Challenging topics

Converting between metric and imperial units

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Introduction

Metric units of measurement are widely used in Europe, including the United Kingdom. However, there are occasions when knowledge of imperial units is useful. This may occur:

- when dealing with a customer in the United States (where imperial measures are used, although they sometimes differ from UK measurements)
- when replacing equipment that was originally measured in imperial with the nearest metric equivalent
- when dealing with a customer who is familiar with imperial but where the supplier uses metric.

In these situations it is important to be able to convert metric units into imperial measurements and imperial measurements into their metric equivalents.

Also, the ability to use a variety of conversions with confidence is an important aspect of being functional with Mathematics; studying metric and imperial units introduces learners to the requirements of Functional Mathematics at Level 2.

Learning objectives and outcomes

To help learners to:

- convert between imperial and metric units of measurement
- use approximations to judge the accuracy of conversions.

Resources required

- Whiteboard or overhead projector.
- OHP transparency (or equivalent) of **Sheet 1: Bathroom fitting?**
- **Sheet 2: Putting the learning in context**.

For each learner you will need (optional):

- a calculator
- a ruler that shows 30 centimetres and 12 inches.

For each small group of learners you will need:

- **Sheet 1: Bathroom fitting?**
- **Card set A: Converting between metric and imperial.**

Starting points

This session tackles the problem of converting between imperial and metric units of measurement. Learners will already have met the metric system, but some may be unfamiliar with imperial measures.

Planning learning in multiple environments

As teachers*, we spend a lot of time planning the learning experience in our classroom, workshop or training area. However, it is worth considering how we can encourage our learners to explore their learning in a wider range of settings. Pointing learners in the direction of a relevant TV programme, a newspaper article, or even an advertisement, can bring learning alive. There may be opportunities to ask learners to observe something on the way to work or college, to reflect on an aspect of their own social or home lives, or to apply a newly learned skill in a workplace situation. All these can help the learning process, making it more real and relevant.

Mathematics occurs everywhere in our lives; helping learners to recognise the occasions where it pops up, and to incorporate these into their own thinking, is a step towards real and useful learning.

* We use the word 'teacher' as a generic term to include teachers, tutors, trainers, lecturers and instructors in the further education (FE) system.

Indicative timing

One hour.

Suggested approach

Stage 1: Beginning the session

Group discussion

This activity starts by establishing the use of imperial units in everyday life.

Write the words 'inches', 'feet' and 'miles' in the centre of the whiteboard or OHP transparency, and ask learners to give examples of where these measurements are used. At this stage, it is not necessary to consider conversion between these and the metric system. The aim is to establish that these units of measurement are still in use.

Comment

To encourage the discussion you may remind learners that:

- Imperial measurements are used in the United States, so companies with customers in America need to be familiar with them

- when renovation work is being done, for example, on Victorian buildings, the original measurements will have been in imperial units
- when old equipment is replaced, the original measurements will be in imperial units
- measurements of some materials can be given in either metric or imperial
- some customers will use imperial measurements to describe what they want; as an aspect of customer care, learners may have to translate these measurements into metric to supply the goods
- we often use imperial units in conversation, for example, fuel efficiency measured in miles per gallon, speed measured as miles per hour, a person's height measured in feet and inches; learners will be able to think of their own examples.

Continue the discussion until you have established the point that imperial measurements still have important uses.

Stage 2: Working in groups

Arrange learners in pairs and give each pair a copy of **Sheet 1: Bathroom fitting?** Give each learner a calculator if you think this is appropriate.

Ask learners to read the dialogue on Sheet 1 and decide if the new suite will fit into the bathroom. They should be prepared to explain their answer in terms of the floor plan.

Comment

- The diagram shows the common abbreviations for feet and inches, which may need to be explained to some learners.
- The dialogue is intended to give learners a means of conversion from inches to centimetres. However, bathroom equipment is measured in millimetres, so learners may need to be reminded of the number of millimetres in a centimetre.

Extending the learning

Learners who complete the activity quickly could be asked to prepare a dialogue of advice about how to calculate 2' 6'' in metric. They should think of a situation in which the measurement is relevant and use a standard rate of conversion. A 30 cm ruler, showing metric and imperial units, may be useful at this point so that learners can decide their own conversion rate.

Stage 3: Reviewing the learning

Group discussion

Display **Sheet 1: Bathroom fitting?** on a screen using a data projector or overhead projector.

In a group discussion, compare and contrast reactions to the statements in the dialogue. The discussion should continue until consensus is reached and all learners are clear about the calculations involved.

Comment

- Although the bathroom items may fit, the statement 'If your replacements are smaller then they will fit' over-simplifies the problem.
- If the items in the bathroom suite are to fit, the gaps between them will be small. As an aspect of good customer care, you might discuss the value of talking to the hotel about changing their choice of replacement fittings.
- It may be worth pointing out that, although the calculations needed for this example do not occur very often, this makes it all the more important that they are done accurately.

Stage 4: Working in groups

Give each pair of learners **Card set A: Converting between metric and imperial.** Each pair should match cards that are approximately equal in value using the conversion:

1 inch ≈ 2.54 cm

Learners should try to match the cards without using a calculator.

The cards can sometimes be matched in pairs and sometimes in sets of three.

Blank cards should be provided so that learners can write new cards to make up sets.

Stage 5: Extending the learning

At the end of the matching session you might ask each pair of learners to identify a match of three cards and suggest or make a card that extends the sequence to four.

You could also use the session to begin a discussion about approximations. You might do this by giving learners a new card for 1676 mm and invite them to match this to an existing set of cards. You can then ask learners to extend existing sets using approximations.


Comment

It will be useful to remind learners about when to round up and when to round down.

Sheet 1: Bathroom fitting?

7' 6"

We have to renovate the bathrooms in a Victorian hotel. This is the original drawing; the bath is 66" by 27", the vanity unit is 26" square, the toilet cistern is 18" by 9" and the toilet is 24" by 16".

2' 4"

6' 8"

70"

92"
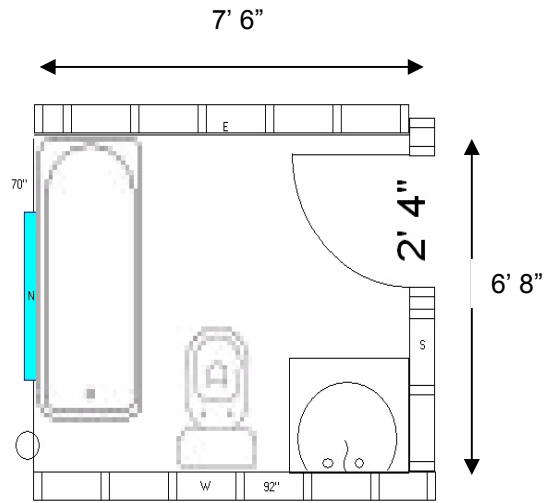
The hotel wants to keep the plumbing in the same place but install a new suite that has a bath 700 mm by 1700 mm, a double sink vanity unit 1230 mm by 500 mm, a toilet cistern 500 mm by 200 mm and a toilet 500 mm by 360 mm. I have drawn the new bath in but my boss wants to know if the whole suite will fit in.

711 mm

70"

92"
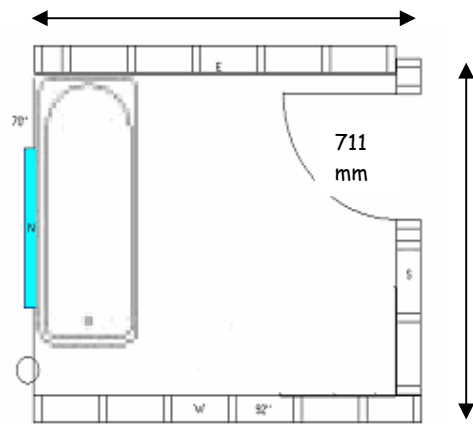
Easy, just measure the things that are there now. If your replacements are smaller then they will fit.

Good idea, but the hotel is on the Isle of Skye and my boss wants to know if I can work out the answer from the old drawings to save us the journey.

OK, well I can tell you that:
1 inch = 2.54 cm = 25.4 mm

I think there are 12 inches in a foot.

If you put the two things together you ought to be able to work out the other measurements.

Card set A: Converting between metric and imperial (1 of 2)

1 in	2.54 cm	25.4 mm
304.8 mm	12 in	30.48 cm
25.4 cm	10 in	1680 mm
90 in	1.68 m	0.7 m
80 in	18 in	45.72 cm

Card set A: Converting between metric and imperial (2 of 2)

660.4 mm	26 in	2.5 in
66 in	27 in	228.6 cm
203.2cm		

Sheet 2: Putting the learning in context

The Qualifications and Curriculum Authority (QCA) standards for Functional Mathematics suggests that, at Level 2, learners will be able to 'use, convert and calculate using metric and, where appropriate, imperial measures' (QCA Functional Skills Standards, page 26). The following contexts offer opportunities to explore conversion between metric and imperial units.

Replacement door handles and locks and extensions to buildings

Renovation work sometimes involves replacing existing fittings because it is undesirable or extremely expensive to replace an entire item. This may be the source of situations such as:

''While renovating a prestigious building, you have to replace some eight inch mortise locks. The door is extremely expensive and you do not want to drill new holes for the door-handles. What is the metric equivalent of the size of the locks?''

You may wish to change the scenario or the details, but it is important to retain the idea of replacement rather than buying everything new, because this would be costly and undesirable.

Similar problems arise when a new extension is built to an existing (Victorian) building, and there may be many opportunities to explore the problems of using metric bricks that have to approximate to imperial ones.

Trading abroad

Companies that deal with both the United States and Europe may need to be able to use both metric and imperial units, as in this situation:

''You are working for a company that designs sound systems and you read an article in the trade magazine that compares four Hi-Fi speakers. It says that they all feature 6.5 inch bass/mid drivers and one inch dome tweeters. Could your company compete by buying equivalent parts in Europe and selling to the US? Use the internet to find out the cost of these components in the US and compare them with the cost of the European (metric) equivalents.''

Helping people to convert

People who have used imperial units for most of their lives may find it difficult to convert quantities into metric equivalents. It may help to design a conversion chart; this is one of the elements of this task.

''You are working for a care home and notice that many of the staff are used to working in imperial units and have difficulty converting from metric (which is used in many of the goods and aids in the home).. Choose the metric units that you think would be most commonly used in labels, instructions and so on, and design a conversion table for each one. You might like to design a poster to be displayed with illustrations of typical goods showing metric and imperial equivalents.''

Alternatively, you might encourage learners to design a website to help users convert from imperial to metric.

''You are working for a website that is going to help people become familiar with metric measures. Choose five common items for the website and show their metric equivalents.''