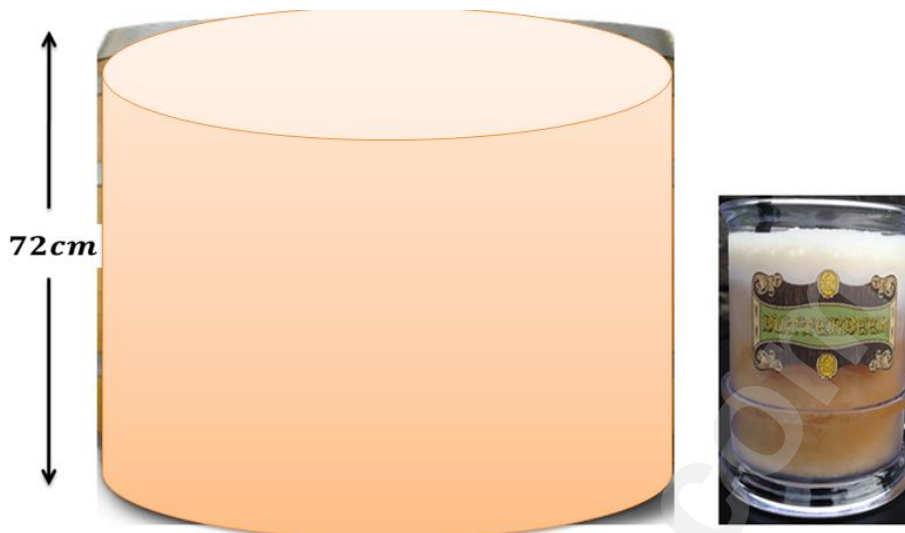




eduresourceza.com



After the “snowball fight day” Tasneem’s friend Pila, decides to brew some Butterbeer so everyone can warm up. Pila decides to use a 12l brewing vessel with a height of 72 cm to make his Butterbeer. Calculate the **diameter** of the vessel in cm.

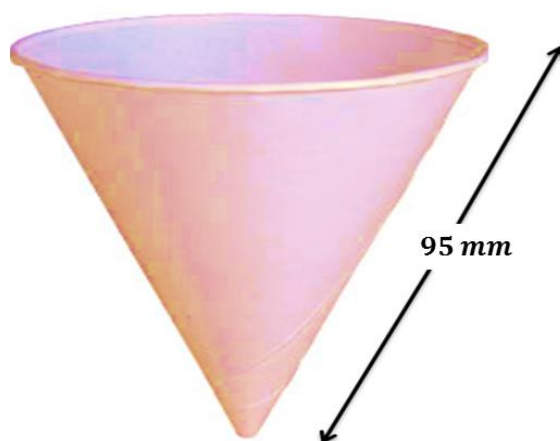
- $1l = 1\,000\,000\,mm^3$
- $Volume_{cylinder} = \pi \times r^2 \times h$

(8)

Question 3

[34]

After returning from Alaska, Tasneem’s friend Jordan decides to use a concept she learned from a local in Alaska to make money. The concept is to make snowcones with various fruit juice flavours. Jordan needs to make cone holders out of plastic of **length 95 mm** and **diameter of 49,5 mm**.



3.1 Calculate the surface area in mm^2 of plastic Jordan needs to make one cone.

(3)

$$\text{Surface area}_{\text{cone}} = \pi r \times \text{length}$$

- 3.2 Jordan buys plastic that is $3m$ wide and $4m$ long. How many cone holders will she be able to make from the plastic? (7)
- 3.3 Determine the perpendicular height of one cone holder. Draw a rough sketch to support your answer. (4)
- 3.4 Calculate how much slush (ice and juice) each cone will be able to hold in **ml**. (4)

$$\text{Volume} = \frac{1}{3} \times \text{Area of base} \times \text{perpendicular height}$$

$$1\text{ml} = 1\,000\text{ mm}^3$$

- 3.5 Calculate how many **litres** of slush Jordan will need to fill all the cone holders. (4)
- 3.6 Jordan mixes the slush in the ratio of 3 parts juice to 4 parts crushed ice (3 : 4). One litre of juice costs $R13,50$ and one litre of crushed ice costs $R5,50$. Plastic costs $R35,00$ per $1m^2$. Calculate Jordan's total expenditure (calculate the cost of the juice, crushed ice, the plastic and then the total cost). (9)
- 3.7 Jordan decides to sell each snowcone at $R6,00$. Will she make a profit at this selling price? Use calculations to support your answer. (3)

- 2.1 Miley had always dreamt of wearing an elegant tiara with her wedding dress, something that she will need to have custom made.



If the circumference of Miley's tiara is 50cm and the diameter of Miley's head is 13cm determine whether the tiara will be too small for her head by calculating the diameter of the tiara.

(4)

$$\text{Circumference} = 2\pi r$$

- 2.2 Liam undertook the responsibility of ordering the cake.

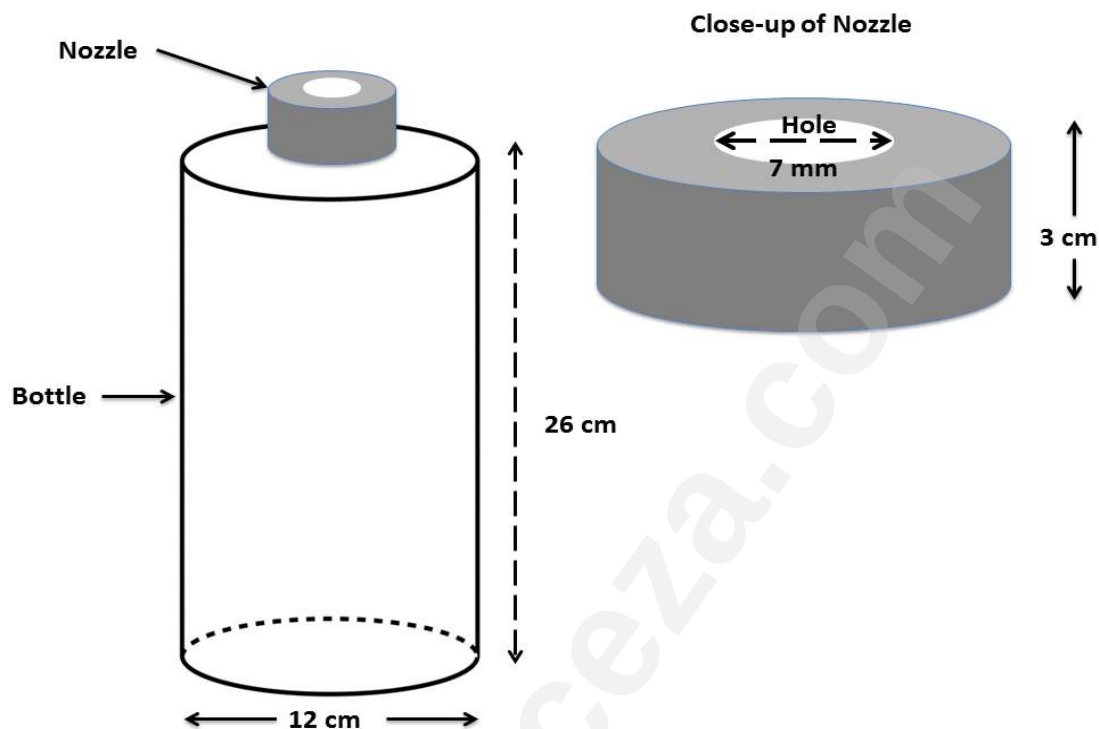


The radius of the base cake tier is 240 mm, the radius of the middle tier is 0,20 m and the radius of the upper most tier is 15 cm. The height of each tier is 10 cm, 12 cm and 14 cm, as shown on the diagram above. Calculate the volume of the entire cake in cm^3 .

(5)

$$\text{Volume} = \pi r^2 \times \text{height}$$

To acquire more customers at Market Day, Mr Maharaj decides to give the first 50 customers each a bottle of his homemade apple juice.



$$\text{Area of circle} = \pi \times (\text{radius})^2$$

$$\text{Volume of Cylinder} = \pi \times (\text{radius})^2 \times \text{height}$$

$$\text{Assume } \pi = 3.14$$

$$1 \text{ cm}^3 = 1 \text{ millilitre}$$

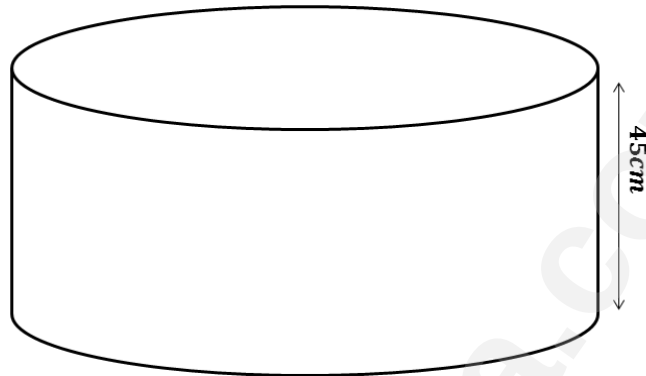
$$1 \text{ litre} = 1\,000 \text{ millilitres}$$

If all bottles were filled to the maximum, including the nozzle, show that Mr Maharaj requires 147 litres

of apple juice to fill all 50 bottles.

(10)

Kara washes her dishes by hand two times daily in **two** identical cylindrical basins. She uses one basin for washing the dishes and the other for rinsing the dishes. Each basin has a height of **45cm** and a volume of **173092,50 cm³** as shown in the diagram below.



Kara is considering buying a dishwasher that she will use to wash dishes daily.



- 3.1 Kara calculates that the radius of the basin must be 40cm if the volume is 173092,50 cm³. Is her calculation correct? Justify your answer with calculations. (4)

Use the formula: **Volume of a cylindrical basin = $\pi \times r^2 \times h$**

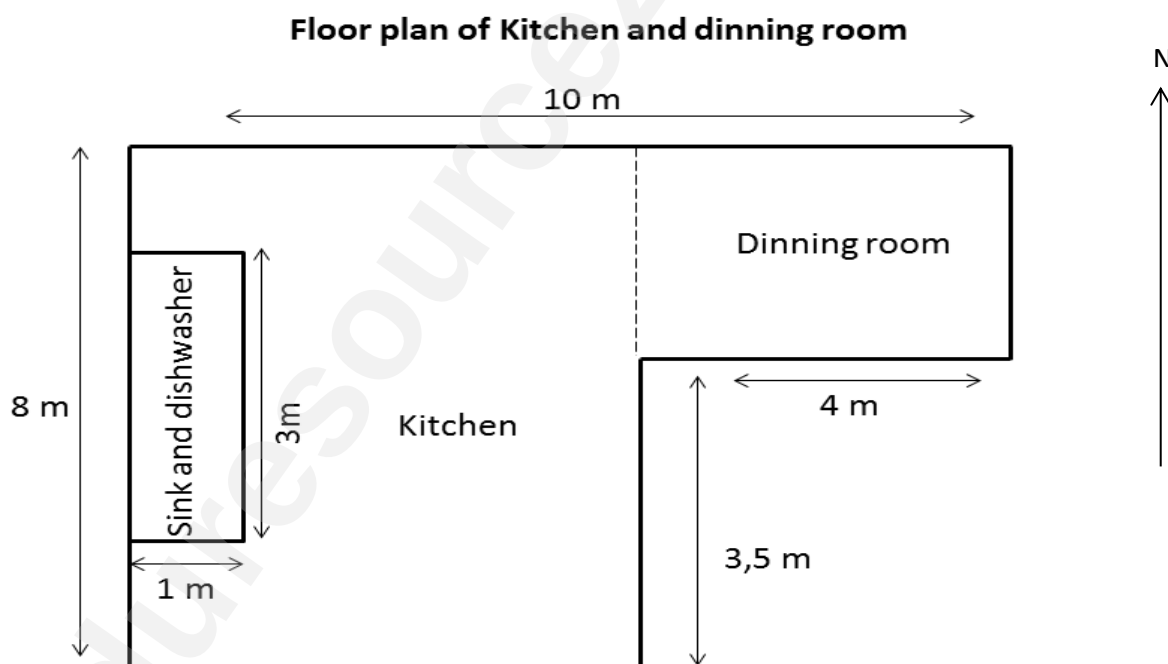
- 3.2 Kara fills each basin to $\frac{3}{4}$ of its capacity whenever she washes or rinses the dishes. Calculate how much water (in litres) she will use daily to **wash and rinse** the dishes by hand. (5)

Remember: 1 000cm³ = 1 litre

- 3.3 A manufacturer of a dishwasher claims that their dishwasher uses **six times less** water in comparison to washing the same number of dishes by hand.

- 3.3.1 Calculate how much water this dishwasher will use to wash Kara's dishes daily if it uses six times less water compared to hand washing. (3)
- 3.3.2 Is the claim of the manufacturer realistic? Justify your answer by giving a reason. (2)
- 3.4 Kara's husband Mikail decides to tile the floor of their kitchen and dining room as an anniversary gift to her using red and white tiles.

- A **rectangular space** for the sink and dishwasher is located against one wall of the kitchen as illustrated in the sketch.
- The width of the space is 1 m , and the length is 3 m . The space is not going to be tiled.
- The area of 1 tile is $0,16\text{ m}^2$.



- 3.4.1 A scale drawing is to be made of the kitchen and dining room. Determine the scale (in unit form) to be used if the length of the north wall is 42 mm on the map. (2)
- 3.4.2 Mikail wants to calculate the area of the floor in reality to be tiled excluding the sink and dishwasher space. Some of his calculations are incorrect. Redo his calculations to arrive at the correct answer. The following shows his calculations:

$$\text{Area}_{\text{kitchen}} = 8 \times 10 = 80\text{ m}^2$$

$$\text{Area}_{\text{dining room}} = 4 \times 8 = 32\text{ m}^2$$

$$Area_{space} = 1 \times 3 = 3m^2$$

$$Total\ area\ to\ be\ tiled = 80 + 32 + 3 = 115m^2$$

(5)

- 3.4.3 Calculate the total number of tiles to be bought if the tiler requires that 9% more tiles must be purchased to allow for cutting and breakages. (6)

Question 8

[10]

8. Mrs van Zyl rents a closed trailer for the learners' luggage for their trip to the airport. The dimensions of the trailer are shown below.

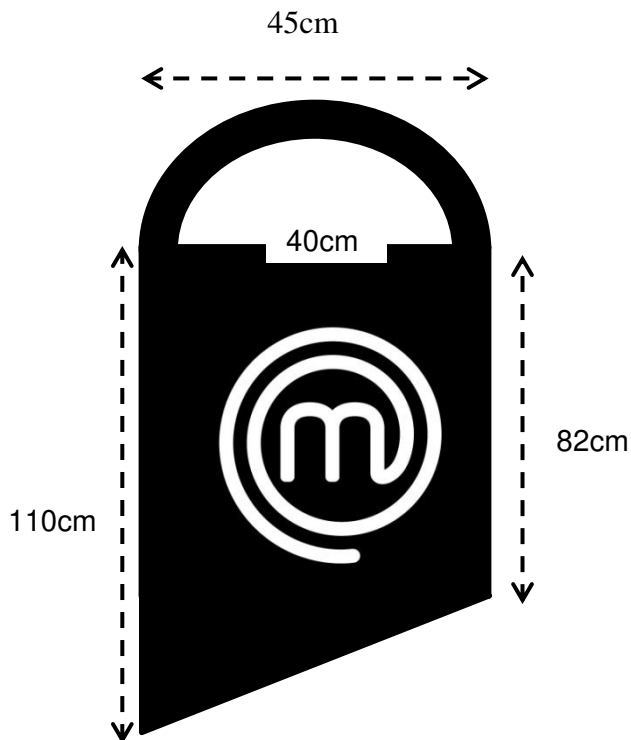


- 8.1 Calculate the volume of the trailer in cubic meters. (4)
- 8.2 Each learner/teacher is permitted to bring with them one suitcase as per the airline regulations below. If there are 12 learners and 2 teachers going on the tour, calculate whether the trailer will be big enough for their suitcases.



QUESTION 4

4.1 The MasterChef official apron is designed by a clothing company as follows:



Area of rectangle = length $\times$ breadth

*Area of triangle = $\frac{1}{2} \times \text{base} \times$
perpendicular height*

Area of circle = $\pi \times (\text{radius})^2$

Circumference = $\pi \times \text{diameter}$

Assume $\pi = 3,14$

4.1.1 Calculate how many square metres (**area**) of material are required to make an apron.

(Round your answer off to 2 decimal places)

(11)

4.1.2 A stitch needs to be sewn around the outside **perimeter** of the apron only.

How many centimetres of stitching are required?

(6)

4.1.3 The MasterChef logo, which is glued onto the front of the apron, is 3-dimensional.

If its area is 52cm^2 and it is 15mm thick, calculate the volume of the logo, rounded

to the nearest mm^3 .

(4)

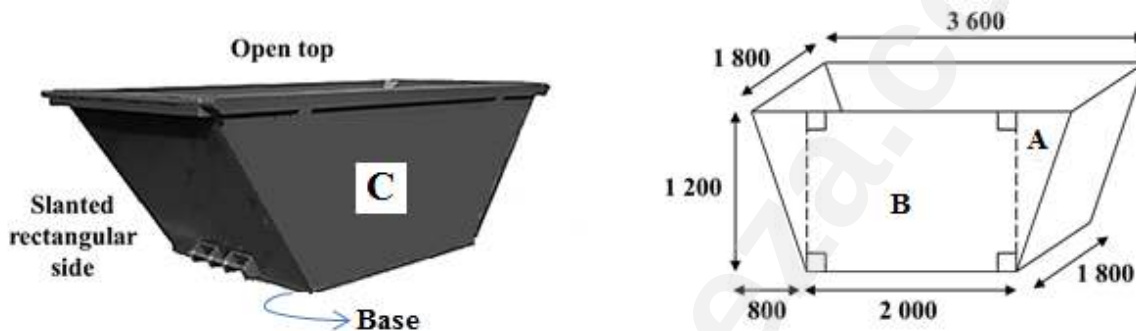


QUESTION 2**[28 Marks]**

[Adapted from DBE, Feb/Mar 2015]

Mr Padayachee owns a refuse removal company which offers the hire of mini-skip bins to remove building and garden refuse from building sites and private homes. Mr Padayachee wishes to repaint the exterior sides of some of his containers.

The dimensions of a container are shown on the diagram below. All measurements are given in millimetres.



2.1. State the dimensions for the base of the container in meters. (2)

2.2. Calculate the area (in mm^2) of the triangular part marked **A** on the diagram. (2)

$$A = \frac{1}{2} \times \text{base} \times \text{perpendicular height}$$

2.3. Calculate the area (in mm^2) of the rectangular part marked **B** on the diagram. (2)

$$A = l \times b$$

2.4. Calculate the total exterior area (in mm^2) of the part marked **C** on the picture. Show all working. (3)

2.5. Convert your answer in question 2.4 to square meters (m^2) if $1 \text{ m}^2 = 1\,000\,000 \text{ mm}^2$. (2)

2.6. Calculate the area (in mm^2) of one of the slanted rectangular sides. Round your answer off to the nearest whole number. (6)

2.7. Mr Padayachee wishes to repaint 15 identical mini-skips. He will only paint the exterior of the four sides.

2.7.1. If the total exterior area to be painted on one mini-skip is $11,91\text{m}^2$, calculate the total exterior area of all the mini-skips that will be repainted, rounded to the nearest m^2 . (2)

2.7.2. The paint consultant recommends applying two coats of paint to every mini-skip. The paint is sold in 5 litre tins and each tin will cover 25m^2 .

Determine how many 5 litre tins Mr Padayachee will have to buy. (5)

2.8. Mr Padayachee wishes place a strip of reflective tape around the rim of the newly painted mini-skip bins so that they can be seen at night.

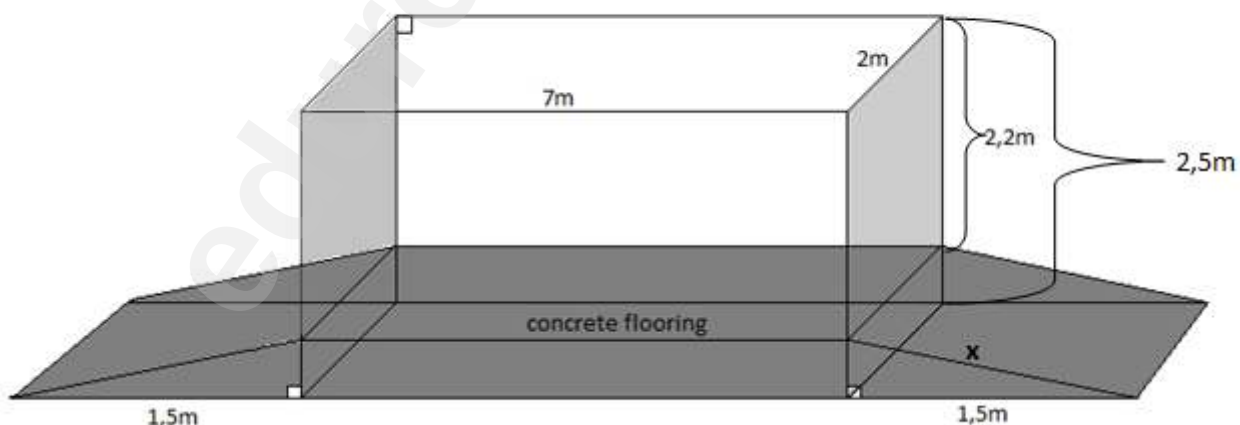
2.8.1. Calculate the length of tape (in cm) he will need for ONE bin. (2)

2.8.2. The tape is sold at \$27,41 per roll. Determine the cost in South African Rands for a single roll of tape if \$1 = R12,65. (2)

QUESTION 3

The Matric students of Ashton College Ballito 2015 have decided that for their farewell gift to the school they are going to revamp the walk way tunnel that will lead from the new land across the highway onto the school premises.

The design of the walk way tunnel is indicated below:



- The tunnel is a rectangular prism with dimensions of $7\text{m} \times 2\text{m} \times 2,5\text{m}$.
- The walkway flooring of the tunnel will have to be raised 30cm above ground level, with two identical concrete ramps on either side. This is to avoid the natural water flow through the tunnel.
- Only 2 walls and the roof will be painted.

Formulae you may need: [Downloaded from eduresourceza.com](http://eduresourceza.com)

Area of a triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

Area of a rectangle = length $\times$ breadth

Volume of a triangular prism = area of triangle $\times$ height of object

Volume of rectangular prism = length $\times$ breadth $\times$ height

3.1 The Matric committee need to order the concrete to build the walkway:

3.1.1 Calculate the volume of concrete, in m^3 , needed to make one triangular ramp. (2)

3.1.2 Calculate the volume of concrete needed to make the concrete flooring of the rectangular tunnel. (2)

3.1.3 What is the total volume of concrete needed to make the concrete flooring of the walkway? (4)

3.2 The Matric committee also need to order the paint to paint the interior walls and roof of the tunnel. Due to the damp, one coat of waterproofing will be needed and two coats of the desired colour paint will be used:

3.2.1 Calculate the total surface area that is needed to be painted. (4)

3.2.2 If 1 litre of colour paint covers $10m^2$, how many litres will be needed to paint the walls? (3)

3.2.3 The cost of paint is as follows:

R65,99 per litre of colour paint

R83,50 per litre of waterproofing paint

If 5 litres of waterproofing paint is needed to paint the tunnel, calculate the total cost of painting the tunnel. (4)

3.2.4 Using the theorem of Pythagoras, calculate the value of x; the length of the ramp. (3)

QUESTION 2

The cost of electricity in South Africa has increased drastically over the last few years. Mrs Mbambo investigates a number of options to reduce her electricity expenditure.

2.1 Mrs Mbambo investigates buying a geyser blanket.

Because hot water electricity use comprises around 40% of a typical household's consumption, it is important to reduce heat losses in this area. Under normal circumstances, often geyser water temperature will drop by 1 degree C per hour, so constant energy is needed to maintain the temperature. This blanket can cut this energy use by half... the geyser blanket ensures a substantial saving both financially and environmentally for each household.

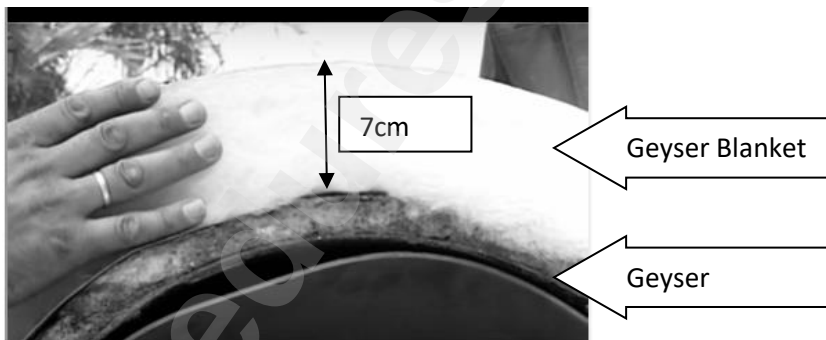
Source: <http://savingenergy.co.za/geyser-blanket>

She has a standard geyser powered by electricity. The geyser has a radius of 20,6 cm and a height is 1,5m. The temperature on Mrs Mbambo's geyser is set at 65°C.

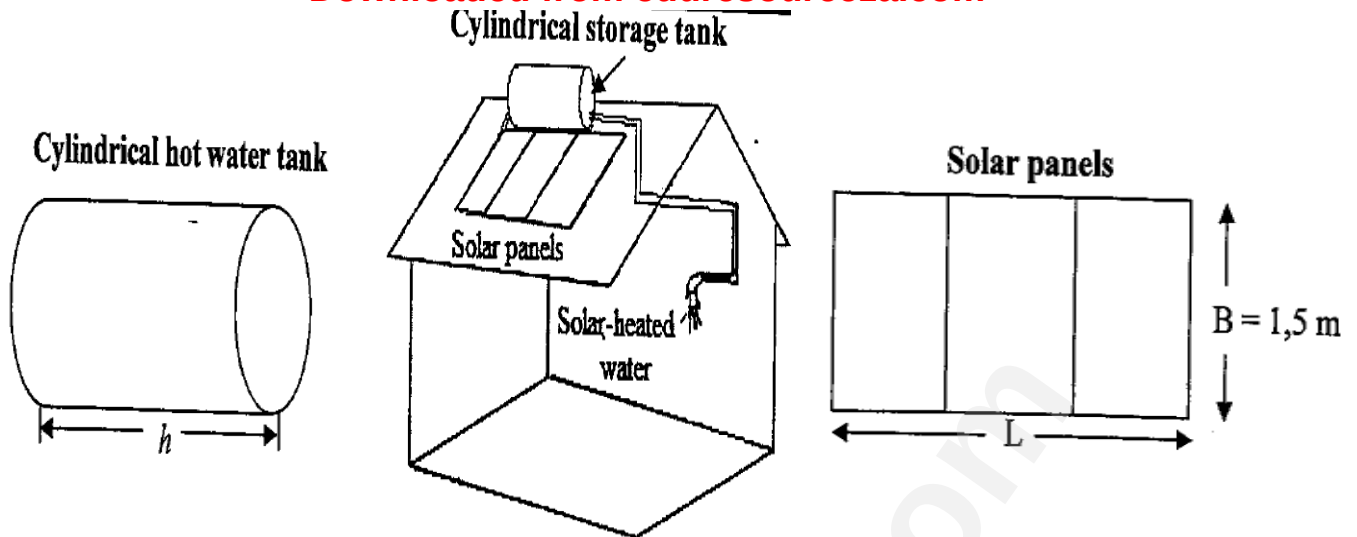
Area of circle = πr^2
 Total surface area = $2 \times \pi r^2 + 2\pi r \times h$
 Volume of a cylinder = $\pi r^2 h$



The two pictures below show the geyser cut across (a cross-section) to show customers how the blanket wraps around the body of the geyser.



- 2.1.1 Calculate the volume to the nearest cm^3 of the geyser without the blanket. (4)
- 2.1.2 At 06:00 Mrs Mbambo switches her geyser off. Calculate the temperature of the geyser water at 1:30pm. (5)
- 2.1.3 Determine the new radius and height of the geyser **with** the blanket fitted. (3)
- 2.1.4 Assuming that the blanket has a constant width of 7cm all around the geyser, including the base and top (ignore the flap in the picture), calculate the total surface area to the nearest cm^2 of the geyser with the blanket. (4)



The solar geyser consists of rectangular solar panels and a cylindrical storage tank as shown in the diagrams.

The solar panels use sunlight to heat the water stored in the cylindrical tank.

The heated water can then be used in the house.

There are 5 people in total in the Mbambo household.

You may use the following formulae:

$$\begin{aligned} \text{Area of a rectangle} &= \text{length} \times \text{breadth} \\ \text{Volume of a cylinder} &= \pi r^2 h \end{aligned}$$

To reduce her electricity bill, Mrs Mbambo decides to install a solar geyser on the roof of her house.

- 2.2.1 Mrs Mbambo was told that she needed solar panels with an area of $2,2\text{m}^2$ for the first two members in her household and thereafter an area of $0,75\text{m}^2$ for each additional member. (4)
- Determine the total length (l) (to 1 decimal place) of the solar panels if the breadth (b) is $1,5\text{m}$. (4)
 - The hot water tank on the roof has a volume of 150 litres and a radius of 20cm. Calculate (to the nearest cm) the height of the tank if $1 \text{ litre} = 1000\text{cm}^3$. (5)
- 2.2.2 Ken's Plumbers and Electricians normally charge R12 475 to supply and install the solar geyser. They offered a discount of R4 550 on the geyser that Mrs Mbambo ordered.
- Mrs Mbambo currently pays an average of R890,00 per month for electricity.
 - She calculated that 42% of her electricity usage is for water heating.
 - She states that if she can save 42% on her monthly electricity bill, she will be able to recover the cost of the solar geyser within two years.

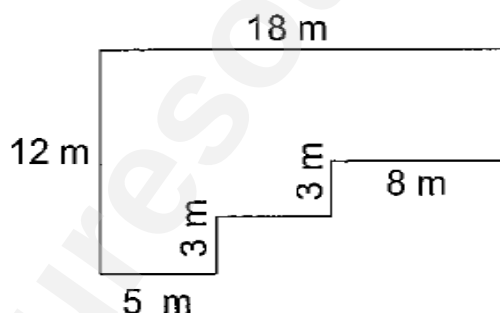
Determine whether Mrs Mbambo's statement is valid. Justify your answer, showing ALL relevant calculations. (6)

[31]

QUESTION 3

Use the key and map on the Annexure to answer the questions that follow.

- 3.1 The University of Chicago Harper Memorial Library is on the annexure. The key on the annexure indicates the departments that the offices belong to. The offices of Professor Patel, the Dean of the College, are also located on this floor. (A Dean is an Academic Head of Department at a university)
- 3.1.1 Write down the number of bathrooms this floor has. (1)
- 3.1.2 Professor Macdonald in the Mathematics department is the Assistant Professor to the Dean, Professor Patel. He needs an office next door to Professor Patel. Write down the office he could be placed in. (1)
- 3.1.3 Before a student visits a staff member, they need to go to the Information desk. Write down the closest stair case they should use. (2)
- 3.1.4 If staff work in “offices” only, calculate the maximum number of staff that this office block can accommodate. (Assume there can only be one staff member per office) (2)
- 3.1.5 Determine the direction that the conference room windows are facing. (2)
- 3.1.6 A standard office desk breadth of 1,1m and a length of 2m. Make a scale drawing of such a desk using a scale of 1:25. (3)
- 3.2 Part of the ceiling of the Harper Memorial Library was damaged in a recent storm. As part of the repair to the ceiling the maintenance manager Mr Williams asked for insulation to be installed. This insulation helps to keep the heating and cooling costs low. Consider the following outline for a ceiling below:



- 3.2.1 How many square metres of insulation would be needed to add a single layer to this part of the library's ceiling? (4)
- 3.2.2 Insulation is often sold in various size rolls. To find the cheapest way to purchase insulation, you need to consider various options in the table provided below:
Use the table on your annexure to answer the questions below.

			3.2.2 a)	3.2.2 b)	3.2.2 c)
Insulation package	Number of m ² / roll	Cost per roll	Cost per m ² R/m ²	Number of rolls for roof	Total cost
Brand A	12m ²	R180			
Brand B	8m ²	R153			
Brand C	22m ²	R421			

- a) Which insulation brand is the cheapest? Explain your answer by working out the cost in Rands/m². (4)
- b) How many rolls of each brand would be needed for this part of the Library's ceiling? (Partial rolls of insulation material are not available) (4)
- c) Calculate the cost of insulating this part of the ceiling and conclude which brand will be the cheapest. (5)

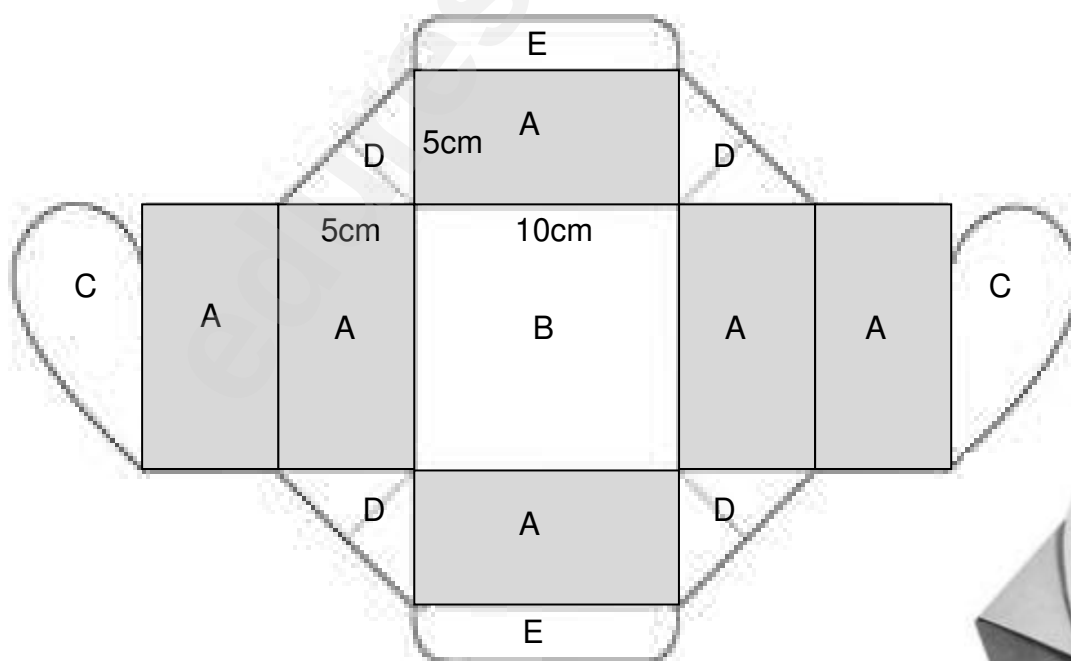
			3.2.2 a)	3.2.2 b)	3.2.2 c)
Insulation package	Number of m ² / roll	Cost per roll	Cost per m ² R/m ²	Number of rolls for roof	Total cost
Brand A	12m ²	R180			
Brand B	8m ²	R153			
Brand C	22m ²	R421			

- 3.3 Professor Patel decides to give heart-shaped chocolate –filled gift boxes to all the secretaries in appreciation for their hard work.
Examine the net of one gift box below. It is made out of red cardboard.

- The Base (B) is a square with sides 10cm
- The breadth of the shaded area (A) is 5cm
- The “half” heart area (C) is 32,5cm² each
- The area E is 5cm²

Formulae:

Area of rectangle = length x breadth
Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

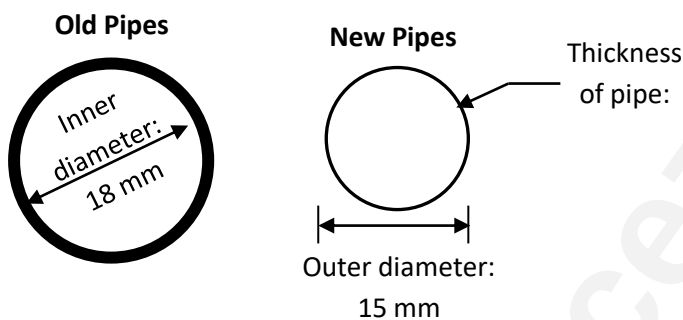


Source: <http://www.homemade-gifts-made-easy.com/printable-gift-boxes-hearts.html>

- 3.3.1 Calculate the total area of the net of one gift box made from red cardboard. (10)
- 3.3.2 Professor Patel decides to make 2 dozen gift boxes. Calculate the area of red cardboard that is needed in total. (2)
- 3.3.3 The cost of the chocolate –filled gift boxes is R600. R120 of that total is for the cardboard and glue used in making them. How much did each chocolate cost if 4 equal – sized chocolates is placed in each gift box? (4)
- [44]

Question 3

A man wants to change the hot water pipes at his home. The current pipes are larger with an inner diameter of 18mm, while his new pipes will have the following measurements:



The following formulae might be useful in answering the questions below:

Formulas

$$\text{Area of rectangle} = l \times b \quad \text{Area of triangle} = \frac{1}{2} \times b \times h \quad \text{Area of circle} = \pi \times r^2$$

$$\text{Theorem of Pythagoras: } a^2 = b^2 + c^2 \quad \text{Perimeter of circle} = 2 \times \pi \times r \quad \pi = 3,142$$

$$\text{Volume of prism} = \text{Area of base} \times \text{length of prism}$$

$$\text{Surface Area of closed prism} = 2 \times \text{Area of base} + \text{perimeter of base} \times \text{length of prism}$$

$$\text{Surface Area of Open ended prism} = \text{perimeter of base} \times \text{length of prism}$$

- 3.1 Calculate the inner radius of the new pipes. Answer in cm. (3)
- 3.2 Using your answer to question 3.1, calculate the amount of water that will fit inside 1 meter of the new pipe. Answer in cm^3 . (4)
- 3.3 The man has also bought a new shower head. The smaller diameter pipe also means less time for the hot water to reach the shower.

How a shower “heats up”

All of the cold water that is in the pipe leading from the hot water geyser to the shower needs to first exit the pipe in order for the hot water to flow out of the shower head.

(3)

- 3.3.1 Using your answer to question 3.2 and the following information, calculate the volume of water, in litres, that is in the pipe leading from the geyser to the shower head:

(5)

- There are 12 m of pipe from the geyser to the shower head
- $1 \text{ m}^3 = 1000 \text{ litres}$

- 3.3.2 The flow rate of the new shower head is 1,5 gallons per minute. Using your answer to question 3.3.1, calculate how long (to the nearest second) he would have to let the water run for until the shower heats up. 1 litre = 0,264172 gallons

- 3.4 In order to calculate how much the replacement piping is going to cost he draws a diagram. It is shown in **APPENDIX D**. Use the diagram to answer the questions which follow:

- 3.4.1 Is the diagram on **APPENDIX D** to scale? Give full reasoning to support your answer. (3)

- 3.4.2 The lengths of each individual piece of pipe needed to complete the project are indicated on the diagram. However, the piping is sold in full lengths which are 6 m each. A whole number of lengths will need to be bought and then cut into the required lengths before being assembled. (3)

How many 6 m lengths will need to be bought in order to complete the project?

- 3.4.3 Using your answer to question 3.4.2 and the following information, calculate the total cost for the materials needed to complete the project. (4)

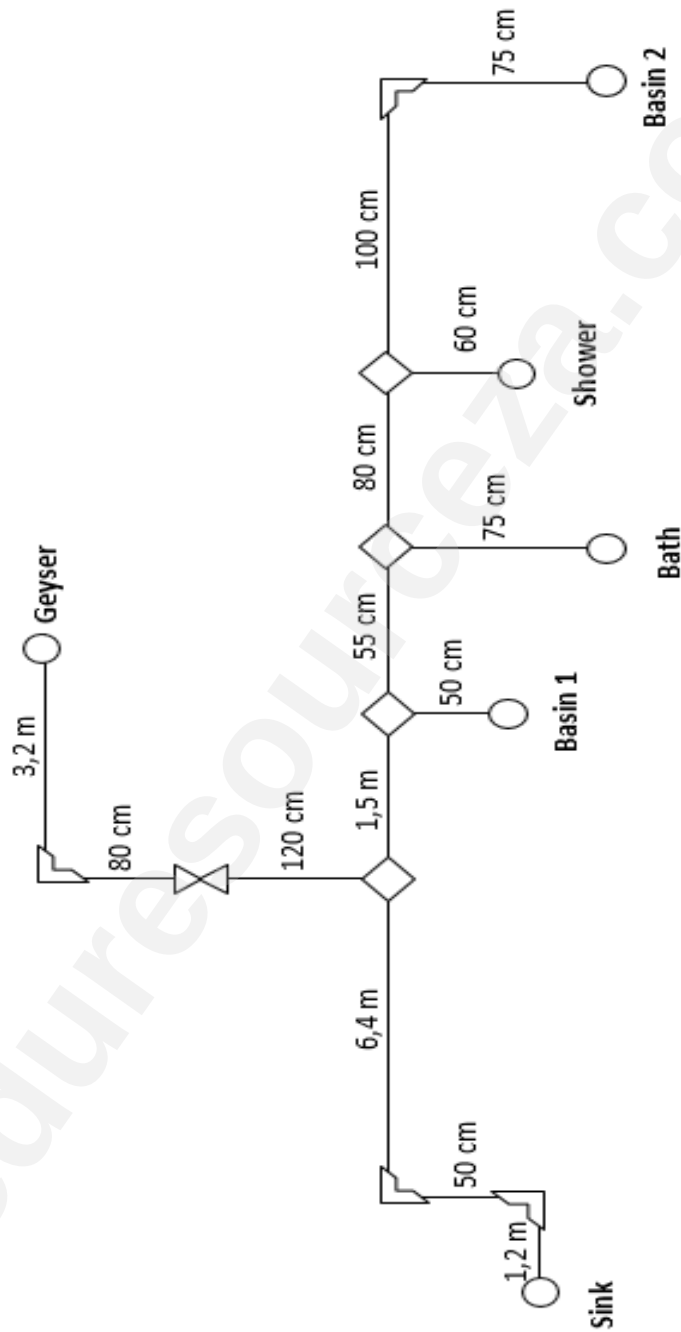
- R129,00 – 1 x 6 m length (15 mm piping)
- R54,50 – 1 x Shut-off valve
- R23,50 – 1 x elbow junction
- R23,50 – 1 x T-junction
- R16,50 – 1 x pipe connector

- 3.4.4 A plumber quotes him R5 400 to do the entire job (including materials). The man decides to save money and do the job himself with the help of another man (who charges him R600 excluding materials). Using your answer to question 3.4.3, calculate the percentage of the plumber’s quote that the man saved by doing the job himself. **Round your answer to the nearest whole percentage.** (5)

[30]

Appendix D: Question 3.4

Water pipe replacement plan



Key

 : Shut-off valve

 : T-junction

 : Elbow junction

 : Pipe connector