

Contents

Review 1	Calculating with numbers & expressions	4
Review 2	Linear equations, Simultaneous equations	56
Review 3	Coordinates and functions	76
Review 4	Figures	110
Review 5	Organizing and making use of data; Probability	196

Chapter 1 Calculating with expressions

1	Calculating with polynomials	7
	Multiplying a monomial and a polynomial / Dividing a polynomial by a monomial / Four arithmetic operations with monomials and polynomials / Multiplying two polynomials / Formula for expanding expressions of the form $(x+a)(x+b)$ / Expanding expressions of the form $(a+b)^2$ and $(a-b)^2$ / Expanding expressions of the form $(a+b)(a-b)$ / Various calculations	
2	Factoring	19
	Prime numbers and prime factorization / Extracting common factors / Factoring $x^2 + (a+b)x + ab$ / Factoring $a^2 + 2ab + b^2$ and $a^2 - 2ab + b^2$ / Factoring $a^2 - b^2$ / Various ways of factoring / Factoring by replacement	
3	Using calculations of expressions	27
	Evaluating expressions / Using formulas when calculating numbers / Using expressions to set up a proof / Using calculations of expressions for figures	

	Comprehension test for Chapter 1,	
	End-of-chapter problems	32
	Complements Complex factoring	34
	Complements Greatest common factors and least common multiples	35

Chapter 2 Square roots

1	Square roots	37
	Meaning of square roots and how to represent them / Relative size of square roots / Size of square roots / Rational and irrational numbers, Recurring decimals	
2	Multiplying and dividing expressions containing radical signs	42
	Products and quotients of square roots / Converting between \sqrt{a} and $b\sqrt{c}$ / Rationalizing denominators / Multiplication and division / Approximating values	

	of square roots	
3	Calculating expressions containing radical signs	48
	Addition and subtraction / Four arithmetic calculations / Using the expansion formulas / Evaluating expressions / Using square roots	
	Study seminar Rationalizing denominators that are in the form of $\sqrt{a} \pm \sqrt{b}$	
	Comprehension test for Chapter 2,	
	End-of-chapter problems	54

Chapter 3 Quadratic equations

1	How to solve quadratic equations	59
	How to solve $ax^2 - b = 0$ / How to solve $(x+m)^2 = n$ / How to solve $x^2 + px + q = 0$ / How to use the quadratic formula to solve quadratic equations / How to use factoring to solve quadratic equations / Various quadratic equations	
2	Using quadratic equations	66
	Problems about values of variables / Problems about numbers / Problems about figures / Problems about graphs of functions / Problems about ratios / Solving problems using the quadratic formula	
	Comprehension test for Chapter 3,	
	End-of-chapter problems	74

Chapter 4 Functions

1	The function $y = ax^2$	81
	The function $y = ax^2$ / Expressing the relationship between two quantities as $y = ax^2$ / Graphing the function $y = ax^2$ / Properties of the function $y = ax^2$	
2	Properties of the function $y = ax^2$	87
	Domains / Rate of change / Using the rate of change / Points where a parabola and a line intersect / Area of triangles	
3	Using graphs of functions	95
	Graphs of functions and segments / Graphs of functions and squares / Graphs of functions and parallelograms / Bisecting areas / Changing shapes without changing area / Changing shapes without changing area using quadrilaterals / Moving points and functions / Moving figures and functions / Various functions	

9th grade

Comprehension test for Chapter 4,
End-of-chapter problems 108

Chapter 5 Similar figures

1 Similar figures 115
 Similarity between figures / Properties of ratios /
 Properties of similar figures, Similarity ratios /
 Conditions for similar triangles / Ratios of the
 lengths of sides in similar triangles / Proving the
 similarity of two triangles / Using reductions

2 Parallel lines and ratios of segments .. 125
 Triangles and ratios / Parallel lines and ratios /
 Using the relationship of parallel lines and ratios /
 Midpoint theorem / Using the midpoint theorem /
 Angle bisectors and ratios
Study seminar The centroid of a triangle

3 Ratios of area, Ratios of volume 134
 Ratios of area / Ratios of the areas of similar
 figures / Ratio of the surface areas and ratio of the
 volumes of similar figures

4 Using similarity 138
 Ratios of segment / Using ratios of area / Using
 ratios of volume / Using ratios of segment on
 coordinate planes
Study seminar Ceva's theorem, Menelaus'
 theorem

Comprehension test for Chapter 5,
End-of-chapter problems 144

Chapter 6 Properties of circles

1 Circles and lines 147
 Circles and lines / Lengths of tangents /
 Circumscribed circles and inscribed circles

2 Inscribed angle theorem 151
 Inscribed angle theorem / The converse of the
 inscribed angle theorem / Proofs using the inscribed
 angle theorem / A circle and similar triangles /
 Proving similarity using a circle / Proofs using the
 converse of the inscribed angle theorem
Study seminar Quadrangle inscribed in a
 circle / Alternate segment theorem / Intersecting
 chords theorem

Comprehension test for Chapter 6,
End-of-chapter problems 164

Chapter 7 The Pythagorean theorem

1 The Pythagorean theorem 167
 The Pythagorean theorem / Proving that the
 Pythagorean theorem is true / The converse of the
 Pythagorean theorem

2 The Pythagorean theorem and plane figures 171
 Special right triangles / Drawing an auxiliary line
 in an isosceles triangle or a trapezoid / Various
 triangles / Distance between two points / Chords
 in a circle / Tangent to a circle

3 The Pythagorean theorem and solids .. 180
 Cuboids and cubes / Pyramids / Cones / Spheres
Study seminar Height and volume of a regular
 tetrahedron

4 Solving various problems by applying the Pythagorean theorem 186
 Problems about plane figures / Similarity and the
 Pythagorean theorem / Problems about circles /
 The shortest distance on the surface of a solid /
 Polygon formed inside a solid / Problems about
 solids

Comprehension test for Chapter 7,
End-of-chapter problems 194

Chapter 8 Sample surveys

1 Sample surveys 199
 Censuses and sample surveys / Using sample
 surveys

Comprehension test for Chapter 8,
End-of-chapter problems 201

Complements Inequalities 202

Complements Base- n number system 205

Key points learned during junior high school 206