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## How to use this work program

### Accessing the online resources

To access the online resources, please go to: https://www.backtofrontmaths.com.au/b2fmathshome

### Running the program each week

Each week is designed with five maths lessons so that you can do it each day. Different days have different types of lessons to make sure that students experience the kind of thinking that they need to continue growing in maths. The types of lessons include:

- **At-home investigation:** This is a hands-on task where students explore a new idea before they are taught that skill. They need to come up with an idea to try to solve the problem, try out their idea, decide if it worked or not, try again if needed, and explain what they did.
  If your child has time with your teacher with a webcam, the teacher will generally be doing this lesson with your child. This is the lesson that will require the heaviest input from you to help your child think through an idea and generally requires the use of some hands-on materials that are listed in the information page.
- **Connecting lesson:** This type of lesson has questions that lead students to develop their ideas and learn a new skill. It should be fairly easy for a student to do, but you will need to be available to read the question to your child as needed, encourage them to think further, and make sure that they complete the work. Most of these lessons will include 10 minutes of practising number operations or concepts through activities or games.
- **Interleaved practise lesson:** This type of lesson provides 8-10 questions from different areas of maths so that students practise remembering what they have previously been taught. Some of the questions may not be easy for your child, so feel free to help whenever you see them struggling.
- **Generalising lesson:** This lesson contains some extension material for use if your child found the week's lessons too easy. *If you would prefer*, you can spend this lesson playing more of the number games that are included in the connecting lesson or giving your child time to complete any of the lessons that they have not yet done.

### Getting help

The website above will have answers to frequently asked questions as well as videos to help you successfully teach your child at home. If you have further questions or need support, please contact your child's teacher directly using the contact details that they have provided to you. If they can't answer your questions, they will contact the B2FMaths@Home team directly to get an answer within 3 days.

## What you need to know this week

### Week overview

This week we are teaching the concept of Length. In upper primary, this means measuring accurately in centimetres and metres, as well as millimetres where appropriate. It also means calculating the perimeter (length around the outside of a shape). Finally, students move on to converting between metres, centimetres, millimetres and kilometres.  Please note, there is a video on the webpage to help you understand this concept.

### Students need to work out:
- A metre is the base unit for length measurement. We know this because there is not a prefix in front of the word metre (e.g. *centi*metre, *milli*metre).
- All of our measurements involve using multiples of ten.
- Cent means 100th (there are 100c in $1). That means that 100cm = 1m.
- Milli means 1000th. That means that 1000mm = 1m. It also means that 10mm = 1cm.
- Perimeter is a measure of length. It is the distance around the outside of a 2D shape or 3D object.

### We are also hoping that students will learn:
- One length can be written in different units (e.g. a wall length of 2.4m would be recorded as 2400mm by a builder as they work in millimetres)
- To compare lengths, we need to make sure that we are using the same units.

### You will need the following objects:
- A ruler or measuring tape

## Teacher Overview

Students will consolidate understanding of cm and m, introduce the units mm and km, then learn to convert between the units.

Ideally, we would use the following sequence of thinking to develop the concept of length from Year 3 to Year 6:
1. Work out that there are 100cm in each metre (Year 3).
2. Measure length accurately using cm and m (Year 4).
3. Work out that perimeter is obtained when all length measurements are added together (Year 5).
4. Understand the relationship between m, cm, mm and km, and link this with an understanding of place value including decimal numbers (Year 6).
5. Use formula to calculate perimeter of rectangles, and develop formulas for other shapes (Year 7).

## What to emphasise

**If you have time online with a webcam**
Ask students questions that emphasise the "students need to work out" section from the previous page, such as asking them to explain how they used their metre strip to measure the floor. Watch them measuring their desk or a piece of paper to check for gaps, overlaps etc. Ask them to explain what they found difficult in the At-Home Investigation.

Check that the parents have completed the number tasks with their students to ensure that they are emphasising place value and operations.

**If you have only email or phone contact**
Check that parents have read the "What you need to know this week" section. Check that they understand the importance of completing the number tasks so that students retain what they have learned and think regularly about place value and operations.

## Tracking student achievement
Check the parent's comment on the At-Home Investigation. Check Friday's lesson. Has the student *used* a formula for the perimeter of rectangles accurately?
- If so, tick **M4C** on the tracking sheet. For an A standard, the student needs to *establish* or develop the formula.

## Monday: At-Home Investigation

**You will need:**
- A measuring tape or ruler
- Clear space along the floor wherever possible

**Steps:**
1. Make sure you have read "What you need to know this week" so that you know what to emphasise with your child.
2. Read the sheet to your child. Ask for their ideas on how to solve the problem. Don't give your opinion just yet on their ideas, even if they are clearly wrong.
3. Make sure that you try out their ideas first before you try to help them come up with a better plan. This is important because then they will know *why* their idea didn't work.
4. Help your child think about what worked and what didn't, then come up with a new plan if needed.
5. Encourage your child to draw or write answers to the questions on the page.
6. Discuss what your child found out with them. Keep in mind the ideas from the "What you need to know this week" section so that you can ask questions that are appropriate to the issues identified.
7. We will be coming back to measuring perimeter again later in this program, so don't worry too much if today didn't quite work.
8. If your child found this task easy, ask them to convert the perimeter to centimetres or millimetres. There is a video on the website to demonstrate converting between units of measurement.

## At-Home Investigation
*Come up with a plan to measure the perimeter of your lounge room and your bedroom*

**My plan:** answer these questions
- Look at the lengths that you will have to measure for each room. What problems can you see? Come up with a plan for measuring the length of each wall without having to move your furniture.

- How will I make sure that I am measuring accurately when there is furniture in the way? What would happen if I didn't measure straight along?

**Carry out my plan:** follow these steps and answer the questions
- Measure each room and calculate the perimeter. Explain how you did it in the space below and give the final measurement for each.

**Extend your learning:** follow this step and answer the question
How would you write the perimeter of each room in centimetres? How about millimetres?

## Teacher Overview

This is a *Problem Solving* task.

The emphasis is on *designing* an investigation, *developing* a plan, *testing* it out, *verifying* that the plan worked, changing it as needed and *communicating* the procedure. There is also an emphasis on *generalising* an appropriate process that can be replicated when measuring the length of other objects.

This task will be tricky to run via a webcam, but you can probably talk to kids about what they did and what they found AFTER they have tried the investigation. Try to stick to the ideas in the section on "What you need to know about this week".

**Watch out for:**
- Accounting for furniture – maintaining a straight path
- Measuring accurately using both cm and m
- Adding accurately

**Good questions to prompt thinking:**
- Which part of room will we have to measure?
- What will we do if there is a couch in the way? Can we just bend the line and measure the whole way around the couch?
- If we are going to compare the perimeter of each room, how do we keep track of what we are doing and how long each wall is?

**Students requiring support:**
- Start by just asking students to measure the length of one room.
- Next, ask students to compare the lengths of two rooms rather than calculate the perimeter.
- Next, try asking students just to calculate the perimeter of their table.

**Extension:**
- Encourage students to convert between units of length.
- Encourage students to draw their room to scale.

## Tuesday: Connecting lesson

**Steps:**
1. Make sure you have read "What you need to know this week" so that you know what to emphasise with your child.
2. Read the sheet to your child. Ask for their ideas on what perimeter might mean using question 2. For your reference: perimeter is the distance along the edges of a shape.
3. Encourage your child to develop a formula for calculating perimeter of a rectangle such as 2(L+W). This means "Add the length and width, then double that total".
4. Think through the Backwards questions together as they will help your child connect the length of the sides of a rectangle with its perimeter.
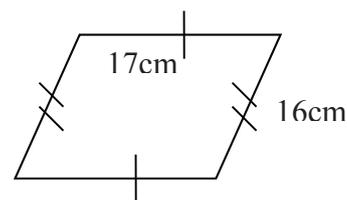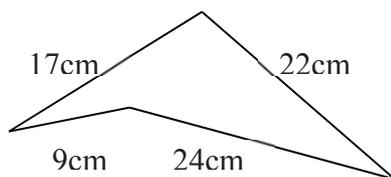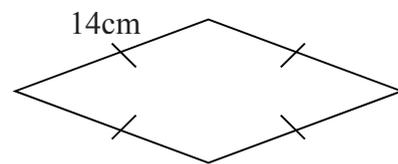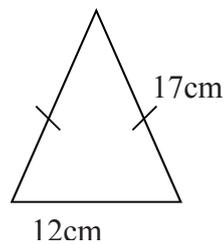
# E1. Find the perimeter and adding length measurements

Last time you were examining perimeter, you worked out how to find the perimeter of a variety of shapes. Use the example below to remind you how to calculate the perimeter of any straight-sided shape, and answer the questions.

1. What does "perimeter" mean?

2. In the shape below, the perimeter is 47cm. How did we work it out?

7cm  7cm  4cm  8cm  6cm  15cm
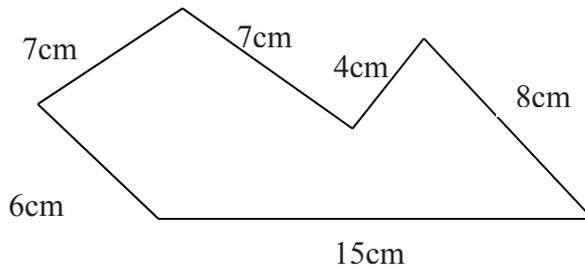
3. Use this to calculate the perimeters of the shapes below:

13cm  5cm

12cm  7cm  7cm  8cm

17cm  12cm

14cm

17cm  22cm  9cm  24cm

17cm  16cm

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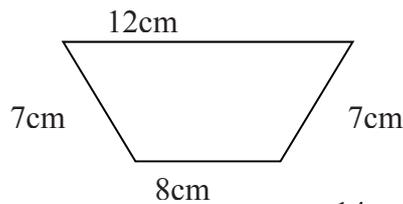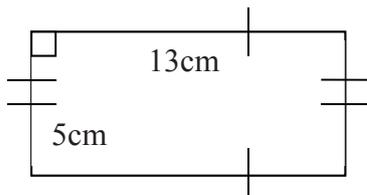
**BACKWARDS QUESTION:**

If the perimeter of two squares side-by-side was 60m, what was the side length of one square?

If the perimeter of a rectangle was 20cm, how long could its sides be?

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## Teacher Overview

This is an ***Understanding*** task.

The emphasis is on *connecting* the idea of path length with perimeter.

This task will be relatively easy to run via a webcam. Focus on the connections and try to have students link the idea of multiple measurements that are the same length (e.g. they might have used 5 lengths, so multiply by 5).

**Watch out for:**
- Using the same lengths in the park task
- Adding the lengths on page 2
- Working out a formula for the manipulation problems

**Extension:**
- Encourage students to develop an equation for the manipulation questions using what they know about regular shapes.

## Wednesday: At-Home Investigation for Extension

This lesson allows your child to extend what they have learned about length to investigate the circumference (perimeter) of a circle. While this topic is not necessary for achieving the minimum standard at year 7, it is a good opportunity to play with an idea together.

**Number practice:** *Multiplication facts*
Ask your child to complete one of the multiplication grids at the bottom of this page. Be aware that this might take a considerable period of time the first time around. Hopefully in a few weeks you will find that the time taken is much shorter.

**Worksheet task: 30 minutes**
You will need a ruler and some string. This lesson encourages your child to think about how many times the diameter of a circle fits around its circumference. They should find that it is always around 3 times. This number is actually pi, which is approximately 3.14.

Make sure that your child **explains out loud** how they calculated the relationship between the diameter and the circumference as that will help them to remember the relationship in the future.

**Multiplication Practise:**

| X | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |

Record your time here for the 49 questions:

Mark your answers using a calculator or with an adult. Circle any that are wrong.

# E2.  Circumference and diameter of a circle

There is a relationship between the diameter of a circle and its circumference.  Use the questions below to help you work out what the relationship is.

Make a piece of string the same length as the diameter of each of the circles below.  Try to fit it around the outside of the circle (circumference).  How many times does it go?
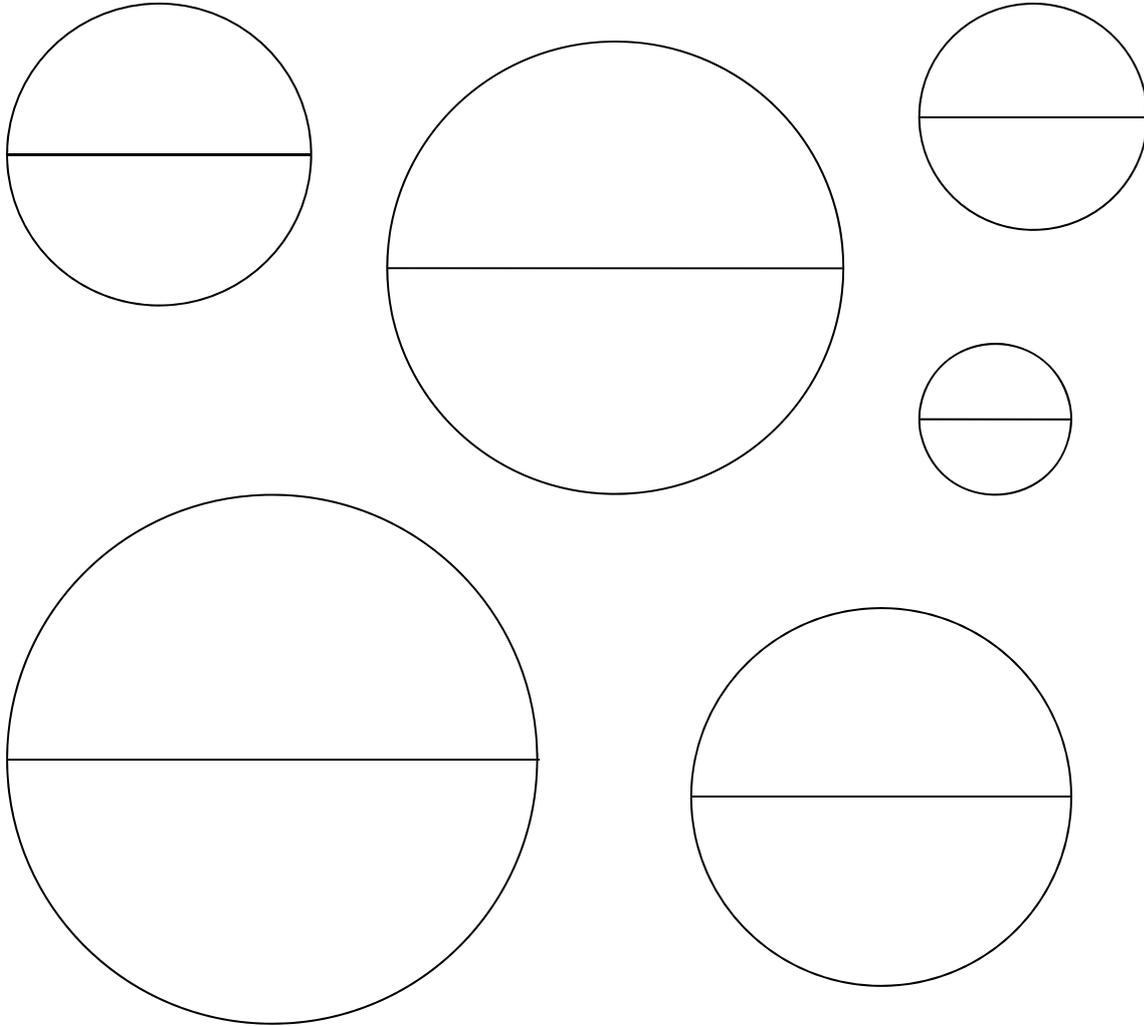
What is the relationship between the circumference and diameter of a circle?  What do you do to the diameter to get the circumference?

### Backwards Question:
If the circumference of a circle was 30cm, about how long would its radius be?

## Teacher Overview

This is a **Problem Solving and Reasoning** lesson. It gives students a chance to plan their approach, test out an idea, look for patterns and extend what they have already learned about length to circles. While the content is not technically necessary for the achievement standard, this lesson is more about giving students an opportunity to develop skills in *modelling*, *investigating*, *deducing* patterns, *developing* and *testing* conjectures and *generalising*.

## Thursday: Interleaved Practice Questions

**Why we are using mixed up questions:**
In this lesson your child will be reviewing a range of skills that they have learned previously. Each question is unrelated to the previous question, because we want your child to have to *think hard* about what to do. Mixing up questions like this, rather than just practising related questions, has been shown in research to improve student retention of concepts by 60% over a 4 month period.

**What to expect:**
Your child will probably have forgotten how to complete quite a few of the questions. If needed, change the numbers in each question to make them easier because this will still require your child to think hard and remember a process. If they still can't work it out, feel free to show them, but try using different numbers rather than the exact same question. There are answers to each question on the website in case you get stuck.

## Interleaved practise

Number:

1.  Complete the following number sequence:  ___ , -7 , -4 , -1 , ___, 5 , ___ , ___
    Describe the number pattern.

2.  312 478 + ____ = 403 673

3.  Read this number and say it: 102 413 048.  Write it in words. How many millions, thousands, hundreds, tens and ones does it have?

4.  What change would you get from $80.00 if you purchased a t-shirt for $27.80 and a cap for $12.25?  Show two different combinations of dollars and cents that you might receive.

5.  What is 25% of 80?  What fraction of 80 does it represent?  Write it as a decimal.

Measurement/Geometry:

6.  Find 3 items in your pantry that are measured in grams.  List them from lightest to heaviest and write their mass in kilograms.

7.  What time is it?  You want to watch a television show at 16:30. The show runs for 50 minutes. What time will it end?

8.  Draw what this shape would look like if you flipped it along the horizontal axis.

    

Chance/Data:

9.  If it has rained for the last two days and the weather bureau says that the weather pattern will probably continue, how might you express the likelihood as a percentage?

## Teacher Overview

The questions on this worksheet are drawn from the "C standard" of the Achievement Standard. See your tracking sheet for more detail. Each week the interleaved questions will get a little harder, and more concepts will be reviewed throughout the program as we teach that concept. We have included answers to these questions on the B2FMaths@Home so that parents can find them if needed.

**Support for struggling students:**
You might like to try the interleaved questions from a lower year level, or simply reduce the numbers in the questions. You might also give the student the answer then ask them to work out how the answer was obtained.

## Friday: Connecting Lesson

You will need a calculator for this lesson. Expect this lesson to take longer than average.

This lesson is designed to help students connect different units for measuring length to the place value and decimal number systems. It is a very difficult concept for most students to understand and often takes considerable time to master. We will be practising this concept again for most weeks from now on in the Interleaved Practice lessons to develop a strong understanding.

You might want to watch the video on the website. This is also suitable for sharing with your child IF they can't work out the patterns after trying the worksheet. Try the questions on the worksheet first, then use the video if you get stuck.

Work through the questions systematically with your child. Focus on identifying the patterns and connecting the different units of measurement. Ask your child to say their answer out loud each time to better build their retention.

If you end up stuck with this lesson, ask your child's teacher for help.

# E16. Converting between units

TR p113

> 🗒 Converting between different units for length, mass, area and volume is very similar to multiplying and dividing by 10s, 100s and 1000s using place value. In this activity you will use a place value chart to work out how the different units are related.

| Millions | Hundred thousands | Ten thousands | Thousands | Hundreds | Tens | Ones (then decimal point) | tenths | hundredths | thousandths | ten thousandths | hundred thousandths | Millionths |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

**Instructions:**
1. The standard unit for length is called a metre. Write the symbol for metres in the ones column because it is the unit on which all other length measurements are based.
2. How many centimetres are there in one metre? Use this to work out which column is the centimetres column. Write the symbol for centimetres in this column. *Check: if you put a one in this column and then fill in the relevant zeroes and decimal points does it show one centimetre converts to one metre?*
3. How many millimetres are there in one metre? Use this to work out which column is the millimetres column. Write the symbol for millimetres in this column. *Check: if you put a one in this column and then fill in the relevant zeroes and decimal points does it show one millimetre converts to one metre?*
4. How many kilometres are there in one metre? Use this to work out which column is the kilometres column. Write the symbol for kilometres in this column. *Check: if you put a one in this column and then fill in the relevant zeroes and decimal points does it show one kilometre converts to one metre?*

**To work out how many of one unit there are in a second unit:**
1. Place the number of units that you have in the relevant column. E.g. if you want to change 5cm to something else, put a 5 in the cm column. Pay attention to place value, and only put one digit in each column. E.g. if you want to change 125cm to something else, put the 5 in the cm, the 2 in the column to its left, and the 1 in the next column to the left.
2. Place a decimal point at the end of the number in the column that you want to convert the measurement into. E.g. if you are converting into metres, place a decimal point just after the number in the metres column. If there isn't a number in that column already, place a zero.
3. Fill in any zeroes that are missing between the numbers then read off your answer.

**Try these:**

5cm  = _____m      5mm = _____m        5m = _____cm      5m = _____mm

5cm  = _____km    5km = _____mm     5cm = _____mm    5km = _____cm

72cm = _____mm   72km = _____cm    72mm = _____m    72m = _____km

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**Operations:**
In order to change between the different units you are actually performing an operation of multiplication or division.  The number of places between the two units that you are converting tells you whether you are multiplying or dividing by 10, 100, 1000 or more.  To work out the patterns in this change answer the following questions:

1.  When you were converting between cm and m, how many places did the decimal point move?  E.g. 5cm = _____m.

2.  Why do you think it moved this many places?  What does multiplying and dividing by 10, 100, 1000 or more have to do with this?

3.  What is the pattern between how many cm there are in one m and the number of places that the decimal point moved?

4.  Are cm bigger or smaller than m?  And is your answer bigger or smaller than your starting number?  What is the pattern?

*So therefore to convert from one unit to another I need to work out:*
1.  How many of the one unit there are in the second unit.  This should tell us the factor (10, 100, 1000 or more) that we are multiplying or dividing by.
2.  Whether the answer should be bigger or smaller.  This should tell us whether we are multiplying or dividing by that factor.

**Try it out:**
1.  Change 35m to cm:

    a.  How many cm in one m?

    b.  Should the answer be bigger or smaller?

    c.  So the operation is: _____

2.  Change 35mm to cm:
    a.  How many mm in one cm?

    b.  Should the answer be bigger or smaller?

    c.  So the operation is: _____

3.  Change 35km to m:
    a.  How many m in one km?

    b.  Should the answer be bigger or smaller?

    c.  So the operation is: _____

4.  Change 35cm to km:
    a.  How many cm in one km?

    b.  Should the answer be bigger or smaller?

    c.  So the operation is: _____

Summarise what you have learned about changing between different units of length here:

Your job now is to work out how to change between the different units for mass, volume and area using the same process. When you have worked it out, write some steps for yourself to remember here then answer the questions that follow.

To convert between tonne, kg and g:

To convert between kL, L and mL:

**CHALLENGE QUESTION:**
To convert between hectares, $m^2$ and $cm^2$:

Try these:

| Change: | into: | and also into: | How I did it: |
|---|---|---|---|
| 35kg | g | t | |
| 35g | kg | t | |
| 214mL | L | kL | |
| 214L | mL | kL | |

**BACKWARDS QUESTIONS:**

| $103m^2$ | $cm^2$ | Ha | |
|---|---|---|---|
| 23.4cm | mm | m | |
| 0.7cm | m | km | |

## Teacher Overview

This is a **_Conceptual Understanding_** and **_Reasoning_** lesson. It is designed to extend student understanding further and encourage students to connect and convert between units of length.

A video is provided about this concept on the website. Watch it to build your own understanding of the link between place value and length conversion.

Connecting different representations is a C standard. Converting between different representations is an A standard.