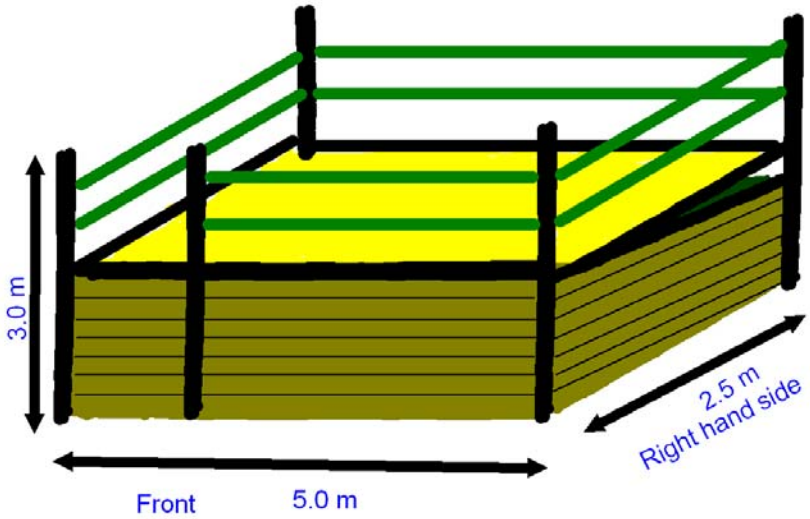
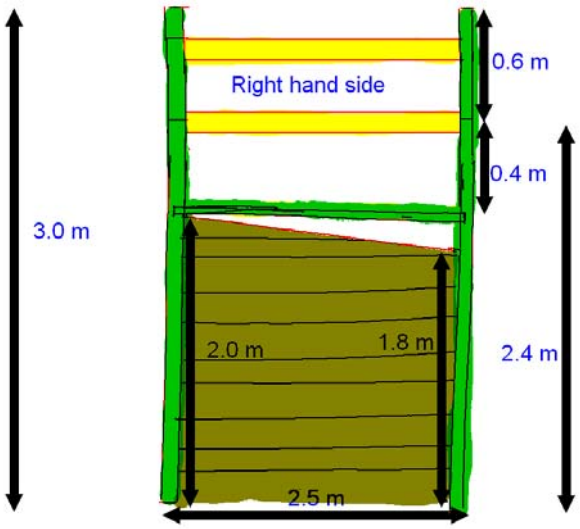
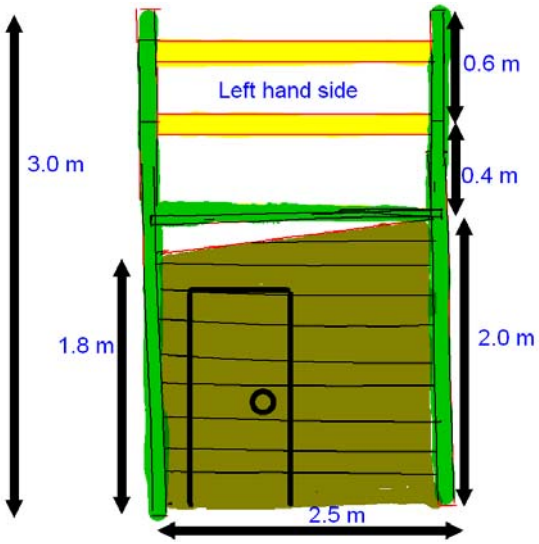
Brief

You wish to build a wooden 5m by 2.5m rectangular shed, with a built in roof observation platform accessed by an external stairway. The maximum height of the roof must be 2m and the total height of the building must not exceed 3 m.

1. Design & Planning



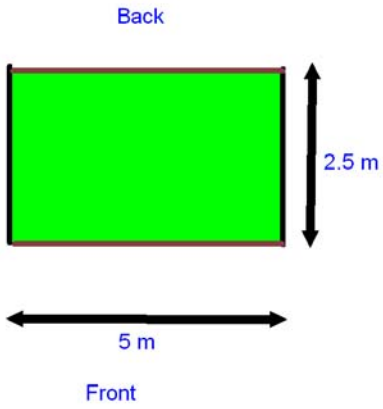




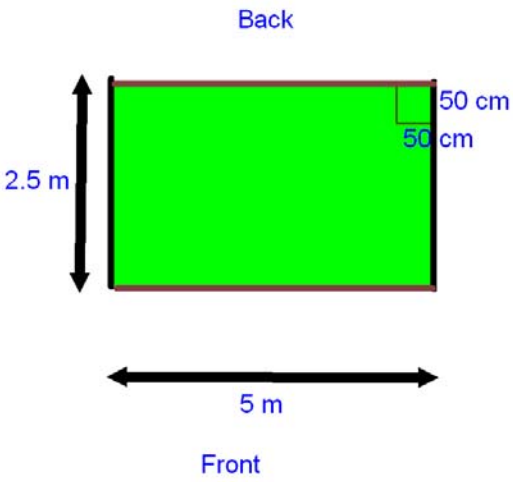
- Produce a scale drawing of each of these views, using a scale of 1:10

2. Land Preparation

Mark out the area of the shed, strip off the turf and smooth out the soil as well as you can.



- What area of turf needs to be removed from the ground to clear it ?
- What length of string is needed to edge the perimeter ?
- What should the length of the diagonals be ? Why ?



You decide to cut the turf into 50cm by 50cm divots for use in the vegetable garden.

- How many divots are cut ?

The divots are carried 10 at a time in a wheelbarrow to the vegetable garden. The radius of the wheel is 7.5 cm .

You notice that the wheel makes exactly 10 revolutions as you walk from the building site to the vegetable garden.

- How far is the vegetable garden from the building site ?

- What is the total distance walked with the wheelbarrow to remove all the divots and return to the building site ?
  Give your answer to the nearest centimetre.

- Use the formula Work = Weight of person (Kg) x distance moved
  to calculate how much work you did.

It takes a total time of 15 minutes to remove all the divots.

- What average speed did the wheelbarrow attain :-
  in metres / hour ?
  in kilometres / hour ?
  in metres / second ?

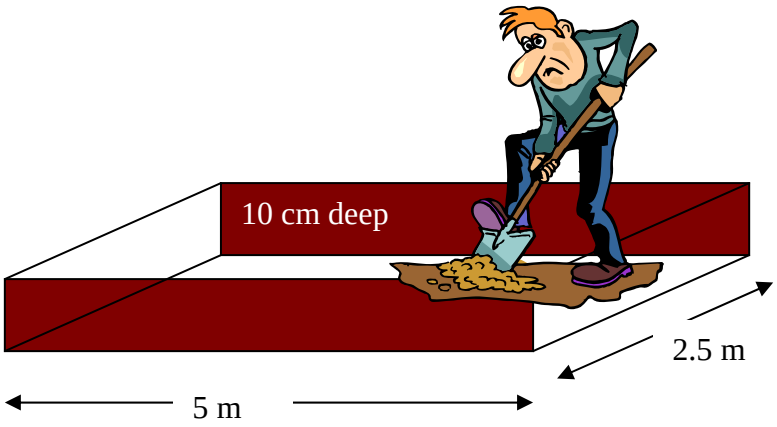
- Use Standard Form to rewrite the three average speeds that have just been worked out.

- Use the formula $Power = \frac{Work\ done}{Time\ taken \quad (s)}$

  to calculate how much power you used in Watts.

3. Foundation Preparation

The site is to be cleared to a depth of 10 cm



- What volume of earth is removed?

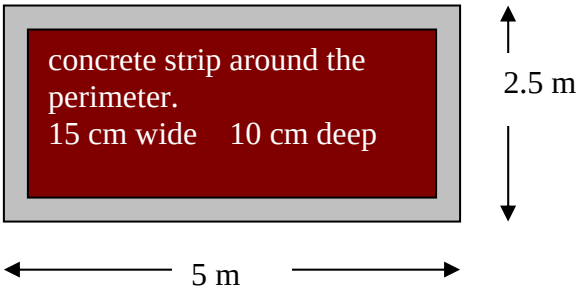
The earth is to be put into raised beds measuring 1.2m x 0.8m x 1m

- How many raised beds will be required?

The wheel barrow has a capacity of 90 litres.

- How many trips will be required to remove the earth?

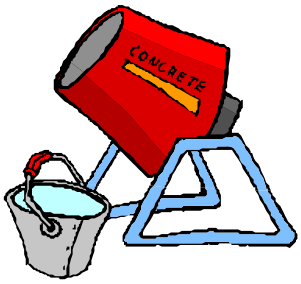
The building is to sit on a concrete foundation that is 15 cm wide.
This strip of concrete goes around the perimeter of the site.



- What volume of concrete is required?

The concrete is to be mixed in the ratio

Cement :	Sand :	Aggregate
1 :	2.5 :	3.5



This yields 0.09 m^3 of concrete per 25 kg of cement.

- How many mixes are required at this ratio ?
- How many 25kg bags of cement are required ?
- What weight of sand is required ?
- What weight of aggregate is required ?

1.1 tonnes of gravel is required to infill the rest of the base.

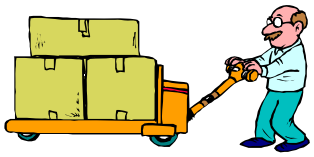
- Carry out a costing exercise to find the total cost of building the foundations.

Blogs online

Sand	855kg bag	£48
Aggregate	855kg bag	£48
Gravel	855kg bag	£48

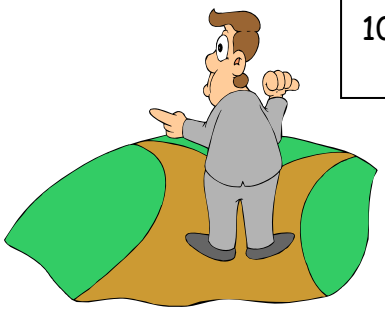
Delivery £20 per bag

Build or Bust Local warehouse



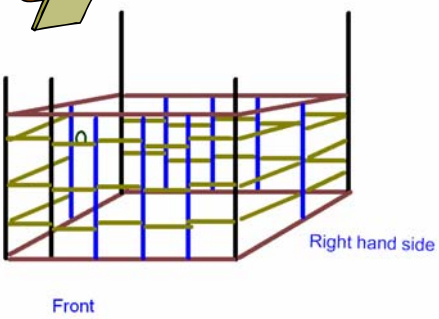
Cement 25kg bag
£2.34
Sand 25kg bag
£1.26
Aggregate 20 kg bag
£1.44
Gravel 20 kg bag
£1.44

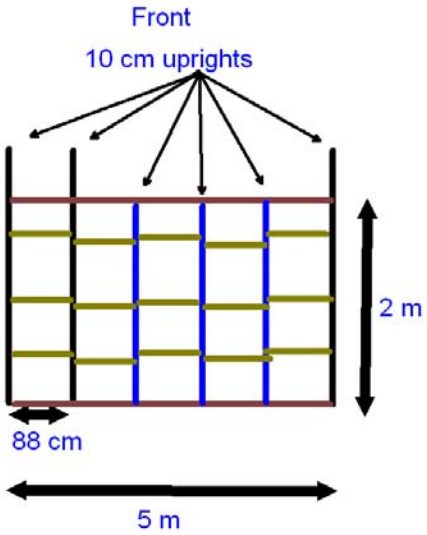
10% discount on orders over £100



- Which supplier provides best value for money?
- Why? Give reasons for your answer.
- How much do the foundations cost in total?

4. Materials

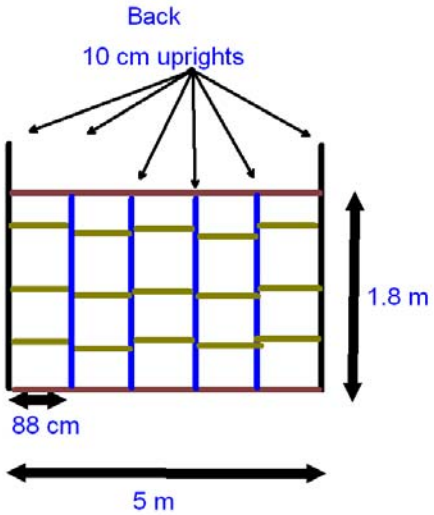




Wood required to be purchased for front frame		
Wood size	Position	Number required
100mm x 100mm x 2.4m	End posts	3
75mm x 100mm x 2m	Uprights	3
50mm x 100mm x 0.88m	Noggins	15
50mm x 150mm x 4.8m	Base / Top	2

- Copy and complete the table

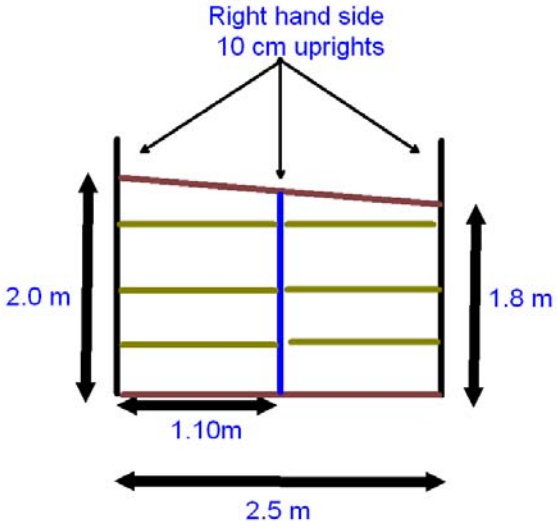
Wood required to be purchased for back frame		
Wood size	Position	Number required
100mm x 100mm x 2.4m	End posts	
75mm x 100mm x	Uprights	
50mm x 100mm x 0.88m	Noggins	15
50mm x 150mm x 4.8m	Base / Top	2



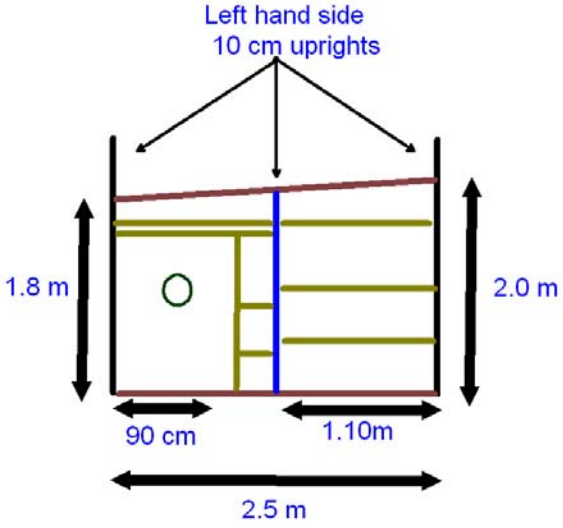
- What rule links the number of uprights to the number of noggins?

- Copy and complete the tables.

Wood required to be purchased for right hand frame		
Wood size	Position	Number required
75mm x 100mm x	Uprights	1
50mm x 100mm x 2.1m	Noggins	6
50mm x 150mm x 2.3m	Base	1
50mm x 150mm x	Top	1



Wood required to be purchased for left hand frame		
Wood size	Position	Number required
75mm x 100mm x	Uprights	1
50mm x 100mm x 1.1m	Noggins	
50mm x 100mm x	Noggins	2
50mm x 100mm x 1.6m	Noggin	1
50mm x 150mm x	Base	1
50mm x 150mm x	Top	1



Wood required to be purchased for shed roof frame		
Wood size	Position	Number required
75mm x 100mm x	Uprights	
50mm x 100mm x 0.88m	Noggins	15
50mm x 100mm x	Noggins	2
50mm x 100mm x 1.6m	Noggin	1
50mm x 150mm x	Base	1
50mm x 150mm x	Top	1

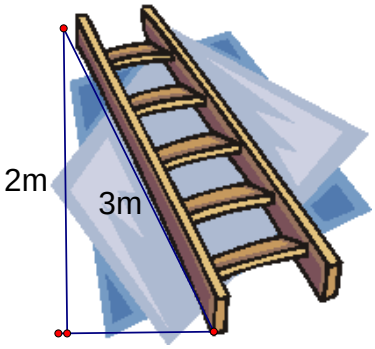
- What is the angle of declination of the roof ?

The roof is to be covered with 6mm marine plywood.

- How many 2500 x 1220mm sheets will be required ?
- What area of roofing felt will be required to clad the roof ?
- How many 1m x 15 m rolls of felt will be required ?

The rest of the frame is to be clad with 125mm x 16mm Shiplap weatherboard, which covers a height of 12.5 cm per 4.8m long plank.

- How many planks are required for the front wall ?
- And the back wall ?
- And the side walls ?



The pitch of the stairs must not exceed 42°

- Write the above statement as an inequation.
- Will a stair length of 3m comply ? Explain your answer.

The stairs are to be constructed from 50mm x 150mm x 4.8 m planks. The rise is 20cm , with a tread width of 68cm.

- How many steps are required ?
- How many planks are required ?

The observation platform is to sit on 50mm x 150mm supports, with the same timber being used as a safety rail.

- Can these supports and rails be constructed from 4.8 m planks? Give reasons for your answer.

5. Costs

- Copy the table.
- Use the information in Appendix 1 to find the total cost of the wood.
- Complete the missing entries and calculate the cost of the project.

Wood size	Position	Total length required	Price Per metre (Ex VAT) £	Cost (Ex Vat) £	VAT	Total cost £
100mm x 100mm	End posts	m				
75mm x 100mm	Uprights	m				
50mm x 100mm	Noggins	m				
50mm x 150mm	Supports/rails Base/ Top/stairs	m				
125mm x 16mm	Cladding	m	£0.70			
2500 x 1220mm plywood	Roof	sheets	£37.61 per sheet			
				Wood Total		
Description	Size	Quantity	Cost per pack (ex VAT)	Cost (Ex Vat) £	VAT	
Decking Pack	(4.8 m X 2.4 m)	1	£320.00			
Decking screws	(Pack of 200)	2	£7.13			16.76
Screw pack	(Pack of 1400)	1	£12.00			
Exterior Coachbolts	(Pack of 50) M10 x 150	1				£47.45
Angle brackets	(Pack of 20)	1	£10.00			
Roofing felt	1m x 15m		£13.86			
Timber paint	45litres	1	£ 15.00			
				Sub total		
				Foundations		
				Grand Total		

- Where can savings be made ?

Appendix 1 : Timber prices

Treated Sawn Timber Prices (per metre)

Timber Size (mm)	0 - 99m Price	100+ m Price
25 x 25	0.25	0.23
25 x 50	0.50	0.45
25 x 75	0.75	0.68
25 x 100	0.98	0.88
25 x 125	1.22	1.10
25 x 150	1.48	1.33
25 x 175	1.72	1.55
25 x 200	1.96	1.76
25 x 225	2.21	1.99
50 x 50	0.83	0.75
50 x 75	1.12	1.01
50 x 100	1.49	1.34
50 x 125	1.85	1.67
50 x 150	2.22	2.00
50 x 175	2.59	2.33
50 x 200	2.96	2.66
75 x 75	1.77	1.59
75 x 100	2.37	2.13
75 x 125	2.95	2.66
75 x 150	3.55	3.20
75 x 175	4.14	3.73
75 x 200	4.73	4.26
75 x 225	5.32	4.79
100 x 100	3.32	2.99
100 x 125	4.14	3.73
100 x 150	4.98	4.48
100 x 175	5.80	5.22
100 x 200	6.62	5.96

All prices exclude VAT