) **Determine** the amount of drug that is already naturally occurring in the patient's bloodstream at the moment they take the medication. — 1 mark

b) **Calculate** how long it takes for the amount of the drug in the patient's bloodstream to return to its natural level. — 2 marks

c) **Determine** 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. **Determine** the earliest time that a patient can take a second dose of the medication. — 3 marks

e) **Explain** why your answer to (d) should not be 1 PM despite this being a solution to the relevant equation. — 2 marks

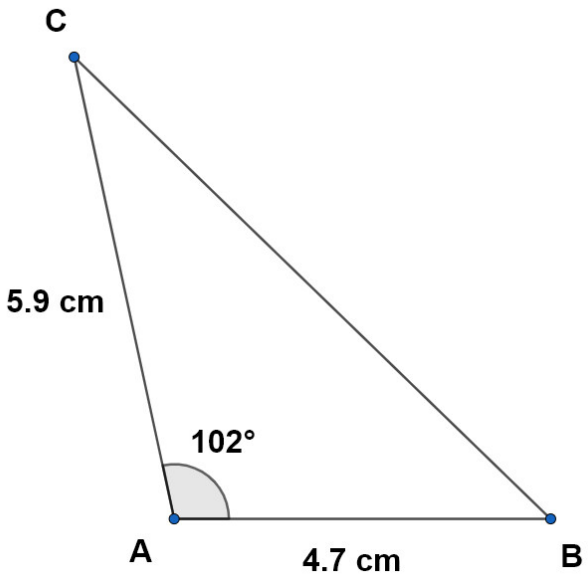
**Exercise 2** Calc. : ✓

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

1. **Solve** the equation showing all stages of your working and **give** the solution(s) as exact value(s). — 5 marks
2. **Write** 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:




1. **Give** the length of the missing side accurate to one decimal place. — 3 marks
2. **Calculate** the sizes of the angles of the triangle, giving the results to an accuracy of one decimal place. — 5 marks
3. **Calculate** the area of this triangle, giving the result to an accuracy of one decimal place. — 3 marks

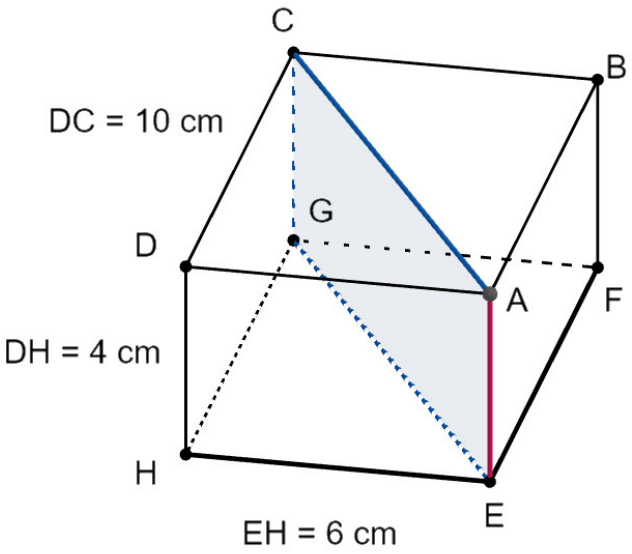
**Exercise 4** Calc. : ✓

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 $\overrightarrow{AB}$ and **calculate** its magnitude. — 2 marks
2. **Determine** the magnitude of the vector $\overrightarrow{AC}$. — 2 marks
3. **Calculate** the size of the angle between $\overrightarrow{AB}$ and $\overrightarrow{AC}$ 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 $\overrightarrow{BC}$. — 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** $P(\overline{O})$. — 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