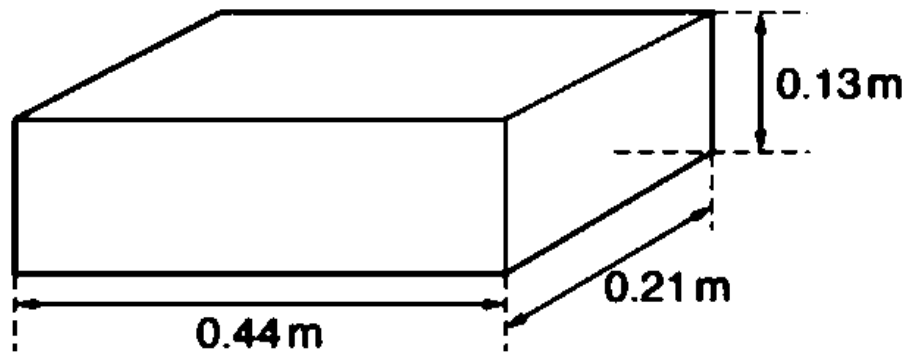


### Item 1

A certain man had a plan of constructing rentals on his newly acquired plot of land in a region experiencing sunny weather. The engineer advised him on the materials to be used. Some of the materials were bricks, sand, cement, galvanized iron sheets and timber. There was a concrete brick seller who presented a sample of a brick with dimensions as shown in the figure



The man thought of using black galvanized iron sheets but was advised by the engineer to use silvered iron sheets instead and first determine whether the bricks were of standard density.

#### Hint;

Proposed density of the concrete block by engineer was between  $400 \text{ to } 500 \text{ kgm}^{-3}$

#### Task

Assuming you are the son of the man, having acquired the knowledge of measurement in physics, help your dad to;

- Calculate the space the concrete block can occupy.
- Help your dad to know whether the concrete block is suitable for construction.
- Explain to your dad why the engineer proposed to use silvered iron sheets instead of black one.

## Item 2

A motorcyclist bought a brand new motor bike. He rode it for a half a year without any disturbance, the tyres started wearing off with time and it could slide causing un-steady motion on the ground, the chain also started making unnecessary noise ; One day he traveled a long distance to attend a burial ceremony travelling a speed of  $20 \text{ ms}^{-1}$  , he then decelerated uniformly at  $6 \text{ ms}^{-2}$  and was displaced through a distance of  $25 \text{ m}$  . he then parked his bike in direct sunshine, unfortunately one of the tyres burst and he was worried.

### Task

Using your knowledge of physics, help the motorcyclist to;

- Understand the possible cause of sliding of the bike and unnecessary noise from the chain and how to reduce the effect.
- Calculate his final velocity and the time taken
- Explain why one of the tyres burst.

## Item 3

A certain man living in a place experiencing prolonged drought planned to construct a storage house(building). During the construction, two engineers were hired to guide the process. They were supposed to install simple machines which could be effective for the job by raising the load such as sand, bricks and timber to the raised heights of the structure .

Below are the suggested simple machines to be used .

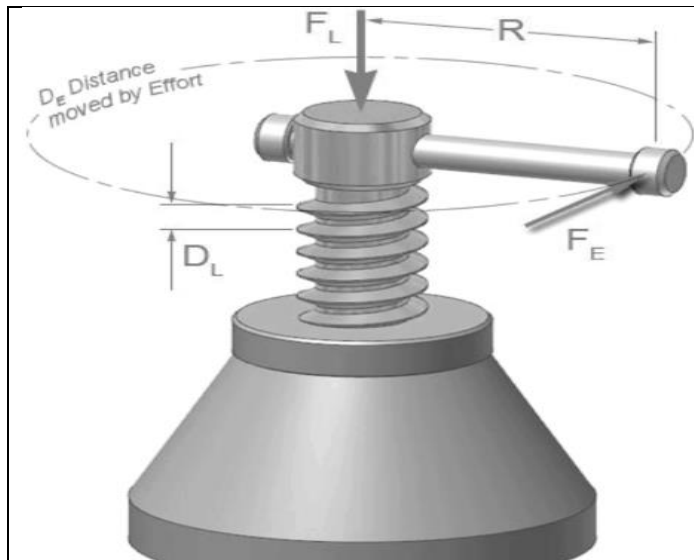


Figure 1

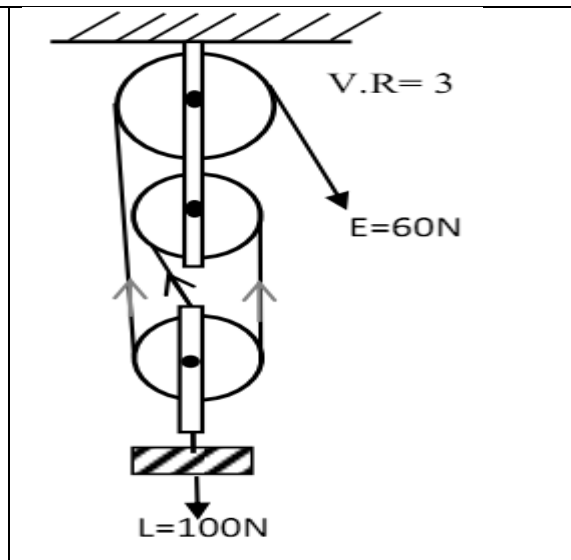


Figure 2

### Hint

$F_L$  is the load of 100 N

$F_E$  is the amount of force applied to the handle of 60 N

$DL$  is the distance between the successive threads of the screw of 2mm

$R$  is the length of the handle of 20 cm

On finishing stage of the house, the engineer had a suggestion of painting the raised structure with highly polished surface (white colour) but the owner of the house wanted dull colours such as black or blue.

### Task

Using your knowledge of physics, help the;

- (a) Engineer on making the right choice of machine suggested to be used .
- (b) Owner of the house on making the right choice of colour of the house.

### Item 4

In a certain country, scientists discovered minerals (petroleum ). However, they had little knowledge on the extraction (mining) of them. They had to hire specialists from the neighbouring country who advised them to construct pipelines for easy transportation of petroleum products. Engineers built structures(store) where they were to keep their machines during the process, they used silvered galvanized iron sheets and cylindrical pipes for the roof.

### Hint

Cross sectional area of the pipes =  $2.0 \times 10^{-8} \text{m}^2$

### Task

As a physics student, explain why;

- (a)The engineer preferred;
  - (i) silverd iron sheets.
  - (ii) hollow cylindrical pipes in raising the structure (store).
- (b) Assuming the maximum load the hollow cylindrical pipes can sustain is 50N of the roofing, compute the maximum stress on the pipes.

### Item 5

A certain man had a wedding party which took place at a certain church, very many people were invited, those who came from far carried their luggage and decided to travel by bus which had a cabin (boot) and rack on top of the bus. As the conductor was arranging for the journey, he decided to place the luggage on top of the bus' rack. while some passengers wanted to sit with their bags or the conductor to put them in the cabin but the conductor insisted and put them top of the bus' top as shown in the figure below



### Hint

Average mass of the bus = 1tonne

Initial velocity of the bus = 20 m/s

After 5 seconds, the bus accelerated at a rate of  $2 \text{ m/s}^{-2}$

### Task

Using your knowledge of physics,

- (a) Explain to the passengers why it is risky to sit with their bags or put them on the bus' rack?
- (b) Compute the accelerating force of the bus.