

# Tutor Guidelines

## Functional Mathematics

Level 4 Unit 2: Algebra



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## **Acknowledgements**

This booklet is part of a pack of resources for Functional Mathematics Level 4 which FÁS commissioned for use in their training programmes. A similar set of resources has been developed for Functional Mathematics Level 3.

A team from the National Adult Literacy Agency (NALA) and the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCEMS-TL) developed and edited the materials.

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We are grateful to Kathleen Cramer and her team in Newbridge Youth Training and Development Centre who gave feedback on extracts from the Level 3 materials.

**Tutor Guidelines for Activity A1: Keeping the score****Activity****Keeping the score****A1**

This activity links to **unit learning outcomes 2.1 and 2.5.**

**Learning Outcomes**

1. Discuss the presence of variables in a range of real life situations.
2. Construct algebraic expressions for real life situations using the correct terminology and including rearrangement of formulae.

**Key Learning Points**

1. Understanding the concept of a variable
2. Recognising the presence of variables in real life situations
3. Replacing variables with values through substitution
4. Constructing algebraic expressions for real life situations
5. Solving word problems through rearrangement

**Materials you will need for this activity**

- Practice Sheet A1
- Solution Sheet A1

## Tutor Guidelines for Activity A1: Keeping the score

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A1: Keeping the score

### Guiding the Learners through Activity A1

- Keeping the Score – introduce and develop the concept of variables and substitution through real life activities of interest to the learners.
- Explain what the learners will be able to do after this activity.
- Explain that a variable is a letter or a symbol that represents a number or an unknown quantity. A variable can be any letter of the alphabet and its value can change depending on the problem or situation. We use substitution to replace a variable with a number.
- Invite learners to discuss and record, in pairs or groups, how they might use variables and substitution in their own lives.
- Check that learners know the numerical worth of a point or goal scored in hurling and Gaelic football. Learners could look up the rules using the internet before you go through the Worked Example.
- **Explain** and **demonstrate** the concepts and procedures by working through the **Worked Example** on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.

When you judge that learners are ready, invite them to try the **tasks**. These allow learners to put their newly learned skills into practice. The examples here are of keeping the score in a game of Australian Rules and rugby. Before attempting the task, you might ask the learners if

### Tutor Guidelines for Activity A1: Keeping the score

anyone knows what the rules of these games are. How do you score?  
What is each score worth?

- As well as **individual** work, learners could work in **pairs** or small **groups** to discuss their method and answers.
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Facilitate learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.
- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners

### Tutor Guidelines for Activity A1: Keeping the score

decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.

- **Practice Sheet A1** will give learners a chance to develop their skills in substitution of variables.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A2: Indices****Activity****Indices****A2**

This activity links to **unit learning outcome 2.2**.

**Learning Outcomes**

1. Demonstrate an understanding of the laws of indices and the rules of logarithms by using the laws and rules to simplify expressions, solve equations, and transpose formulae.

**Key Learning Points**

1. Understanding the laws of indices

**Materials you will need for this activity**

- Calculator
- Practice Sheet A2
- Solution Sheet A2

## Tutor Guidelines for Activity A2: Indices

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A2: Indices

### Guiding the Learners through Activity A2

- **Recap** on the key learning points from the previous session.
- Indices – introduce and develop the concept of indices.
- Explain what the learners will be able to do after this activity.
- In Level 4 Unit 1, learners were introduced to **scientific notation**. **Recap** on this and remind learners of examples, such as that we can write  $2 \times 2 \times 2$  as  $2^3$ .
- This activity introduces **laws of Indices**. These are about manipulation of multiplication and division. The activity encourages learners to **find patterns** in order to discover the laws of indices themselves.
- This Activity goes through **5** main interlinking **rules of indices**. There are **worked examples** and **tasks** provided for each rule.
- For each rule, **explain** and **demonstrate** the procedures by working through the **Worked Example** on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it is necessary. This time ask the learners to **write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. As well as **individual** work, learners could work in **pairs** or small **groups** to discuss their method and answers.

### Tutor Guidelines for Activity A2: Indices

- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.
- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.

### Tutor Guidelines for Activity A2: Indices

- **Practice Sheet A2** allows learners to get some practice at working with and applying the laws of indices.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A3: The Richter scale****Activity****The Richter scale****A3**

This activity links to **unit learning outcomes 2.1 and 2.2.**

**Learning Outcomes**

1. Demonstrate an understanding of the laws of indices and the rules of logarithms by using the laws and rules to simplify expressions, solve equations, and transpose formulae.
2. Discuss the presence of variables in a range of real life situations.

**Key Learning Points**

1. Understanding the laws of indices and the rules of logs
2. Recognising the links between both
3. Applying such knowledge to a number of basic examples where you convert from log to index form and vice versa
4. Using the knowledge of indices and logs to simplify expressions, solve equations and transpose formulae

**Materials you will need for this activity**

- Practice Sheet A3
- Solution Sheet A3

## Tutor Guidelines for Activity A3: The Richter scale

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

### Tutor Guidelines for Activity A3: The Richter scale

#### Guiding the Learners through Activity A3

- **Recap** on the key learning points from the previous session. Ensure that learners are competent with basic algebra and comfortable working with indices from the previous activity. This is necessary in order to use, manipulate and work with the laws of logs. The general rule of logs  $b^L=N$  then  $\log_b N=L$  shows the connection between logs and indices.
- Explain what the learners will be able to do after this activity.
- The Richter scale – introduce and develop the concept of Logs through real life activities of interest to the learners.
- Discuss the uses of logs in everyday life, such as the Richter scale, the pH scale and the Decibel scale. Ask learners to share what they already know about these scales. You could also ask learners to do some research on the internet to understand what each scale measures. **Geogebra** may also be a useful resource here. **Graphing** the Richter scale or decibel scale may assist the visual learners.
- **Explain** and **demonstrate** the concepts and procedures by working through the **Worked Examples** on the whiteboard or flipchart. Each Worked Example is followed by a related task for learners to practise the new skills. For each Worked Example, ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.

### Tutor Guidelines for Activity A3: The Richter scale

- When you judge that learners are ready, invite them to try the relevant **task**.
- Tasks 1 and 2 allow learners to practise converting from index to log form and vice versa. Ensure that learners are aware of this link.
- Inform learners that in the Worked Example 1 and Task 3, the figures used are the actual Richter scale measures. You could encourage learners to look up other earthquakes and find their actual measures on the Richter scale.
- They could then use that information and logs to investigate how many times more intense was this earthquake when it is compared with the smallest earthquake that can be measured.
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.

### Tutor Guidelines for Activity A3: The Richter scale

- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.
- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- Practice Sheet A3 allows learners to practise working with logs.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A4: Car rental****Activity****Car rental****A4**

This activity links to **unit learning outcomes 2.4 and 2.5.**

**Learning Outcomes**

1. Construct algebraic expression and formulae for real life situations using the correct terminology and including rearrangement of formulae.
2. Solve linear equations.
3. Discuss the presence of variables in real life situations.

**Key Learning Points**

1. Understanding the concept of an equation
2. Constructing algebraic expressions and equations for real life situations
3. Replacing variables with values through substitution
4. Solving linear equations

**Materials you will need for this activity**

- Practice Sheet A4
- Solution Sheet A4

## Tutor Guidelines for Activity A4: Car rental

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A4: Car rental

### Guiding the Learners through Activity A4

- **Recap** on the key learning points from the previous sessions. In particular help learners recap on what a ‘variable’ is.
- Explain what the learners will be able to do after this activity.
- Car Rental – introduce the concept of **building equations**.
- **Ask learners what they already know about equations.** In pairs or groups, learners might list what they know about equations and where they may need to use them in their own lives. From Level 3, learners should know that **an equation is a mathematical sentence with an equals sign (=) stating that two expressions are equal.**
- **Explain the concept:** Ask learners to draw or model a **balance scale**, where both sides are equal; or **use an actual balance scale** asking learners to adjust it so that both sides are equal. When they have done that, explain that in maths an equation is like a balance scale where everything must be equal on both sides. **Give an example**, such as:  $2 + 3 + 6 = 11$ .
- **Explain the basic procedure for constructing an algebraic equation** for a real life situation: We allow a variable to stand for the unknown value and we construct the equation around this.
- Once the equation is constructed, help learners recap on what they know from Level 3 about **solving** algebraic equations. Highlight the ‘**Golden Rule**’: Whatever we do to one side of the equation, we must do to the other side.

### Tutor Guidelines for Activity A4: Car rental

- There is a Worked Example on constructing and solving an equation, followed by tasks which allow learners to put their newly learned skills into practice.
- **Explain** and **demonstrate** the concepts and procedures by working through the **Worked Example** on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. In the tasks the learners must construct and solve equations based on real life situations.
- In Task 2, the learner must make a decision about which car to rent. You could change this task by changing the trip Eoin intends to make. You could ask learners make up their own trip and calculate the distance using AA Route planner [http://www2.aireland.ie/routes\\_beta/](http://www2.aireland.ie/routes_beta/).
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.

### Tutor Guidelines for Activity A4: Car rental

- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms. Encourage learners to keep a **personal dictionary**.
- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- Practice Sheet A4 allows learners to get some more practice constructing and solving equations.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A5: Using formulae****Activity****Using formulae****A5**

This activity links to **unit learning outcomes 2.1 and 2.5.**

**Learning Outcomes**

1. Construct algebraic expression and formulae for real life situations using the correct terminology and including rearrangement of formulae.
2. Discuss the presence of variables in a range of real life situations.

**Key Learning Points**

1. Constructing algebraic expressions and equations for real life situations
2. Using correct terminology
3. Solving word problems using formulae through rearrangement
4. Replacing variables with values through substitution

**Materials you will need for this activity**

- Practice Sheet A5
- Solution Sheet A5

## Tutor Guidelines for Activity A5: Using formulae

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A5: Using formulae

### Guiding the Learners through Activity A5

- Using Formulae – introduce and develop the concept of using formulae through real life activities of interest to the learners.
- **Recap** on the key learning points from the previous session. Ensure that learners are familiar with and confident in constructing expressions and equations and also with substitution of variables.
- Explain what the learners will be able to do after this activity. In this activity the learner will translate sentences into formulae.
- **Explain ‘ formula’:**
  - A formula is a **shorthand** for expressing a stated rule or relationship.
  - In a formula, **we use variables and mathematical symbols** (such as +, -, =) **to represent words**.
  - We can evaluate (work out) a formula by substituting specific values in the place of variables.
- In the **Worked Example**, we see **how to construct a formula**. In this example the formula is for the relationship between degrees Fahrenheit and Celsius. We can then **use that formula** to find, for example, the equivalent temperature in degrees Fahrenheit when it is 22 degrees Celsius and the equivalent temperature in degrees Celsius when it is 80 degrees Fahrenheit.
- **Explain** and **demonstrate** by working through the **Worked Example** on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.

### Tutor Guidelines for Activity A5: Using formulae

- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. You might like them to work in pairs or small groups to discuss their method and answers.
- In Task 2, you could ask the learners to use the internet to look up famous baseball players and calculate their batting averages.
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.

### Tutor Guidelines for Activity A5: Using formulae

- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- **Practice Sheet A5** allows learners to get some more practice in using formulae.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A6: Taxi fare****Activity****Taxi fare****A6**

This activity links to **unit learning outcomes 2.4 and 2.6.**

**Learning Outcomes**

1. Solve linear inequalities of one variable.
2. Solve problems for real life situations by mathematizing the situation and making an initial model, apply mathematical techniques and discussing and making conclusions.

**Key Learning Points**

1. Understanding the concept of an inequality
2. Solving linear inequalities of one variable
3. Formulating real life situations into mathematical models making assumptions if necessary
4. Solving using appropriate mathematical techniques
5. Discussing and making conclusions if necessary

**Materials you will need for this activity**

- Practice Sheet A6
- Solution Sheet A6

## Tutor Guidelines for Activity A6: Taxi fare

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A6: Taxi fare

### Guiding the Learners through Activity A6

- Taxi fare – Introduce and develop the concept of solving inequalities.
- Explain what learners will be able to do after this activity.
- Recap on the key learning points from the previous session.
- Check that learners know **the differences between an equation and an inequality**. Clarify the inequality signs and their meaning.
- Explain that the law obliges all taxi operators to make sure their taxi has a **taximeter** correctly installed and calibrated. To ‘calibrate’ a measuring instrument – such as a thermometer or in this case a taximeter - means to set it in accordance with a particular measuring standard. Taximeters must be calibrated in accordance with the **National Maximum Taxi Fare**. The driver must turn on the taximeter when a passenger hires the taxi and must turn it off at the end of the journey. You can get further information at <http://taxiregulation.nationaltransport.ie/for-users/tax-fare-calculator/how-taxi-fares-are-calculated>.
- **Ask learners what they already know about inequalities**. You could ask learners to work in pairs and list what they know about inequalities from Level 3 and where they might use or solve them in their own lives.
- The **Worked Example** shows how to construct an inequality to calculate how many kilometres Sarah can travel without exceeding her budget. **Explain** and **demonstrate** by working through the example on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.

### Tutor Guidelines for Activity A6: Taxi fare

- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. You might like them to work in pairs or small groups to discuss their method and answers.
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.

### Tutor Guidelines for Activity A6: Taxi fare

- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- Practice Sheet A6 allows learners to get some more practice in constructing and solving inequalities.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A7: Exam time****Activity****Exam time****A7**

This activity links to **unit learning outcomes 2.4 and 2.5.**

**Learning Outcomes**

1. Solving algebraic equations including simultaneous linear equations of two unknowns.
2. Construction algebraic expressions and formula for real life situations using the correct terminology.

**Key Learning Points**

1. Solving simultaneous linear equations of two unknowns
2. Constructing algebraic equations for real life situations

**Materials you will need for this activity**

- Practice Sheet A7
- Solution Sheet A7

## Tutor Guidelines for Activity A7: Exam time

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with** relevant topics from **learners' other subjects and activities**.

## Tutor Guidelines for Activity A7: Exam time

### Guiding the Learners through Activity A7

- Exam Time – Introduce and develop the concept of solving simultaneous equations.
- Explain what the learners will be able to do after this activity.
- **Recap** on key learning points from the previous session.
- Ask learners to discuss what they already know about simultaneous equations from Level 3. In pairs or groups, they could list where they may need to use or solve them in their own lives.
- Check that learners understand that simultaneous equations are two equations with at least two unknowns ( $x$  and  $y$ ). In order to solve such equations they must be simultaneously satisfied by particular values of  $x$  and  $y$ .
- Remind learners that in exams there are often different marks awarded for different questions and answers.
- The Worked Example shows how to construct and solve simultaneous equations. **Explain** and **demonstrate** by working through the example on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.

### Tutor Guidelines for Activity A7: Exam time

- When you judge that learners are ready, invite them to try **Tasks 1 and 2** where they must construct and solve simultaneous equations based on real life examples. You might like them to work in pairs or small groups to discuss their method and answers.
- **Monitor and support** learners as they carry out the tasks. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.

### Tutor Guidelines for Activity A7: Exam time

- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- In the 'Practise your skills' section, the learners are given an extra example where they must use simultaneous equations to calculate how many penalties Robbie Keane scored. **Practice Sheet A7** allows learners to get some more practice in solving simultaneous equations.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A8: Quadratic equations****Activity****Quadratic equations****A8**

This activity links to **unit learning outcome 2.3**.

**Learning Outcomes**

1. Solve quadratic equations using factors.

**Key Learning Points**

1. Understanding the concept of a quadratic equation
2. Solving such equations using factors.

**Materials you will need for this activity**

- Practice Sheet A8
- Solution Sheet A8

## Tutor Guidelines for Activity A8: Quadratic equations

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

## Tutor Guidelines for Activity A8: Quadratic equations

### Guiding the Learners through Activity A8

- Quadratic Equations – Introduce and develop the concept of solving quadratic equations through real life activities relevant to the learners.
- Explain what the learners will be able to do after this activity.
- **Recap** on key learning points from the previous session.
- **Ask learners what they already know about quadratic equations.** In pairs or groups, learners might list what they know about quadratic equations. An equation of the form  $ax^2 + bx + c = 0$  is called a quadratic equation. Remember 'a' is the  $x^2$  coefficient, 'b' is the x coefficient and 'c' is a constant.
- Discuss what is meant by the term 'factors' and 'to factorise'.
- This Activity goes through **three main methods of factorising** in mathematics:
  - taking out a common factor
  - factorising by grouping and
  - factorising quadratic equations.

**These methods are interlinked and they are progressive:** one builds on the other. This means that learners will not be able to factorise by grouping if they cannot take out a common factor and will not be able to factorise quadratics if they cannot factorise by grouping. It is important that each learner has a solid foundation in the first method (taking out a common factor) before moving on to the second method (grouping), and that they have a solid foundation in both of those

### Tutor Guidelines for Activity A8: Quadratic equations

before moving onto factorising quadratic equations. The Learner Pack provides Worked Examples and other examples for each method.

- Once the learner can factorise a quadratic, it is also important that they can solve a quadratic equation. In order to solve this equation for  $x$  we must realise that the product of the two factors is zero. Therefore, at least one of these factors is zero.
- For each Worked Example **explain** and **demonstrate** by working through the example on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.
- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. You might like them to work in pairs or small groups to discuss their method and answers.
- **Monitor and support** learners as they carry out the **tasks**. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.

### Tutor Guidelines for Activity A8: Quadratic equations

- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.
- If you think it would be helpful to your group: Make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- **Practice Sheet A8** allows learners to get some more practice in solving quadratic equations.
- **At the end of the session** sum up the key learning points and say what the main focus of the next session will be.
- Facilitate learners to **evaluate** the session: what they found useful, what they found difficult and what they would like to do next.
- Use their feedback to inform your **planning** for the next session.

**Tutor Guidelines for Activity A9: Garden dimensions****Activity**                      **Garden dimensions**                      **A9**

This activity links to **unit learning outcome 2.3**.

**Learning Outcomes**

1. Solve quadratic equations using the quadratic formula.

**Key Learning Points**

1. Solving equations using quadratic formula method
2. Recognising when to use this method

**Materials you will need for this activity**

- Practice Sheet A9
- Solution Sheet A9

## Tutor Guidelines for Activity A9: Garden dimensions

### Before the session

- Read through the relevant section in the Learner Pack. **Try out the exercises.**
- Notice **mathematical words and concepts** that may be new or unfamiliar to your learners. Record those as part of developing a **glossary** for this module. Record any other words from this section of the Learner Pack that you think may be new to your learners, or that might have a different meaning to the one they are familiar with.
- **Plan how you will introduce and explain these key words** and concepts in this session or over a number of sessions. Plan to **facilitate learners to**
  - say where they have met these words before and how they understand them from that experience;
  - link the new learning to that experience;
  - understand that a word can have different meanings in different contexts; and
  - be able to explain the meaning of the words in the maths context .
- Plan to involve learners in **using** those key words frequently. For example, learners could take part in focused discussions; in making brief presentations on what they have learned; in using the internet to search for explanations and illustrations of the key words.
- Plan to use a **few different methods and materials**– visual, auditory and kinaesthetic or tactile – to appeal to the different learning styles in your group. Learners could create and use quizzes, games, wordwalls, worksheets, or make mindmaps, flowcharts, images or 3-D models of the concepts and procedures. Plan to encourage learners to use the appropriate maths language as they work together on these and other tasks.
- The Learner Pack Activities are **examples**. Try to use topics that relate to your learners' experience, interests, needs and aspirations. Consult with learners and colleagues to **link the maths learning with relevant topics from learners' other subjects and activities**.

**Tutor Guidelines for Activity A9: Garden dimensions****Guiding the Learners through Activity A9**

- Garden Dimensions – Introduce and develop the concept of solving quadratic equations using the formula.
- Explain what the learners will be able to do after this activity.
- **Recap** on key learning points about **quadratic equations** from the previous activity. You introduced learners to quadratic equations of the form  $ax^2 + bx + c = 0$  where 'a' is the  $x^2$  coefficient, 'b' is the x coefficient and 'c' is a constant.

- Explain that we can **solve** such an equation **by using the formula**

**method** where  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .

We need that **quadratic formula** because some quadratic equations cannot be solved using the Guide Number method shown previously. When this happens we have to use the quadratic formula. We must **label the values a, b and c and substitute these into the formula and solve for x.**

- In the Worked Example, learners must solve a real life example in which the formula is used. You should highlight to the learner the importance of a diagram when solving these problems. **Explain and demonstrate** by working through the example on the whiteboard or flipchart. Ask learners to **talk you through** the steps, with reference to their pack. Use focused questioning to check understanding at each stage.

**Tutor Guidelines for Activity A9: Garden dimensions**

- Go through the example again if you think it would be helpful. This time **ask the learners to write each step** and as they write to **say** what it means.
- When you judge that learners are ready, invite them to try the **tasks**. You might like them to work in pairs or small groups to discuss their method and answers.
- **Monitor and support** learners as they carry out the **tasks**. Encourage **questions** and **focused discussion**. The learners should check and confirm their answers using the **calculators**.
- Give learners **feedback** on the tasks they have done. Highlight the procedures and understandings that they correctly applied, helping them to **reinforce the key learning points** involved. Help them to identify any errors and to notice the key learning points involved in those. Help learners **plan** their next activities to build on the learning from the tasks they have just completed.
- **Encourage learners to set tasks** for each other based on the learning from this session.
- **Encourage learners to summarise** what they have learned: to express it verbally and by creating mind-maps or flowcharts or 3-d models or other aids. Learners can work individually and/or in pairs or threes to make these.
- Facilitate the group to build a **group glossary** of mathematical terms.
- Encourage learners to keep a **personal dictionary**.

**Tutor Guidelines for Activity A9: Garden dimensions**

- If you think it would be helpful to your group: make, or encourage the group to make, a **wordwall** displaying the key terms, the definitions you and the learners have agreed and any related images that learners decide would be helpful. Learners can use this display as a resource for checking meaning and spelling as required. **Change** the words throughout the module according as learners become familiar with them and as you introduce new topics, terms and concepts.
- **Practice Sheet A9** allows learners to get some more practice in solving quadratic equations using the formula method.
- **At the end of the session** sum up the key learning points.
- Facilitate learners to **evaluate** the session.
- At the end of the module, facilitate the learners to evaluate the module.
- Use their feedback to inform your **planning** for the next time you facilitate this module.



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Programmes 2007 - 2013  
Co-funded by the Irish Government  
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