

Contents

1 Real Numbers

15

Themes

Properties of real numbers; whole numbers, natural numbers, integers, fractions, rational numbers, square roots, irrational numbers

Vocabulary

Definitions of types of numbers; properties of real numbers, derivatives
Common procedures followed by mathematicians: factoring, using reciprocals/
division, collecting like items, using average, converting to decimal or fractional
notation

Writing

Paragraph structure, cohesion and coherence

Note-taking

Identifying main points in a lecture: "Imaginary and complex numbers" contents

2 Algebraic Expressions, Equations and Functions

31

Themes

Algebraic expressions, equations and functions

Discussion

Skimming and scanning, identifying main points

Vocabulary

Using a variety of words to describe arithmetic processes; translating "text" to algebra;
reading functions and equations

Note-taking

Linear style abbreviations and symbols

Style

Introducing formality by comparing two excerpts

3 Exponents and Exponential Functions

53

Themes

Exponents and exponential functions; exponential decay and growth; geometric
progressions and scientific notation

Academic vocabulary

Definitions;

Writing the product as a monomial in a standard form

Numbers of Science: Conversions from Metric system to English

Metric prefixes for powers of 10

Comparing objects of widely different sizes: orders of magnitude

Academic writing and style

Introduction to paraphrasing;

Expressing cause and effect as a paraphrasing tool

4 Introduction to Reasoning and Proof

77

Themes

The language of proofs regarding segments; inductive and deductive reasoning, theorems, logic tables, axioms, methods of proof

Discussion

Useful phrases

Vocabulary

Definitions of Logic Theory terms

Writing

The language and symbols of proofs

Note-taking

Writing

Mathematical proofs by induction, identifying the base, hypothesis and conclusion

5 Introduction to Probability

97

Themes

Introduction to probability, random events, random variables and their categorisations, density and distribution functions, notation and axiomatic definition of probability

Vocabulary

Definitions of probability related terms; collocations; notation in probability, adverbial phrases

Academic style

Introduction to academic caution; modal verbs and the lack of tentative language in Mathematics

Note-taking

Peer-reviewing notes on probability webinar

6 Introduction to Statistics

115

Themes

Data, sample population, numerical descriptors, rational equations and functions; descriptive and inferential statistics, statistical significance; standard deviation, coefficient of variation, mean, median; graphs

Vocabulary

Statistics: Definitions

Word formation and use-in-context

Language

The use of gerund and infinitive in Mathematics

Presentation/Writing

Reporting graphs and charts

Writing

Writing a report following a chart or graph

Plagiarism, citations and references; why and how we use them

7 Geometry connections

135

Themes

Introduction to Geometry; lines, points, planes and angles, parallel and perpendicular lines

Discussion

Expressing agreement, disagreement or acknowledgement

Academic vocabulary

Use in context, definitions of popular mathematical terms

Geometric shapes: 2D and 3D definitions

Giving examples

Academic writing

Summary guidelines and practice

Note-taking

Identifying the moves in a lecture; using reference verbs

8 Properties of Triangles

159

Themes

Triangles; main and secondary elements of a triangle, types of triangles by lengths of sides, classification according to internal angles, the Pythagorean Theorem, the concepts of congruence and similarity

Vocabulary

Definitions; use-in-context: types of triangles

Writing a two-column proof

Making comparisons

Writing

Passive voice

Presentation

Opening/closing phrases and transitions

9 Introduction to Trigonometry

175

Themes

Right triangle Trigonometry, ratios, sine, cosine, tangent, trigonometric identities, function graphs

Academic vocabulary

The language of theorems, axioms and proofs

Note-taking practice

The unit circle

Academic presentation skills

Signposting language that engages your audience enhances the impact of your speech

10 The Geometry of the Circle

197

Themes

Properties of circles; chords, tangents, secants, equations and graphs of circles

Vocabulary

Use-in-context; definitions

Geometry tools

Note-taking

Equations and graphs of circles

Writing

How to write an argumentative essay on "Pure vs. Applied Mathematics"

Using evaluative language to unfavour someone's view

11 Polygons and Quadrilaterals

225

Themes

Polygons and quadrilaterals; parallelograms, rhombi, rectangles, squares, kites and trapezoids

Ratios, proportions and similarity applied to polygons and quadrilaterals, proportionality with parallel lines, dilations and fractions

Vocabulary

Definitions; use-in-context; adjective suffixes

Academic language focus

Subject verb agreement; quantifiers

Academic style

Avoiding wordiness and repetition

Academic presentation skills

From text to slides

Using visuals to enhance the impact of your presentation

Note-taking

Tessellations

12 The Geometry of Three Dimensions

251

Themes

Introduction to the geometry of three dimensions, points and lines in space, coordinate systems, polyhedra and solids of revolution

Academic vocabulary

Definitions: use in context

Academic style

Formality and complexity;

Comparing texts written for different audiences

Introduction to critical reading

Common pitfalls when writing a scientific paper

Appendix

273

Glossary

287

Evaluation criteria

323

Transcripts

331

Bibliography

349