If you have suggested additions, or you find that some links are not working, please email [resourcelist@fess.ie](mailto:resourcelist@fess.ie)

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| **Minor Award Name** | **Functional Mathematics** |
| **Minor Award Code** | **4N2138** |
| **Level** | **4** |

**Suggested resources to support delivery:**

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| --- | --- | --- | --- | --- |
| **Theme/Topic** | **Type** | **Relevance** | **Author/Source** | **Web Link** |
| |  | | --- | | **Rounding** | | **Significant figures** | | **Estimation** | | On-line pdf file | Sections 4.5 and 4.6: Revision of rounding and estimating with worked sample questions followed by many exercises. Pages 9 – 11. | Centre for Innovation in Mathematics Teaching (CIMT) | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_4.pdf> |
| On-line tuition | Lesson on estimating with worked examples showing sensible levels of rounding and calculating expected answers. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8i4/bk8_4i6.htm> |
| On-line quiz | Practice in rounding and estimating | Project Maths | <http://www.projectmaths.ie/documents/JCActivities/RoundingAndEstimating.html> |
| **Order of operations** | On-line tuition | Lesson on order of operations and practice exercises that can be checked interactively online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8i4/bk8_4i3.htm> |
| On-line tuition | On-line quiz with hints, and videos with complete lessons | Khan Academy | <https://www.khanacademy.org/math/pre-algebra/order-of-operations/place_value/e/place_value> |
| **Decimals**  **Place value** | On-line tuition | Lesson on decimal place value including examples and interactive exercises | Math.com | <http://www.math.com/school/subject1/lessons/S1U1L2GL.html> |
| On-line tuition | Instructional videos on decimal place value | Khan Academy | <https://www.khanacademy.org/math/arithmetic/decimals/decimal-place-value/v/decimal-place-value> |
| **Negative numbers**  **Integers** | Pdf file | Examples and exercises including addition, subtraction, multiplication and division. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7_15.pdf> |
| Instructional videos on negative numbers. | John Cooper | <https://www.youtube.com/playlist?list=PLLCq8uXUkPyaNgcZ94mLxGmnB2_C2o85H> |
| Geogebra | Geogebra interactive file | Project Maths | <http://www.projectmaths.ie/geogebra/adding-integers/> |
| **Fractions** | On-line tuition | Examples of fractions and exercises that can be checked online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i10/bk7_10i1.htm> |
| On-line revision | Worked sample questions on fractions and exercises that can be checked online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i10/bk7_10i3.htm> |
| Pdf file | Adding, subtracting, multiplying and dividing fractions. Worked examples and exercises including real-life questions. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7_20.pdf> |
| On-line tuition | Worked examples and revision exercises on fractions that can be checked online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i4/bk9_4i2.html> |
| On-line tuition | Instructional videos: Introduction to fractions, recognizing fractions, identifying numerators and denominators | Khan Academy | <https://www.khanacademy.org/math/arithmetic/fractions> |
| On-line tuition | Instructional videos on rational numbers including equivalent fractions and reducing fractions | John Cooper | <https://www.youtube.com/playlist?list=PLLCq8uXUkPyYacJ3SkpdGhmHio7JrpEEE> |
| On-line tuition | Lesson on fractions and instructional video | Onlinemathlearning.com | <http://www.onlinemathlearning.com/fractions.html> |
| On-line tuition | Definitions of different types of factions with examples | Math.com | <http://www.math.com/school/subject1/lessons/S1U4L1GL.html> |
| **Equivalent fractions** | Pdf file | Examples and exercises on equivalent fractions including real-life questions. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_4.pdf> |
| Online tuition | Explanation of equivalent fractions with diagrams, examples and questions with online checking | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i10/bk7_10i2.htm> |
| Online tuition | Sample questions on equivalent fractions and exercises that can be checked online. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i4/bk9_4i1.html> |
| **Converting fraction, percent, decimal** | Pdf | Section 4.4 – examples and exercises on fraction, decimal and percentage equivalents | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_4.pdf> |
| Online tuition | Converting decimals into fractions. Lesson, examples and questions with online checking | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i1.htm> |
| Online tuition | Converting fractions to decimals. Lesson, examples and questions with online checking | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i2.htm> |
| Online tuition | Converting between fractions, decimals and percentages. Lesson, examples and questions with online checking | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i4.htm> |
| Online tuition | More on equivalence of fractions, decimals and percentages. Examples and questions with online checking | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i4/bk9_4i4.html> |
| Online video | Converting fractions to decimals, percent’s to decimals and fraction and decimals to fractions | Khan Academy | <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/v/converting-fractions-to-decimals> |
| Online video | Video: Converting between different types of rational numbers | John Cooper | <https://www.youtube.com/watch?v=yz-KqHYSdck&list=PLLCq8uXUkPyYacJ3SkpdGhmHio7JrpEEE&index=7&feature=plpp_video> |
| Online lesson | Video: Converting between fractions, per cents, decimals and ratios | Onlinemathlearning.com  John Cooper | <https://www.youtube.com/watch?v=TFFc8dPubdY&list=PLLCq8uXUkPyYacJ3SkpdGhmHio7JrpEEE&index=13&feature=plpp_video> |
| Online lesson | Lesson on fractions to decimals with denominators that are multiples of 10 with online worksheets | Onlinemathlearning.com | <http://www.onlinemathlearning.com/fractions-to-decimals.html> |
| Online lesson | Lesson on fractions to decimals with denominators other than multiples of 10 | Onlinemathlearning.com | <http://www.onlinemathlearning.com/fractions-into-decimals.html> |
| Online lesson | Lesson on percent’s and decimals with online worksheets | Onlinemathlearning.com | <http://www.onlinemathlearning.com/percent-to-decimal.html> |
| pdf file | Lesson on converting proper and improper fractions to percent’s | Project Maths | <http://www.onlinemathlearning.com/fraction-to-percent.html> |
| pdf file | Project Maths Worksheet | <http://www.projectmaths.ie/documents/JCActivities/FractionsDecimalsPercentages.pdf> |
| |  | | --- | | **Per cent increase**  **/decrease** | | **Per cent discount** | | **Per cent error** | | Pdf file | Section 9.5. Examples and exercises in increasing and decreasing quantities by a percentage | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_9.pdf> |
| Pdf file | Section 4.5. Percentage increases and decreases. Examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_4.pdf> |
| Online tuition | Introduction to percentages: examples and exercises that can be checked online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i17/bk7_17i3.htm> |
| Online tuition | Percentage increases and decreases: examples and exercises that can be checked online | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i4/bk9_4i5.html> |
| Online quiz | Online quiz: Percent word problems | Khan Academy | <https://www.khanacademy.org/math/algebra-basics/core-algebra-foundations/algebra-foundations-decimal-operations/e/percentage_word_problems_1> |
| Online quiz | Online quiz: Discount, tax and tip word problems | Khan Academy | <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/percent-word-probs-pre-alg/e/discount_tax_and_tip_word_problems> |
| Online quiz | Online quiz: Markup and commission word problems | Khan Academy | <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/percent-word-probs-pre-alg/e/markup_and_commission_word_problems> |
| Video | Lesson on beginning per cent | John Cooper | <https://www.youtube.com/watch?v=Sc53tsFXp9A&list=PLLCq8uXUkPyZ0QxLk4kPFb0n-T6Qd5-2R&index=2&feature=plpp_video> |
| Video | Lesson on calculating percent | John Cooper | <https://www.youtube.com/watch?v=2-vr4D1Hr6Q&list=PLLCq8uXUkPyZ0QxLk4kPFb0n-T6Qd5-2R&index=7&feature=plpp_video> |
| Online tuition | Brief text and video with worksheets: Percentage of a number | Onlinemathlearning.com | <http://www.onlinemathlearning.com/percentage-of-number.html> |
| Online tuition | Brief text and video with worksheets: Percentage Increase or Decrease | Onlinemathlearning.com | <http://www.onlinemathlearning.com/percentage-increase.html> |
| Online tuition | Per cent: Lesson including examples and interactive exercises | math.com | <http://www.math.com/school/subject1/lessons/S1U1L7GL.html> |
| Website | Government examples for calculating PAYE | Revenue Irish Tax and Customs | <http://www.revenue.ie/en/personal/faqs/how-do-i-work-out-my-tax.html#section4> |
| |  | | --- | | **Exponents**  **Indices** | |  | | Pdf file | Section 2.3: Index Notation. Explanation, examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_2.pdf> |
| Pdf file | FAS Practice Sheet, pages 5 & 6 | FAS | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Scientific Notation** | Pdf file | Activity N3 The Solar System  Worked examples | FAS | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_Answers_Unit1.pdf> |
| **Law of indices** | Pdf file | Section 3.2: Laws of Indices. Explanation, examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_3.pdf> |
| **Logarithms** | Pdf file | Lesson plane using earthquakes as an example | CIMT | <http://www.cimt.plymouth.ac.uk/resources/topical/earthquakes/earthquakes_lp.pdf> |
| Pdf file | Online book entitled Explaining Logarithms” | Dan Umbarger | <http://www.mathlogarithms.com/images/ExplainingLogarithms.pdf> |
| Pdf file | Several practice questions on logarithms | Project Maths Development Team | <http://www.projectmaths.ie/documents/PDF/ActivitiesOnLogs.pdf?strand> |
| Online lesson | Online lesson with quiz | Maths is Fun | <https://www.mathsisfun.com/algebra/exponents-logarithms.html> |
| Pdf | Fás Practice Sheet on converting index to log and log to index. | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Simple interest** | Online tuition | Brief text and video with worksheets:  Simple Interest Formula | Onlinemathlearning.com | <http://www.onlinemathlearning.com/simple-interest-formula.html> |
| Pdf file | Activity N5 Interest, pages 11-12. Three  worked examples | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_Answers_Unit1.pdf> |
| |  | | --- | | **Compound interest** | |  | | Pdf file | Activity N6: Banking Options, pages 13-17. Four worked examples. | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_Answers_Unit1.pdf> |
| Powerpoint | Power Point Presentation on investigating compound interest | Project Maths | <http://www.projectmaths.ie/workshops/workshop7/InvestigatingCompoundInterest.pptx?strand> |
| **VAT** | Pdf | Activity N10: VAT, pages 28-31. Two worked examples. | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_Answers_Unit1.pdf> |
| Website | Guide to VAT | Revenue Irish Tax and Customs | <http://www.revenue.ie/en/tax/vat/rates/index.jsp> |
| **Variables** | Pdf | Fás Practice Sheet A1, pages 3 & 4 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Solving equations** | Pdf file | Section 12.3 (pages 11-18)  Solving Linear Equations | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_12.pdf> |
| Online tuition | Linear Equations: simple and harder examples. Equations with unknown letter on both sides. Using an equation to solve a number puzzle | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i16/bk7_16i3.htm> |
| Online tuition | Linear  Equations (1). Revising simple equations | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8i12/bk8_12i3.htm> |
| Online tuition | Linear Equations with Brackets. Examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8i8/bk8_8i2.htm> |
| Video | Video: Solving Linear Equations: Same Thing to Both Sides of the Equation | Khan Academy | <https://www.khanacademy.org/math/in-seventh-grade-math/simple-equations/equation-definition/v/why-we-do-the-same-thing-to-both-sides-simple-equations> |
| Video | Video: One-step addition & subtraction equations | Khan Academy | <https://www.khanacademy.org/math/in-seventh-grade-math/simple-equations/equation-definition/v/adding-and-subtracting-the-same-thing-from-both-sides> |
| Video | Video: Introduction to two-step equations | Khan Academy | <https://www.khanacademy.org/math/in-seventh-grade-math/simple-equations/equation-definition/v/why-we-do-the-same-thing-to-both-sides-two-step-equations> |
| Online tuition | Interactive exercises: One-step addition & subtraction equations | Khan Academy | <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/one_step_equations> |
| Online tuition | Interactive exercises: One-step multiplication & division equations | Khan Academy | <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/linear_equations_1> |
| Online tuition | Interactive exercises: Two-step equations | Khan Academy | <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/linear_equations_2> |
| Video | Video: Solving equations (2) | John Cooper | <https://www.youtube.com/watch?v=25OXrr18b_k> |
| Video | Video: Solving equations (3) | John Cooper | <https://www.youtube.com/watch?v=i4UWrc6x0Uc> |
| Online tuition | Solving One Step Equations | onlinemathlearning.com | <http://www.onlinemathlearning.com/solving-one-step-equations.html> |
| Online tuition | Solving Two Step Equations – Integers | onlinemathlearning.com | <http://www.onlinemathlearning.com/solving-two-step-equations-integers.html> |
| Online tuition | Techniques for Solving Equations | onlinemathlearning.com | <http://www.onlinemathlearning.com/solving-equations-techniques.html> |
| Online tuition | Solving addition and subtraction equations | math.com | <http://www.math.com/school/subject2/lessons/S2U3L1GL.html> |
| Online tuition | Solving multiplication equations | math.com | <http://www.math.com/school/subject2/lessons/S2U3L2GL.html> |
| Online tuition | Solving division equations | math.com | <http://www.math.com/school/subject2/lessons/S2U3L3GL.html> |
| Pdf | Fás Practice Sheet A4, pages 9-10 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| pdf file | Instructional sheet on solving equations of the form ax + b =c | Project Maths | <http://www.projectmaths.ie/documents/JCActivities/SolvingSimpleLinearEquations.pdf> |
| |  | | --- | | **Simplify expressions** | | **Expand brackets** | |  | | Pdf file | Expansion of single brackets | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_8.pdf> |
| Pdf file | Section 11.2. Examples and exercises on Simplifying Expressions | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_11.pdf> |
| Online tuition | Interactive exercises: Expansion of single brackets | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8i8/bk8_8i1.htm> |
| Online tuition | Interactive exercises on simplifying expressions | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i11/bk9_11i2.html> |
| Online tuition  Video | Video: Simplifying Expressions  Simplifying Expressions | Khan Academy | <https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-manipulating-expressions/v/combining-like-terms-and-the-distributive-property> |
| Video | Video: Simplifying Expressions (1) | John Cooper | <https://www.youtube.com/watch?v=7tioDXBjY6Q> |
| Video | Video: Simplifying Expressions (2) | John Cooper | <https://www.youtube.com/watch?v=TUjxV9dg6Lc> |
| Online tuition | Lesson: Simplify Expressions and Distributive Property | onlinemathlearning.com | <http://www.onlinemathlearning.com/simplify-expressions-distributive-property.html> |
| Video | Lessons on adding and multiplying rational expressions | onlinemathlearning.com | <http://www.onlinemathlearning.com/combine-like-terms-expressions.html> |
| Online tuition | Interactive lesson on simplifying expressions | math.com | <http://www.math.com/school/subject2/lessons/S2U2L5GL.html> |
| Online tuition | Combining Like Terms | math.com | <http://www.math.com/school/subject2/lessons/S2U2L4DP.html> |
| **Formulas** | Pdf file | Examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book8/bk8_12.pdf> |
| Pdf | Fás Practice sheet A5, pages 11-12 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Inequalities** | Pdf file | Examples and exercises, pages 1-3 | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_13.pdf> |
| Pdf | Fás Practice sheet A6, pages 13-15 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Simultaneous equations** | Online sheet | Classic Simultaneous Equations Problem | Math World | <http://mathworld.wolfram.com/AssandMuleProblem.html> |
| Pdf file | Section 10.8: Simultaneous linear equations. Text Lesson, examples and exercises. | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/allgcse/bkb10.pdf> |
| Video | Instructional video: Simultaneous Equations (1) | John Cooper | <https://www.youtube.com/watch?v=g1lJv0lEPLA> |
| Video | Instructional video: Simultaneous Equations (2) | John Cooper | <https://www.youtube.com/watch?v=zQnXxGufNkA> |
| Pdf | Fás Practice sheet A7, pages 16-17 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Quadratic equations** | Interactive teaching sheet | Lesson on quadratic equations | Math World | <http://mathworld.wolfram.com/QuadraticEquation.html> |
| Pdf file | Section 17.2: Quadratic Equations: Factorisation. Examples and exercises | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_17.pdf> |
| Online exercises | Interactive exercises on quadratic equations | CIMT | <http://www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9i17/bk9_17i2.html> |
| Videos | Nine instructional videos covering this topic | John Cooper | <https://www.youtube.com/playlist?list=PLLCq8uXUkPyZq8BqV8LxoAQrg4jdvBr4D> |
| Pdf | Fás Practice sheetA8, pages 18-19 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |
| **Quadratic formula** | Information sheet | Interactive information sheet on the quadratic formula | Math World | <http://mathworld.wolfram.com/QuadraticFormula.html> |
| Videos | Instructional videos | John Cooper | <https://www.youtube.com/watch?v=naRfZts3sU4&list=PLLCq8uXUkPyZq8BqV8LxoAQrg4jdvBr4D&index=5> |
| Pdf | Fás practice sheets A9, pages 20-21 | Fás | <http://www.youthreach.ie/wp-content/uploads/4N2138_Functional-Maths_-PracticeSheets_Unit-2.pdf> |

**Useful Organisations:**

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| **Name** | **Contact Information** |
| Centre for Innovation in Mathematics Teaching (CIMT) | <http://www.cimt.plymouth.ac.uk> |
| Math World | <http://mathworld.wolfram.com> |
| Project Maths | <http://www.projectmaths.ie> |
| Mathematical Association of America MAA | <http://www.maa.org/> |
| Maths is Fun | <http://www.mathsisfun.com/> |
| Cut the Knot | <http://www.cut-the-knot.org/content.shtml> |
| edhelper | <http://www.edhelper.com/math.htm> |
| Murderous Maths | <http://www.murderousmaths.co.uk/indextxt.htm> |
| Kuta Software | <https://www.kutasoftware.com/> |
| Golden Key Educational Publishing | [www.goldenkey.ie](http://www.goldenkey.ie) |

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| **MOOCs (Massive Online Open Courses)** | |
| Free access to online courses  Search regularly for new courses and new start dates | <https://www.mooc-list.com/> |