Learner Pack

Functional Mathematics

Level 3 Unit 1: Number

Acknowledgements

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Activity N1: Using a calculator

Activity

Using the calculator

N1

This activity links to **award learning outcome 1.4.**

Introduction

Calculators can make adding, subtracting, multiplying and dividing much easier. Most calculators also work out percentages, fractions and decimals. Scientific calculators are large. They have more buttons than a normal calculator and are able to do even more mathematics than a normal calculator.

What will you learn?

Learning Outcomes

You will be able to:

1. Use a calculator to perform common mathematical functions, to include the use of +, -, × and ÷.

Activity N1: Using a calculator

Key Learning Points

1. Using a calculator
2. Using the function keys on a calculator
3. Adding, subtracting, multiplying and dividing using a calculator
4. Solving numerical problems up to 4 digit numbers with a calculator
5. Adding to or subtracting from totals using a calculator
6. Using the clear function

Materials you will need for this activity

- Calculator
- Practice Sheet N1
- Solution Sheet N1

What do you need to know before you start?

Sometimes it is easy to make mistakes inputting numbers into the calculator. It is important to have a rough idea or estimate of what the answer might be before using the calculator.

Activity N1: Using a calculator

Getting Started

Different calculators have different buttons for different functions. Check the operator's manual that came with the calculator if you have any questions on how your calculator works.

For example the **Clear** and **Clear Entry** buttons vary from calculator to calculator.

Clear

This button clears the calculator, and resets any functions.
On most new calculators this is generally the ON/ C button.

Clear Entry

This button erases the last number or operation entered. On most new calculators this is generally the DEL button.

Activity N1: Using a calculator

Worked Example

Gráinne has €11.00. She goes to the shop and buys **pasta** which costs €1.05, **pasta sauce** which costs €2.25 and a **packet of mince** which costs €4.80.

Use your calculator to work out the answers to the following.

a) How much did Gráinne spend in the shop?

b) What change will Gráinne get from her €11.00?

c) She would also like to buy The Irish Times newspaper which costs €1.90. Does she have enough money for the newspaper?

d) If so how much change will she get?

Activity N1: Using a calculator

Solution

a) Type **1.05 + 2.25 + 4.80** into your calculator.
Press the **equals (=) sign**.
This gives you a sum of 8.1
Gráinne spent €8.10 in the shop.

b) What change will Gráinne get from her €11.00?

To erase the data from the last time you used the calculator press the **clear** function. In most calculators this is the ON/C button.

It depends on the type of calculator. Check your operating manual or ask your tutor, if necessary.

Type **11 – 8.1** into your calculator and press the equals (**=**) sign.
This will give you 2.9.

Gráinne will get €2.90 change.

c) Gráinne has enough for the newspaper. She has €2.90 left and the newspaper is only €1.90.

d) **To calculate the change:**

2.9 should be on the screen of your calculator from the last time you used it. **Press the minus sign (-)** and type **1.9** followed by the equals sign (**=**).

This will give you 1.

Gráinne will get €1.00 change.

Activity N1: Using a calculator

Task 1

Mytown Electrical Store is stocking up on 8GB iPods for a promotion.

Each iPod costs the store €173.20.

a) How much will it cost the store to buy 37 of these 8GB iPods?

b) If the store has €8,500 to spend, how many of these iPods could it buy?

Activity N1: Using a calculator

Task 2

a) Brian brings home an income of €490.40 euro each week.

Use the calculator to work out the answers to these questions:

(i) How much will Brian earn in one year?

(ii) How much will he earn in one month?

(iii) In the month of February, Brian paid €76.80 for electricity and €56.70 for gas. His monthly grocery bill was €175.69. His TV, internet and phone bill was €66.

How much of his income had Brian left over after he paid his bills?

Activity N1: Using a calculator

Task 3

"I'll guess your secret number."

Try this calculator trick on a friend.

Give your friend the calculator and ask them to do this:

Pick any number and write it down on a sheet of paper. Keep it secret.
Type that number into your calculator. Don't let me see it.

Then:

- Multiply the number by 2 and press =
- Add 4 to your answer and press =
- Divide your answer by 2 and press =
- Add 7 and press =
- Multiply by 8 and press =
- Subtract 12 and press =
- Divide by 4 and press =
- Subtract 11 and press =

Now ask your friend to give you back the calculator. Tell them that you will soon be able tell them the secret number they wrote down at the start.

Then use the calculator to do this:

- Subtract 4 and press =
- Divide by 2 and press =

You will now have the number that your friend wrote down at the start.

Activity N1: Using a calculator

Practise your skills

- Use Practice Sheet N1.
- As you go through this pack, first try to do the maths calculations without the calculator. Then use the calculator to check your calculations and answers.

Activity N2: Playing darts

Activity **Playing darts** N2

This activity links to **award learning outcomes** 1.1 and 1.4.

Introduction

The game of darts is popular in Ireland. To keep score or to follow the score we need to recognise, understand and use natural numbers. We use natural numbers every day in various ways and in many different places. This activity will help with this.

What will you learn?

Learning Outcomes

You will be able to:

1. Use natural numbers (N) in basic mathematical functions drawn from real life situations.
2. Use a calculator to perform common mathematical functions to include use of +.

Activity N2: Playing darts

Key Learning Points

1. Understanding the basic mathematical functions
2. Identifying natural numbers (N)
3. Adding 1, 2 and 3 digit numbers without a calculator
4. Applying mathematical solutions to real life situations
5. Adding using a calculator

Materials you will need for this activity

- A dart board, magnetic if possible, or a picture of a dart board
- Calculator
- Practice Sheet N2
- Solution Sheet N2

What do you need to know before you start?

Maths

Natural numbers are the set of positive, whole numbers. They are also known as **counting numbers**. Counting is something we do often in everyday life, for example, keeping score in a game, counting people attending a concert or recording the score of a soccer match.

Darts

For players and spectators to enjoy a game of darts, they need to be able to add natural numbers to keep the score.

Activity N2: Playing darts

Getting Started

N is the symbol used to represent the set of **natural numbers.**
Examples of natural numbers include 4, 16, and 378.

4 is an example of a 1 digit natural number.
16 is an example of a 2 digit natural number.
378 is an example of a 3 digit natural number.

0 (zero) is also a natural number.

Remember:

- Natural numbers always have a **positive** (+) value: they are never negative.
- Natural numbers are always **whole** numbers. That means that a number with a fraction or a decimal is not a natural number.
  For example, $12\frac{1}{2}$ and 12.5 are not natural numbers.

Addition

Addition is a mathematical operation. We use the plus sign + to show that we are adding.
We add numbers to find the **total** number. **For example**, if you have €5 in notes and €3 in coins, how do you work out the **total** amount of euro you have?
You add €5 and €3 and you get the **total** €8.

Activity N2: Playing darts

Here is how to write down addition using maths symbols.

When we are working out addition on paper we usually **align** the numbers under each other. That means **line up** the **ones** (or units) under each other and line up the **tens** under each other. Put a plus sign beside the numbers to show that you are adding.

For example, if we are adding 15 and 23 we write:

$$\begin{array}{r} \mathbf{15} \\ \underline{\mathbf{+23}} \end{array}$$

To find the **total** this is what we do:

First add the ones or units 5 and 3. 5 + 3 = **8**

$$\begin{array}{r} 1\mathbf{5} \\ \underline{+\ 2\mathbf{3}} \\ \mathbf{8} \end{array}$$

Next add the tens 1 and 2. 1 + 2 = **3**

$$\begin{array}{r} \mathbf{15} \\ \underline{\mathbf{+\ 23}} \\ \mathbf{38} \end{array}$$

This gives an answer of **38**. The **total** is **€38**.

Activity N2: Playing darts

Worked Example Adding Natural Numbers

Mark Webster took part in the Darts World Grand Prix in Citywest, Dublin. During his first match Mark threw a **19**, a **17** and an**18**.

Calculate what Mark's **total** score was for this throw.

Solution

To calculate his total score add the three positive whole numbers that Mark threw:

$$\begin{array}{r} 19 \\ +\ 17 \\ \underline{18} \\ \mathbf{54} \end{array}$$

We can also write it like this:

19 + 17 + 18 = **54**

Activity N2: Playing darts

Task 1

Answer the following questions without using a calculator.

a) If Mark threw an 18, a 20 and a 5 what would his score be?

b) Mark's opponent Adrian Lewis threw his three darts next. He hit a 1, a 20 and a 20. What was his score?

c) Here are some statistics for darts player Raymond van Barneveld:

- From 1996 - 2000 he played 22 darts matches.
- From 2001 - 2005 he played 36 matches.
- From 2006 - 2011 he played 29 matches.

How many matches did Raymond play altogether from 1996-2011?

Check your answers using your calculator.

Activity N2: Playing darts

Task 2

Look at the numbers in the box below.

Put a circle around any number that **is** a **natural n**umber.

13.2	214	-34	29	64.5	11 ½
0	-55	$34\frac{1}{4}$	234	-45	3568

Activity N2: Playing darts

Task 3

Without using your calculator add the following natural numbers.

12	61	1002
15	258	695
<u>13</u>	<u>326</u>	<u>126</u>

Check your answers using your calculator.

Practise your skills

- Use Practice Sheet N2
- Play a game of darts and keep the score, or keep the score in another game that you like to play or watch.
- Mary went on a two-day trek to the lost city of the Incas "Machu Picchu". On the first day the group climbed to a height of 3,348 metres. On the second day they climbed another 1,752 metres and reached the summit.

  How high did they climb altogether?

Activity N3: Battle of the provinces

Activity **Battle of the provinces** **N3**

(Google Images)

This activity links to **award learning outcomes** 1.1. and 1.4.

Introduction

Rugby is a team sport which is popular in Ireland. There are teams representing the four provinces: Munster, Leinster, Ulster and Connaught. In this activity we will use the topic of rugby to learn about subtracting natural numbers.

What will you learn?

Learning Outcomes

You will be able to:

1. Use natural numbers (N) in basic mathematical functions, drawn from real life situations.
2. Use a calculator to perform common mathematical functions to include use of the minus sign **–**.

Activity N3: Battle of the provinces

Key Learning Points

1. Understanding the basic mathematical functions
2. Subtracting 1, 2 and 3 digit numbers without a calculator
3. Applying mathematical solutions to real life situations
4. Subtracting using a calculator

Materials you will need for this activity

- Practice Sheet N3
- Solution Sheet N3

What do you need to know before you start?

Maths

From N2 you should know this:

- What are natural numbers?
- What is the symbol used to represent natural numbers?
- Is zero a natural number?

Rugby

What are the rules about gaining ground on the opposing team?

Activity N3: Battle of the provinces

Getting Started

Subtraction is the **inverse** of addition.

This means that if we start with a number, then add any number to it, and then subtract the number we added, we will end up back at the original number.

For example:
Start with 9. Add 12.
You will get 21.

9 + 12 = 21

Then subtract from 21 the same number you added, 12.
You will see that you are back to the original number: 9.

You can signify this by using the minus sign –
21 – 12 = 9

To subtract 23 from 45, first subtract the **ones** (5 - 3 = 2) and then subtract the tens (4 - 2 = 2). This gives an answer of 22.

Maths language: As well as ‘subtract’, we can say ‘take away’ or ‘minus’.

Activity N3: Battle of the provinces

Worked Example Subtracting Natural Numbers

Gaining ground in rugby

In a game between Ulster and Connacht, the Ulster team made a strong run and gained 20 metres. The Connacht team then forced Ulster back 8 metres. How many metres did Ulster gain on the attack?

Activity N3: Battle of the provinces

Solution

First Ulster gained 20 metres. They then lost 8 metres.

To calculate how much ground Ulster gained we subtract 8 metres from 20 metres.

$20 - 8 = 12$

Ulster gained 12 metres during that attack.

Activity N3: Battle of the provinces

Task 1

If Ulster gained 24 metres but were forced back 9 metres, how many metres have they gained overall?

Task 2

During the game, Connacht made a good run and gained 38 metres, but Ulster defended and forced Connacht back 11 metres. How many metres did Connacht gain altogether?

Check your answers using your calculator.

Activity N3: Battle of the provinces

Practise your skills

- Use Practice Sheet N3
- Play or watch a game of rugby and try to estimate the ground gained and lost during different phases of the game.
- Play a game of darts and keep the score. This involves subtracting scores from a starting total of 501.
- For the next few days, notice where you use subtraction in your everyday life. For example, when you are shopping you might subtract to work out how much change you will get. Tell your tutor and the group about those examples: what you were working out, why and how you did it.
- Record the examples in your maths diary.

Activity N5: Climate

Activity # Temperature **N4**

This activity links to **award learning outcomes** 1.1.

Introduction

We hear about Temperature every day – for example, when we listen to the weather forecast. Temperatures can vary greatly within a year in Ireland. For example, it could be as high as 24 degrees Celsius (24^{o}C) in July and as low as -10 degrees Celsius (-10^{o}C) in January. When we read temperatures we read negative numbers as well as positive numbers. This activity will help you to read, understand and use negative numbers in everyday life.

What will you learn?

Learning Outcomes

You will be able to:

1. Use **integers** (Z) in basic mathematical functions, in real life situations.

Activity N5: Climate

Key Learning Points

1. Identifying integers (Z)
2. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N4
- Solution Sheet N4

What do you need to know before you start?

Maths

Integers are a set of numbers larger than the set of natural numbers. They include **all whole numbers**, both **positive and negative**.

Getting Started

- **Z** is the symbol used to represent integers.
- **All** natural numbers are integers.

Examples of integers include 0, 2, -2, 65, - 736, 10,034.

Activity N5: Climate

Worked Example Integers

The number line below represents some **integers**: that is, positive and negative whole numbers

What are the **negative** numbers?

What are the **positive** numbers?

Use the number line to help you answer this question:

Is -5 greater than or less than -4?

Solution

Negative numbers are -6, -5, -4, -3, -2 and -1.

Positive numbers are 0, 1, 2, 3, 4, 5 and 6.

-5 is less than -4.

Activity N5: Climate

Task 1

Put a circle around any number that is an integer.

13.2	214	-34	29	64.5	11 ½
0	-55	$34\frac{1}{4}$	234	-45	3568

Activity N5: Climate

Task 2

Use the number line to help you decide whether the following statements are **true** or **false**:

- -3 is greater than -2 ____________________
- 2 is three greater than -1 ____________________

Activity N5: Climate

Task 3

In Ireland's climate, it is rare to have extreme heat or cold. However, sometimes our temperatures have hit both those extremities. The table below shows data on Ireland's climate, as recorded by Met Eireann.

Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Record high °C	19	18	24	26	28	33	32	32	29	25	20	18
Record low °C	-19	-18	-17	-9	-7	-3	-1	-3	-8	-12	-19	-19

Source: Met Éireann / Met Office

Use the data in the table to answer the following questions:

a) What was the highest temperature? ______________

b) What was the lowest temperature? ______________

c) Is -18º C greater than or less than -17º C? ______________

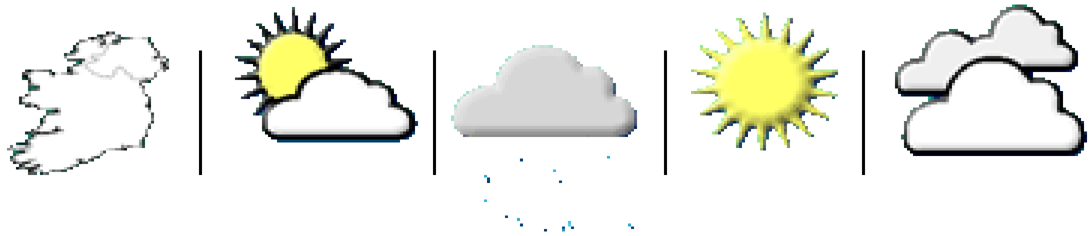
d) True or false: 4º C is six degrees hotter than -1º C? ______________

Practise your skills

- Use Practice Sheet N4

Activity N5: Climate

Activity **Climate** **N5**



(Goggle Images)

This activity links to **award learning outcomes** 1.1.

Introduction

We come across integers – negative whole numbers as well as positive whole numbers – in everyday activities, such as reading temperatures. It is important to be able to add and subtract these integers.

What will you learn?

Learning Outcomes

You will be able to:

1. Use integers (Z) in basic mathematical functions, drawn from real life situations.

Key Learning Points

1. Adding and subtracting 1, 2 and 3 digit numbers without a calculator
2. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N5
- Solution Sheet N5

Activity N5: Climate

What do you need to know before you start?

- You need to be comfortable with the maths in Activities N1 – N4.
- You should be familiar with temperature and negative numbers from the previous activity N4.

Getting Started

Integers include all positive and negative whole numbers.

Examples of integers are: 0 2 -2 65 - 736 10,034

Adding and subtracting integers means being able to add and subtract numbers that are both negative and positive.

For example

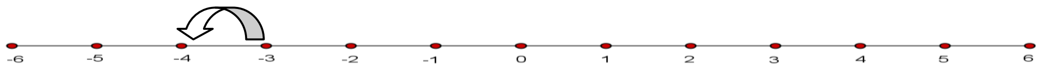
- 4 + 2 = - 2

Look at the number line below. For **addition**, you move in a **positive** direction: that is, to the right.

For **subtraction**, you move in the **negative** direction: that is, to the left.

For example

- 3 - 1 = - 4



Activity N5: Climate

Worked Example Adding and Subtracting Integers

We discussed temperature in Activity N4. Notice again how we use positive and negative numbers when describing temperature.

To compare temperatures in Ireland with that of other countries, we may need to add or subtract both positive and negative numbers.

Look at the following table. It shows the temperature in degrees Celsius recorded in Moscow and Dublin in January and July.

	January	**July**
Moscow	-19	31
Dublin	-12	18

a) Where was the highest temperature recorded?

b) Where and when was the lowest temperature recorded?

c) When was the highest temperature in Dublin?

d) In which month was the temperature in Moscow 7 degrees Celsius lower than in Dublin?

Activity N5: Climate

Solution

a) The highest temperature recorded was in Moscow.

b) The lowest temperature recorded was in Moscow in January.

c) The highest temperature in Dublin was in July.

d) The temperature in Moscow was 7 degrees Celsius lower than in Dublin in January.

Activity N5: Climate

Task 1

Look again at the temperature chart for Moscow and Dublin and answer the following question:

What was the difference in degrees in the temperature between Moscow and Dublin in July?

Activity N5: Climate

Task 2

Look again at the temperature chart for Moscow and Dublin and answer the following question:

What was the difference in degrees in the temperature between Moscow and Dublin in January?

Practise your skills

- Use Practice Sheet N5.

Activity N6: Calorie intake

Activity | # Calorie intake | **N6**

This activity links to **award learning outcomes** 1.1. and 1.4.

Introduction

In this activity we will give an example of a real life situation involving the multiplication of integers. Integers are the set of negative and positive whole numbers.

What will you learn?

Learning Outcomes

You will be able to:

1. Use integers (Z) in basic mathematical functions, drawn from real life situations.
2. Use a calculator to perform common mathematical functions to include use of ×.

Activity N6: Calorie intake

Key Learning Points

1. Understanding the basic mathematical functions
2. Adding and subtracting 1, 2 and 3 digit numbers without a calculator
3. Multiplying by single digit numbers without a calculator
4. Applying mathematical solutions to real life situations
5. Multiplying using a calculator

Materials you will need for this activity

- Practice Sheet N6
- Solution Sheet N6

What do you need to know before you start?

Maths

You need to be comfortable with the maths knowledge and skills in activities N1 – N5.

Calorie Intake

Daily Calorie Intake means the recommended number of calories from food and drinks to meet your needs and goals. Recommended daily calorie intake varies from person to person. There are guidelines you can use to decide how many calories you should have per day.

- Find out the recommended daily calorie intake for males and females.
- Know about calories and how your body consumes them and burns them up.

Activity N6: Calorie intake

Getting Started

X This is a multiplication sign, a sign for multiplying one number by another number.

Multiplication can be linked to addition.

Think back to the activity of playing darts. If your dart landed on a double 20 you worked out that score by adding two twenties: 20 + 20 = 40

If you scored a 'triple', you worked that out by adding three twenties:
20 + 20 + 20 = 60

You could also have used **multiplication** to work out the score:

Double 20: $20 \times 2 = 40$
Triple 20: $20 \times 3 = 60$

We also need to know how to multiply integers: positive whole numbers as well as negative whole numbers. When we multiply whole numbers that have **the same sign** the result is always a **positive** number.

For example: 5 x 4 = 20
-5 x **-**4 = 20

If we multiply whole numbers that have **different signs** then the answer will be **negative.**

For example: -5 x 4 = - 20
5 x - 4 = - 20

Activity N6: Calorie intake

Worked Example — Multiplying integers

The table below lists the food that Elaine ate last Monday and her calorie intake for that day.

Use the information in the table to answer the following without using a calculator:

a) Fill in the gaps in the table.

b) Write out the multiplication that you did to fill in the gaps.

c) How many calories in total did Elaine consume?

Food Consumed	**Calorie Intake**	**Total Calorie Intake**
2 slices of wholegrain toast (no butter)	75 (per slice)	
Banana	105	105
Bowl of vegetable soup	30	30
2 slices of brown bread	65 (per slice)	
Yogurt	170	170
Chicken Breast	258	258
2 potatoes	58 (per potato)	
Small tin of beans	82	82
Dairy Milk Bar	255	255

Activity N6: Calorie intake

Solution

a)

Food Consumed	Calorie Intake	Total Calorie Intake
2 slices of wholegrain toast (no butter)	75 (per slice)	150
Banana	105	105
Bowl of vegetable soup	30	30
2 slices of brown bread	65 (per slice)	130
Yogurt	170	170
Chicken Breast	258	258
2 potatoes	58 (per potato)	116
Small tin of beans	82	82
Dairy Milk Bar	255	255

b) 2 x 75 = 150 (2 slices of wholegrain toast)

2 x 65 = 130 (2 slices of brown bread)

2 x 58 = 116 (2 potatoes)

c) We can now add these calories to the rest:

150 + 130 + 116 + 105 + 30 +170 + 258 + 82 + 255 = 1296.

Elaine had a total calorie intake of 1296 calories last Monday.

Activity N6: Calorie intake

Task 1

Elaine went to the gym last Monday and spent 10 minutes each on three similar exercise machines.

She burned 54 calories every 10 minutes she spent exercising.

How many calories did Elaine burn altogether in that time?

Check your answers using your calculator.

Activity N6: Calorie intake

Task 2

Find out the recommended calorie intake per day for women. You could use the internet, or find the information in a book, or ask someone who you think would know this - for example, a catering tutor or a health and fitness instructor.

What is the difference between Elaine's calorie intake and the recommended intake for women?

Show how you worked out this answer using subtraction.

Check your answers using your calculator.

Activity N6: Calorie intake

Task 3

Multiply out these numbers:

$4 \times 7 =$

$-2 \times 3 =$

$6 \times -8 =$

$-9 \times 2 =$

$-5 \times -6 =$

Practise your skills

- Use Practice Sheet N6

Activity N7: Winning money

Activity **Winning money** N7

(Google Images)

This activity links to **award learning outcomes 1.1.** and **1.4.**

Introduction

We use the mathematical skill of **division** often in everyday life. For example, we use it when dealing with money, If we want to work out how much we get paid per day or per hour, or if we want to divide winnings between people, we can use division. This activity will help with division.

What will you learn?

Learning Outcomes

You will be able to:

1. Use integers (Z) in basic mathematical functions, drawn from real life situations.
2. Use a calculator to perform common mathematical functions to include use of ÷.

Activity N7: Winning money

Key Learning Points

1. Understanding the basic mathematical functions
2. Dividing by single digit numbers without a calculator
3. Applying mathematical solutions to real life situations
4. Dividing using a calculator

Materials you will need for this activity

- Practice Sheet N7
- Solution Sheet N7

What do you need to know before you start?

Maths

You should be familiar with the concept of integers. They include all positive and negative whole numbers. Z is the symbol used to represent them.

Examples of integers include 0 2 -2 65 - 736 10,034

Getting Started

We know from Activity N6 that when multiplying whole numbers with the same sign, the answer is positive and if the signs are different then the answer will be negative. For example:

- 3 x -6 = + 18

- 5 x 4 = - 20

The same is true for **division** of integers. For example:

16 ÷ 8 = 2

-8 ÷ -2 = 4

56 ÷ -7 = -8

-16 ÷ 4 = -4

Activity N7: Winning money

Worked Example Dividing integers

James won €12,800 in a local lotto draw. He kept €4,400 and divided the remainder equally between his 7 children. How much did each child get?

Solution

Total money = €12,800

Money to be divided between children = €12,800 - €4,400 = **€8,4**00

Money each child gets **= €8,400 ÷ 7 = €1,200**

Activity N7: Winning money

Task 1

1st Place	€10,000
2nd Place	€8,000
3rd Place	€6,000
4th Place	€4,000
5th Place	€2,000

Joanne and Tony have 2 grown up children.

Joanne bought a ticket for the Grand Draw.

Joanne won 2nd prize. She decided to divide her winnings equally between Tony, the children and herself.

How much will each person get?

Show your workings on a separate page.

Check your answer using your calculator.

Activity N7: Winning money

Task 2

A syndicate of 8 people won €27,000 in the National Lottery.

They decided to give €3,000 of the winnings to charity and divide the rest equally between the 8 people in the syndicate.

How much will each person get?

Show your workings.

Check your answer using your calculator.

Practise your skills

- Use Practice Sheet N7

Activity N10: Wins and Losses

Activity **Circles** N8

This activity links to **award learning outcomes** 1.1.

Introduction

Every day we meet numbers that are **not whole numbers**. For example, we might buy clothes in a sale at half price (½ price). These numbers are called **rational** numbers (Q).

What will you learn?

Learning Outcomes

You will be able to:

1. Use rational numbers (Q) in basic mathematical functions, drawn from real life situations.

Key Learning Points

1. Identifying rational numbers (Q)

Activity N10: Wins and Losses

Materials you will need for this activity

- The fraction circle kit.
- Practice Sheet N8
- Solution Sheet N8

What do you need to know before you start?

Q is the symbol used to represent rational numbers.

There are times when we divide one integer by another and get an answer that is not a whole number.

For example if we divide 3 by 4 we get an answer of ¾. This is called a **rational** number. However it is more commonly known as a **fraction**.

The fraction ¾ is a result of dividing the **top** number, called the **numerator**, by the **bottom** number, called the **denominator**.

We meet fractions in everyday life when we are:

- measuring objects: we might need a half of a metre of wood for a specific task
- sharing food: if we divide a pizza evenly between four friends, each friend gets one quarter
- reading the time: a quarter of an hour;
- cooking: a recipe might say we need one third of a cup of sugar.

Activity N10: Wins and Losses

What does 'fraction' mean?

To understand what a fraction is, think of dividing up one whole thing such as a pizza or a cake:

- The whole thing is divided up.
- There are a certain number of parts.
- All those parts together make up the whole thing.
- Each of those parts is called a fraction of the whole thing.

Getting Started

Use the **Circles Fraction Kit** that your tutor will give you.

In small groups, use the pieces in the kit to make up as many single coloured circles as you can.

Then look at the circles you have made.

What do you notice about the circles and the parts?

What does this tell you about fractions?

Discuss this with the group and your tutor.

Activity N10: Wins and Losses

Worked Example Fractions

In the coloured circles, each of the equal parts is a fraction.
Each fraction has a name. **The fraction name depends on the number of parts that make up the whole.**

Examine your coloured circles. If the whole circle is made up 2 equal parts, then each part is one of two parts. We call it a **half** and we **write** it as one over two: $\frac{1}{2}$.

The **symbol** for one half is $\frac{1}{2}$.

If the whole circle is made up of **3 equal parts**, then each part is one of three parts. We call it **one third** and we **write** it as one over three: $\frac{1}{3}$
The **symbol** for onethird is $\frac{1}{3}$.

Complete the following table.

One part of the whole	Name	Symbol
1 part of 3 is	One third	$\frac{1}{3}$
1 part of 4 is		
1 part of 5 is		
1 part of 8 is		

Activity N10: Wins and Losses

Solution

One part of the whole	Name	Symbol
1 part of 3 is	One third	$\frac{1}{3}$
1 part of 4 is	One quarter	$\frac{1}{4}$
1 part of 5 is	One fifth	$\frac{1}{5}$
1 part of 8 is	One eight	$\frac{1}{8}$

Activity N10: Wins and Losses

Task 1

Fill in the table for each of the coloured circles.

The second one is done for you.

Colour of Circle	How many parts make the whole circle?	Each part is named….	Symbol for each part
Yellow			
Green	2	One half	$\frac{1}{2}$
Blue			
Red			
Purple			
Orange			

Activity N10: Wins and Losses

Task 2

From the previous task we know that three parts make up the whole of the blue circle in your Fraction Circle kit.

So each one of these parts is **one part out of three**.

We call it **one third** and we write it as **$\frac{1}{3}$.**

If you put two of the three parts together, that is **two parts out of three**.

We call it **two thirds** and we write it like this: $\frac{2}{3}$

Write the names of these fractions:

$\frac{3}{4}$

$\frac{4}{5}$

$\frac{6}{7}$

Activity N10: Wins and Losses

Task 3

Working in pairs, take turns to make fractions using the fractions kit.
Ask each other to name the fractions that you have made.

Practise your skills

- Use Practice Sheet N8
- Think about where you see fractions in your own life.

Activity N10: Wins and Losses

Activity **Snap** **N9**

This activity links to **award learning outcomes** **1.1** and **1.3.**

(Google Images)

Introduction

Rational numbers are any numbers that can be written in fraction form.

$\frac{1}{3}$ and $\frac{2}{6}$ are **equivalent fractions.** **Equivalent** means that they **have the same value or are equal to each other**. This activity will help you to understand and use equivalent fractions.

What will you learn?

Learning Outcomes

You will be able to:

1. Use rational numbers (Q) in basic mathematical functions, drawn from real life situations.
2. Manipulate basic fractions and their equivalence.

Key Learning Points

1. Identifying rational numbers (Q)
2. Identifying and using basic fractions

Activity N10: Wins and Losses

Materials you will need for this activity

- Fraction SNAP cards
- The fraction circle kit used in N8
- Practice Sheet N9
- Solution Sheet N9

What do you need to know before you start?

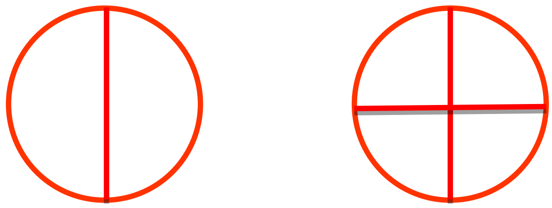
- You should be familiar with the maths knowledge and skills in N8.
- You need to be familiar with the rules of the card game SNAP.
  If you haven't played SNAP before, ask a friend to show you, or look up the rules in a book or on the internet.

Activity N10: Wins and Losses

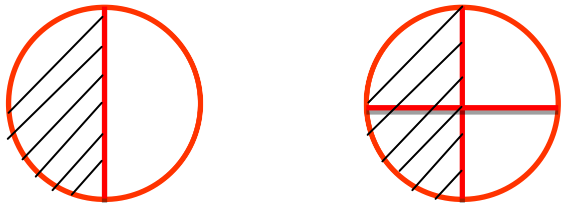
Getting Started

In the diagrams below the first circle is divided into two equal parts (**halves**).

The second circle is the same size as the first and it is divided into four equal parts (**quarters**).



Now notice that the same portion of each circle is shaded.



In other words **one half** of the circle is **equal** to **two quarters**.

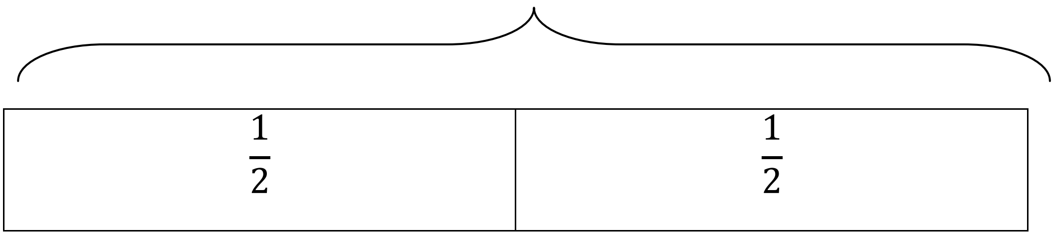
We write it like this:

$$\frac{1}{2} = \frac{2}{4}$$

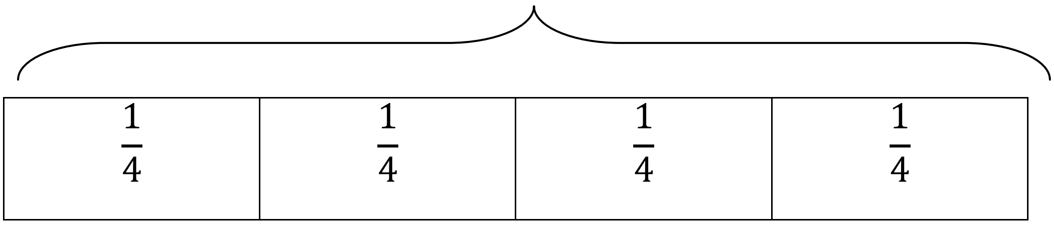
Activity N10: Wins and Losses

We can also show this in bar diagrams.

In the bar diagrams below the **first bar diagram** is divided into **two halves.**

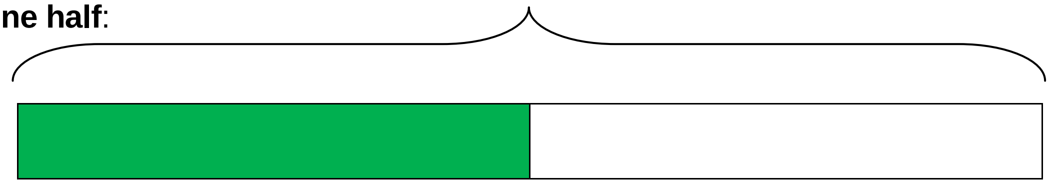


The **second bar diagram** shows the **same size** divided into **four quarters**.

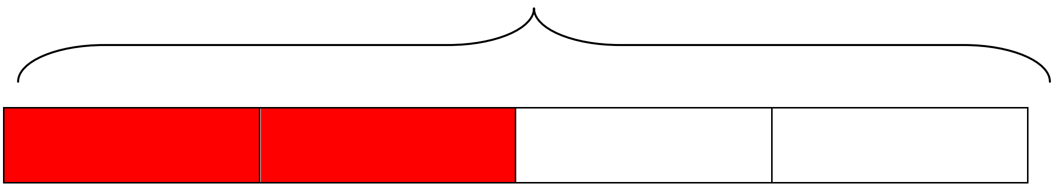


Below, we have shaded in the **same** portion of each diagram:

One half:



Two quarters:



The two bar diagrams show that **one half** is **equal** to **two quarters**. We write it like this: $\frac{1}{2} = \frac{2}{4}$

Activity N10: Wins and Losses

Equivalent forms of fractions

We have seen that a half is **equal to** two quarters.

Another word for equal is **equivalent**.

So, $\frac{2}{4}$ is an **equivalent form** of $\frac{1}{2}$**.**

We can write any fraction in its equivalent form.
There can be more than one equivalent form for a fraction.

For example:

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$$

In this example $\frac{1}{3}$ is called the **simplest form** of the fraction $\frac{3}{9}$.

1 and 3 have no **common factors** except 1, so the fraction cannot be simplified any further than $\frac{1}{3}$.

Activity N10: Wins and Losses

Worked Example Equivalent Fractions

Complete the following table. The first one is done for you.

Fraction	Equivalent Fraction
$\frac{2}{4}$	$\frac{1}{2}$
$\frac{2}{8}$	$\frac{1}{}$
$\frac{3}{9}$	$\frac{1}{}$
$\frac{5}{15}$	$\frac{1}{}$
$\frac{4}{16}$	$\frac{1}{}$

Activity N10: Wins and Losses

Solution

Fraction	**Equivalent Fraction**
$\frac{2}{4}$	$\frac{1}{2}$
$\frac{2}{8}$	$\frac{1}{4}$
$\frac{3}{9}$	$\frac{1}{3}$
$\frac{5}{15}$	$\frac{1}{3}$
$\frac{4}{16}$	$\frac{1}{4}$

Activity N10: Wins and Losses

Task 1

Working in pairs, use the fraction circle kit or draw bar diagrams to show that the following are equivalent fractions:

$$\frac{5}{15} = \frac{1}{3}$$

$$\frac{1}{2} = \frac{8}{16}$$

$$\frac{6}{12} = \frac{2}{4}$$

$$\frac{2}{10} = \frac{1}{5}$$

$$\frac{2}{3} = \frac{10}{15}$$

Activity N10: Wins and Losses

Task 2

Use the set of fraction cards in the resources section to play the card game "Snap". Play in groups of 4.

Deal the cards out equally between the players.

Players take it in turn to place their card face up in the middle of the table, each player adding to the pile.

If the fraction on the card that is turned up is **equivalent to** the card underneath it, all players try to be the first to place their hand on top of the pile and call 'snap'.

For example, if $\frac{1}{3}$ is the card on the top of the pile of cards and the next person plays its equivalent fraction $\frac{3}{9}$, you should try to be first to place your hand on the top of the pile of cards and call "snap". The person who is the first to call 'snap' wins and picks up the pile of cards.

The aim of the game is to win all the cards.

Practise your skills

- Use Practice Sheet N9.
- Practise your fraction skills by using the fraction circles and the fraction SNAP cards.

Activity N10: Wins and Losses

Activity # Wins and losses **N10**

(Google Images)

This activity links to **award learning outcomes 1.1** and **1.3.**

Introduction

This activity will help with **converting simple fractions to ratios**

What will you learn?

Learning Outcomes

You will be able to:

1. Use rational numbers (Q) in basic mathematical functions, drawn from real life situations.
2. Manipulate basic fractions to include ratios.

Key Learning Points

1. Applying mathematical solutions to real life situations
2. Converting simple fractions to ratios

Activity N10: Wins and Losses

Materials you will need for this activity

- Practice Sheet N10
- Solution Sheet N10

What do you need to know before you start?

You must be familiar with equivalent fractions from N9.

In particular, you should know **how to break fractions down into their simplest form**. Here is an **example** from the previous activity.

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$$

In this example $\frac{1}{3}$ is called the **simplest form** of the fraction $\frac{3}{9}$.

1 and 3 have no **common factors** except 1, so the fraction cannot be simplified any further than $\frac{1}{3}$.

Activity N10: Wins and Losses

Getting Started

Ratios

A ratio is a comparison of two numbers. We can use it for example to compare the number of wins to the number of losses, or the number of sandwiches to the number of people, or the number of students to teachers.

For example we may say:

- Leinster has 2 losses and 6 wins.
- We need 5 sandwiches for every 2 people.
- The school has a ratio of 30 students to 1 teacher.

We can **say** that the ratio of Leinster's losses to wins is **2 to 6.**
To **write** a ratio we usually separate the two numbers in the ratio with a colon**:** **for example** we would write that the ratio of Leinster's losses to wins is **2 : 6.**

Ratios and fractions

Ratios are simply another way of writing fractions.

This is how to **convert a ratio to a fraction**:

- The **first number** in the ratio becomes the **numerator** in the fraction.
- The **second number** becomes the **denominator** in the fraction.

So we can **write** the ratio of Leinster's losses to wins as:

2:6 **or** $\mathbf{\frac{2}{6}}$

Activity N10: Wins and Losses

Simplifying ratios

Just like fractions, we can **simplify ratios** if the two numbers have a **common factor**.

For example we can **simplify** Leinster's loss:win ratio from **2:6 to 1:3**. That means that for each loss that Leinster have, they have three wins.
So to **write** the ratio of Leinster's losses to wins we can write **1:3 or** $\frac{1}{3}$.

Worked Example Fractions to Ratios

In the 2010-2011 Premier League soccer season in England, Tottenham Hotspur **played 38** matches.

They finished in 5th position. They **drew 14** matches and **lost 8** matches.
We can say that Tottenham **drew** $\frac{14}{38}$ and **lost** $\frac{8}{38}$ of their games.

a) Write a fraction showing how many games Tottenham won.

b) Simplify this fraction. That is, write this fraction as its simplest equivalent or in its simplest form.

c) Convert this fraction to a ratio.

d) Explain in words what this ratio means.

Activity N10: Wins and Losses

Solution

a) 38 – 14 – 8 = 16

Tottenham won $\frac{16}{38}$ of their games.

b) $\frac{16}{38} = \frac{8}{19}$

c) $\frac{8}{19}$ converts to 8 : 19

d) This means that in the 2010-2011 season, Tottenham won 8 out of

every 19 games played.

Activity N10: Wins and Losses

Task 1

In order to qualify for Euro 2012, the Republic of Ireland soccer team played 10 games in their group, as well as two play-off matches.

They finished 2nd in their group. They won 6 of their 10 groups games.

a) Write a fraction showing how many of their group games Ireland won.

b) Write this fraction as its simplest equivalent.

c) Convert this fraction to a ratio.

d) Explain in words what this ratio means.

Activity N10: Wins and Losses

Task 2

In the 2010-2011 Heineken Cup, the Munster rugby team failed to qualify from their group. They played 6 games, won 3 and drew none.

a) Write a fraction showing how many games Munster lost.

b) Write this fraction as its simplest equivalent.

c) Convert this fraction to a ratio.

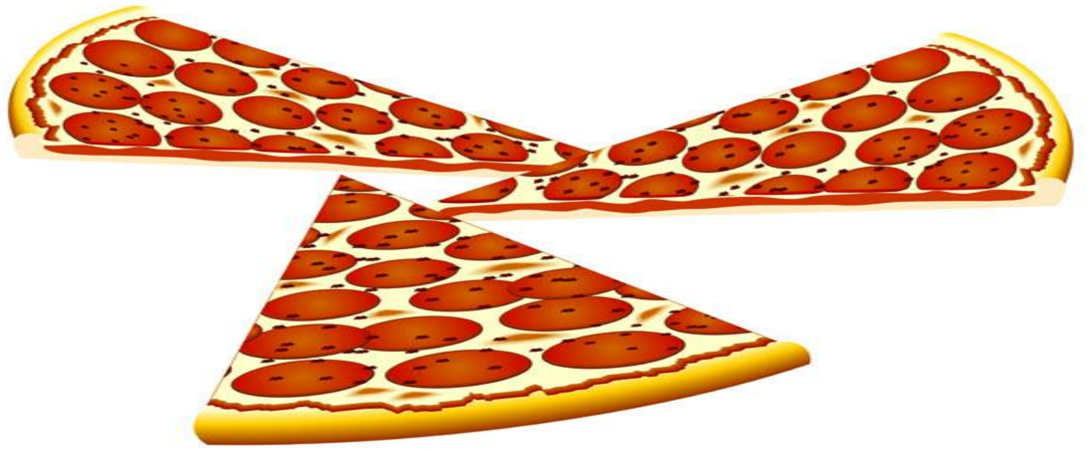
d) Explain in words what this ratio means.

Practise your skills

- Use Practice Sheet N10.

Activity N11: How many slices

Activity How many slices? N11



This activity links to **award learning outcomes** 1.1 and 1.3.

Introduction

It is not only integers, or whole numbers, that are used in everyday life. We also need to understand how to add and subtract **fractions**. This activity aims to help with that.

What will you learn?

Learning Outcomes

You will be able to:

1. Use rational numbers (Q) in basic mathematical functions, drawn from real life situations.
2. Manipulate basic fractions.

Activity N11: How many slices

Key Learning Points

1. Adding and subtracting fractions
2. Identifying and using basic fractions
3. Solving numerical and verbal problems using basic fractions
4. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N11
- Solution Sheet N11
- The circle kit used in N8.

What do you need to know before you start?

- Be familiar with the maths knowledge and skills from N8 and N9.

Getting Started

In N8, we learned that if we divide 3 by 4 we get an answer of $\frac{3}{4}$.

This fraction is a result of dividing the top number (called the **numerator**) by the bottom number (called the **denominator**).

When adding or subtracting fractions with the **same** denominator, we can simply add or subtract the numerator.

For example:

$$\frac{2}{5}+\frac{1}{5}=\frac{3}{5} \quad \text{or} \quad \frac{4}{5}-\frac{1}{5}=\frac{3}{5}$$

Activity N11: How many slices

Worked Example Adding and Subtracting Fractions

Your local pizzeria sells individual pizza slices.

They cut one full pizza into eight slices or eighths.

On Wednesday last, one customer bought three slices of the pizza and another customer bought two slices.

What fraction of the pizza remains after these purchases?

Write or draw how you worked it out.

Tip: You could use the fraction circle kit from the resources section to help you to work this out.

Activity N11: How many slices

Solution

When three of the eight slices have been sold and removed the pizza will look like this:

When a further two of the eight slices have been sold and removed the pizza will look like this:

These pictures show that there are $\frac{3}{8}$ of the pizza left.

Activity N11: How many slices

Task 1

The staff in the pizzeria cut up another pizza into 8 equal slices.

Three customers come in.

One buys one slice, another buys two slices and the third buys one slice.

What fraction of the pizza remains after these purchases?

You can use the fraction circles to help you.

Activity N11: How many slices

Task 2

Helen owns a small bakery shop and needs to decide how many cakes to bake. On Thursday she baked a birthday cake and a chocolate cake. She cut each cake into six slices. Therefore, each cake was divided into sixths.

That day, Helen sold three slices from the birthday cake.

Helen also sold four slices from the chocolate cake.

Activity N11: How many slices

Helen estimates that the sales will be the same again on Friday. She is trying to decide how many cakes to bake for Friday.

What decision would you make?

In pairs, **discuss** this and **decide** would you bake one cake or two cakes as normal?

Give the reason for your answer.

Practise your skills

- Use Practice Sheet N11

Activity N12: Pizza

Activity Pizza N12

This activity links to **award learning outcomes** **1.1** and **1.3.**

Introduction

We have seen in previous activities how to add and subtract fractions with the same denominator. This activity will help you to be able to add and subtract fractions which have **different** denominators.

What will you learn?

Learning Outcomes

You will be able to:

1. Use rational numbers (Q) in basic mathematical functions, drawn from real life situations.
2. Manipulate basic fractions.

Activity N12: Pizza

Key Learning Points

1. Adding and subtracting fractions
2. Identifying and using basic fractions
3. Solving numerical and verbal problems using basic fractions
4. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N12
- Solution Sheet N12
- The circle kit used in N8

What do you need to know before you start?

You must be familiar with the previous fraction activities in this pack.

Getting Started

In N11, we learned that when adding or subtracting fractions with the same denominator, we can simply add or subtract the numerator.

For example:

$$\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$$

However, if the denominators of the fractions are **not** the same, then we need another method.

Activity N12: Pizza

Worked Example Adding and Subtracting Fractions

Your tutor will give you circles from the fraction circle kit. They will include $\frac{1}{6}$ and $\frac{1}{4}$ and some other fraction circles.

What fraction do you get when you add $\frac{1}{6}$ and $\frac{1}{4}$ together?

With a partner or in small groups, try to work this out on your own before getting help from your tutor.

Solution

You get $\frac{5}{12}$

Activity N12: Pizza

Task 1

Use the fraction circles to add and subtract the following fractions:

$$\frac{1}{5}+\frac{1}{3}=$$

$$\frac{2}{3}+\frac{1}{4}=$$

$$\frac{1}{3}-\frac{1}{6}=$$

$$\frac{1}{2}+\frac{2}{5}=$$

$$\frac{1}{2}-\frac{2}{5}=$$

Activity N12: Pizza

Task 2

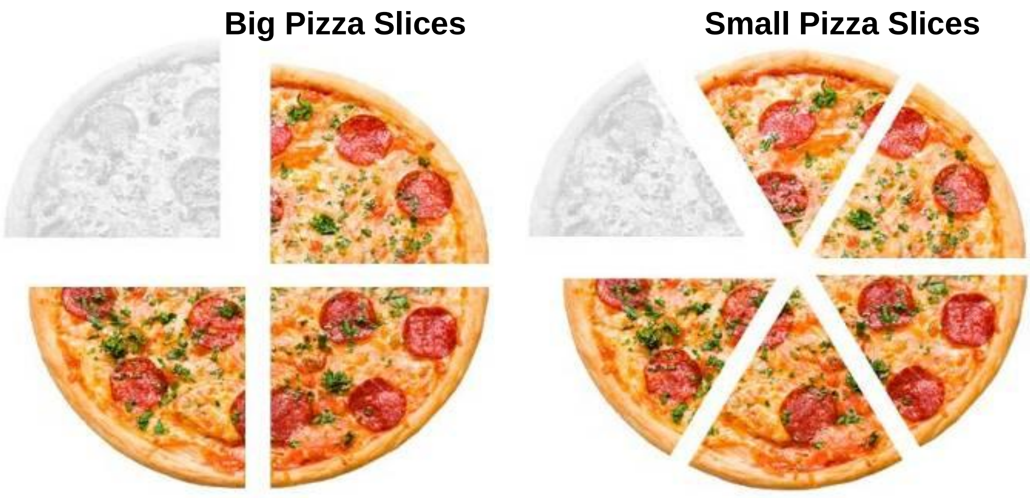
Your local pizzeria has decided to sell large and small pizza slices.

They cut one pizza into four large slices to make quarters.

They cut the other pizza into six slices, so each small slice is one-sixth of the whole pizza.

Activity N12: Pizza

A mother and child come into the pizzeria. The mother buys one large slice of pizza for herself and a small slice for her child.



a) Write in fractions how much is left in each pizza after the sale.

Big Pizza Slices ________________________________

Small Pizza Slices ________________________________

b) How much pizza is left overall?

Tip: First you must find a common denominator for the two fractions. You can use you fraction circles to help.

____

Practise your skills

- Use Practice Sheet N12

Activity # Recipes **N13**

This activity links to **award learning outcomes 1.1.**

Introduction

When we cook we often follow a recipe. To follow a recipe we need to understand different types of numbers. This activity will help with this.

What will you learn?

Learning Outcomes

You will be able to:

1. Use real numbers (R) in basic mathematical functions, drawn from real life situations.

Key Learning Points

1. Identifying real numbers (R)
2. Applying mathematical solutions to real life situations.

Activity N13: Recipes

Materials you will need for this activity

- Practice Sheet N13
- Solution Sheet N13
- A recipe

What do you need to know before you start?

You need to be familiar with natural numbers (whole numbers), integers (positive and negative whole numbers) and rational numbers (fractions).

Getting Started

Real numbers include almost all numbers and are represented by the **symbol R.** They include positive and negative whole numbers, fractions and decimal numbers. Decimal numbers are any numbers that contain a decimal point, for example 4·3, 6·77, 2·5467, 20·25.

We use **decimals** in our daily lives. For example, we might say that the distance from our house to the nearest shop is **1·5** kilometres.

Activity N13: Recipes

Worked Example Real Numbers

Look at the recipe below. **List the real numbers that you see in the Ingredients part of the recipe.**

Recipe for mushroom soup

Ingredients

1 teaspoon vegetable oil

10 mushrooms, chopped

50g/2oz flour

575ml stock or 2 stock cubes dissolved in 575ml of boiling water

$^{3}/_{4}$ pt. milk

Pinch of salt, if desired

Pepper

1·5 finely chopped onions

Instructions

1. Heat the oil in a saucepan.
2. Add the mushrooms and onion and fry.
3. Stir continually for 5 minutes.
4. Add the flour and stir well. Cook for another 2 minutes.
5. Gradually stir in the stock and milk and bring to the boil.
6. Simmer for 20 minutes, until thickened.
7. Add salt and pepper to taste

Solution

The real numbers in the ingredients part of the recipe are:

1, 10, 50, 2, 575, 2, $^{3}/_{4}$, 1, 1·5

Activity N13: Recipes

Task 1

Write out a recipe that you know or find a recipe that you like in a magazine or from the internet.

What are the real numbers in the recipe?

Activity N13: Recipes

Task 2

Look at the numbers in the box below.

Are they all real numbers? Tick the answer **yes** or **no:**

Yes ________ **No** _________

13.2	214	-34	29	64.5	11 ½
0	-55	34¼	234	-45	3568

Practise your skills

- Use Practice Sheet N13
- Can you think of three other examples where real numbers are used regularly?

Activity N14: Swimming records

Activity

Swimming records

N14

(Google Images)

This activity links to **award learning outcomes 1.1** and **1.3.**

Introduction

You will meet **decimals** when dealing with money, quantities and time.

It is important to know how to recognise the **value** of each digit in the decimal: it depends on **what side of the decimal point the digit is on** and **how far it is from the decimal point**. This activity will help you to understand and use decimals.

What will you learn?

Learning Outcomes

You will be able to:

1. Use real numbers (R) in basic mathematical functions, drawn from real life situations.
2. Manipulate decimals.

Activity N14: Swimming records

Key Learning Points

1. Identifying and using decimals
2. Solving numerical and verbal problems using decimals
3. Recognising the value of numbers up to two decimal places
4. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N14
- Solution Sheet N14

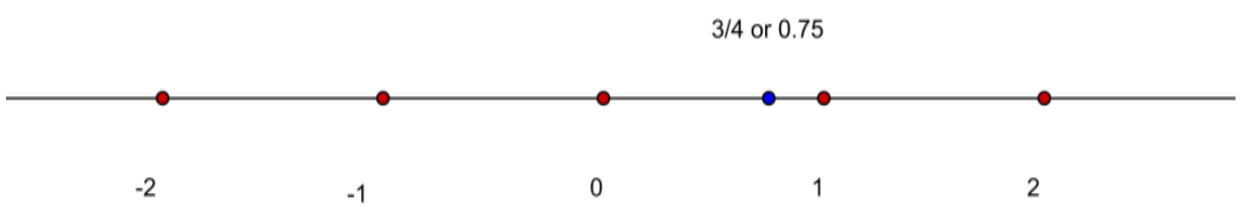
What do you need to know before you start?

- You must be comfortable with the maths from N13.
- It would be useful to know something about how time is recorded during major sporting events.

Getting Started

We can write fractions in decimal form. For example $\frac{3}{4}$ is the same as **0·75.**

We can show both of these on the **number line** as seen below.



Activity N14: Swimming records

Decimal numbers are any numbers that contain a decimal point, for example: 4·3 6·77 2·5467

Each digit in the numbers above has a different **place value**.

Its place value depends on **how close or far it is from the decimal point** and **what side of the decimal point** it is on.

Moving **to the left** of the decimal place, the first place represents ones or units, the second place represents tens, the third place represents hundreds, and the fourth place represents thousands.

Moving t**o the right** of the decimal point, the first place represents tenths and the second place represents hundredths.

Here is an example:

5 2 · 7 6

Tens	Ones	Decimal point	Tenths	Hundredths
5	2	·	7	6

5 is in the place representing **tens**, so it stands for 50.

2 is in the place representing **ones**, so it stands for 2

7 is in the **first place to the right of** the decimal point, representing **tenths**. So it stands for $^{7}/_{10}$

6 is in the **second place to the right** of place, representing **hundredths**. So it stands for $^{6}/_{100}$

Activity N14: Swimming records

Worked Example Place Value

The 100 metre butterfly is one of approximately 300 events in the Olympic Games. Michael Phelps, the American swimmer, won this event in the Olympic Games of 2004 and 2008. He broke an Olympic record in the 2004 games in Athens. He beat his own Olympic record again in 2008 in Beijing.

The Olympic record set by Michael Phelps in 2008 was **50·58 seconds**.

This time was **0·18 seconds slower** than the World Record set by Ian Crocker in 2005.

a) How many seconds, tenths of seconds and hundredths of seconds did it take Michael Phelps to complete the record?

b) How many tenths and hundredths of a second quicker was Ian Crocker in 2005?

Activity N14: Swimming records

Solution

a) It took Michael Phelps 50 seconds, 5 tenths and 8 hundredths of a second to complete the hundred metre butterfly in 2008.

b) Ian Crocker's World Record is 1 tenth and 8 hundredths of a second quicker than the record set by Phelps in 2008.

Activity N14: Swimming records

Task 1

a) In 2004 Phelps swam the 100 metre butterfly in **51.25 seconds**. How many **seconds, tenths** of seconds **and hundredths** of seconds did it take him to complete this event?

a. Phelps new record, **50.58 seconds**, is **0.67 seconds faster** than the original record he set.
How many **tenths** and **hundredths** of a second quicker was Phelps in 2008?

Activity N14: Swimming records

Task 2

a) In what other sports are thousandths of seconds used to separate out the winners?

b) Look up the **current world records** for **three** sports. Use the information to **complete this table**. Include decimal points where necessary.

Sport	World Record	Holder of Record

Practise your skills

- Use Practice Sheet N14

Activity Discover Northern Ireland N15

(Google Images)

This activity links to **award learning outcomes** 1.1 and 1.3.

Introduction

It is clear from the previous activity that it is important to know how to use decimals in everyday life, for example, when dealing with money, travel and many other situations. Addition of decimals is very similar to the addition of natural numbers. This activity will help with this.

What will you learn?

Learning Outcomes

You will be able to:

3. Use real numbers (R) in basic mathematical functions, drawn from real life situations.
4. Manipulate decimals.

Activity N15: Discover Northern Ireland

Key Learning Points

5. Identifying and using decimals
6. Adding decimals
7. Solving numerical and verbal problems using decimals
8. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N15
- Solution Sheet N15
- Link to AA route planner: http://www2.aaireland.ie/routes_beta/

What do you need to know before you start?

- You must be comfortable with the maths from N13 and N14.
- You need to be able to calculate the distance between locations in Ireland using AA route planner.

Activity N15: Discover Northern Ireland

Getting Started

Addition of decimals is very similar to the addition of integers.

We know that when we add whole numbers, such as 15 to 23, we add the **ones** together first (the 5 and 3), and then we add the **tens** together (the 1 and 2). We can only add ones to ones, tens to tens, hundreds to hundreds and so on.

It is the same for decimals: we can only **add tenths to tenths**, **hundredths to hundredths** and so on.

The **easiest way to add decimals** is to **line up the decimal points directly under each other.**

For example we can write **2·653 + 4·17**like this

2· 653
+ 4· 17

6· 823

Activity N15: Discover Northern Ireland

Worked Example Addition of Decimals

Mr. and Mrs. Sweeney live in Boston. They recently came to Ireland and took a trip around Northern Ireland. They stayed in a hotel near Dublin Airport on their first night.

The next morning they travelled by car **from Dublin Airport to Belfast**. The distance from Dublin Airport to Belfast is **158.68** kilometres. Later that day they drove **from Belfast to Carrickfergus** and stayed overnight. The distance they drove from Belfast to Carrickfergus was **18.51** kilometres.

The next day they drove **to the Giants Causeway**, which is a distance of **103.8** kilometres from Carrickfergus.

They then drove another **68.08** kilometres **to Derry city**.

a) How long did the Sweeney's travel on the first day of their tour?

b) How many kilometres had they travelled by the time they reached Derry city?

Activity N15: Discover Northern Ireland

Solution

a) On the first day they travelled from Dublin → Belfast, which is 158·68 km, and from Belfast → Carrickfergus, which is 18·51 km.

So the total distance travelled on Day 1 of the tour is 158·68 + 18·51

$$\begin{array}{r} 158{\cdot}68 \\ \underline{+\ \ 18{\cdot}51} \\ 177{\cdot}19 \end{array}$$

On the first day of their tour the Sweeney's travelled 177·19 km.

b) By the time they reached Derry City they had travelled 177·19 km (Day 1) as well as the trip from Carrickfergus → Giants Causeway (103·8 km) and Giants Causeway → Derry City (68·08).

So the total distance travelled by the time they reached Galway was 177·19 + 103·8 + 68·08

$$\begin{array}{l} 177{\cdot}19 \\ 103{\cdot}8 \\ +68{\cdot}08 \\ \hline 349{\cdot}07 \end{array}$$

When the Sweeney's had reached Derry City they had travelled 349·07 km.

Activity N15: Discover Northern Ireland

Task 1

Tom is a driver with a courier company that makes daily deliveries around Ireland.

Every Thursday he travels from **Limerick city to Belfast**, from B**elfast to Galway city** and from **Galway city** back **to Limerick city**.

a) Using AA route planner, find the distance Tome travels in each of the three parts of his journey.

b) Add these distances together to find the total distance Tom travels each Thursday.

Activity N15: Discover Northern Ireland

Task 2

Choose any **two days** this coming week that you travel by car or by bus. It can be at the weekend or midweek. Mark those days in your **maths diary:** you could use a heading such as **Distances.**

On those two days write down the **distance of each journey** you make. You could use **AA route planner** to get the distance or if it's by car you could check the car's **odometer** at the start and end of your journey to work out the distance.

Then **add these distances together** to find the **total distance** you travelled over the.

Activity N15: Discover Northern Ireland

Practise your skills

- Use Practice Sheet N15.

- The Jamaican National **4 x 100 metre relay** team won gold at the 2008 Beijing Olympics. These are the times that each of the 4 athletes on the Jamaican team took to run the the 100 metres:

  The **first** Jamaican athlete completed his 100m in **9·24 seconds**.
  The **second** athlete completed his 100m in **9·46 seconds**.
  The **third** athlete ran 100m in **8·8 seconds**.
  The **fourth** athlete ran his 100m in **9·6 seconds.**

  With these times the team set a new world record.

  - ➢ How quick were the Jamaican team in the **first half** of the race?

  - ➢ What was the **new World Record** set by the Jamaican Team?

Activity N16: Ingredients

Activity **Ingredients** N16

(Google Images)

This activity links to **award learning outcomes 1.1** and **1.3.**

Introduction

Subtraction of decimals is very similar to the subtraction of natural numbers. This activity will help with that.

What will you learn?

Learning Outcomes

You will be able to:

1. Use real numbers (R) in basic mathematical functions, drawn from real life situations.
2. Manipulate decimals.

Activity N16: Ingredients

Key Learning Points

1. Identifying and using decimals
2. Adding and subtracting decimals
3. Solving numerical and verbal problems using decimals
4. Applying mathematical solutions to real life situations

Materials you will need for this activity

- Practice Sheet N16
- Solution Sheet N16

What do you need to know before you start?

- The relationship between grams and kilograms.
  1 kilogram = 1000 grams and so 0·54 kilograms is 540 grams.

- The relationship between litres and millilitres.
  1 litre = 1000 millilitres and so 0·05 litres is 500 millilitres.

Getting Started

To subtract 23 from 45 you first subtract the ones, 5 - 3 = 2, then subtract the tens, 4 - 2 = 2. That gives an answer of 22.

It is the same for decimals and for this reason, as with addition, we must line up the decimal points before subtracting.

For example: 5·67 - 2·15

$$\begin{array}{r} 5{\cdot}67 \\ \underline{-\ 2{\cdot}15} \\ 3{\cdot}52 \end{array}$$

Activity N16: Ingredients

Worked Example Subtraction of Decimals

Barney's Bakery specialises in sponge cakes and chocolate cakes. Two of the most important ingredients are caster sugar and flour.

On Thursday last the head baker was getting the kitchen ready for Friday morning's work. He got **4·25 kg of flour** and **4·45 kg of caster sugar** from the store, to have in the kitchen ready to start work next morning.

On Friday morning the baker began by baking **16** chocolate cakes. In total these used **1·65 kg of flour** and **1·55 kg of caster sugar.**

The baker also made **2** sponge cakes later that day. In total the two sponge cakes needed **0·43 kg of flour** and 0**·35 kg of caster sugar**.

a) How much of each ingredient did Barney's Bakery use on Friday?

b) Did they have enough supplies to make the cakes ordered?

c) If so, how much was left over?

Activity N16: Ingredients

Solution

a) In order to find out how much of each ingredient was used we must add the flour used in both cakes and then the sugar used in both cakes:

Flour used: 1·65 + 0·43

$$\begin{array}{r} 1{\cdot}65 \\ +\ 0{\cdot}43 \\ \hline \mathbf{2{\cdot}08} \end{array}$$

Caster Sugar used: 2·55 + 0·35

$$\begin{array}{r} 1{\cdot}55 \\ +\ 0{\cdot}35 \\ \hline \mathbf{1{\cdot}9} \end{array}$$

b) In order to see if they had enough supplies we must see if what the baker used was **less than** what he bought the previous day:

$2{\cdot}08 < 4{\cdot}25$

$1{\cdot}9 < 4{\cdot}45$

Therefore, we know that the baker had the supplies to make the required cakes.

Activity N16: Ingredients

c) In order to find out exactly what quantity is remaining, the baker must **take away** what he used from what he started with .

Flour remaining: 2·25 – 2·08

$$\begin{array}{r} 4{\cdot}25 \\ \underline{-\ 2{\cdot}08} \\ \mathbf{2{\cdot}17} \end{array}$$

Caster Sugar remaining: 4·45 – 2·9

$$\begin{array}{r} 4{\cdot}45 \\ \underline{-\ 1{\cdot}9} \\ \mathbf{2{\cdot}55} \end{array}$$

So we know that Barney's have **2·17 kg** (2170 grams) **of flour** remaining and **2·55 kg** (2550 grams) **of sugar** remaining for the following day, Saturday.

You will need to remember those quantities when you are doing Task 1 on the next page!

Activity N16: Ingredients

Task 1

Before starting work on the Saturday, the head baker again went to the store and took **2·8 kg of flour** and **1·4 kg** of caster sugar to the kitchen.

How much flour and sugar did he have ready to use on the Saturday morning?

Tip: **Remember to include what was left over on Friday.**

Activity N16: Ingredients

Task 2

Remember what you found out in Task 1 about how much flour and caster sugar the baker had ready to use on Saturday morning.

On Saturday the head baker in Barney's made 4 chocolate cakes. This used up a total of **0·66 kg of caster sugar** and **0·44 kg of flour.**

He also made 8 sponge cakes and this used up a total of **1·72 kg of flour** and **1·4 kg of caster sugar**.

Finally he made 2 deluxe chocolate layer cakes which used up **0·73 kg of caster sugar** and **0·6 kg of flour.**

a) How much caster sugar did he use on Saturday?

b) How much flour did he use on Saturday?

c) How much caster sugar was left over?

d) How much flour was left over?

Practise your skills

- Use Practice Sheet N16

Activity N17: January sales

Activity **January sales** N17

(Google Images)

This activity links to **award learning outcomes** **1.3** and **1.4.**

Introduction

As with fractions and decimals, **percentages** are used in everyday life. For example, shops advertise their sales by saying what percentage reduction they are offering. In order to **work with percentages we must be able to convert them into fractions** first. This activity will help with this.

What will you learn?

Learning Outcomes

You will be able to:

1. Manipulate percentages.
2. Use a calculator.

Key Learning Points

1. Identifying and using percentages
2. Calculating common percentages with and without a calculator
3. Converting percentages to fractions and decimals
4. Solving numerical and verbal problems using percentages

Activity N17: January sales

Materials you will need for this activity

- Practice Sheet N17
- Solution Sheet N17

What do you need to know before you start?

The word **percent** means **per hundred**, or **out of a hundred**.

We represent it mathematically by the **symbol %.**

3% means **3 out of a 100.** We can also write it as a **fraction**: $\mathbf{^{3}/_{100}}$

If you got 6 questions correct out of 10 you could say you got $^{6}/_{10}$ or 0·6 or 60% of them right. 60% is 60 out of every 100.

Another example is in polls or surveys. In September 2010, the newspapers reported the results of a survey about maths. It found that 40% of adults who participated in the survey struggled with basic maths. That meant that 40 of every hundred people surveyed struggled with basic maths. You could write that as $^{40}/_{100}$ or ·40 or 40%.

Activity N17: January sales

Getting Started

Converting from percentages to fractions

In order to work with percentages we must be able to convert them into fractions first. **Convert** means **change**.

Remember that percent means ‘per hundred’. So to convert a percentage to a fraction we write the percentage over a hundred.

For example: 26% = $^{26}/_{100}$

Then, if possible, simplify that fraction: $^{26}/_{100} = ^{13}/_{50}$

So, **26% = $^{26}/_{100} = ^{13}/_{50}$**

Calculating Common Percentages without a calculator

In order to find 20 % of 100, we must first write the percentage in fraction form and then as a decimal.

20% = $^{20}/_{100} = ^{1}/_{5}$ = 0·2. That is, 1 divided by 5.

Now we must find 0·2 of 100.

In maths,**‘of’** means to **multiply**.

0·2 × 100

To multiply by 100, move the decimal point two places to the right.

0·2 × 100 = 20

Activity N17: January sales

Multiplying decimals

Multiplying by 10, 100, 1000 etc

Earlier we noted the importance of **place value** and how **moving the decimal point** to the right or left significantly changes the value of the number.

Move the **decimal point to the right when multiplying**.
Move it **1 place** when multiplying by **10**,
move it **2 places** when multiplying by **100,** and
move it **3 places** when multiplying by **1,000**.

For example:	3·75 × 10	=	37·5
	42·896 × 100	=	4,289·6

Notice that the numbers are getting larger. Notice how many places the decimal point moved to the right.

Multiplying by other numbers – not 10, 100, 1000 etc. - we multiply just as we did when dealing with whole numbers and **the decimal point does not move** position.

For example: 5·1 × 2 = 10·2 and 4·35 x 3 = 13·05

Activity N17: January sales

Worked Example Percentages

In the January sales, a shop is taking 30% off a new range of coats which have a recommended retail price of €90.

a) By how much is the shop reducing the price, in euro?

b) What price is the shop selling the coat for in the sale?

You may use a calculator to help with the division and multiplication.

Solution

a) In order to find 30 % of €90, we must first write the percentage in fraction form.

$30\% = {}^{30}/100 = {}^{3}/10 = 0{\cdot}3$. That is 3 divided by 10.

Now we must find 0·3 of 90

$0{\cdot}3 \times 90 = 27$

The shop is reducing the price by €27.

b) €90 - €27 = €63

They are selling the coat for €63.

Activity N17: January sales

Task 1

Fill in the gaps in the following table. The first row is done for you.

% Percentage	Fraction	Decimal
20%	$^{20}/_{100}$	0·2
	$^{30}/_{100}$	
45%		
65%		
	$^{85}/_{100}$	

Activity N17: January sales

Task 2

For their January sale, a sports clothing shop advertised a hoodie with a recommended retail price of €27·00. They also advertised tracksuit bottoms with a recommended retail price of €24·00.

They were taking 24% off the recommended retail price of the hoodie and 19% off the recommended retail price of the tracksuit bottoms.

a) If you were to buy the hoodie and the tracksuit bottoms at the original recommended retail price how much would they cost you altogether?

b) How much would you save on the hoodie in the sale?

c) How much would you save on the tracksuit bottoms in the sale?

d) What would the two items cost you in the sale?

Practise your skills

- Use Practice Sheet N17.

Activity N18: Maths results

Activity **Maths results** **N18**

(Google Images)

This activity links to **award learning outcomes** 1.3.

Introduction

In the previous activity we looked at converting percentages to fractions and decimals. In this activity we will look at converting decimals to fractions, fractions to percentages and decimals to percentages.

What will you learn?

Learning Outcomes

You will be able to:

1. Manipulate basic fractions, decimals and percentages.

Key Learning Points

1. Solving numerical and verbal problems using percentages.
2. Converting percentages to fractions and decimals and vice versa.

Activity N18: Maths results

Materials you will need for this activity

- Practice Sheet N18
- Solution Sheet N18

What do you need to know before you start?

You should be comfortable with all the fraction, decimal and percentage activities so far.

This activity looks at Leaving Certificate results. An honour in a Leaving Certificate paper means getting an A, B or C grade. Each year, all Leaving Certificate exam results are released on the website www.examinations.ie.

Getting Started

How to turn a decimal into a fraction

Decimals are just another way of writing fractions. We can write any decimal in fraction form. To do this we need to understand **place value.**

The **digit in the first place to the right of the decimal point** is a **tenth**.

So if there is **one digit to the right of the decimal point** we can write it **over ten.**

For example:

$0{\cdot}6 = {}^{6}/_{10}$

We can **simplify** this: $0{\cdot}6 = {}^{6}/_{10} = {}^{3}/_{5}$

Activity N18: Maths results

Here is another example of converting a decimal into a fraction when there is just **one digit to the right of the decimal point**:

$$2.5 = 2\,{}^{5}/_{10} = 2\,{}^{1}/_{2}$$

$2\,{}^{1}/_{2}$ is an example of a **mixed fraction**.

A mixed fraction is a **proper fraction and a whole number combined.**

You will learn more about mixed fractions in Activity 20.

How do you convert a decimal into a fraction if there are two digits to the right of the decimal point? You put them **over one hundred.**

For example:

$0{\cdot}45 = {}^{45}/_{100}$

We can then **simplify** the fraction: $0{\cdot}45 = {}^{45}/_{100} = {}^{9}/_{20}$.

Activity N18: Maths results

Fraction to Percentage

In order to change fractions to percentages we must remember what the term 'per cent' means. For example: 40% means forty out of a hundred or $^{40}/100$.

To change $^{40}/100$ back to a percentage multiply it by 100. Therefore to convert any fraction to a percentage, multiply the fraction by $^{100}/1$ and simplify. For example:

$\frac{1}{2} = \frac{1}{2} \times \frac{100}{1} = \frac{100}{2} = 50\%$

$\frac{2}{5} = \frac{2}{5} \times \frac{100}{1} = \frac{200}{5} = 40\%$

Tip: When **multiplying fractions** we multiply **top number by top number** and **bottom number by bottom number**. That is, **numerator by numerator** and **denominator by denominator.**

Decimal to Percentage

In order to change a decimal to a percentage we must first convert the decimal to a fraction and then change the fraction to a percentage. For example:

$0{\cdot}8 = \frac{8}{10} \times \frac{100}{1} = \frac{800}{10} = 80\%$

$0{\cdot}85 = \frac{85}{100} = \frac{85}{100} \times \frac{100}{1} = \frac{8500}{100} = 85\%$

Activity N18: Maths results

Worked Example Converting

In 2010, the number of students who sat Higher Level Mathematics for their Leaving Certificate was 8,390. Of those, 15% got an A grade, 0·3 got a B grade and, $^{7}/_{20}$ got a C grade.

The rest of the students did not get an honour - that is, an A, B or C grade.

What percentage of students did not get an honour in Higher Level Mathematics in 2010?

Solution

15% got an A grade.

0·3 got a B grade = 30% got a B grade.

$^{7}/_{20}$ got a C grade = $^{7}/_{20}$ = $^{35}/_{100}$ = 35 % got a C grade.

Therefore, 15 % + 30% + 35% = 80% of students got an honour.

The remaining 20 % of students did not get an honour in Higher Level Mathematics in 2010.

Activity N18: Maths results

Task 1

In the same year, 2010, **37,903** students sat the Ordinary Level Mathematics examfor their Leaving Certificate.

Of those students, $^{7}/_{25}$ got a B grade; 0·29 got a C grade, 0·22 got a D grade,

and $^{9}/_{100}$ students got an E/F grade. The remainder got an A grade.

a) What percentage of students who sat the 2010 Ordinary Level Mathematics exam got an A?

b) What was the difference in the percentage of students who got a C grade and the percentage that got a B grade?

Activity N18: Maths results

Task 2

Fill in the gaps in the following table. The first row is done for you.

% Percentage	Fraction	Decimal
40%	$^{2}/_{5}$	0·4
		0·55
	$^{8}/_{25}$	
56%		
	$^{7}/_{20}$	

Practise your skills

- Use Practice Sheet N18.

Activity N19: The weekly shop

Activity # The weekly shop **N19**

(Google Images)

This activity links to **award learning outcomes 1.3.**

Introduction

In this activity, you will use a mixture of fractions, decimals and percentages to solve problems based on real life.

What will you learn?

Learning Outcomes

You will be able to:

1. Manipulate basic fractions, decimals and percentages.

Key Learning Points

1. Solving numerical and verbal problems using percentages
2. Converting percentages to fractions and decimals and vice versa

Materials you will need for this activity

- Practice Sheet N19
- Solution Sheet N19

Activity N19: The weekly shop

What do you need to know before you start?

You should be comfortable with all the activities so far to do with fractions, decimals and percentages.

Getting Started

In the previous activity we learned how to convert from fractions to decimals and percentages and vice versa.

You will need to know that very well for the tasks in this activity, so it is important to recap.

Fill in the gaps in the following table. The first one is done for you.

% Percentage	Fraction	Decimal
15%	$^{3}/_{20}$	0·15
		0·75
	$^{3}/_{10}$	
68%		
	$^{7}/_{25}$	

Activity N19: The weekly shop

Worked Example

Stephen and Katie spend **€115** in total on their weekly shopping.

Of this €115, they spend $^{1}/_{5}$ on **carbohydrates**, 20% on **protein enriched** foods, 0·3 on **snacks**, $^{1}/_{10}$ on **dairy** products and 0·2 on **red meat**.

How much do they spend on each of those five food types?

Activity N19: The weekly shop

Solution

Carbohydrates:

$^{1}/5 = 0{\cdot}2$

$0.2 \times 115 = 23$

They spend €23 on carbohydrates.

Protein enriched foods:

$20\% = 0{\cdot}2$

$0{\cdot}2 \times 115 = 23$

They spend €23 on protein enriched foods.

Snacks:

$0{\cdot}3 \times 115 = 34{\cdot}5$

They spend €34·50 on snacks.

Dairy Products:

$^{1}/10 = 0{\cdot}1$

$0{\cdot}1 \times 115 = 11{\cdot}5$

They spend €11·50 on dairy products.

Red Meat:

$0{\cdot}2 \times 115 = 23$

They spend €23 red meat.

Activity N19: The weekly shop

Task 1

Ciara spends €75 on her weekly shop. Of this €75, she spends $^{2}/_{5}$ on dairy products, 25 % on carbohydrates and 0·35 on red meat.

How much does Ciara spend on each food type?

Activity N19: The weekly shop

Task 2

In their weekly shop, Tom and Margaret spend €140 euro. Of this €140 they spend $^{1}/_{4}$ on carbohydrates, 15% on protein enriched foods, 0·1 on snacks, $^{1}/_{10}$ on dairy products, $^{3}/_{20}$ on fruit and vegetables and 0·25 on red meat.

How much do they spend on each food type?

Practise your skills

- Use Practice Sheet N19

Activity N20: Dividing your winnings

Activity **Dividing your Winnings** N20

(Google Images)

This activity links to **award learning outcomes** 1.3

Introduction

This activity will work further with ratios and mixed fractions in real life contexts.

What will you learn?

Learning Outcomes
You will be able to:

1. Manipulate basic fractions to include ratios.

Key Learning Points

1. Ratios
2. Mixed fractions

Materials you will need for this activity

- Practice Sheet N20
- Solution Sheet N20

Activity N20: Dividing your winnings

What do you need to know before you start?

You need to understand the concept of **ratios** from N10. Ratios are a way of comparing two numbers. We can write ratios as fractions.

In order to **convert a ratio to a fraction** the first number in the ratio acts as the numerator and the second number acts as the denominator.

For example the ratio of girls to boys in a class is 1:2.

This means that for every one girl in the class, there are two boys.

We can express this ratio as 1:2 or $\frac{1}{2}$.

You also need to be aware of what a **mixed fraction** is. (See N18)

Examples: $2^1/_2$ or $6^1/_4$.

Activity N20: Dividing your winnings

Getting Started

There are three types of fraction:

1. **Proper fraction**:

   The numerator is smaller than the denominator

   Example: $\frac{5}{6}$

2. **Improper fraction:**

   The numerator is larger than the denominator.

   Example: $\frac{6}{5}$

3. **Mixed fraction:**

   This is made up of a whole number and a proper fraction together.

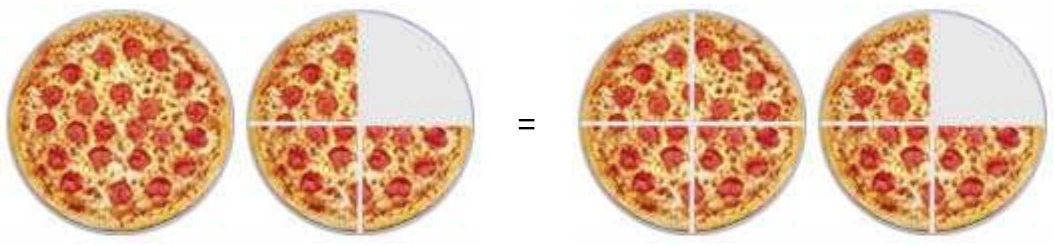
   Example: $1\frac{1}{6}$

You can use **either** an improper fraction or a mixed fraction to show the same amount.

For example $\mathbf{1\ {}^{3}/_{4} = {}^{7}/_{4}}$.

Activity N20: Dividing your winnings

Converting a mixed fraction to an improper fraction



To **convert** a **mixed fraction** – for example, 2 $^4/_5$ – to an **improper fraction**:

Step 1: Multiply the whole number part by the fraction's denominator.
Step 2: Add this to the numerator.
Step 3: Write the result on top of the denominator.

For example convert 2 $^4/_5$ to an improper fraction as follows:

- Multiply the whole number part by the fraction's denominator:
  2 x 5 = 10

- Add this to the numerator:
  10 + 4 = 14

- Write the result on top of the denominator:
  $\frac{14}{5}$

Activity N20: Dividing your winnings

Worked Example 1 Problems involving ratios

William won €900 in the local lotto. He divides the sum of money in the ratio of 5:2:1. He gives the smallest sum to charity.

How much does William give to charity?

Solution

William wants to divide the money in the ratio of 5:2:1.

The first step is to **convert the ratios to fraction form**:

- Add up the ratios:

  5 + 2 + 1 = **8.** This is the **denominator**.

- Put each part over the denominator:

  $\mathbf{\frac{5}{8} : \frac{2}{8} : \frac{1}{8}}$

William gives the **smallest** sum to charity. The smallest of the fractions is $\frac{1}{8}$.

So William gives $\frac{1}{8}$ of €900 to charity.

$\frac{1}{8}$ of 900 =

0.125 x 900 = 112.5

William gives **€112.50** to charity.

Activity N20: Dividing your winnings

Task 1

Ricky won €1500 in the Kilmacud Crokes GAA lotto. He divides the sum of money in the ratio of 4:3:1. He gives the largest sum to his eldest daughter.

How much does Ricky give to his eldest daughter?

Task 2

Alan won €22,000 on the Saturday evening TV show 'Winning Streak'. He decides to divide all of the money between his wife, daughter and grand - daughter in the ratio of 3:2:1 from the wife to the grand-daughter.

How much does the daughter get?

Activity N20: Dividing your winnings

Worked Example 2 Simplifying mixed fractions involving ratios

Simplify $1\frac{5}{8}$: $2\ \frac{3}{8}$: $3\ \frac{1}{8}$

Convert each mixed fraction to an improper fraction:

To do this we multiply the whole number part by the fraction's denominator.

For $\mathbf{1\frac{5}{8}}$: 8 x 1 = 8

Add this to the numerator: 8 + 5 = 13

Write the result on top of the denominator: $\frac{13}{8}$

For $\mathbf{2\frac{3}{8}}$: 8 x 2 = 16

16 + 3 = 19

$\frac{19}{8}$

For $\mathbf{3\frac{1}{8}}$: 8 x 3 = 24

24 + 1 = 25

$\frac{25}{8}$

Each mixed fraction is now an improper fraction with the same denominator:

$\mathbf{\frac{13}{8}: \frac{19}{8}: \frac{25}{8}}$

We can also write this as **13: 19: 25**

Activity N20: Dividing your winnings

Task 3

Simplify $3\frac{2}{5}: 2\ \frac{1}{5}: 4\frac{4}{5}$

Task 4

Simplify $2\frac{1}{3}: 2\ \frac{2}{3}: 3\frac{1}{3}$

Practise your skills

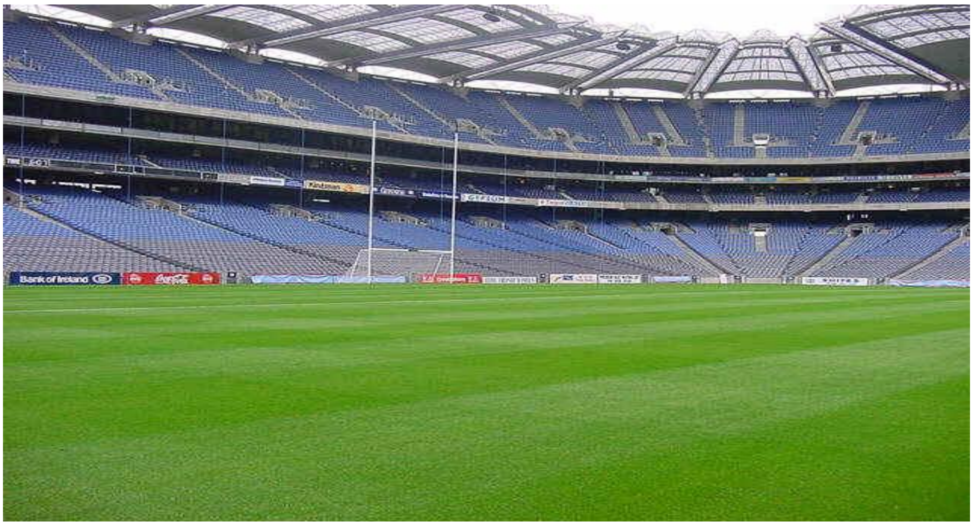
- Use Practice Sheet N20.
- Visit http://www.mathsisfun.com/mixed-fractions.html

Activity N21: Croke Park

Activity

Croke Park

N21



(Google Images)

This activity links to **award learning outcomes** 1.5.

Introduction

In the real world we often say things like “There were about 50,000 people at the match”. We know that is not the exact number as there might really have been 51,283 people there. In the maths world we call this ‘rounding off’ numbers. ‘Rounding off’ means using a number that is very close to the exact one. This activity will help you to learn when and how to round off numbers.

What will you learn?

Learning Outcomes

You will be able to:

1. Estimate and round off answers to numerical problems to include natural numbers and decimal numbers to 2 decimal places.
2. Use a calculator.
3. Manipulate percentages.

Activity N21: Croke Park

Key Learning Points

1. Rounding off answers.
2. Rounding off answers to numerical problems to 2 significant figures, including decimal numbers.
3. Calculating common percentages with a calculator.

Materials you will need for this activity

- Practice Sheet N21
- Solution Sheet N21

What do you need to know before you start?

You need to understand place value and how to calculate percentages.

Activity N21: Croke Park

Getting Started

Rounding off whole numbers

In order to understand how to round off numbers we need to understand **place value**.

For example in the number **13, 457** we know that we have:

1 ten thousand

3 thousands

4 hundreds

5 tens

7 units

Now, if I were asked to round 13, 457 **to the nearest thousand** I would round it to **13,000**. That is because the **hundred value** is **less than 5**.

This makes sense because 13, 457 is **closer to 13,000** than it is to 14,000.

If I were asked to round it **to the nearest hundred** I would round the number to **13,500**. This is because the **tens value** is **greater than 5.**

Again this makes sense as 13,457 is **closer to 13,500** than it is to 13,400.

When rounding off to the nearest thousand, hundred or ten this is what to do:

- When the digit in the next place, to the right of the rounding number, is greater than 5, increase the rounding number by 1.
- When the digit in the next place, to the right of the rounding number, is less than 5, don't change the rounding number.

Activity N21: Croke Park

Rounding off decimals

You can round off decimal numbers in the same way that you round off whole numbers. We round off decimals **to a particular number of decimal places**, depending on how precise we want to be.

For example, we can round off to 2 decimal places or to 3 decimal places. Another way of saying 'Round off to 2 decimal places' , is 'Give your answer correct to 2 decimal places'.

If you want your answer correct **to 2 decimal places**, you **look at the digit to the right of the second decimal place**.

If this digit is 5 or bigger you increase the previous digit.

However, if the digit to the right of the second decimal place is less than 5, you don't change the previous digit.

Activity N21: Croke Park

Worked Example

The exact number of people who attended the 2011 Ladies Gaelic Football Association finals in Croke Park was 20,061. Each person there paid €25 for their ticket.

a) Round off the attendance figure to the nearest thousand.

b) The maximum capacity of Croke Park is 82, 300. Using your Calculator, work out what percentage of the stadium was full? Give the percentage correct to two decimal places.

c) How much did the GAA take in ticket sales for the final?
Round this figure off to the nearest thousand.

d) The next day, a newspaper rounded off the 20,061 figure to the nearest hundred and gave that as the approximate attendance figure in their reports.
What attendance figure did that newspaper give?

Activity N21: Croke Park

Solution

a) 20,000

b) $\frac{20061}{82300} \times \frac{100}{1}\%$

= 24·375455%

= 24·38% because the digit to the right of the 2nd decimal place is 5 or bigger.

c) 20,061 × 25 = 501,525

502,000

d) 20,100

Activity N21: Croke Park

Task 1

a) The Senior Hurling Final in Croke Park in 2011 was between Kilkenny and Tipperary. **81,214** people attended the final. A sports reporter **rounded** this figure off **to the nearest hundred** when he was writing his report.

What figure did he put down?

b) The Croke Park stadium has a **maximum capacity of 82,300.** That means it has enough room for 82, 300 spectators at the very most before it would be full.

What percentage of the stadium was full for the Senior Hurling final in 2011?

When you are working this out:

Use your calculator.
Use the exact figure for the attendance.
Give the percentage correct to two decimal places.

c) 20,061 people attended the 2011 Ladies Gaelic Football Association finals. **Calculate, to the nearest thousand,** the **combined attendance** at the 2011 hurling final and the 2011 ladies football final.

Activity N21: Croke Park

Task 2

The AIB club hurling and football final take place every year on St. Patrick's Day in Croke Park. In 2011 Crossmaglen Rangers (Armagh) won their fifth football title while Clarinbridge (Galway) took their first hurling title. The finals attracted a crowd of 25, 442.

a) Round this attendance figure to the nearest hundred.

b) Round this attendance figure to the nearest thousand.

c) The maximum capacity of Croke Park is 82, 300. Using your calculator and the figures for the exact attendance, what percentage of the stadium was full? Give the percentage correct to two decimal places.

Practise your skills

- Use Practice Sheet N21

- Read reports in newspapers about different events: sports, concerts or marches. Notice how they report the attendances. Do they use exact or approximate figures?

Activity N22: Bus timetables

Activity **Bus timetables** **N22**

(Google images)

This activity links to **award learning outcomes** 1.2.

Introduction

In this activity we will look at number bases in real life by focussing on units of time.

What will you learn?

Learning Outcomes

You will be able to:

1. Demonstrate an understanding of units of time.
2. Manipulate basic fractions.
3. Calculate speed, distance and time.

Activity N22: Bus timetables

Key Learning Points

1. Understanding units of time in real life
2. Interpreting pictorial representation to solve problems
3. Using basic fractions
4. Calculating speed, distance and time

Materials you will need for this activity

- Bus timetables (These can be downloaded on www.dublinbus.ie or www.buseireann.ie)
- Practice Sheet N22
- Solution Sheet N22

What do you need to know before you start?

Units of Time

Every day we deal with a lot of different **number bases**.

For example, when we are shopping we usually count eggs by the **dozen** – a base of 12. We use a **base of 10** for measuring **distance** in the metric system. One of the most important number bases is the one we use for **time.** We calculate time using **a base of 60**. Every minute has 60 seconds and every hour has 60 minutes.

We also have two different ways of telling the time, the **12** – hour clock or the **24** – hour clock. We need to be able to use both.

Speed, Distance and Time

Activity N22: Bus timetables

Speed, distance and time are related. The following formula shows how they relate to each other:

Distance	**=**	**Speed x Time**

So, if we know the **speed** a car went at, and the **time** it took to get from start to finish, we can use this formula to find out the **distance** it travelled.

From that formula, Distance = Speed x Time, we can get two other formulae: one for working out speed and one for working out time:

Speed	**=**	**Distance ÷ Time**

Time	**=**	**Distance ÷ Speed**

Bus Timetables

One example of when it is very important to understand time is when we are planning to travel by bus or train.

A **bus timetable** gives the times when the bus is supposed to leave from a particular stop and arrive at a particular stop. Bus timetables have a lot of different numbers in them. It is important to understand what each number represents, or we might miss the bus!

Activity N22: Bus timetables

Getting Started

We use **a base** of **sixty** for **time**.

We know that an hour has 60 minutes. This means we can calculate how many minutes are in a “half an hour” or “a quarter of an hour”. $\frac{1}{4} \times 60$ is the mathematical way of writing one-quarter of an hour (or sixty minutes).

To calculate how many minutes are in a quarter of an hour, work out $\frac{1}{4} \times 60$.

$\frac{1}{4} \times 60 = 15$. Therefore we know that “a quarter of an hour” means 15 minutes.

By understanding base sixty we can calculate how many minutes are in half an hour, three quarters of an hour and even an hour and a quarter.

When reading **bus timetables** we must also be familiar with the two different ways that we can read the time: a **12 – hour clock** and a **24 – hour clock**.

Look at the image below:

The watch face tells us that is **1.15 pm:** this is the **12 – hour** clock.

However the **digital** section reads **13:15**: this is the **24-hour** clock.

When the 12 – hour clock reaches 12:59 in the afternoon it resets itself to 1 o’clock and uses the letters pm to show that it is past midday. The 24 – hour clock continues to 13:00: we can say this as **one o clock** or as **thirteen hundred hours**.

Activity N22: Bus timetables

Worked Example 1- Converting 24 hour clock to 12 hour clock

Convert the times on the following digital clocks to 12-hour clock mode.

We know that this is 2 hours and 34 minutes after 12 noon and so the time is 2:34 pm.

Again we can see that 18:07 – 12:00 = 6:07 and so we know that the time is 6:07 pm.

We can see that the time has not yet passed 13 hundred hours and so it must lie between 12 midnight and twelve noon. Hence we know that it is 11:32a.m.

Activity N22: Bus timetables

Task 1

Convert the times represented on the digital 24 – hour clocks below to times on the 12 – hour clock. Hint: Use am and pm.

Activity N22: Bus timetables

Worked Example 2 Reading a Bus Timetable

The following is the bus timetable for the number 41 bus that runs from Swords to Abbey Street in Dublin City centre (Source: www.dublinbus.ie)

Monday - Friday	Saturday	Sunday
05:00 05:30 06:00 06:50	07:00 07:30 08:00	07:35 08:30 09:30
06:10	06:35	
07:15 07:30 07:40 07:50	08:40 09:00 09:30	11:10 12:00 12:40
08:15	10:30	
07:52 07:55 08:10 08:30	10:20 10:40 11:05	13:30 14:00 14:30
10:00	13:10	
08:55 09:20 09:40 10:00	12:05 12:25 12:45	15:30 16:00 16:20
11:45	15:05	
10:30 11:00 11:20 11:25	13:20 13:40 14:00	17:05 17:30 17:50
11:50 12:10 12:30 12:50 13:00	16:40	
	14:40 15:00 15:20	19:00 19:30 20:00
12:55 13:05 13:10 13:30 14:20	18:10	
13:50 14:10 14:30 14:50	16:00 16:20 16:45	21:00 21:30 22:00
15:40	20:30	
14:55 15:10 15:30 15:50	17:10 17:30 18:00	23:00
17:00	22:30	
16:05 16:20 16:40 17:00	18:40 19:00 19:30	
18:20		
17:13 17:30 17:50 18:10	20:30 21:00 21:30	
20:00		
18:25 18:50 19:05 19:15	22:30 23:00 23:30	
22:00		
19:45 20:15 20:45 21:15		
21:45 22:15 22:45		

Activity N22: Bus timetables

(i) Patrick works in Champion Sports on Grafton Street in Dublin. He gets the 41 bus every morning at 7.40 am to go to work. At this time the bus usually takes an hour and a quarter to get into the city centre. What time will Patrick be in Abbey Street if there are no delays?

(ii) When working a late shift Patrick leaves get the bus at 10:30am. This bus usually takes three – quarters of an hour. When Patrick gets off the bus on Abbey Street he must then walk for ten minutes to Grafton Street. What time does Patrick usually arrive at work when he is working a late shift?

(iii) Last Sunday the 11:10 am bus was running a half an hour behind schedule. The bus normally takes 35 minutes on Sundays. Patrick needs to be on Grafton Street to open up the store at12 midday. Will he make it on time?

(iv) Next Saturday night Patrick is meeting friends in Dublin city at 9:15 pm. On Saturdays, this bus usually takes 50 minutes to get into the city centre. The place they are meeting is only 5 minutes from the bus stop. What is the latest bus Patrick could get in order to ensure that he is not late meeting his friends?

Activity N22: Bus timetables

Solution to Worked Example 2

(i) A quarter of an hour = $\frac{1}{4} \times 60$ = 15 minutes

The total time for the bus journey = 1 hour 15 minutes.

The bus leaves Swords at 7:40.

$$\begin{array}{r} 7{:}40 \\ +\ \underline{1{:}15} \\ \mathbf{8{:}55} \end{array}$$

If there are no delays Patrick will be on Abbey Street at **8:55 am.**

(ii) Three quarters of an hour = $\frac{3}{4} \times 60$ = 45 minutes

$$\begin{array}{r} 10{:}30 \\ +\ \underline{00{:}45} \\ \mathbf{10{:}75} \end{array}$$

But there are only 60 minutes in an hour so we must change the 75 minutes into hours and minutes:

75 minutes = 1 hour 15 minutes.

Therefore, Patrick will be on Abbey Street at 11:15 am.

It then takes him ten minutes to get to the Champion Sports store.

$$\begin{array}{r} 11{:}15 \\ +\ \underline{00{:}10} \\ 11{:}25 \end{array}$$

When working a late shift Patrick will usually arrive at work at **11:25 am**.

Activity N22: Bus timetables

(iii) Half an hour = $\frac{1}{2} \times 60$ = 30 minutes

$$\begin{array}{r} 11{:}10 \\ +\ \underline{00{:}30} \\ 11{:}40 \end{array}$$

If the 11.10 am bus is thirty minutes late then it will arrive at the bus stop in Swords at11.40 am.

It then takes a further 45 minutes for Patrick to get to his place of work: 35 minutes on the bus and 10 minutes walking.

$$\begin{array}{r} 11{:}40 \\ +\ \underline{00{:}45} \\ \mathbf{11{:}85} \end{array}$$

But there are only 60 minutes in an hour so we must change the 85 minutes into hours and minutes:

85 – 60 = 25, so 85 minutes = 1 hour 25 minutes.

So we know that Patrick will not make it to work for 12 midday due to this delay.

(v) First we must convert 9.15 pm to a time on the 24 – hour clock (since most timetables only deal with the 24 – hour clock).

9:15 pm is 9 hours and 15 minutes after12 midday.

12 + 9 = 21

9:15 pm = 21:15

The total time needed for Patrick to travel to where he will meet his friends is 55 minutes: 50 minutes bus, 5 minutes walking.

This means he cannot get a bus later than 20:20. The best bus for Patrick to get is the 20:00 (8:00 pm) bus from Swords.

Activity N22: Bus timetables

Task 2

On the website below you will find a timetable for the Dublin Bus service that runs from Merrion Square to Maynooth and from Maynooth to Merrion Square.

http://www.dublinbus.ie/en/Your-Journey1/Timetables/All-Timetables/661/

Study both timetables carefully and answer the following questions:

1. Elaine goes to college in NUI Maynooth. On Wednesdays her first class is at 11:00 am. At this time of the day the bus journey from Merrion Square to Maynooth takes about 50 minutes.

   When Elaine gets off the bus she must walk 15 minutes to the campus.

- What bus should Elaine get to be sure of being on time for college on Wednesday mornings?

2. On Thursday evenings Elaine finishes college at 4:50 pm. The journey back to Merrion Square at this time takes an hour and a quarter.

- What is the best bus for Elaine to catch on Thursday evenings?

- If she gets that bus what time will Elaine be back in Merrion Square?

Activity N22: Bus timetables

Task 2 continued

3. On Fridays, Elaine usually gets the **4.15 pm** bus back from Maynooth to Merrion Square. The **bus** usually takes **55 minutes** to make that journey.

   When she gets off the bus in Merrion Square, Elaine **walks** straight to her part-time job as a waitress in a restaurant in Drumcondra.
   That walk takes her about **a half an hour**. She has to be in work at **6:00 pm**.

   Last Friday, the **bus** that usually takes 55 minutes to get from Maynooth to Merrion Square was **delayed** by a **quarter of an hour**.

- Did Elaine make it to work on time?

Activity N22: Bus timetables

Worked Example 3 Reading a bus timetable

The following is the bus timetable for the number 362 bus from Waterford City to Dungarvan in Co. Waterford.

SERVICE NUMBER		362
Waterford (Bus Station)	dep.	1630
Kilmeaden		1650
Carrolls Cross		1700
Kilmacthomas (Bridge)		1715
Dungarvan (Davitt's Quay)	arr.	1740

SEE TABLE 40 FOR FULL DETAILS OF WATERFORD/DUNGARVAN SERVICES.
No services on Christmas Day or Public Holidays.

(http://www.buseireann.ie/pdf/1265819389-362.pdf)

Read the timetable to answer the following questions:

(i) **How long** does the bus journey take?

(ii) If the **distance** of the journey is 50 km, what is the **average speed** of the bus?

Activity N22: Bus timetables

Solution

(i) 17.40 – 16.30 = 1 hour 10 minutes

(ii) **Speed = Distance ÷ Time**

1 hour 10 minutes can be expressed as $1\ ^{10}/_{60} = {}^{70}/_{60} = 1.167$

Speed = 50 ÷ 1.167

Speed = 42.8449 km/hour

Activity N22: Bus timetables

Task 3

The following is the bus timetable for the number 377 bus from Wexford Town to Enniscorthy.

		WEDNESDAY		
SERVICE NUMBER		377	377	
Wexford (Hanrahan Stn)	dep.	1120	1430	....
Oylegate	↓	1130	1440	....
Enniscorthy (Templeshannon)	arr.	1145	1455	....

(Source: www.buseireann.ie)

Read the timetable to answer the following questions.

(i) **How long** does the bus journey take?

(ii) If the **distance** of the journey is 24 km, what is the **average speed** of the bus?

Activity N22: Bus timetables

Task 4

The following is the bus timetable for the number 460 bus from Sligo Town to Castlerea in Co. Roscommon.

SERVICE NUMBER		460	
Sligo (Bus Station)	dep.	0845	....
Ballisodare		0857	....
Collooney		0901	....
Coolaney			....
Ballymote		0918	....
Gurteen		0937	....
Ballaghaderreen		0956	....
Loughlynn		1011	....
Castlerea	arr.	1025	....

No services on Public Holidays.

Source: www.buseireann.ie

Read the timetable to answer the following questions.

(i) **How long** does the bus journey take?

(ii) If the **average speed** of the bus is 50 km per hour, what is the **distance** of the journey?

Activity N22: Bus timetables

Practise your skills

- On a sheet of paper write out three different places where you have seen a clock recently. Over the next three days record the time on each of these different clocks.
  State whether the time you recorded was on a 24 – hour clock or a 12 – hour clock and then convert it to the opposite.

- Use **Practice Sheet N22**.

Activity N23: Winter sales

Activity **Winter sales** **N23**

(Google images)

This activity links to **award learning outcomes1.2, 1.3, 1.4, 1.5**

Introduction

In this activity we will look at number bases in real life by looking at shopping.

What will you learn?

Learning Outcomes

You will be able to:

1. Demonstrate an understanding of money and shopping.
2. Manipulate basic fractions and percentages.
3. Use a calculator to perform common mathematical functions including the % key.
4. Estimate and round off answers to numerical problems including natural numbers and decimal numbers to 2 decimal places.

Activity N23: Winter sales

Key Learning Points

1. Understanding number bases used in shopping.
2. Calculating common percentages with and without a calculator.
3. Recognising the value of numbers up to 2 decimal places.
4. Solving numerical and verbal problems using basic fractions and percentages
5. Calculating percentages.
6. Estimating the total of a selection of items in a shopping context.

Materials you will need for this activity

- Local shopping brochures
- Access to the internet
- Practice Sheet N23
- Solution Sheet N23

Activity N23: Winter sales

What do you need to know before you start?

Maths

In the previous activity we began looking at number bases by using the example of time. We also need to understand number bases when using **money**. The euro uses a **number base** of **100**. That means that in every euro there are 100 cents.

As well as using our understanding of this number base when we shop, we also use **estimation**. In mathematics, estimation involves **rounding numbers,** either whole numbers or decimals, **to the** nearest whole unit, tenth or hundredth.

The general rule of thumb when estimating is that if the next number to the right is 5 or greater you round up but if this number is less than 5 then the previous number remains the same.

Example

If we were to round **28<u>7</u>** to the **nearest ten** we would round it to **290** since 7 is **greater than** 5.

On the other hand, if we were to round **18·6<u>3</u>** to the **nearest tenth** we would round it to 18·6 since 3 is **less than** 5.

Shopping

We need to combine different mathematics when we do shopping. We need a good understanding of number bases when adding up the total cost. We often need to use fractions and percentages when calculating sale prices. We often use rounding off or estimating when trying to work out the approximate total cost of our shopping.

Activity N23: Winter sales

Getting Started

Before we start we must recap on **how to add decimals**.

Remember since money uses a base of one hundred, our **cent column can never go over one hundred**. Once we reach one hundred cent this becomes one euro and the number by which we exceed one hundred is how many cents we have left.

Also when shopping in the sales we often see items reduced by 20% or 50% or advertised at half price.

In order to calculate the new selling price we must first find out what the reduction is. We do this by calculating the percentage or fraction of the original price.

Remember, in order to calculate a percentage **of** a number we **multiply** the number by the percentage written in fraction form.

For example, to get **50% of 200** we **multiply** 200 by $^{50}/_{100}$.

$^{50}/_{100} = \frac{1}{2}$

$200 \times \frac{1}{2} = 100$

Activity N23: Winter sales

Worked Example Christmas Sales

For Christmas, Jade got a €150 One - for - All voucher. She decided to spend it during the sales.

In January she went shopping to get a new outfit. In Mystore shop she saw

- a pair of boots that had an original price of €85 but were reduced by 25%;
- a pair of jeans priced at €42·35 – there was no reduction in that price;
- a jacket and a t-shirt which priced originally at €34·50 but that were in the half-price sale.

(i) Calculate the cost of the pair of boots in the sale.

(ii) Calculate the cost of the jacket and t-shirt in the sale.

(iii) **Round off** the cost of each item to the nearest euro.
Work out how much will be left on Jade's voucher to the nearest euro after she has bought those items.

(iv) Draw up a receipt for the sale of those items. On this receipt show the exact total cost and the total savings made.

(v) VAT on all clothes in Ireland is charged at a rate of 23%. All prices are inclusive of VAT. Calculate, to the nearest cent, the total amount of VAT Jade paid in this transaction.

Activity N23: Winter sales

Solution

(i) The original cost of a pair of boots was €85. They were reduced by 25%.

To calculate the **reduction** find 25% of €85.

25% = $\frac{25}{100}$

Reduction = $\frac{25}{100}$ x 85 = **21·25**

Sale price of the pair of boots = €85 - €21·25 = **€63·75**.

(ii) The original cost of the jacket and t - shirt was €34·50 and they are on sale at half price.

Sale price of the jacket and t - shirt = $\frac{1}{2}$ x 34·50 = **€17·25**

(iii) The following table shows the exact cost of each item as well as the price of each item rounded to the nearest euro.

Item	Exact Price	Rounded Off Price
Boots	€63·75	€64
Jeans	€42·35	€42
Jacket and T - Shirt	€17·25	€17

The **estimated total cost** is: €64 + 42 + €17 = **€123**

From this we can estimate that Jade has approximately €150 - €123 left on her voucher.

€150 - €123 = €27

So Jade has approximately **€27 left** on her voucher.

Activity N23: Winter sales

(iv) Exact total cost:

€63·75
€17·25
+ €42·35
€123·35

Total savings:

€21·25
+ €17·25
€38·50

Sample Receipt

Sales Receipt

06 - 01 - 12	**16:45**
Boots	63.75
Jeans	42.35
Jacket, T-shirt	17.25
Total Savings	38.50
Total Cost	123.35

Thank you for shopping at Mystore

(v) The total VAT paid by Jade is 23% of €123·35.

$\frac{23}{100}$ x 123·35 = 28·3705

VAT = €28·37

Activity N23: Winter sales

Task 1

In the table below, column 1 gives the grocery shopping list that the Maguire family took with them to the shops last week. The other columns include the marked price per unit and details of any Special Offer discounts.

Use the information in the table to solve the problems on the next page.

Shopping List Items	Marked Price for 1 Unit	Special Offer Discounts
1 punnet of mushrooms	99 cent	
2 cartons of milk	€1·09	
1 box of Weetabix	€3·45	25% off this week.
Fairy Liquid	€2·75	
1 pack of Chipsticks	€2·25	10% off this week
4 Corner Crunch Yogurts	69 cent	Buy one get one free
A box of Ariel Washing Powder	€10·50	Half price this week

Activity N23: Winter sales

(i) Estimate the total cost of all these items before reductions, to the nearest euro.

(ii) Calculate the total amount of savings made this week by the Maguire family.

(iii) Calculate the total amount of the 7 items on the Maguire family's grocery list.

(iv) The Maguire family bought more than the seven items on their list. The total price for all their shopping was **four times** the price of these seven items. Calculate the total amount of the Maguire's weekly shopping bill, to the nearest ten cent.

Activity N23: Winter sales

Task 2

a) Write a **list** of ten items you would regularly buy in a grocery store or supermarket.

b) **Estimate** the cost of each item, **to the nearest euro.**

c) Find out the **prices** of these items in your local shop or supermarket. You could visit the shop or you could search on the website of the supermarket. See if they are offering any **discounts** at the time.

d) Draw up a receipt like the one in the Worked Example. Show the total cost of the ten items on your list. How much would you save if you bought the ten items with this week's special offer discounts?

Practise your skills

- Use Practice Sheet N23

Activity N24: Furnishing a room

Activity **Furnishing a room** N24

(Google images)

This activity links to **award learning outcomes** 1.2, 1.3

Introduction

In this activity we will look at different units of measurement including millimetres, centimetres and metres and millilitres, centilitres and litres.

What will you learn?

Learning Outcomes

You will be able to:

1. Demonstrate an understanding of units of measurement.
2. Manipulate basic fractions.
3. Manipulate basic decimals.

Activity N24: Furnishing a room

Key Learning Points

1. Understanding number bases in real life including units of measurement.
2. Solving problems involving a selection of number bases.
3. Solving numerical and verbal problems using basic fractions.
4. Solving numerical and verbal problems using basic decimals.
5. Recognising the value of numbers up to 2 decimal places.

Materials you will need for this activity

- Measuring tape
- 500 ml bottle
- Beaker with ½ litre mark
- Practice Sheet N24
- Solution Sheet N24

What do you need to know before you start?

Maths

We use different units of measurement for the length and for the capacity of objects.

Some of the **key terms** we use for **length or distance** are: **millimetres (mm), centimetres (cm), and metres (m).**
Some key terms we use for **capacity** are: **millilitres (ml), centilitres (cl) and litres (l).**

Milli- comes from the Latin word for t**housand**. So the prefix milli- represents one-thousandth.
Centi- comes from the Latin word for **hundred** and so the prefix centi represents one-hundredth.

Activity N24: Furnishing a room

Relationship between the key terms

When **measuring length** it is important to know the **relationship** between **metres, centimetres** and **millimetres:**

1 metre (m)	**=**	**100 centimetres (cm)**	**=**	**1000 millimetres (mm)**

This means that every one metre is equivalent to a hundred centimetres or to one thousand millimetres.

When we know this relationship we should be able to **convert measurements from metres to centimetres to millimetres.**

When **measuring capacity** it is important to know the **relationship** between **litres (l), centilitres (cl)** and **millilitres (ml):**

1 litre (l)	**=**	**100 centilitres (cl)**	**=**	**1000 millilitres (ml)**

This means that every one litre is equal to a hundred centilitres or one thousand millilitres.

When we know this relationship we should be able to **convert measurements from litres to centilitres to millilitres.**

Activity N24: Furnishing a room

Examples

- **To express 10 metres in centimetres:**

  We know that 1 metre = 100 centimetres.

  Therefore 10 metres = (100 x 10) centimetres = 1,000 centimetres.

- **To express 400 centimetres in millimetres**:

  We know that 100 cm = 1000 mm.

  Therefore 400 cm = (1000 x 4) mm = 4,000mm.

- **To express 1.5 litres in centilitres**:

  We know that 1 litre = 100 centilitres.

  Therefore 1.5 litres = (100 x 1.5) centilitres = 150 centilitres.

- **To express 500 millilitres in centilitres:**

  We know that 1000 ml = 100 cl.

  Therefore 500 ml = (½ x 100) cl = 50 cl.

Activity N24: Furnishing a room

Why do we need to understand the relationship between the six key terms?

Here is an example:

Some shops sell flat pack furniture. When we are shopping for a piece of furniture for the home, we usually measure the space at home where it will be going. We measure to find the **dimensions** of the space where it will go. We might write the dimensions in, for example, centimetres.

Some shops sell flat pack furniture. Because the item of furniture is in the pack, we cannot actually measure it until we take it out and assemble it. So to see if it will fit in the space at home, we must read the dimensions that are written on the pack.

Often, the dimensions printed on the pack may be different to the dimensions we used to measure the space where the furniture will go. For example, we might have written the dimensions in centimetres, but the pack might give them in millimetres.

This is an example of where we need to know how to convert between metres and centimetres and millimetres.

The same would apply if we want to buy a particular size jug or measuring bowl or any other container: we might have written the volume in one way, and the pack might give it in another way. So we need to be able to convert between litres, centilitres and millilitres.

Activity N24: Furnishing a room

Getting Started

The most important thing to remember is the relationship between the six key terms. This is summarised in the following table:

1 metre	=	100 centimetres	=	1,000 millimetres
1 litre	=	100 centilitres	=	1,000 millilitres

Conversion means **changing** from one to another. For example we can convert metres to centimetres. We can do those kinds of conversions if we remember the relationship – or the **equation** - summarised in the table above.

Using the equations in the table, we can convert from metres to centimetres to millimetres, or from litres to centilitres to millilitres.

First we would write out the equation that we know for 1 metre or 1 litre, and then we would solve it, keeping the balance of this equation.

See the example on the next page.

Activity N24: Furnishing a room

Example: Converting from metres to centimetres

Convert **10 metres** to centimetres.

Step 1:

We write out the equation that we know:

1 metre = 100 centimetre

Step 2:

Because we are looking for **10** metres in centimetres we must **multiply the left hand side** of this equation **by 10:**

10 metres = ? centimetres

Step 3:

Because an equation has to have **balance between the left and right** side, we must also **multiply the right hand side** of the equation by **10.**

10 metres = (100 x 10) centimetres

10 metres = 1,000 cm.

Activity N24: Furnishing a room

Worked Example 1 Measuring

(Google Images)

(a) This desk is advertised in a furniture catalogue. The catalogue gives the desk's **width** as **1·5 metres**.

Express its width in centimetres and millimetres.

(b) The label on a bottle of water says that the bottle contains **2 litres** of water.

Express 2 litres in centilitres and millilitres.

(c) In December 2011 the highest wave ever recorded in Ireland was recorded off the Donegal coast.

This wave measured **2,000 centimetres**.

Calculate the height of the wave in metres.

(Irish Times)

Activity N24: Furnishing a room

Solution to Worked Example 1

(a) In this question, we want to convert metres to centimetres.

We know that the relationship or equation is:

1 metre = 100 centimetres.

We want to convert **1·5 metres**. So we must **multiply both sides of the equation** by 1.5.
(1 x 1.5) metres = (100 x 1.5) centimetres.
1.5 metres = 150 centimetres.

Now we want to **convert metres to millimetres**.
We know the relationship is: **1 metre = 1,000 millimetres**

We want to **convert 1.5 metres** and so we must **multiply both sides of the equation** by 1.5.

(1 x 1.5) metres = (1000 x 1.5) millimetres
1.5 metres = 1,500 millimetres.

Activity N24: Furnishing a room

(b) In this question we want to convert litres to centilitres.

We know that the relationship is:

1 litre = 100 centilitres.

We want to convert **2 litres**. So we must **multiply both sides of the equation** by 2.

(1 x 2) litres = (100 x 2) centilitres.
2 litres = 200 centilitres.

Now we want to **convert litres to millilitres**.
We know the relationship is: **1 litre = 1,000 millilitres**

We want to **convert 2 litres** and so we must **multiply both sides of the equation** by 2.

(1 x 2) litres = (1000 x 2) millilitres
2 litres = 2,000 millilitres.

Activity N24: Furnishing a room

(c) In this question we want to convert centimetres to metres so we know that the relationship is:

100 centimetres = 1 metre

The wave in question was **2,000 centimetres.** So we must **multiply both sides of the equation** by 20 since 100 x 20 = 2,000.

(100 x 20) centimetres = (1 x 20) metres
2,000 centimetres = 20 metres.

Hence the highest wave ever recorded in Ireland was 20 metres.

Activity N24: Furnishing a room

Task 1

(a) A standard king size bed has a length of **1·8 metres**.

Express the length of a king size bed in **centimetres and millimetres.**

(b)

(i) The **fish tank** in the picture holds **240 litres** of water. What is that in **centilitres?**

(ii) The length of the fish tank is **2,000 millimetres.**

Express its length in **metres.**

(c) You buy a **1·5 litre** bottle of lemonade for a picnic. If each plastic cup can hold **30 centilitres** how many cups of lemonade can you get from this bottle? (**Hint**: Convert 1·5 litres to centilitres first).

Activity N24: Furnishing a room

Worked Example 2 Buying flat pack furniture

Barry has recently moved into a rented room. The room is unfurnished so he needs to buy some furniture. He decides to buy flat pack furniture and make them up himself.

Barry measures his room for the furniture. He will need a single **bed** that is **0.9 metres in width and 1.9 metres in length.**

He wants to get a **wardrobe** that has a maximum **height of 200 centimetres**, a maximum **depth of 100 centimetres** and a maximum **width of 1·8 metres**.

Finally he decides that he will have space for a very small **bedside locker** that has a **width of 45 centimetres**, a **depth of 55 centimetres** and a **height of 60 centimetres.**

(i) When Barry brings these measurements with him into the shop he notices that the dimensions for all **beds** are given in **millimetres** on the flatpacks. So he must convert the measurement he has recorded for the bed. Can you help him with this?

(ii) In the shop Barry sees two different **wardrobes** that he likes. The dimensions given on the side of these boxes are:
Wardrobe 1: 2,300 mm (H) x 2,000 mm (W) x 1000 mm (D)
Wardrobe 2: 1,900 mm (H) x 1,800 mm (D) x 900 mm (D)
Which of these would be within the measurement limits Barry has for his wardrobe?

(iii) The dimensions for the **bedside locker** are given in **millimetres on** the flatpack. Express the dimensions of the locker as they appear on the pack.

Activity N24: Furnishing a room

Solution to Worked Example 2

(i) In order to **convert the dimensions of the bed to millimetres** Barry must convert metres to millimetres.
We know 1 metre = 1,000 millimetres.
So we must multiply both sides by 0.9 to find out the **width of the bed** in millimetres:

0.9 m = (1,000 x 0.9) = 900 mm

To **find out the length of the bed** we multiply both sides of the bed by1.9:

1.9 m = (1,000 x 1.9) = 1,900 mm

New Dimensions = **900 mm x 1,900 mm.**

(ii) The dimensions of the two wardrobes in the shop are all expressed in millimetres. So we must express the maximum dimensions for Barry's **wardrobe** in millimetres.

Height = 200 centimetres -we must convert this to millimetres.
100 cm = 1000 mm
⇒ **200 cm = 2,000 mm**

Depth = 100 centimetres. We know that **100 cm = 1,000 mm.**

Width = 1.8 metres. We must convert this to millimetres.
1 m = 1,000 mm
⇒ **1.8 m = 1,800 mm**

Activity N24: Furnishing a room

We know that our dimensions cannot exceed 2,000 mm (H), 1,000 mm (D) and 1,800 mm (W).

Therefore, **Barry must choose wardrobe 2** because Wardrobe 1 exceeds the height and width limits.

(iii) We know that **100 cm = 1000 mm**.

If we **divide both sides by 100**, we can see that **1 cm = 10 mm**.

This helps us to convert the dimensions of the **bedside locker.**

The **dimensions Barry has** for his bedside locker are:
45 cm, 55 cm and **60 cm.**
We need to convert these to millimetres (mm).

We have worked out that **1 cm = 10 mm.**

⇒ 45 cm = (10 x 45) mm = **450 mm**
55 cm = (10 x 55) mm = **550 mm**
60 cm = (10 x 60) mm = **600 mm**

Therefore the dimensions Barry would expect to find on the packaging of a bedside locker to suit his needs would be **450 (W) x 550 (D) x 600 (H).**

Activity N24: Furnishing a room

Task 2 At the salon

"Snip-It" is a new hairdressing salon that has recently opened in Cork city. The hairdresser placed an order with the wholesaler. The order was for a **box of shampoo**. Each **box c**ontains **5 X 2 litre bottles** of shampoo.

The hairdresser puts the shampoo from these bottles into the special dispensers beside the sinks.

(i) Calculate in **millilitres** the total amount of shampoo in the box ordered by "Snip – It".

(ii) The dispensers beside the sinks are set up to dispense **20 cl of shampoo** each time. For each customer who is getting their hair washed, the hairdressers must dispense **2 lots** of shampoo.

How many hairwashes will this box of shampoo cover?

(iii) After the first week the manager of "Snip – It" wishes to order a further **seven boxes** of shampoo. Each **box** has a **height of 45 centimetres** The **storeroom i**n the salon is **2.15 metres** in height. Will it be possible to store all the boxes on top of each other in the storeroom?

Activity N24: Furnishing a room

Task 3

In groups of three, pick three objects that you can measure with a metre stick. For example, you could pick the door frame, the floor, the computer screen.

Measure each object in centimetres: for example, the width of the floor, the length of the door frame, the length of the diagonal on the computer screen.

Using the relationships (or equations) that you know from Activity N24, **convert your measurements** to **metres** and then to **millimetres.**

Practise your skills

- Use Practice Sheet N24

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