



Level 1/2 Constructing the Built Environment Unit 3 Planning Construction Projects

Name _____



The learner will-

LO1 Know job roles involved in realising construction and built environment projects.

The learner can-

AC1.1 Describe activities of those involved in construction projects.

AC1.2 Describe responsibilities of those involved in construction projects.

AC1.3 Describe outputs of those involved in realising construction projects.

Those involved

- client's team (client, architect, engineer, quantity surveyor, project manager, designer)
- contractor's team (builder/site engineer, site supervisor, safety officer, tradespersons, specialist sub-contractors)
- statutory personnel (building inspector, town planner, public health inspector)
- general (administrator, finance officer, public liaison officer, purchasing/procurement officer, catering, security).

Construction projects

- refurbishments
- extensions.

<https://www.goconstruct.org/>

Roles within the construction industry (Unit 3)

Investigate the roles, responsibilities and outputs of people involved in construction projects.

Client's Team

client, architect, engineer, quantity surveyor, project manager, designer.

Client's Team- Client

Activities-

Responsibilities-

Outputs-

Client's Team- Architect

Activities-

Responsibilities-

Outputs-

Client's Team- Engineer

Activities-

Responsibilities-

Outputs-

Client's Team- Quantity Surveyor

Activities-

Responsibilities-

Outputs-

Client's Team- Project Manager

Activities-

Responsibilities-

Outputs-

Client's Team- Designer

Activities-

Responsibilities-

Outputs-

Contractor's Team- Site Supervisor

Activities-

Responsibilities-

Outputs-

Contractor's Team- Safety Officer

Activities-

Responsibilities-

Outputs-

Contractor's Team- Tradespersons

Activities-

Responsibilities-

Outputs-

Contractor's Team- Specialist Sub-Contractors

Activities-

Responsibilities-

Outputs-

Statutory personnel- building inspector, town planner, public health inspector.

Statutory Personnel- building inspector

Activities-

Responsibilities-

Outputs-

Statutory Personnel- Town Planner

Activities-

Responsibilities-

Outputs-

Statutory Personnel- Public Health Inspector

Activities-

Responsibilities-

Outputs-

General- administrator, finance officer, public liaison officer, purchasing/procurement officer, catering, security.

General- Administrator

Activities-

Responsibilities-

Outputs-

General- Finance Officer

Activities-

Responsibilities-

Outputs-

General- Public Liaison Officer

Activities-

Responsibilities-

Outputs-

General- Purchasing/procurement officer

Activities-

Responsibilities-

Outputs-

General- Catering

Activities-

Responsibilities-

Outputs-

General- Security

Activities-

Responsibilities-

Outputs-

Construction projects

- refurbishments
- Extensions

Investigate refurbishment construction projects and extension construction projects.

Refurbishments

Extensions

The learner will-

LO2 Understand how built environment development projects are realised.

AC2.1 Describe processes used in built environment development projects.

Processes

- planning (design, project planning, procurement)
- construction (secure site, site clearance, substructure, superstructure)
- handover to client (commissioning, handover)
- maintenance.

Describe the following processes-

Planning

Design-

Project planning-

Procurement-

Describe the following processes-

Construction

Secure site-

Site clearance-

Substructure-

Super structure-

Commissioning-

Handover-

Maintenance-

Maintenance-

The learner will-

LO2 Understand how built environment development projects are realised.

AC2.2 Calculate resources to meet requirements for built environment development projects.

Calculate

- area
- volume
- percentages
- scaling
- best value
- Tolerances
- VAT
- tender price.

Resources

- plant
- labour
- materials.

What are costings?

Why do we need to work out prices?

Costings are the calculations of areas worked together with prices of materials, labour and any other charges needed for a project presented to a client or company.

Calculating costings is a VERY important part of a construction project. You need to make sure that your calculations are correct so that both you and your client get the best deal from the project.

If you get your costings wrong and underestimate how much a job will cost, then you will make a loss on it. If you overestimate how much a job will cost then you'll be too expensive and the client will hire someone else.

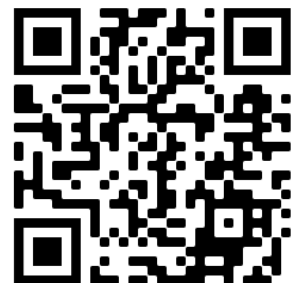
Calculating costings

Costings are usually calculated based on an **area** of a room/space, the amount of **time** that something will take and the cost of **materials** at their market value

Usually smaller builders will do the costings themselves but bigger companies will employ a **quantity surveyor**. They are well paid professionals who's job it is to survey the building plans and calculate exactly how much of each material to order, what trades people they will need to do the job and what plant (machinery and equipment) will need to be hired.

Watch this video clip for an insight into the job of a **Quantity Surveyor**.

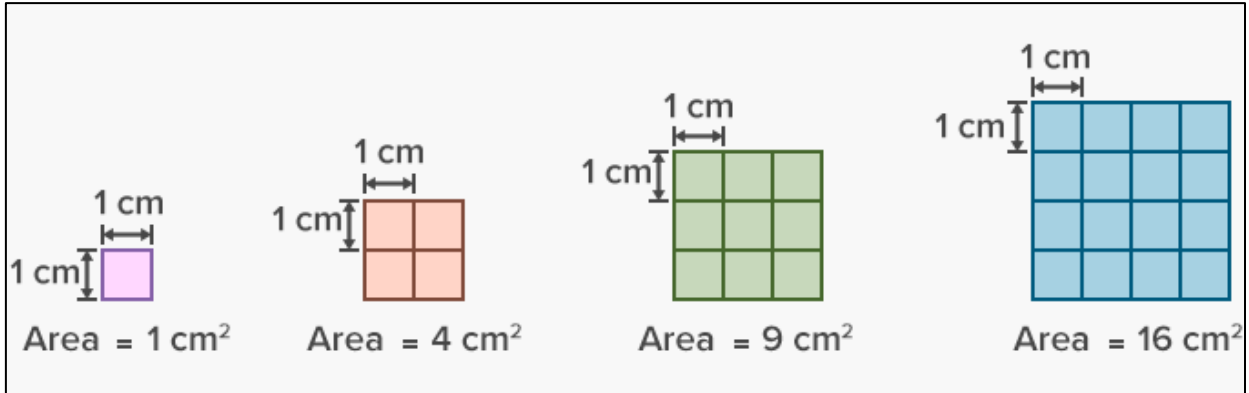
<https://www.youtube.com/watch?v=oPdfRwtH4bE>



The basics of **quantity surveying** rely on being able to work out accurately the amount of materials to order for a job. This requires the ability to calculate area and volume.

What is area?

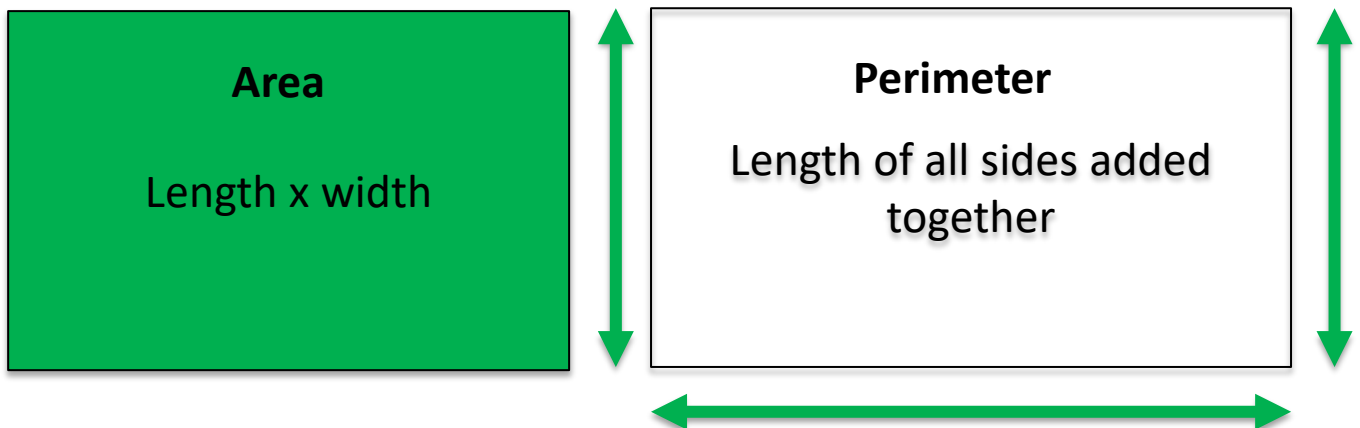
In maths, the **area** can be defined as the space occupied by a flat shape or the surface of an object. ... **Area** is measured in square units such as square centimetres, square feet, square inches, square meters etc.



Area Vs Perimeter

An area is the amount of space that is taken up within a shape.

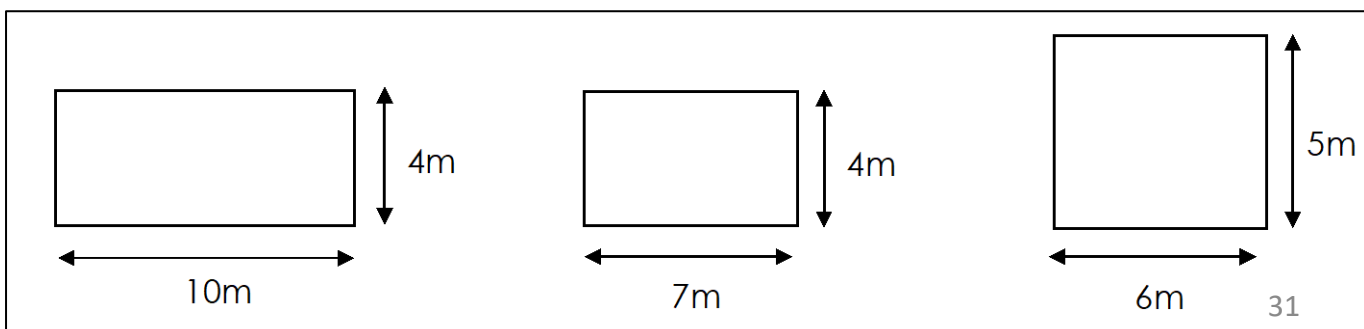
The perimeter is the length of the outside of the shape. Imagine, you had to walk around the outside of schools fence, the distance around the outside is the perimeter.



To calculate **area**....

The units you will need to focus on are "Metres squared or m^2

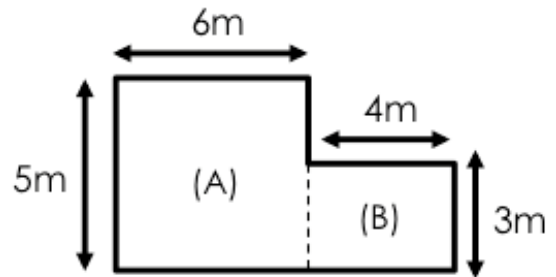
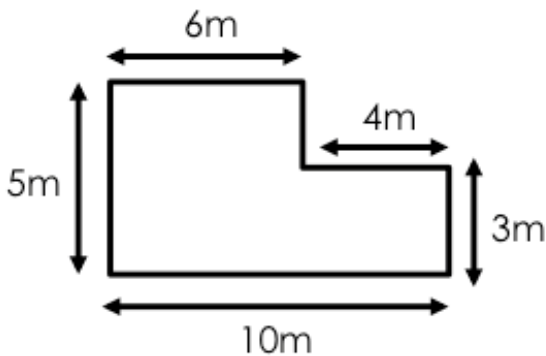
For this you need to know that the formula is length x width



Compound Area

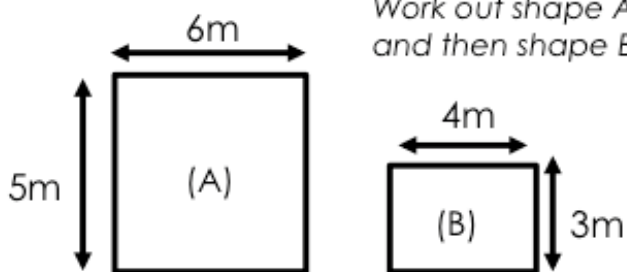
The shapes will not always be simple, they may be more complex.

You have to split the shapes into more simple ones and then combine your answers.



You only need the measurements that matter for each shape

*Work out shape A
and then shape B*



$$A) 6 \times 5 = 30$$

$$B) 4 \times 3 = 12$$

Then add these answers together

$$\text{Total area} = 42\text{m}^2$$

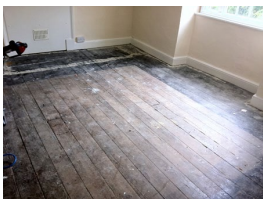
Costings

Once you know the area of what you are building and the price of the materials to build that area, you need to add in the labour cost of the workers doing the job.

Possible costings:

- Area (m²) x materials cost per m²
- Time x {workers} price per hour
- Area (m²) x materials + labour cost

Example costing calculation



Area = 10m²



Materials cost =
£8 per m²



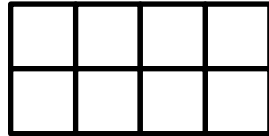
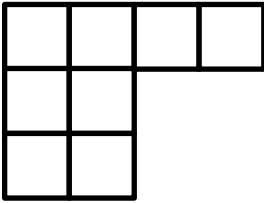
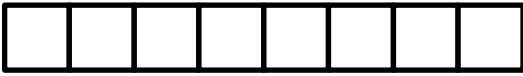
Labour =
£100 per
job

$$10\text{m}^2 \times \text{£}8 = \text{£}80 + \text{£}100$$

$$\text{Total} = \text{£}180$$

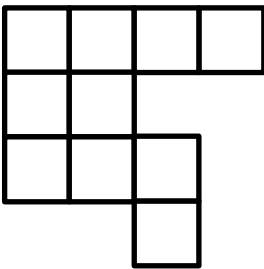
Section A: Area

Area is: **THE SIZE OF A FLAT SURFACE**

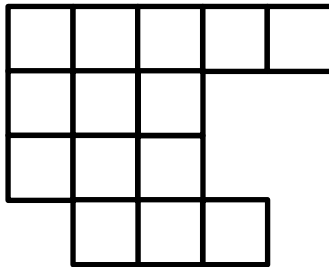


All of these shapes have the same area of 8

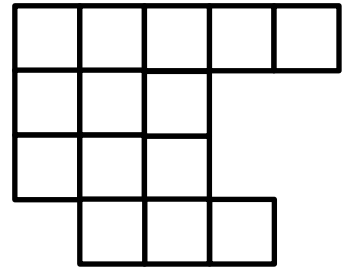
What is the area of the shapes below (All answers are in m^2)



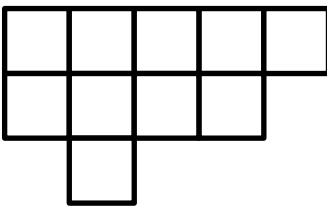
Ans _____



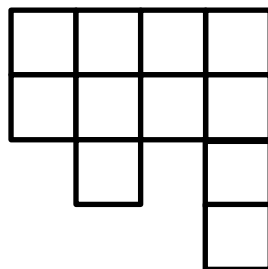
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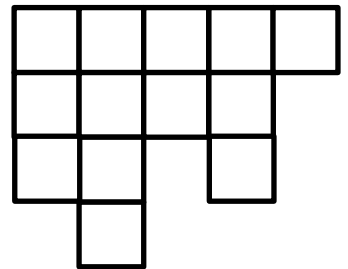
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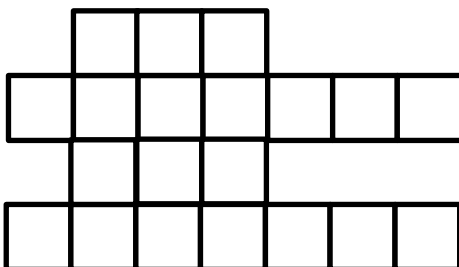
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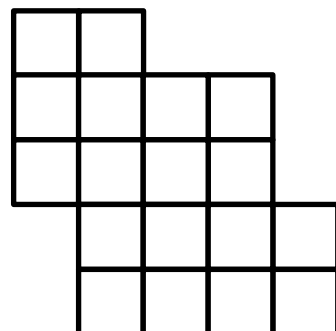
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Ans _____



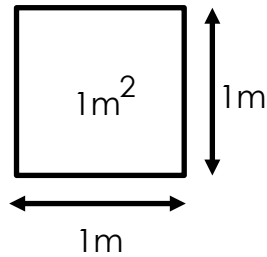
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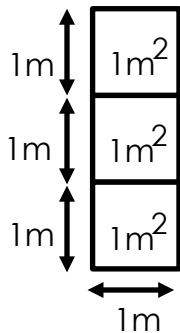
Ans _____

Section A: Area

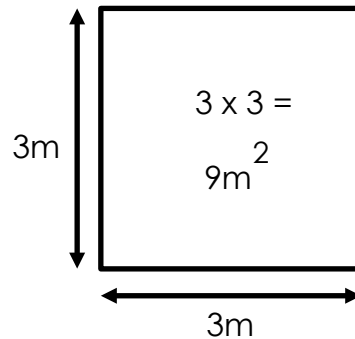
The basic **unit** of area in the metric system is the **square metre**, which is a square that has 1 metre on each side:



Be careful when you say "square metres" and "metres squared", they are different



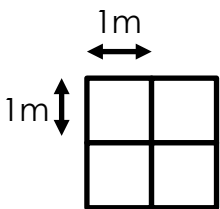
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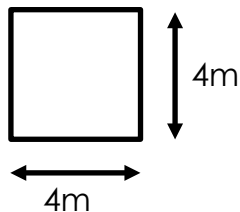
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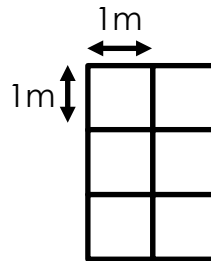
Write in the correct term/answer below



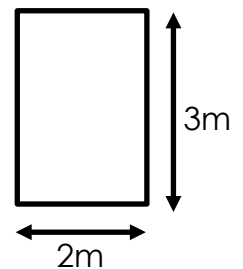
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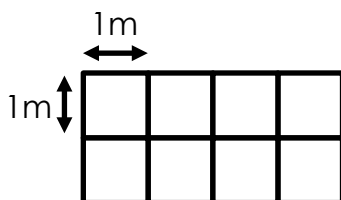
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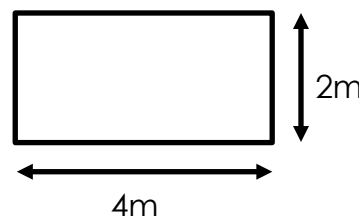
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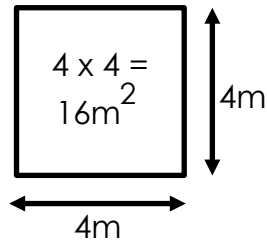
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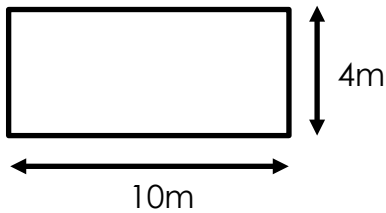
Ans _____

Section A: Area

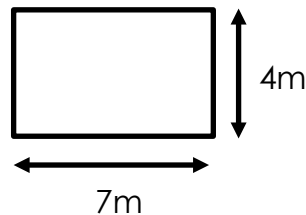
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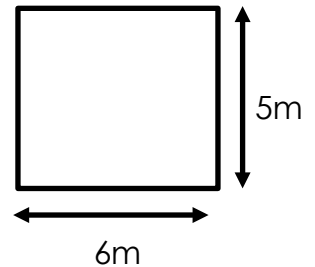
Calculate the areas of the shapes below – **don't forget your units**



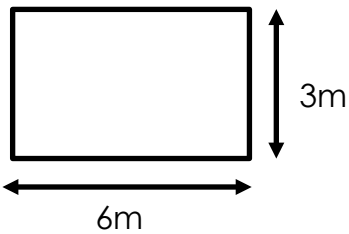
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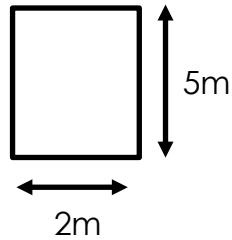
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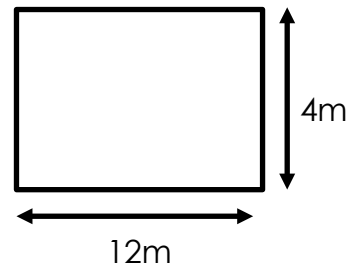
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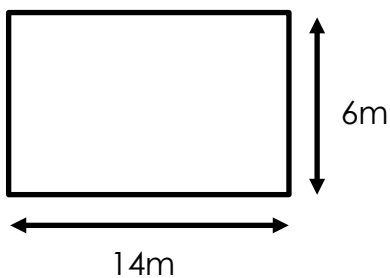
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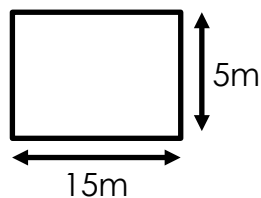
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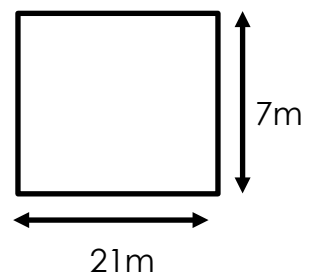
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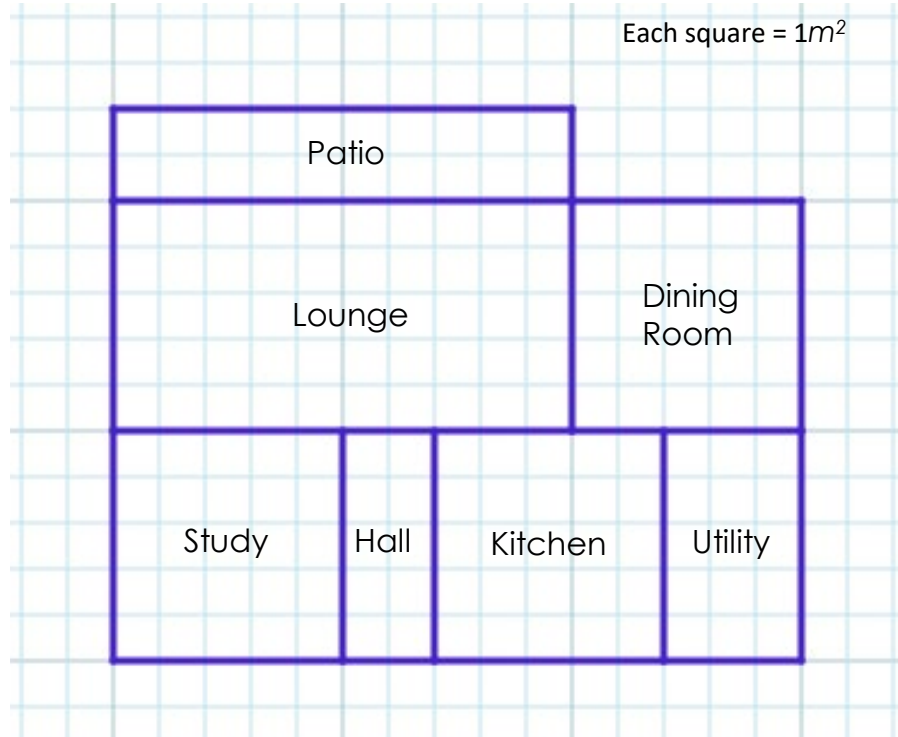


Ans _____

Drawings not to scale

Section A: Area

Tip:
To calculate a total cost, multiply the area by the amount per m^2

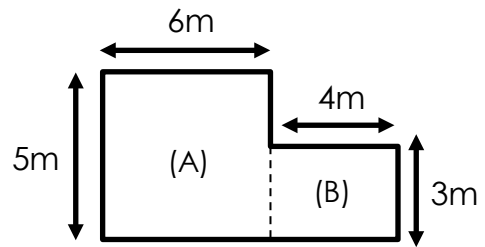
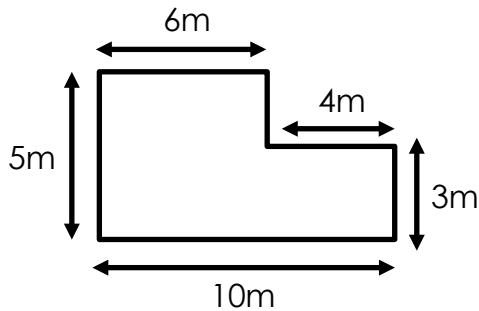


Room	Request	Cost	Area	Total Cost
Hall	Wooden floor -	£8 per m^2		
Study	Carpet -	£5 per m^2		
Kitchen	Tiled floor-	£15 per m^2		
Utility	Tiled floor -	£12 per m^2		
Dining Room	Carpet -	£8 per m^2		
Lounge	Carpet -	£21 per m^2		
Patio	Concrete -	£13 per m^2		
Total Cost				

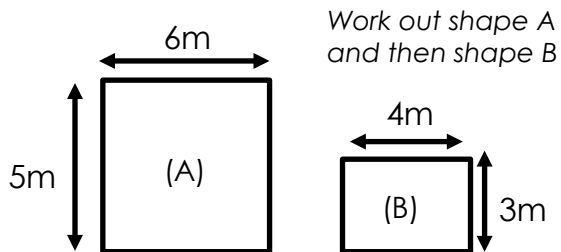
Lesson(s)	Costings
Topic	Costings- Compound Area
Word(s) of the lesson	Compound Area.
Duration	1 lesson
Resources	Calculator
How to complete the lesson	<p>1: Watch the video in the link (calculating compound / composite area)</p> <p>https://www.youtube.com/watch?v=z4Lat1uOQI4</p> 

Section A: Area

The shapes will not always be simple, they may be more complex.
You have to split the shapes and then combine your answers



You only need the measurements that matter for each shape



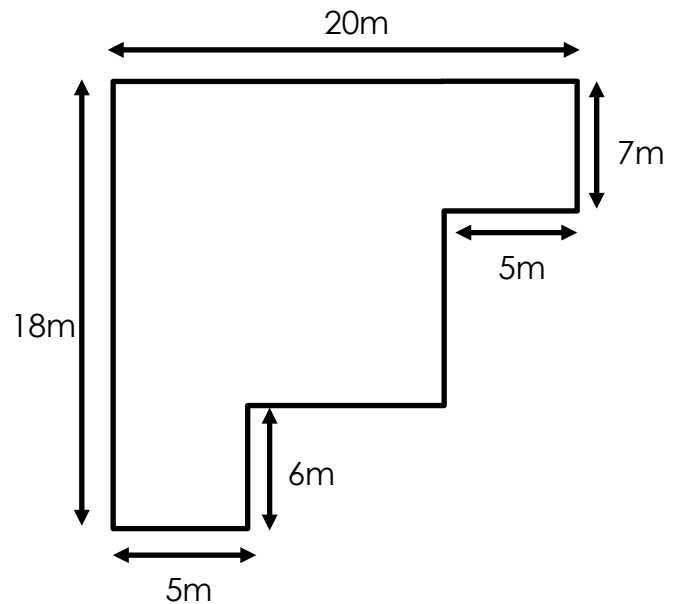
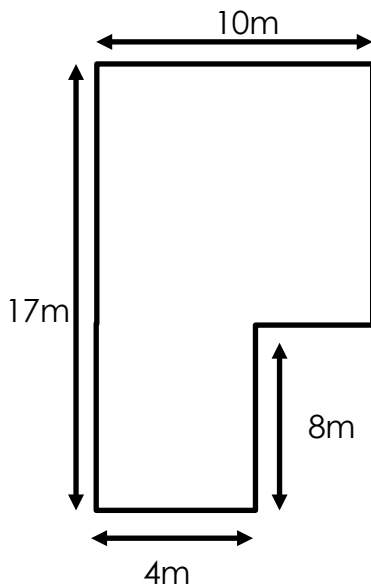
Work out shape A
and then shape B

$$\begin{aligned} \text{A)} & 6 \times 5 = 30 \\ \text{B)} & 4 \times 3 = 12 \end{aligned}$$

Then add these answers together

$$\text{Total area} = 42\text{m}^2$$

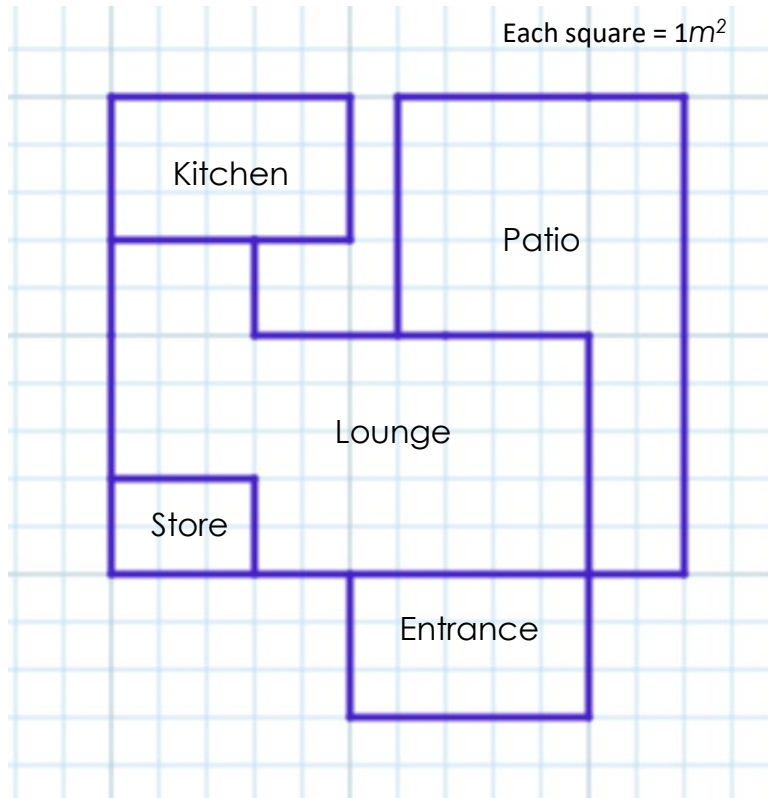
Calculate the areas of these complex shapes below – **don't forget your units**
This time, not all the measurements are given to you. Show your working



Ans _____

Ans _____

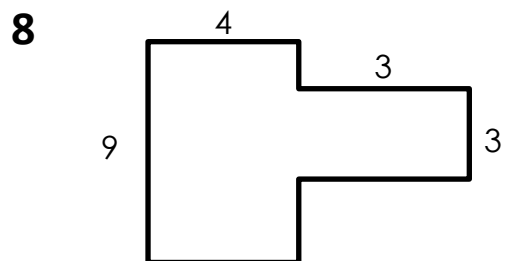
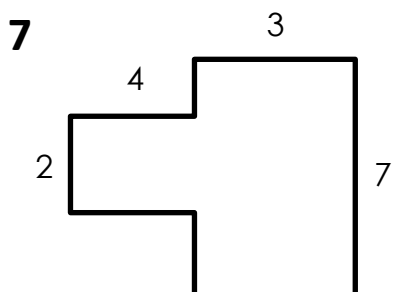
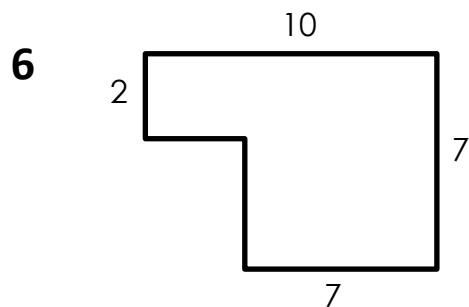
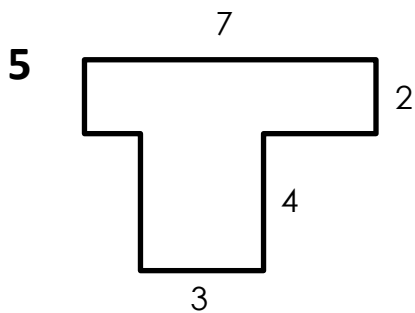
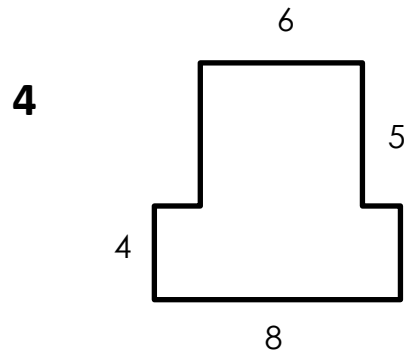
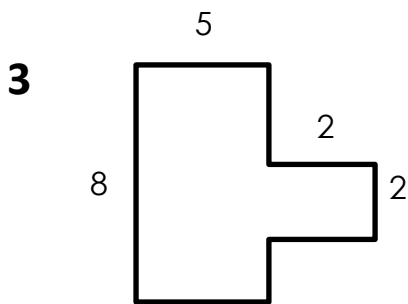
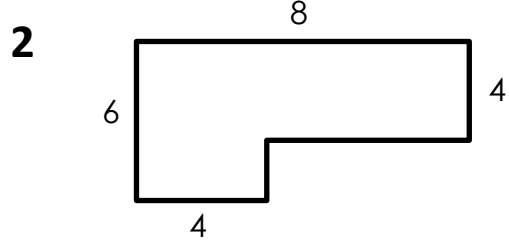
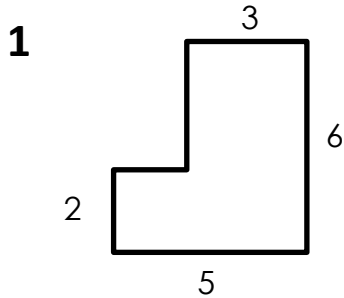
Section A: Area



Room	Request	Cost	Area	Total Cost
Entrance	Floor paint –	1 tub will cover 2.5 m^2 - 1 tub = £18		
Lounge	Carpet –	£15 per m^2		
Store	Tile –	£7 per m^2		
Kitchen	1 tile will cover 2 m^2 -	Each tile £15		
Patio	Concreting whole area and laying paving slabs-	£150 Paving slabs - £12 per m^2		
Total Cost				

Section A: TEST 1



Below are a range of complex shapes. Calculate the area and the perimeter for these shapes and write your answers on the next page (All measurements in m)



Section A: TEST 1

Write your answers to the questions on the last page in the boxes below
YOU CAN USE THE SPACE IN THE BOXES TO SHOW YOUR WORKING BUT MAKE IT
CLEAR WHAT YOUR ANSWER IS

Q	Area	Perimeter	MARK
1			
2			
3			
4			
5			
6			
7			
8			

Lesson(s)	Costings
Topic	Costings- Area of circles & triangles
Word(s) of the lesson	Compound Area.
Duration	1 lesson
Resources	<p>Calculator</p> <p>Extension Task:</p> <p>Draw a plan of a garden that includes areas made up of circles or semi circles, triangles and rectangles for the different areas, eg a circular pond, a triangular patio and a lawn made up of a series of rectangles.</p> <p>Add measurements to your shapes and calculate the areas of the different parts.</p>
How to complete the lesson	<p>1: Not everything we build can be broken down into rectangles so we need to be able to calculate the area of circular and triangular shapes. Once we know how to do this, we can calculate the area of pretty much any shape. You have been doing this in maths for a long time already but you should still watch the video clips below for a recap.</p> <p>Calculating the area & circumference of a circle: https://www.youtube.com/watch?v=O-cawByg2aA</p>  <p>Calculating the area of a triangle (skip to 4:50 for triangles) https://www.youtube.com/watch?v=xCdxURXMdFY</p> 

Section A: Area

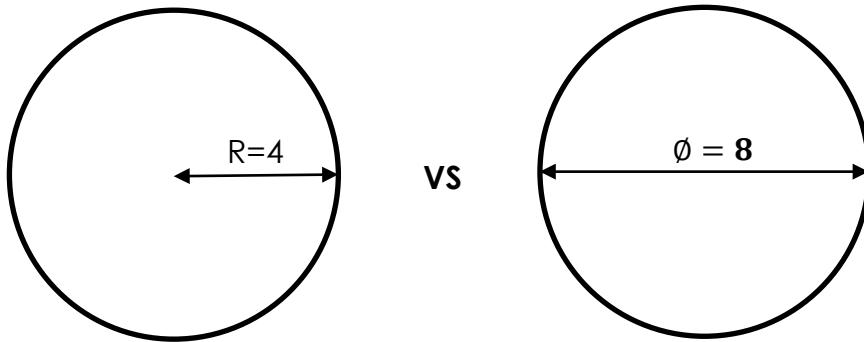
The area of something isn't always going to be square or rectangular
Sometimes area is circular

$$\text{Area of a circle} = \pi \times r^2$$

π = the number pi (3.1416... – used to calculate circular area)

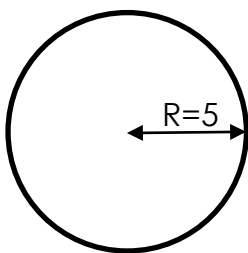
R = Radius (Distance from the centre of the circle to the outside)

D (\emptyset) = Diameter (Distance all way across the circle)

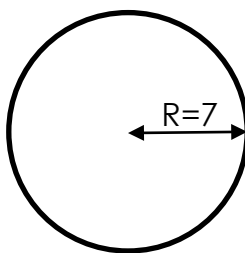


These two circles will have the same area, why?

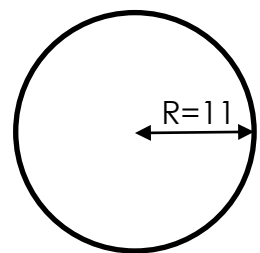
Calculate the area of these circles below:



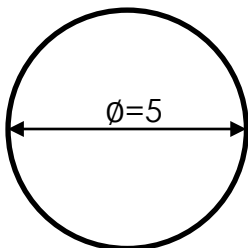
Ans _____



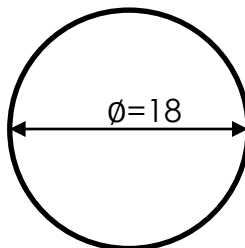
Ans _____



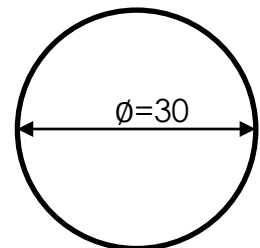
Ans _____



Ans _____



Ans _____



Ans _____

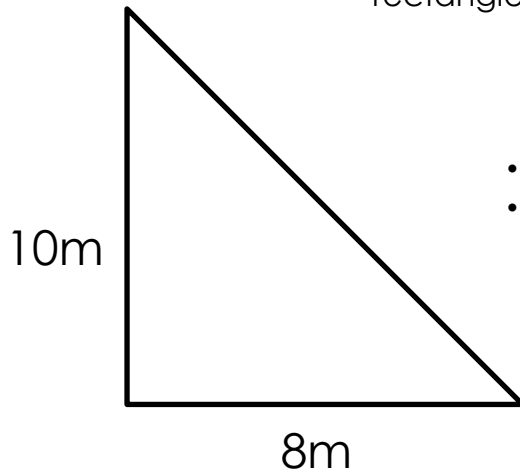
Section A: Area

The area of something isn't always going to be square or rectangular
Sometimes area is triangular

$$\text{Area of a triangle} = \mathbf{B \times H / 2}$$

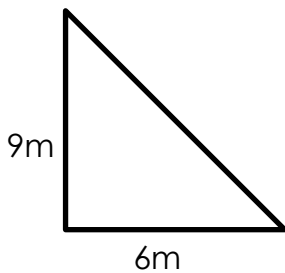
B = Base length
H – Height length

Easy way to remember how to do a right angle triangle is to work out as if it was a square or rectangle and then divide the number by 2

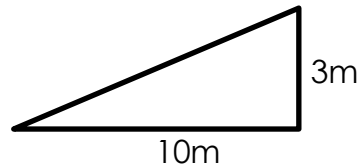


- $10 \times 8 = 80$
- $80 / 2 = \underline{\quad} \text{m}^2$

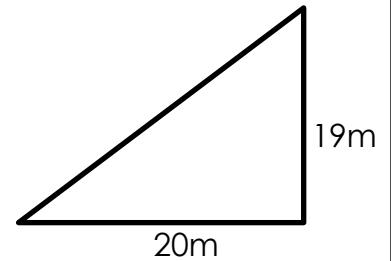
Calculate the area of these triangle below – don't forget your units



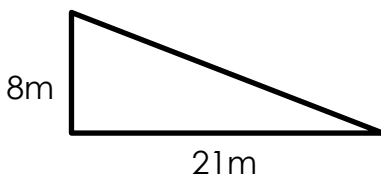
Ans _____



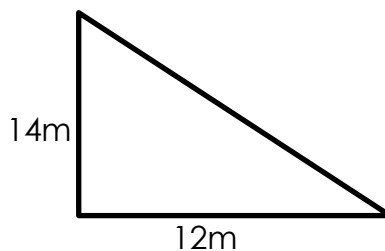
Ans _____



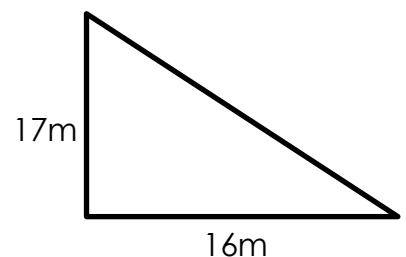
Ans _____



Ans _____



Ans _____

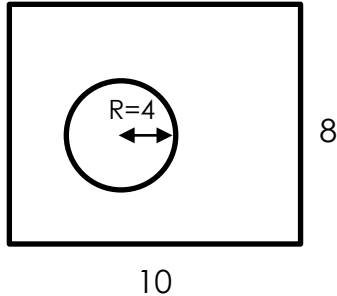


Ans _____

Section A: Area

Now that you can work out the areas of squares, rectangles, circles and triangles. Sometimes you may have to take one shape away from another or add shapes together

Add

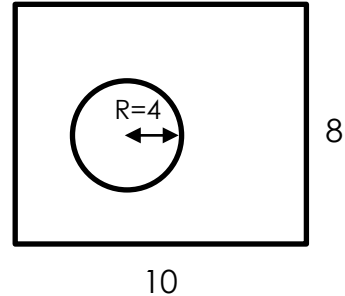


$$\text{Square} = 10 \times 8 = 80$$

$$\text{Circle} = \pi \times 4^2 = 50.27$$

$$\text{Add} = 130.27\text{m}^2$$

Subtract

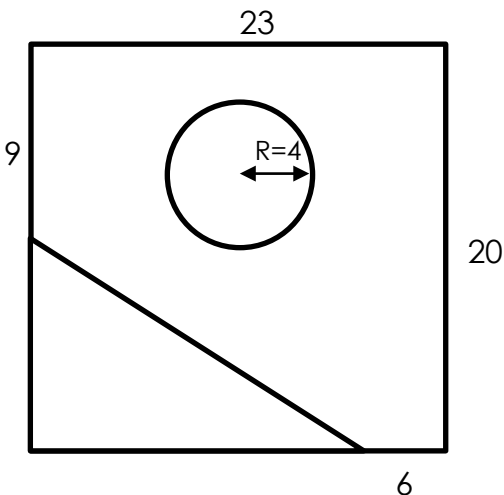


$$\text{Square} = 10 \times 8 = 80$$

$$\text{Circle} = \pi \times 4^2 = 50.27$$

$$\text{Subtract} = 29.73\text{m}^2$$

The wording of the question will help you understand what you have to do



The drawing on the left is of a garden. There is a pond in the middle of the grass and some wooden decking in the bottom corner. The owner of the garden would also like to know the total length of the perimeter of his garden so he can buy a fence. All measurements are in metres (m)

- 1) Calculate the area of the grass
- 2) Calculate the area of the decking
- 3) Total area of the garden
- 4) What is the perimeter?


Ans 1 _____

Ans 2 _____

Ans 3 _____

Ans 4 _____

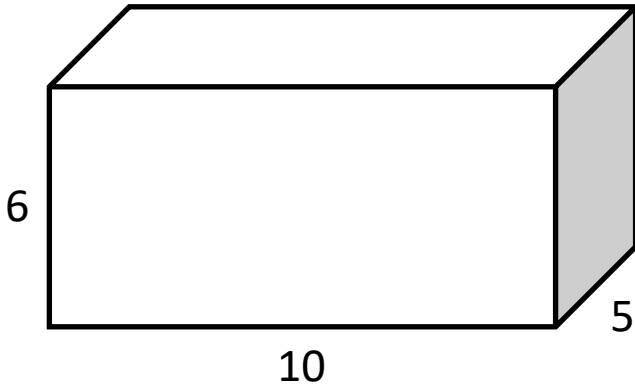
Space for working:

Lesson(s)	Costings
Topic	Costings- Volume
Word(s) of the lesson	Volume, cuboid, cylinder.
Duration	1 lesson
Resources	Video clip on calculating volume Calculator
How to complete the lesson	<p>Now we are comfortable in calculating area, we need to move onto volume. Whilst area can be used to calculate materials for fairly 2D constructions such as floor coverings, walls and fencing, a lot of constructions are very much 3D. If you have dug a foundation that needs to be filled with concrete to support a building, you need to know the volume of that hole so you order the correct amount of cement.</p> <p>1: Watch the video to recap on calculating volume (you have done this many times in maths and there is an explanation on the top of the worksheet too).</p> <p>https://www.youtube.com/watch?v=qJwecTgce6c</p> 

Section B: Volume

Now that you can work out the area of a surface/shape you now need to calculate the volume (how much space a 3D shape takes up)

The units you will need to focus on are "Metres cubed or m^3
For this you need to know that the formula is length x width x height

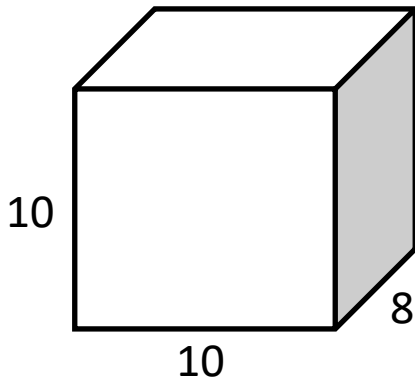


$L \times W \times H$

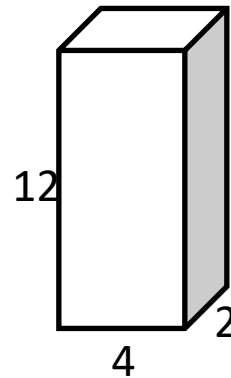
$$10 \times 5 \times 6 = 300m^3$$

It doesn't matter what order you multiply these together

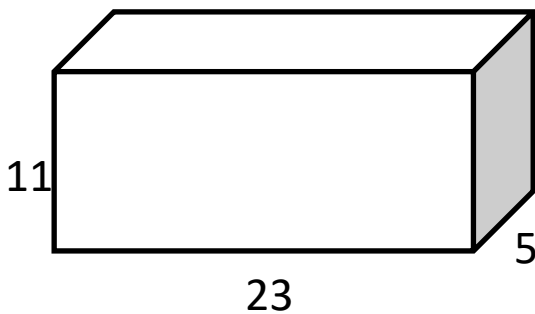
Work out the answers for the shapes below



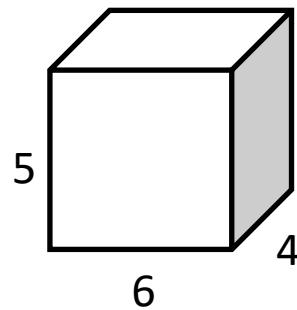
Ans _____



Ans _____



Ans _____



Ans _____

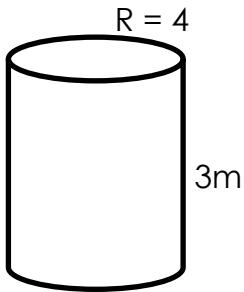
Note: the result is in m^3 (cubic metres) because we have multiplied metres together three times

Section B: Volume

You may also need to work out the volume of cylindrical object too.
Not everything is square or has straight edges. For this you will need to remember how to calculate the area of a circle

Area of a circle = _____

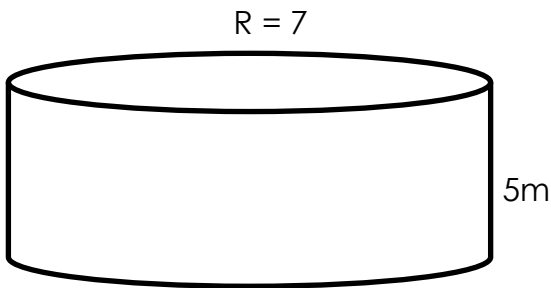
Now you multiply that number by the height of the cylinder



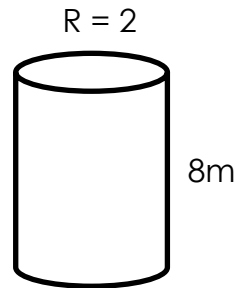
$$\text{Circle} = \pi \times 4 = 50.27$$

$$3m \text{ (Height)} \times 50.27 = 150.81m^3$$

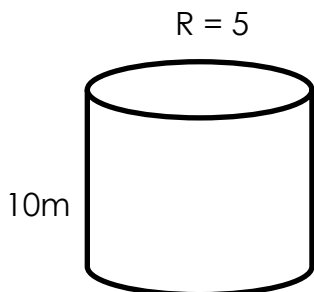
Work out the answers for the shapes below



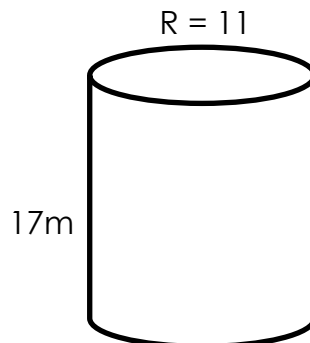
Ans _____



Ans _____



Ans _____

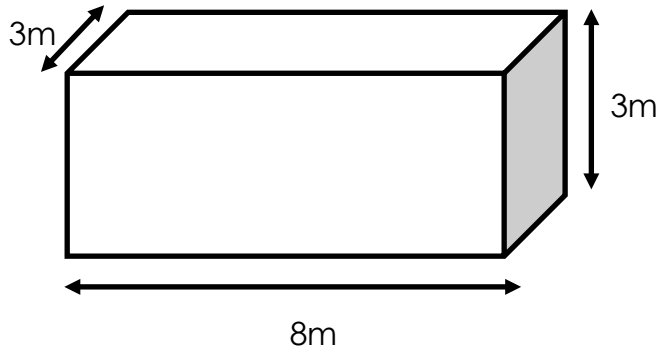


Ans _____

Note: always round up to 2 decimal places (e.g $80.4465 = 80.45$)

Section C: Costings

In this section you will need to use both area and volume to work out a range of costings



Above is the dimensions for a new pool to be dug in a back garden, calculate the area of the surface of the pool.

Ans _____

Calculate the volume of earth that needs to be removed for the pool

Ans _____

Above are the dimensions for the pool. The 4 sides are going to be tiled. The cost of the special tiles are £18 per square metre. Calculate the total cost for tiling the 4 sides of the pool

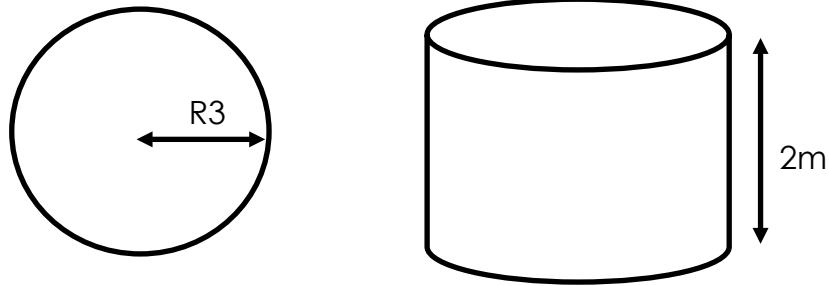
Ans _____

The pool will be filled leaving 1m at the top. Calculate the total volume of water that will be needed to fill the pool

Ans _____

Section C: Costings

In this section you will need to use both area and volume to work out a range of costings



Above is the dimensions for a new hot tub to be dug in a back garden, calculate the area of the surface of the pool.

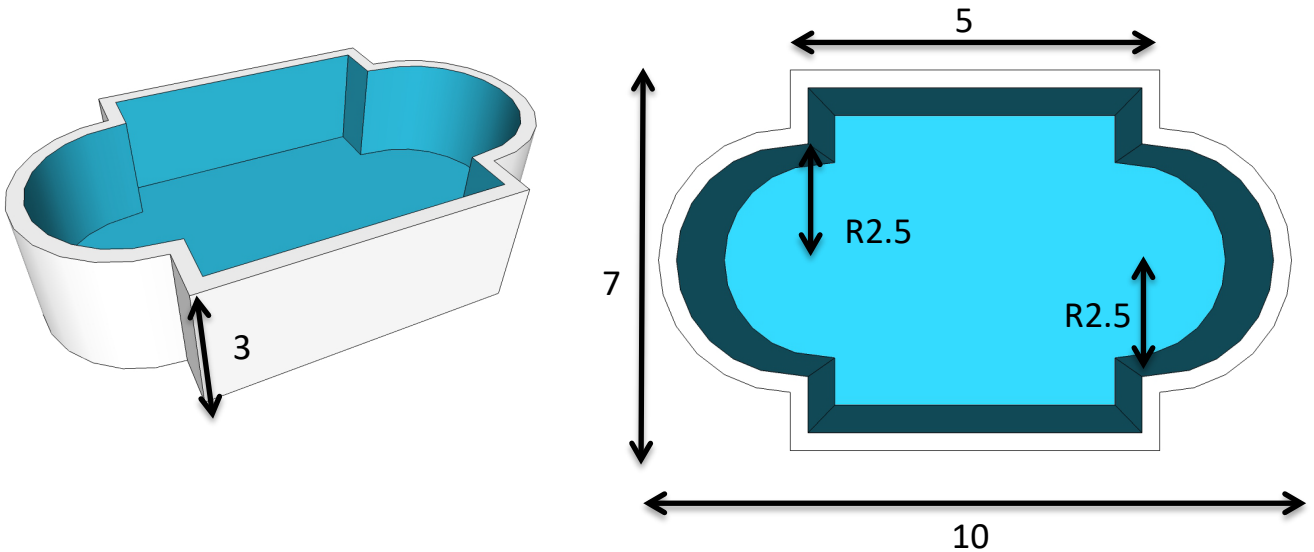
Ans _____

Calculate the volume of earth that needs to be removed for the pool

Ans _____

Section C: Costings

Compound volume: To work out the total volume of this pool you need to calculate the volume of the two semi cylinders and add these to the volume of the volume of the cuboid part.



Hint: Think about how to break this more complex calculation down into simple shapes, just like you did with the compound area calculations.

Above is the dimensions for a new swimming pool to be dug in a back garden, calculate the area of the surface of the pool.

Ans _____

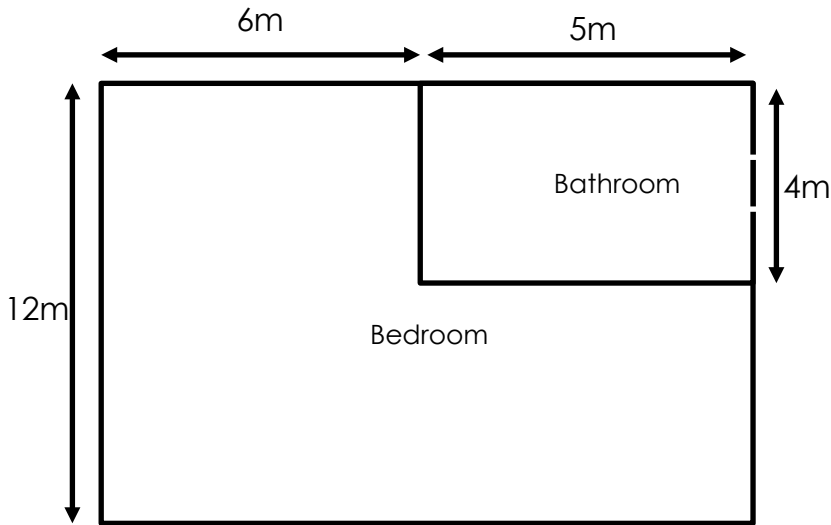
Calculate the volume of earth that needs to be removed for the pool

Ans _____

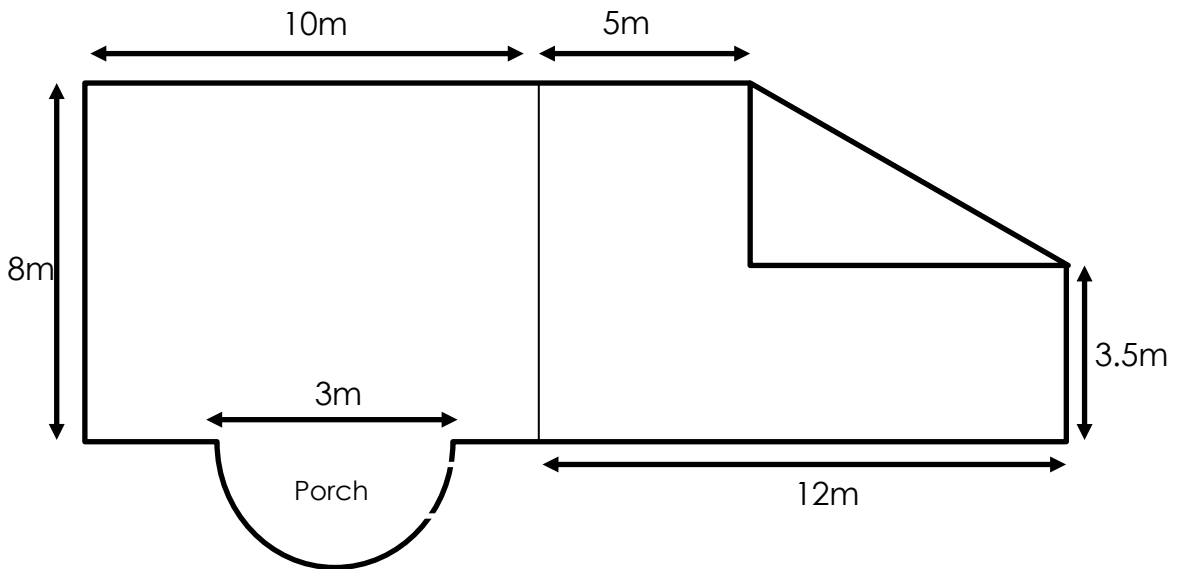
Lesson(s)	Exam style questions
Topic	Costings-
Word(s) of the lesson	Volume, Area, Unit
Duration	1 lesson
Resources	<p>Calculator</p> <p>Extension Task:</p> <p>Design your own exam style question in a similar format to the ones you have just completed.</p>
How to complete the lesson	<p>This lesson you are going to be putting what you have learnt over the past 2 weeks about calculating area, volume and costing a job into practice by completing some exam style questions.</p> <p>Complete the questions on the following pages.</p> <p>Make sure you show all your working out! This is really important as in the exam you can still get the answer wrong but pick up marks if you have used the correct calculations.</p> <p>Make sure that your working out is very clear and explain at each stage what you are calculating.</p>

Section C: Costings

You will be given a range of floorplans/ drawings in Unit 3 – It is important that you know what they mean and how to understand them.



This is a simple floor plan with clearly labelled rooms and dimensions for you to calculate the area. A simple floor plan will usually just be squares and rectangles. Sometimes you may not be given all of the measurements and may need to work those out first before you can work out the area.



Write below the different types of calculations you will need to do:

- _____
- _____
- _____
- _____

They may be more complex with a range of different shapes that you may have to work out. You may need to take shapes away or add extra bits on.

Make sure you read the questions carefully when working out these measurements. Only work out what it is asking you.

Section C: Costings

In Construction it is very important that you are able to correctly calculate the cost of materials so that you don't over charge somebody or lose money yourself.

In this section you will need to use both area and volume calculations to work out a range of costings

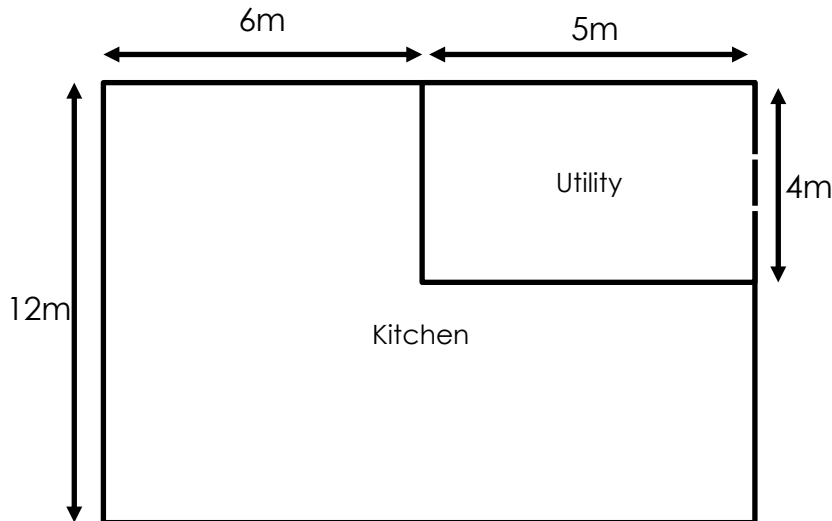
Example:

You have worked out the area for some flooring, and the floor costs £10 per metre squared (m^2)

All you have to do is multiply the floor area by the flooring cost.

$$34m^2 \times £10 \text{ per } m^2 = £340$$

Calculate the costings for the floor plans below



Room	Request	Area	Cost	Total Cost
Kitchen	Wooden floor - £11 per m^2			
Utility	Tiled floor - £5.50 per m^2			

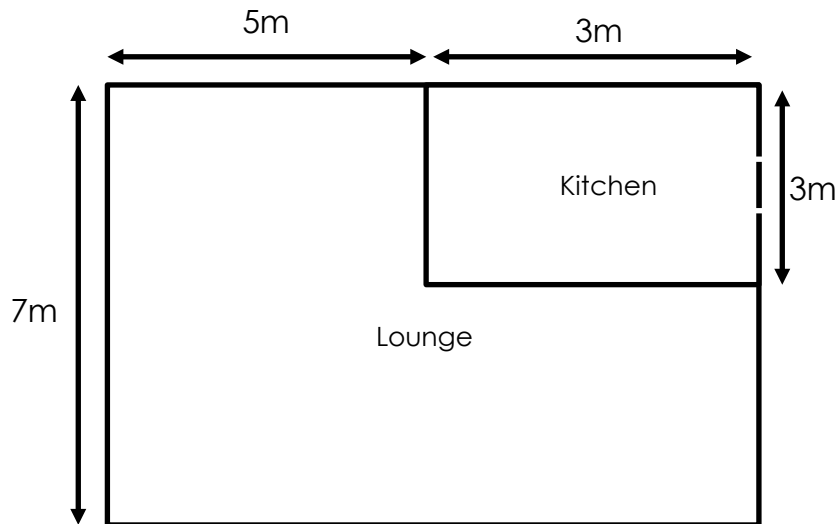
Total Cost

£

Section C: Costings

In this section you will need to use area to work out a range of costings

Calculate the costings for the floor plans below



Room	Request	Area	Cost	Total Cost
Kitchen	Tiled floor - £16.50 per m ²			
Utility	Carpet - £12 per m ² Underlay - £5 per m ²			
Total Cost				£