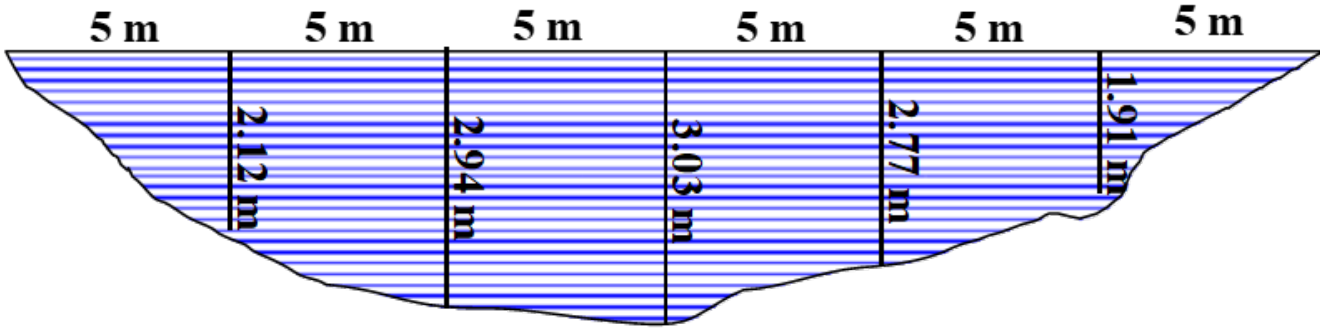
1. The Ministry of Fisheries and Aquatic Resources intends to establish a commercial fish farming project in a natural water body. Before approving the project, surveyors measured the depths of the water body at equal intervals across the proposed site, as shown in the figure, to estimate its cross-sectional area.



The Engineering Department has recommended the site for commercial fish farming on condition that the estimated cross-sectional area of the water body is at least $62.85m^2$, the minimum area required for the project accommodation requirements.

To accommodate workers at the project site, the Ministry has acquired a rectangular piece of land measuring 123.65 m in length, measured correct to two decimal places, and 96.774 m in width, measured correct to three decimal places. Each accommodation tent, including the required clearance around it, occupies a rectangular space measuring 4.50 m by 6.85 m, both measured correct to two decimal places.

According to the Site Engineer, the campsite can accommodate the required 390 to 410 tents.
The Permanent Secretary requires evidence that both the proposed fish farming site and the campsite satisfy the project requirements before granting approval for implementation.
Task

(a) Provide the evidence required by the Permanent Secretary regarding the suitability of the proposed fish farming site.

(b) Investigate whether the proposed campsite satisfies the Ministry's accommodation requirements.

2. A district education office conducted a common end of term Mathematics assessment to evaluate learners' performance across government secondary schools. To guide planning for academic intervention programmes, the office selected a sample of learners and summarised their marks as shown in the table below.

Marks(%)	**Number of learners**
$20-29$	9
$30-34$	12
$35-44$	27
$45-49$	13
$50-54$	25
$55-59$	18
$60-74$	30

Before preparing the district assessment report, the assessment committee requires the distribution of learners' marks to be presented graphically so that the most common mark attained can be identified. The committee also reviews the variation in learners' marks to establish whether learners performed consistently and identifies the middle 60% range of the marks to guide decisions on academic intervention.

In the current year, 500 learners sat the Mathematics assessment. Based on records from previous years, learners' marks are assumed to be approximately normally distributed with a mean of 48.6% and a standard deviation of 12.9%. According to the district assessment policy, learners who score between 50% and 60% are considered to have attained satisfactory performance. The district has budgeted learning materials for 95 learners in the enrichment programme for learners with satisfactory performance and would like to establish whether the available materials are likely to be sufficient.
The assessment officer has been assigned to analyse the assessment results and prepare a report to guide the district's decisions
Task

(a) Prepare a report on:

i. the learners' level of achievement;

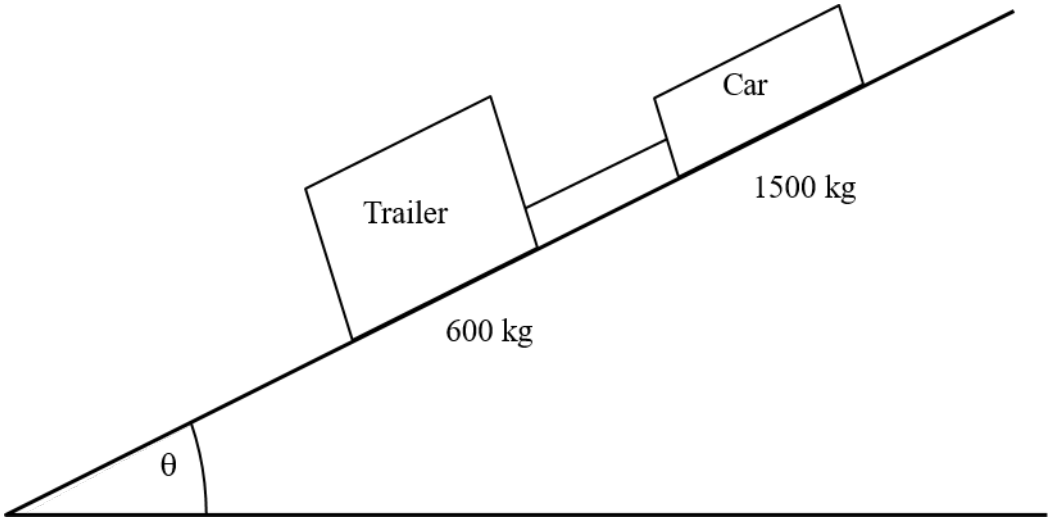
ii. the consistency of learners' performance.

(b) Assess whether the learning materials budgeted for the enrichment programme are likely to be sufficient for learners who attain satisfactory performance.

3. The Uganda National Roads Authority (UNRA) is testing a towing vehicle that will be used to transport construction materials to a road project located on a steep hillside. Before the towing system is deployed, engineers must verify that it can safely pull a fully loaded trailer up the access road. A trailer of mass 600 kg is connected to a car of mass 1500 kg by a light rigid tow bar. The car moves up the line of greatest slope of a road inclined at an angle θ to the horizontal, where

$$\sin\theta = \frac{7}{25}$$

as shown in the figure below



A constant resistance of $400N$ acts on the car, while a constant resistance of $300N$ acts on the trailer. The engine of the car produces a constant driving force of $8400N$.
According to the Project Engineer, the proposed towing system is suitable for transporting construction materials provided that:

- the towing vehicle accelerates at not less than $0.90ms^{-2}$; and
- the tension in the tow bar does not exceed $2600N$.

The Executive Director requires evidence to verify the Project Engineer's recommendation before approving the towing system for use at the construction site.

Task

Investigate the Project Engineer's recommendation and hence advise the Executive Director whether the proposed towing system should be approved for transporting construction materials.

TOGETHER WE CAN CLOSE THE LEARNING GAP