A Guide to Advanced Measurement

Teaching Approach

Through the series, Advanced Measurement, the learners will develop further and practice certain skills that have been taught in the previous series. This series of video lessons and tasks have all been designed to match the order of the CAPS document. It has been designed like this so that the teaching will flow smoothly, and a logical process can be followed.

Before starting this series, it is important to take note of what content and Advanced Measuring aspects that you will be teaching. Below are a series of points concerning the topics the video lessons will be focusing on.

- Understanding and calculating perimeter and area
- Investigating and identifying the most cost effective options for building on a housing plot.
- Investigating and using different quotes from different companies.
- Calculating the volume of concrete needed for the floor of a house.
- Calculate the area of the floor plan of a house.
- Investigate and identify cost effective options for flooring options for the house.
- Measuring and calculating the surface area of the geyser blanket in order to find out the amount of insulation material needed.
- Calculating the volume of water the geyser can hold at certain percentage levels.
- Investigating the temperature of the geyser using degrees Centigrade and Fahrenheit.

In each video lesson, we explain and demonstrate only one or two examples of each concept or method that we use. We leave it to you to reinforce the learning with many examples for learners to work on in class and for homework. You can use the activities given in the task video. Full answers are also provided for every worked example in each lesson and for every activity in the task answers. In addition there are online resources provided where you can find more examples.

Video Summaries

Some videos have a 'PAUSE' moment, at which point the teacher or learner can choose to pause the video and try to answer the question posed or calculate the answer to the problem under discussion. Once the video starts again, the answer to the question or the right answer to the calculation is given.

Mindset suggests a number of ways to use the video lessons. These include:

- Watch or show a lesson as an introduction to a lesson
- Watch of show a lesson after a lesson, as a summary or as a way of adding in some interesting real-life applications or practical aspects
- Design a worksheet or set of questions about one video lesson. Then ask learners to watch a video related to the lesson and to complete the worksheet or questions, either in groups or individually
- Worksheets and questions based on video lessons can be used as short assessments or exercises
- Ask learners to watch a particular video lesson for homework (in the school library or on the website, depending on how the material is available) as preparation for the next days lesson; if desired, learners can be given specific questions to answer in preparation for the next day's lesson

1. Investigating Housing Plots

We will focus on understanding and calculating perimeter and area; investigating and identifying the most cost effective options for building on the plot.

2. Working with Floor Plans

During this lesson, we calculate the volume of concrete needed for the floor, the area and investigate and identify cost effective options for flooring options for the house.

3. Calculations with Electric Geysers

In this lesson we will focus on measuring and calculating the surface area of the geyser blanket in order to find out the amount of insulation material needed.

Resource Material

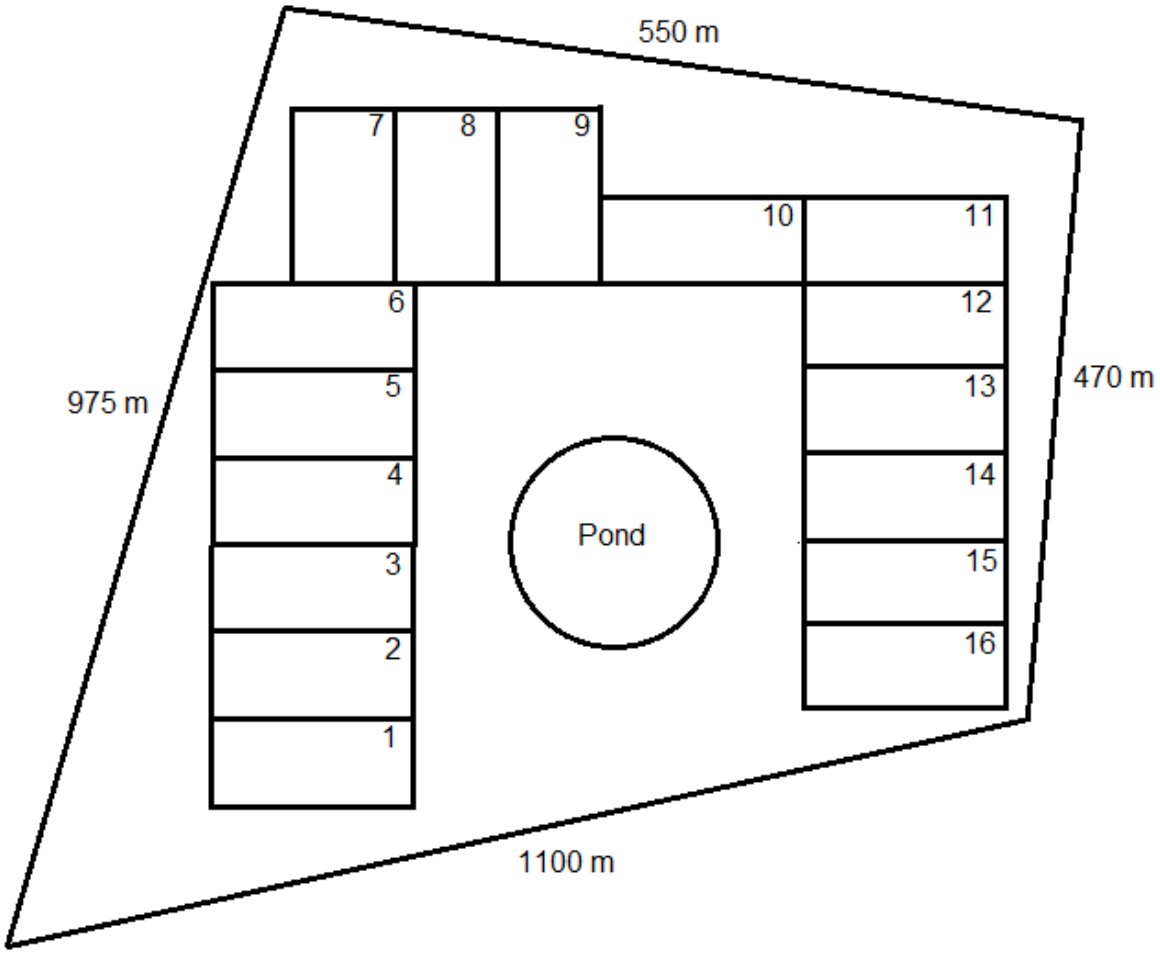
Resource materials are a list of links available to teachers and learners to enhance their experience of the subject matter. They are not necessarily CAPS aligned and need to be used with discretion.

1. Investigating Housing Plots	http://printables.scholastic.com/printables/detail/?id=43880	A printable worksheet which introduces a project on designing a bedroom to scale.
2. Working with Floor Plans	http://www.calculator.net/concrete-calculator.html	Concrete calculator
	http://en.wikipedia.org/wiki/Floor_plan	An encyclopaedia on floor plans
3. Calculations with Electric Geysers	http://math.about.com/od/formulas/ss/surfaceareavol_3.htm	Surface area and volume of a cylinder

Task

Question 1

Study the following diagram. It is a plan of the land where the RDP houses will be laid out on the plot.



1.1 Calculate the total length of the boundary wall/fence.

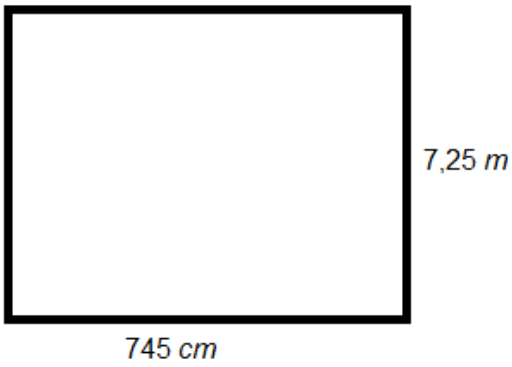
1.2 Convert this answer to kilometres.

	Fence	**Vibracrete wall**
Company A	R280.00 per metre	R28 500 per 100 metres
Company B	R500.00 per two metres	R290.00 per metre

1.3 Use your answers and the table to calculate the total costs in Rands, for both the fence and the vibracrete wall for Company A and B.

Question 2

This diagram shows the size of one plot in the complex. There are 16 plots exactly like this in the complex.



2.1 Convert 745 cm to metres.
2.2 Calculate the area of one house plot. Give your answer in m^2.
2.3 What is the total area of all 16 plots? Give your answer in m^2.
2.4 One of the contractors calculated the area of all 16 plots to be $864m^2$. What has he done wrong in the calculation?

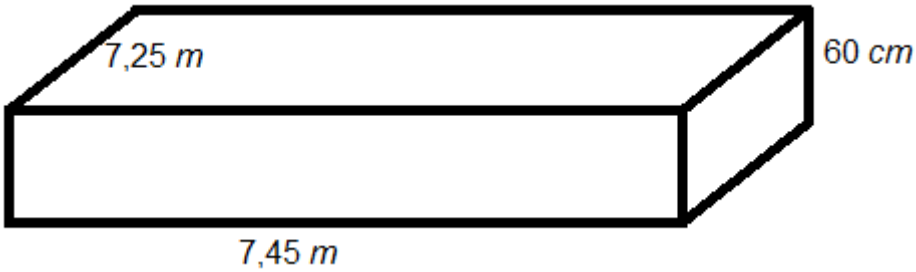
Question 3

The contractors want to lay $650m^2$ of grass. Grass is sold in slabs that have a length of 40 cm and a breadth of 25 cm

3.1 Calculate the area of one piece of grass slab. Give your answer in m^2.
3.2 Calculate how many grass slabs will be needed to cover the area.
3.3 If one slab of grass costs R9,50, what would the total cost be for the grass?

Question 4

This is a diagram of the concrete slab that needs to be laid as a foundation for each house in the complex.

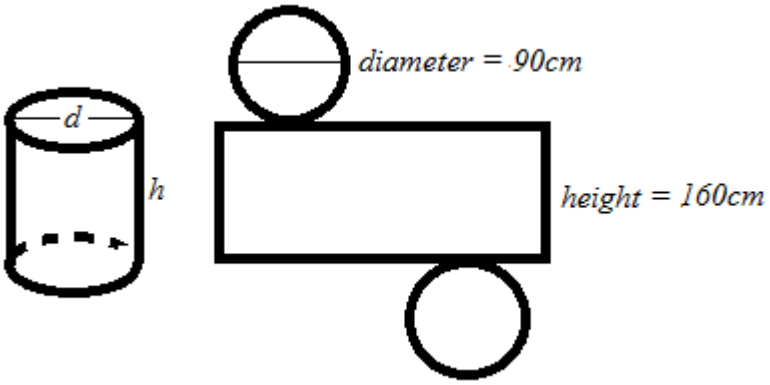


4.1 Calculate the volume of concrete needed, in m^3.
4.2 If $1m^3$ = 1000 litres, how many litres of concrete is used for the foundation?
4.3 Calculate the total cost of the concrete if $1m^3$ is R225.00.

Question 5

The contractors want to paint the walls of the house with two coats of paint. The area of all of the interior walls equals $78m^2$. If one litre of paint covers $5m^2$, how many 5 litre tins of paint does he need?

Question 6



6.1 Using the diagram of the net of the cylinder, which is the pattern for the insulation blanket, determine the measurements, in metres, of the radius and the length of the geyser blanket.

6.2 Calculate the total surface area of the insulation blanket. Give your answer to the nearest m^2. Use $\pi = 3,142$.

6.3 Using your answer from the previous question, calculate the total amount of insulation material needed, including the 30% extra recommended by the supplier.

6.4 Which formulae would you use to calculate the volume of a cylinder?

$2\pi r^2 + 2\pi rh$ or $\pi r^2 h$

(Where r = radius, and h = height or length)

6.5 Calculate the volume of water in the geyser when it is full. Give your answer rounded to the nearest cm^3. Use $\pi = 3,142$.

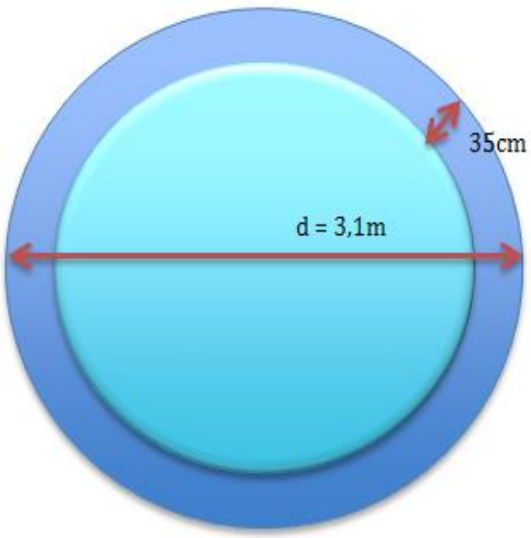
6.6 Using your answers from the previous questions, calculate the following:

6.6.1 The volume of the geyser when it is 60% full

6.6.2 The amount of water in litres that the geyser can hold at that level. Use 1 cm^3 = 0,001 l

Question 7

The picture below is of a circular fish pond that will be built in the courtyard of complex. The fishpond has an outer diameter of 3,1m. The concrete rim is 35cm in width, and the pond is 65cm in height. Use this diagram to answer the following questions.



7.1 Convert all of the measurements to centimetres.

7.2 Calculate the volume of concrete needed to build the fishpond rim. Use $\pi = 3,142$.

7.3 Calculate the amount of water in litres that the fishpond can hold when the water level is 15cm from the top. Use the unit conversion: 1 cm^3 = 0,001 litres.

Task Answers

Question 1

1.1 Perimeter = 550m + 470m + 1100m + 975m = 3095m

1.2 1km = 1000m

3095m ÷ 1000 = 3,095km or 3,10km

1.3 Company A

Cost of fence = 3095m × R280.00/m
= R866 600,00

Cost of wall = R28 500 per 100m
= R28 500÷100
= R285/m

∴ R285/m × 3095m = R882 075,00

Company B

Cost of fence = R500.00 per 2 metres
= R500.00÷2
= R250/m

∴ R250/m × 3095 = R773 750,00

Cost of wall = R290/m × 3095
= R897 550,00

Question 2

2.1 Length: 745cm = 7,45m

2.2 Area of one house plot = length × breadth
= 7,45m × 7,25m
= 54,0125…m^2
= 54,01m^2

2.3 Area of 16 plots = area of one plot × 16
= 54.01m^2 × 16
= 864,16m^2

2.4 The contractor has rounded the answer down to the lowest whole number.

Question 3

3.1 Unit conversion: 1m = 100cm

Length: 40cm = 0,40m (÷100)

Breadth: 25cm = 0,25m (÷100)

Area of one grass slab = length × breadth
= 0,40m × 0,25m
= 0,1m^2

3.2 Number of slabs needed = area of lawn ÷ area of one grass slab
= 650m^2 ÷ 0,1m^2
= 6500 slabs

3.3 1 slab = R9.50

6500 slabs × R9,50 = R61 750,00

Question 4

4.1 Unit conversion: 1m = 100cm

Depth = 60cm ÷100 = 0,60m

Volume = length × breadth × height

= 7,45m × 7,25m × 0,60m

= 32,407m^3

= 33m^3

4.2 1m^3 = 1000 litres

32,407m^3 × 1000 = 32 407 litres

4.3 1m^3 = R225,00

R225,00 × 33m^3 = R7425

Question 5

1st coat: 78 m^2 ÷ 5 m^2 = 15,6 litres

Therefore, 3 coats = 33,2 litres, rounded up to 33 litres.

33 ÷ 5 = 6,60 five litre cans, rounded up to 7 five litre cans.

Question 6

6.1 Radius = half of the Diameter

= Diameter ÷ 2

= 90cm ÷ 2

= 45cm

Unit conversion: 1m = 100cm

∴ 45cm ÷ 100 = 0,45m

Height/length = 160cm ÷ 100 = 1,6m

6.2 Total surface area = $2\pi r + 2\pi rh$

= 2× 3.142 × (0,45) + 2 ×3,142× 0,45 ×1,6

= 1,2725… + 4,5244

= 5,7969 … m

= 6 m^2

6.3 Total surface area = 6 m

30% = 30 ÷ 100 = 0,30

∴ 0,30 × 6 m^2 = 1,8 m^2

6 m^2 + 1,8 m^2 = 7,8 m^2 of insulation

6.4 $\pi r^2 h$ (where r = radius, and h = height or length)

6.5 Volume = $\pi r^2 h$ (where r = radius, and h = height or length)

∴ r = 45cm h =160cm

Volume = $\pi r^2 h$ where π = 3,142

= 3,142 × $(45)^2$ × 160cm

= 1018008 cm^3

6.6.1 Volume = 1018008 cm^3

$\therefore$ 60% = $\frac{60}{100}$ = 60 ÷ 100 = 0,6

$\therefore$ 0.6 × 1018008 cm^3 = 610804,08 cm^3

= 610804 cm^3

6.6.2. 1 cm^3 = 0,001 litres

$\therefore$ 610804 cm^3 × 0.001 litres = 610,804 litres

= 611 litres

Question 7

7.1 Diameter of outer circle = 3,1m × 100

= 310cm

Width of rim = 35cm

Height = 0,65m × 100

= 65cm

7.2 Volume = $\pi r^2 h$ (where r = radius, and h = height or length) where π = 3,142

Outer circle measurements:

Radius = diameter ÷ 2 = 310cm ÷ 2 = 155cm

Height = 65cm

Volume of outer circle = $\pi r^2 h$

= 3,142 × $(155)^2$ × 65cm

= 4906625,75 cm^3

= 4906626 cm^3

Inner circle measurements:

Diameter = 310cm – 35cm – 35cm = 240cm

Radius = diameter ÷ 2 = 240cm ÷ 2 = 120cm

Height = 65cm

Volume of inner circle = $\pi r^2 h$

= 3,142 × $(120)^2$ × 65cm

= 2940912 cm^3

$\therefore$ Volume of concrete rim = 4906625,75 cm^3 - 2940912 cm^3

= 1965713,75 cm^3

= 1965714 cm^3

7.3 Inner circle measurements:

Diameter = 310cm – 35cm – 35cm = 240cm

Radius = diameter ÷ 2 = 240cm ÷ 2 = 120cm

Height = 65cm – 15cm = 50cm

Volume of inner circle = $\pi r^2 h$

= 3,142 × $(120)^2$ × 50cm

= 226240,00 cm^3

1 cm^3 = 0,00 litres.

∴ 226240,00 cm^3 × 0,001litres

= 2262,24… litres

= 2263 litres

Acknowledgements

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