

Measuring and plans

What students will learn

When they have finished this session, students should be able to:

- Interpret a simple construction plan.
- Measure and mark timber to fit a plan.
- Calculate the amount and cost of timber for a simple plan.

Things you need before you start

Information

Find out what types of timber plans the students might use.

Think about:

- types of plans (simple and detail)
- the sort of measurement and marking they need
- some local projects that students could work on
- the cost of local framing timbers.

Materials

- rules or tape measures, squares
- marking knife or pencils
- timber for students to use.

Course resources

Course Video. Video player.

Introduction

Talk to the students briefly about the main things they will learn and what they will do in this session:

- the types of plans you use locally
- why plans are important
- measurements and marking from plans.

Check they have their workbooks.

What types of plans do we use?

Talk about

The timber construction plans used locally.

traditional/customary methods may not use plans at all:

- the design can change to suit the timber you have
- experienced craftsmen work “by eye”, or “it looks right”.

more formal plans can be:

- the detailed architects plans for buildings
- cutting and shaping plans used for carpentry and cabinet making
- the simple construction plans we are going to use!

Explain why they are important

plans are good because they help us to:

- build things accurately
- make things strong enough, but not waste materials

plans show:

- how things go together
- how big they are
- how much timber is needed
- what sort and size of timber is needed.

Show examples of different plans

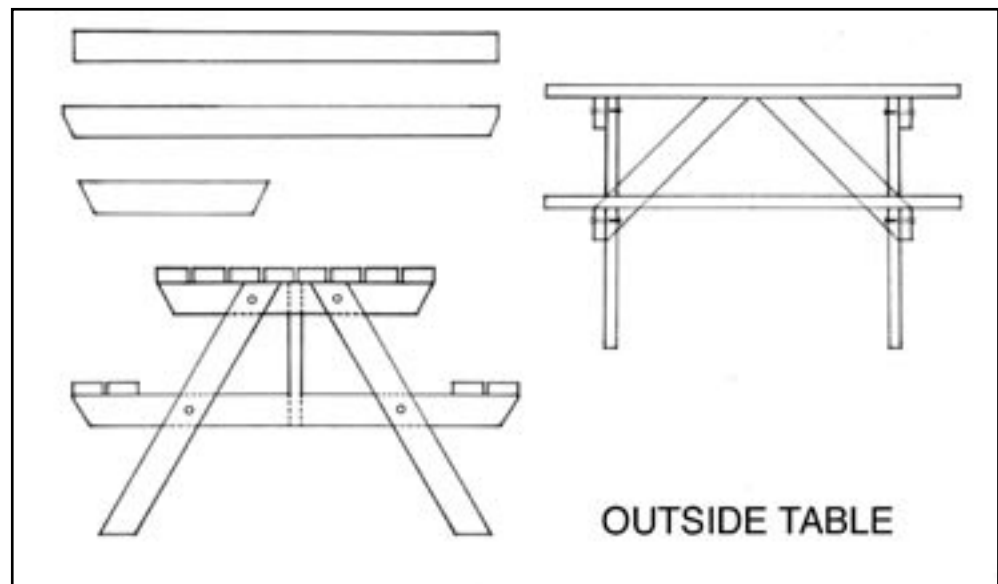
Some examples are shown below (and they are in the student workbook), but use your own examples as well.

Explain what the plans are for and show the students some of the important things about each one — for example, shapes or angles, details of joints and sizes.

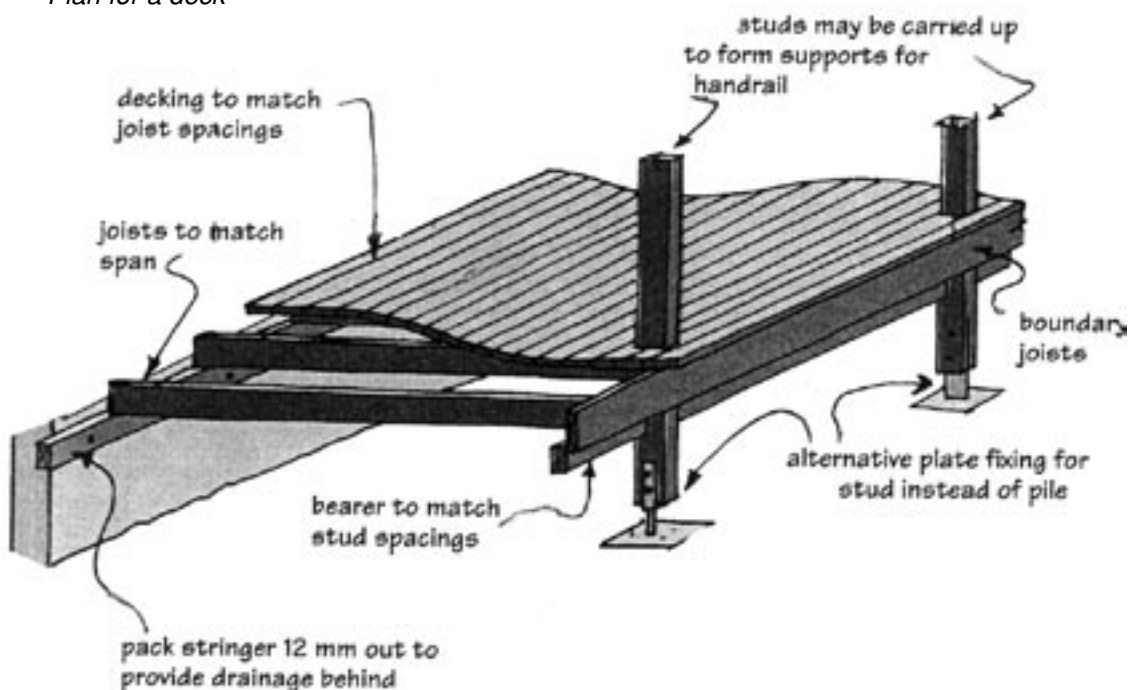
Ask students to

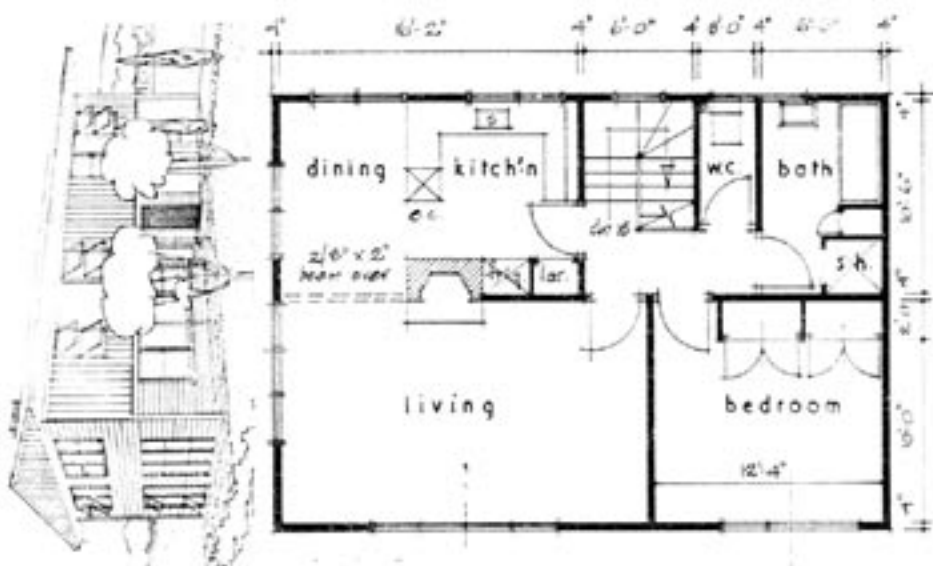
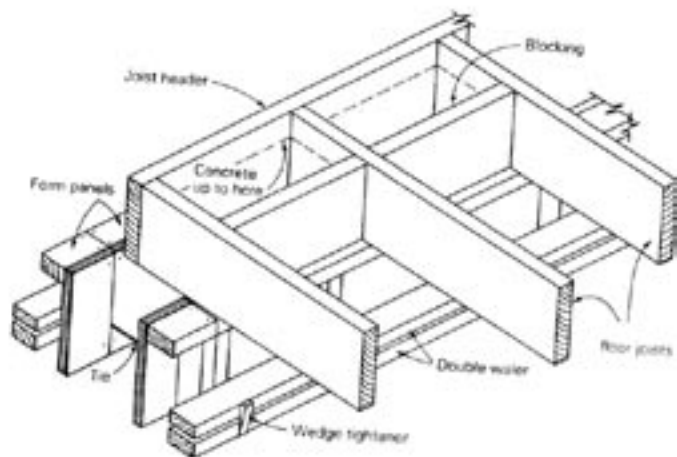
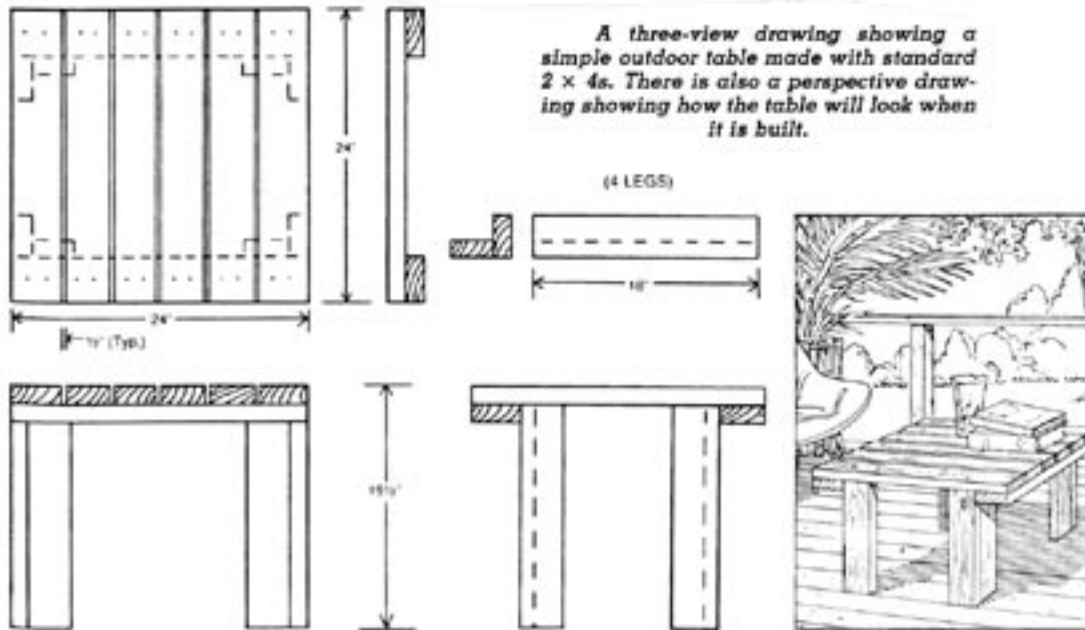
- look at the plans
- ask questions about anything they do not understand.

Plan for an outside table



Plan for a deck





Measures and timber sizes

Talk about

Two important things about working from plans are:

- understanding the numbers — what measurements are shown on the plan
and
- the sizes of timber — they are not always what they say!

Metric and imperial measures

Most countries use the metric system to describe and measure timber.

Measurements are usually given in millimetres (mm) for length and size.

For example, a piece of timber could be described as 1524 x 100 x 50.

This means it is 1524mm long, 100mm wide and 50mm thick.

You may still come across old plans that use the imperial system of feet (') and inches("). The same piece of timber above would be described as 5' x 4" x 2"

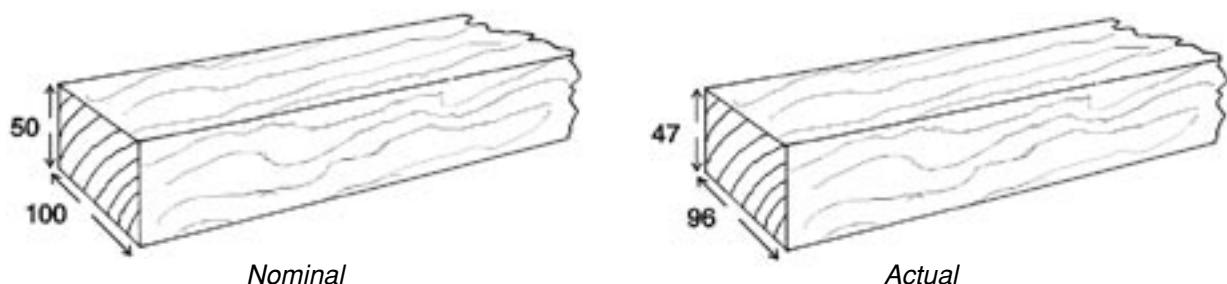
This means it is 5 feet long, 4 inches wide and 2 inches thick.

Timber sizes

Timber is sold in a range of standard sizes, and most plans use these standard sizes.

Note that the timber size given is usually a 'nominal' or 'sawn' size of the timber **before** it was planed or 'dressed'.

The actual size of the timber is usually smaller than the 'nominal' size and can even vary from piece to piece through shrinkage and machining differences.



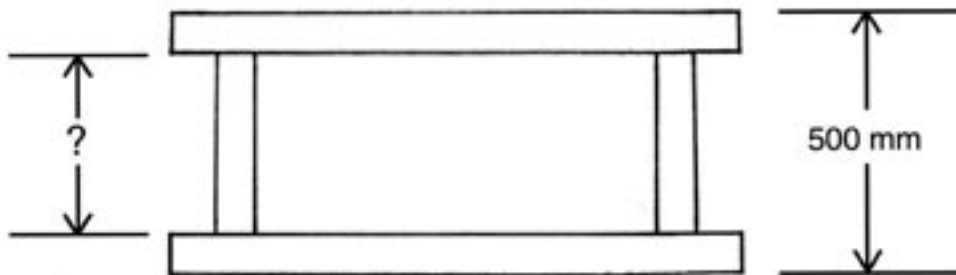
Some examples of sizes (mm)

Nominal or sawn size	Planed or dressed size
25	21
50	46
75	70
100	94
150	144

Explain

This means that some timber lengths cannot be given exactly on a plan.

The actual length can be calculated when you have the timber, or it can be measured from actual dimensions:



Activity

Give the students some pieces of different timber sizes. Try to include rough and dressed examples of the same type and size.

Students then measure the dimensions of the examples.

They write down for each piece:

- what they have measured (for example, 370mm X 94 X 46)
- what the 'nominal' size of the timber is.

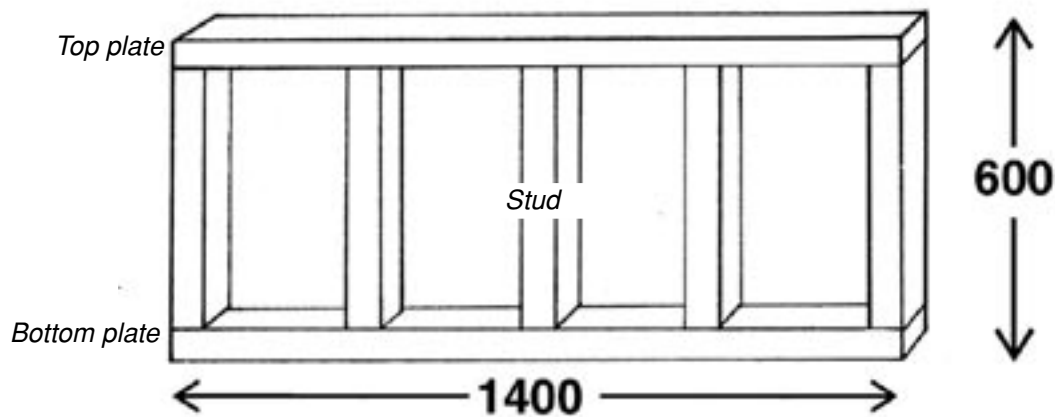
Check what they have done and give feedback.

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Measuring and marking from a plan

Talk about

This example of a framing plan (600 high X 1400 wide)



timber — 100 x 50mm (nominal size)

studs to be at 450mm centres

This plan is also in the workbooks.

Explain

The names for things

in building construction:

- top and bottom pieces are often called “**plates**”
- upright pieces are usually called “**studs**”

How the pieces fit together

the plan shows the type of joint and the right position for each piece

(some pictures are in the workbook)

The idea of “centres”

used for marking positions

It puts the middle (centre) of each piece (stud) in the right place and spaced out across the frame.

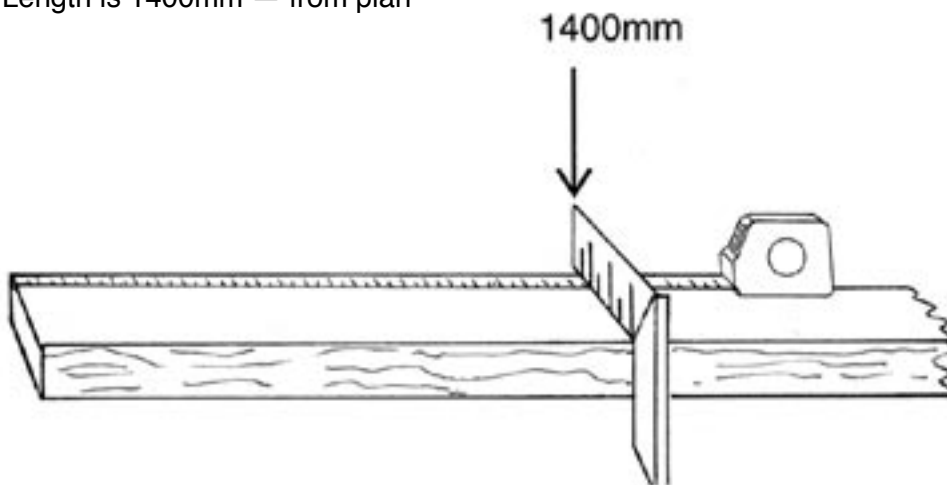
How to work from a plan

Show

- Each of these steps, below.
- Explain each one.

Measure and mark for the top and bottom plates

Length is 1400mm — from plan



Measure and mark the centres for the uprights (studs)

This gets the right spacing between studs.

Mark at 450mm centres (from the plan)

Mark the first centre at 25mm in from one end.

— that is half the thickness of the timber or the 'centre' of the end piece

Then mark the next centre 450mm from your first one — and carry on until all centres are marked. The final centre should be about 25mm from the other end.

25+	450	+	450	+	450	+	450	+25	<i>Top</i>
25+	450	+	450	+	450	+	450	+25	<i>Bottom</i>

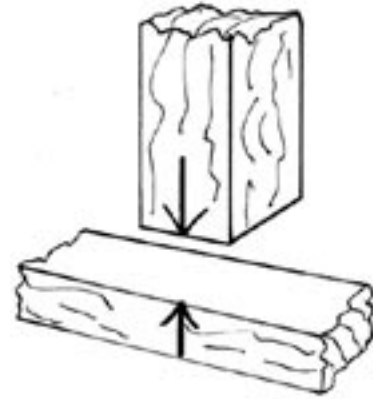
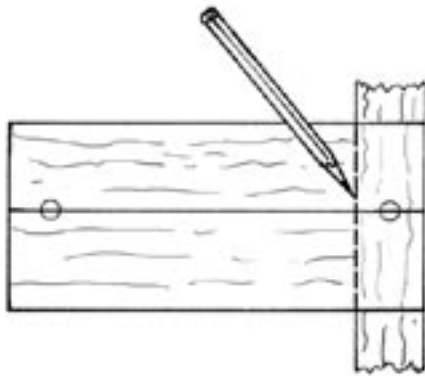
Mark the top and side of the plate.

Mark the top and bottom plates at the same time.

Mark position for studs

Use a piece of the actual stud timber on the centre marks.

- measure and mark the centre(middle) of the stud.
- put this mark in line with your centre mark on the plates
- and mark down the sides of the stud onto the plates.



Length of studs

To work out how long the studs need to be, you could either:

1. Calculate

Measure the thickness of the top and bottom plates together

(the actual size, not nominal size)

in this case it is 92mm



The stud length needs to be:

600mm (from plan) – (less) your measure of the two plates (92mm)

$$600 - 92 = 508\text{mm}$$

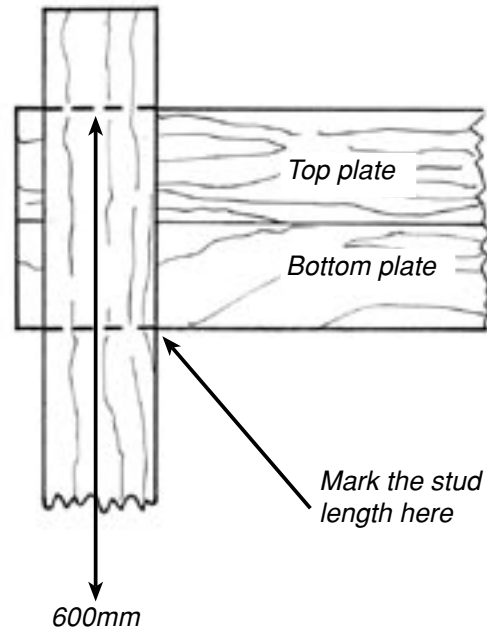
OR you could

2. Use the timber itself

Temporarily mark at 600mm on one piece of timber that will be a stud.

Put the top and bottom plates together and lay them on top of the stud at the 600mm mark.

Use the thickness of the two plates to guide you where to mark the stud to be cut to size.



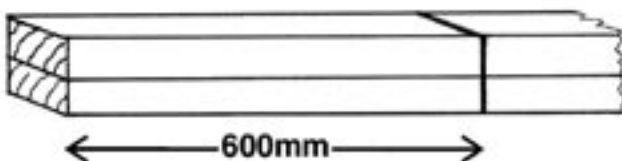
OR you could

3. Measure

If this was part of a wall framing where the top and bottom plates were already fixed to the ceiling and floor, you would measure the actual size for each stud at the centres.

With the frame we have here, you could do it this way:

(it is a long way to do it — but the temporary frame could be very useful when you later build the frame. This way is NOT described in the workbook)

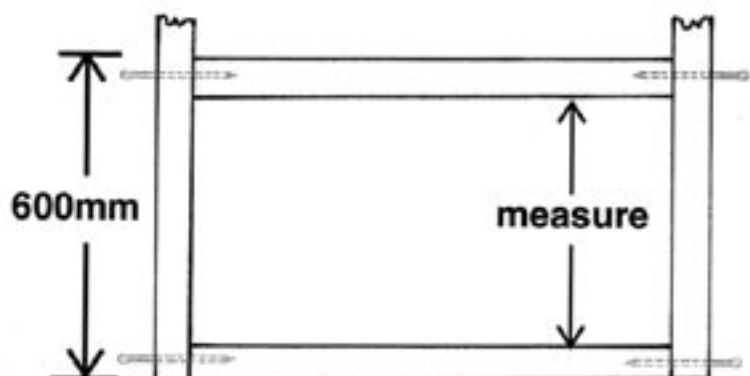


Mark two extra pieces of timber at length 600mm.

(no need to cut them to size).

Temporarily fix these to the ends of the top and bottom plates.

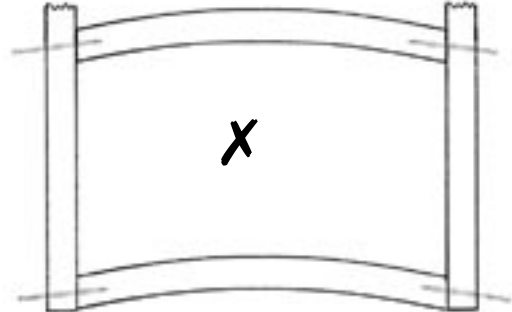
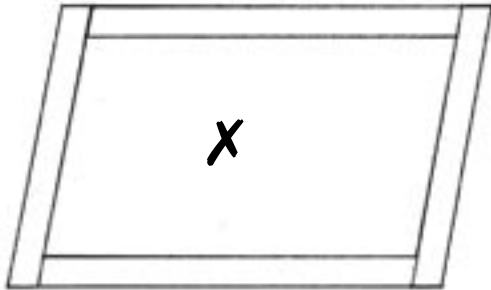
Measure the length of stud you need.



Be careful.

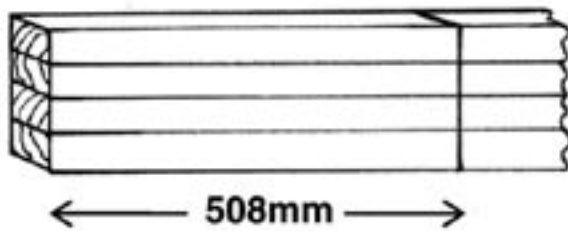
you could get the wrong measurement if

the frame is not 'square' or the plates are warped or bowed.



Mark and cut the studs to your length

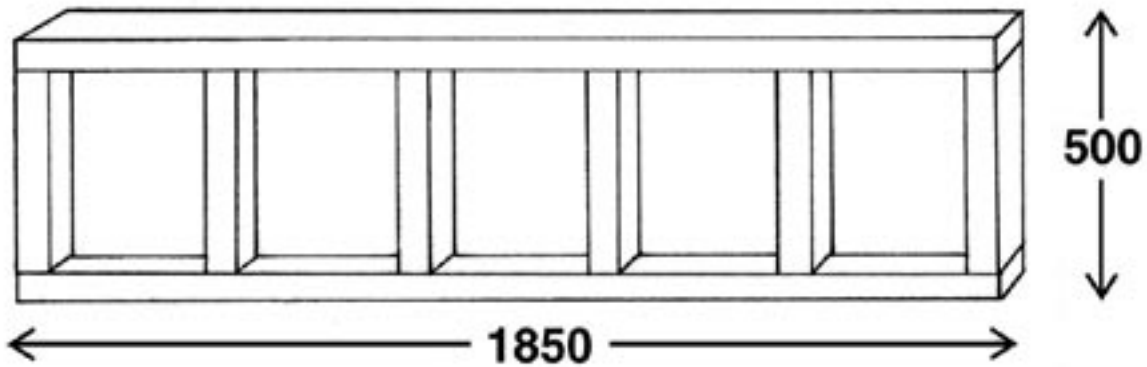
Mark all the studs together.



Activity

Students work out some lengths for themselves.

They use a part plan for another frame.



For the top and bottom pieces of the frame, they use the sizes of two of the sample pieces of timber they measured in the activity earlier.

They work out how long would the upright pieces have to be.

Check out what they have done and give feedback

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Costs of timber in the plan

Explain

the amount and cost of the timber used for the framing plan :

top and bottom plates 2 x 1400mm = 2.8 metres

studs 4 x 508mm = 2.32 metres

total = 5.12 metres of 100 x 50 size timber

But

Timber is usually sold only in certain lengths — so there will be some wastage.

In this case,

- if the longest length of timber available was 5 metres (5000mm)
- you could cut both top and bottom plates 2 x 1400mm = 2800 mm
- and three of the studs at 508mm = 1524mm
- leaving a short piece of about 475mm that is waste.

You need to buy another 1 metre length to cut the other stud.

This will leave about another 492mm of waste.

So. You will need to buy a **total of 6 metres.**

Explain cost

The local cost of 100 x 50 is \$?? per metre (you need to find out the actual cost)

So the cost for this frame would be 6 x \$\$\$ = \$ XX

Activity

1. Students measure and mark timber for another example of a framing plan.

They **could** cut and assemble the frame as well.

2. Students calculate the amount and cost of the timber required.

(They will need the local costs and maximum timber length available)

Check students activity work and give feedback on how they have done.

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