

14+ PAST PAPER PACK

Tonbridge School 14+ Maths

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TONBRIDGE
SCHOOL

Guidance for candidates preparing for the Year 10 Entrance Papers

Boys taking the 14+ Tonbridge Entrance Examination, for entry into Year 10, are required to sit papers in Mathematics and English only. Exams take place in October/November of the year preceding entry and can be written at Tonbridge, BE Education in China, Academic Asia in Hong Kong or at British Council offices around the world. It is the responsibility of the applicant to let the Admissions Officer know in plenty of time where he is intending to sit the exam and to confirm arrangements with the chosen centre.

More information about the exam syllabuses is outlined below.

Mathematics 14+ entrance exam

The Mathematics exam will be a 60 minute paper which is set using the ISEB (Independent Schools Examination Board) Common Entrance syllabuses for Maths Level 3 plus some additional topics.

The basic syllabus for this course can be found on the ISEB webpage at <http://www.iseb.co.uk/> (with all topics on the Maths syllabus page included) but the syllabus will also include:

- Pythagoras (in 2D). Include distance and midpoint of AB with A, B in coordinates, and some calculations leaving roots in answers.
- Sin, Cos, Tan and their inverses for calculating lengths and angles in right-angled and isosceles triangles, including examples with two connected triangles
- Expanding brackets: $a(bx+c)$, $(ax+by)(cx+dy)$, $(ax+by)^2$.
- Solving linear equations, including brackets, x on both sides, fractional coefficients (as hard as $(2x-3)/6+(x+2)/3=5/2$). Related equations, e.g. $400/x = 8$, $4x^2 = 49$.
- Drawing graphs: tables of values, making use of TAB mode on the calculator, $f(x)$ notation. Good drawing techniques. Include $y = ax+b$, $y = ax^2+bx+c$, easy cubics, $y = k/x$
- Gradient of a straight line: theory and use of $y = mx+c$ (from equation to line and from line to equation); recognising parallel lines from their gradients.

English 14+ entrance exam

The English exam will consist of one 90 minute paper, consisting of two sections.

Section A: Poetry Comprehension (45 minutes)

Candidates will be provided with a short poem followed by four or five questions which test their language and comprehension skills. Rather than looking for hidden meanings, candidates will be rewarded for writing clearly about what they see in the poem. As well as basic literary criticism skills candidates might find it helpful to have studied in advance:

- the use of key words and emotive language
- why poets and other writers employ metaphors, similes and personification

Section B: will be a 45 minute 'Writing' paper, consisting of a single section.

Candidates will be given a number of titles and asked to write on them in the form of a short-story, description or argumentative piece. Marks are awarded in this section for clarity and lucidity of written expression, originality (pre-prepared work will be penalised) and imaginative range.

Paper Notes: 14+ Maths Question Paper (14+ Maths Past Paper)

Compiled by [SATs-Papers.co.uk](https://www.SATs-Papers.co.uk) to help you get the most from this paper.

Overview

This is the **Tonbridge School 14+ entrance examination guidance document**, designed for boys seeking entry into Year 10. The examination takes place in October or November of the year before entry and comprises two subjects: **Mathematics** and **English**. Candidates can sit the exam at Tonbridge itself, at examination centres in China and Hong Kong, or at British Council offices worldwide.

The **Mathematics paper** is a 60-minute examination based on the **ISEB Common Entrance Level 3 syllabus** with several additional topics, including Pythagoras' theorem in coordinate geometry, trigonometry (sine, cosine and tangent with inverses), algebraic manipulation, linear and related equations, graph drawing and the theory of straight-line gradients. The **English paper** lasts 90 minutes and is split into two sections: a 45-minute poetry comprehension and a 45-minute creative or argumentative writing task.

This guidance is essential reading for any candidate preparing for the Tonbridge 14+ entrance. It sets out exactly what topics will be examined and the structure of each paper, allowing students to focus their revision appropriately. The document is particularly useful for overseas candidates unfamiliar with the ISEB framework, as it supplements the standard syllabus with Tonbridge-specific extensions.

How this paper is organised

The **Mathematics examination** is a single 60-minute paper covering the ISEB Common Entrance Maths Level 3 syllabus plus six specified extension topics. These extensions include Pythagoras' theorem applied to coordinate geometry (including distance and midpoint calculations with surds), trigonometric functions and their inverses for right-angled and isosceles triangles, expanding brackets of increasing complexity, solving linear equations with fractional coefficients and related equations, graph drawing using calculator table modes and function notation, and straight-line gradient theory including the equation $y = mx + c$.

The **English examination** is a 90-minute paper divided into two equal sections. Section A is a 45-minute poetry comprehension requiring candidates to answer four or five questions on a short poem, testing language and comprehension skills rather than obscure interpretation. Section B is a 45-minute creative writing task where candidates

choose from several titles to produce a short story, descriptive piece or argumentative essay.

No specific mark allocations are given in the guidance document, but the equal time split in the English paper suggests balanced weighting between comprehension and composition. Candidates should note that pre-prepared writing will be penalised in Section B, emphasising the importance of spontaneous, original responses.

Topics covered

- Pythagoras' theorem in two dimensions, including distance and midpoint of line segments with coordinates, and calculations leaving roots (surds) in final answers
- Trigonometry: sine, cosine and tangent ratios and their inverses for calculating lengths and angles in right-angled and isosceles triangles, including multi-triangle problems
- Algebraic manipulation: expanding single and double brackets including expressions of the form $a(bx+c)$, $(ax+by)(cx+dy)$ and $(ax+by)^2$
- Solving linear equations with brackets, unknowns on both sides and fractional coefficients (e.g. $(2x-3)/6+(x+2)/3=5/2$), plus related equations such as $400/x = 8$ and $4x^2 = 49$
- Graph drawing using tables of values and calculator TAB mode, including linear ($y = ax+b$), quadratic ($y = ax^2+bx+c$), cubic and reciprocal ($y = k/x$) functions with function notation
- Gradient of a straight line: theory and application of $y = mx+c$, converting between equations and graphs in both directions, and recognising parallel lines from their gradients
- Poetry comprehension: close reading of a short poem followed by four or five questions testing language analysis and comprehension skills
- Literary devices: identifying and explaining the use of key words, emotive language, metaphors, similes and personification in poetry
- Creative and argumentative writing: producing original short stories, descriptive passages or argumentative essays from a choice of titles within 45 minutes
- Written expression: clarity, lucidity, originality and imaginative range in extended writing under timed conditions

How to use this paper for revision

- Work through the full ISEB Common Entrance Level 3 syllabus first, then focus on the six additional topics Tonbridge specifies, as these extensions distinguish this paper from standard Common Entrance
- Practise leaving answers in surd form (e.g. $\sqrt{50}$ simplified to $5\sqrt{2}$) rather than rounding decimals, particularly in Pythagoras and coordinate geometry questions
- Master the use of your calculator's TAB or TABLE mode for generating coordinates when drawing graphs, as this is explicitly mentioned in the syllabus and will save time
- For trigonometry questions, sketch the triangles clearly and label all known sides and angles before choosing which ratio to use; multi-triangle problems often require breaking down a complex diagram
- Read a wide variety of poetry in the months before the exam, focusing on how poets use language deliberately rather than seeking hidden meanings; Tonbridge rewards clear observation
- Time yourself writing for 45 minutes regularly, aiming to produce a complete piece with a clear beginning, development and ending; pre-prepared stories will be obvious and penalised
- Revise how to identify and explain the effect of metaphors, similes and personification with specific reference to the text, as the poetry section tests analytical writing skills

Common mistakes to avoid

- Leaving Pythagoras answers as unsimplified surds (e.g. $\sqrt{50}$ instead of $5\sqrt{2}$) or rounding to decimals when the question expects exact root form
- Confusing sine, cosine and tangent ratios, particularly in isosceles triangles where candidates forget to split the triangle into two right-angled triangles first
- Errors when expanding $(ax+by)^2$: many students write this as ax^2+by^2 instead of the correct $a^2x^2+2abxy+b^2y^2$, omitting the middle term
- Algebraic slips when solving equations with fractional coefficients, especially forgetting to multiply every term by the common denominator or making sign errors with negatives
- Drawing graphs inaccurately or failing to use a smooth curve for quadratics and cubics; poor plotting and failure to label axes clearly lose marks easily
- Writing vague poetry analysis that describes what happens in the poem rather than explaining how specific words and techniques create meaning or effect
- Producing generic, clichéd creative writing or submitting a piece that is clearly memorised rather than responding genuinely to the title given on the day

Exam technique

For the **Mathematics paper**, allocate your 60 minutes carefully across all question types. Begin with questions on topics you feel most confident about to build momentum, but keep an eye on the marks available for each question to avoid spending too long on low-value items. If a Pythagoras or trigonometry question asks you to leave an answer in surd form, do not round; equally, if a linear equation looks complicated, clear the fractions first by multiplying through. Use your calculator's table mode as instructed for graph questions, and always label axes and plot points precisely. Leave time to check your working, particularly for algebraic manipulation where sign errors are common.

For the **English paper**, divide the 90 minutes strictly: 45 minutes for Section A and 45 minutes for Section B. In the poetry comprehension, read the poem at least twice before attempting any questions, and always support your answers with direct quotations from the text. Write clearly about what you observe rather than inventing complex interpretations; Tonbridge rewards precise analysis of language. In Section B, spend five minutes planning your writing to ensure you have a clear structure before you start. Write naturally and originally in response to the title rather than attempting to reproduce a prepared piece, as examiners will penalise pre-learned work.

Across both papers, read each question carefully to ensure you answer what is asked. For multi-step Mathematics questions, show all working clearly so that method marks can be awarded even if your final answer is incorrect. In English, write legibly and leave time to proofread for spelling, punctuation and grammatical errors. If you finish early, use the remaining time to review your work rather than leaving the exam room.

What to revise alongside this paper

Beyond the specific topics listed, candidates should ensure they have mastered all content from the **ISEB Common Entrance Level 3 syllabus**, including fractions, percentages, ratio, algebraic simplification, area and volume, probability and statistics. Strong foundational skills in these areas will support the more advanced topics Tonbridge tests, particularly when questions combine multiple techniques (for example, a Pythagoras question embedded within a coordinate geometry problem).

For trigonometry and graph work, familiarity with quadratic equations and factorisation will be helpful, as will confidence using a scientific calculator efficiently under timed conditions. Practise using the calculator's memory, table and angle mode functions. For English, read widely across different poetic forms and periods to build your vocabulary for discussing literary techniques; anthologies aimed at GCSE level are a good starting point.

Once confident with this syllabus, students might explore early **GCSE topics** such as simultaneous equations, sequences, transformations and more complex trigonometric identities to deepen their understanding. For English, practising the analysis of prose extracts (not just poetry) and studying how to structure formal arguments will build skills transferable to Section B's argumentative writing option.

Key terms

Pythagoras' theorem, Surd (exact root form), Sine, cosine, tangent, Inverse trigonometric functions, Expanding brackets, Linear equation, Fractional coefficient, Gradient, $y = mx + c$ (straight-line equation), Function notation $f(x)$, Quadratic, cubic, reciprocal graphs, Metaphor, simile, personification, Emotive language, Poetry comprehension, Originality

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Name: School:



TONBRIDGE SCHOOL

Year 10 Entrance Examinations: Specimen A

MATHEMATICS

Time allowed: 1 hour

Total Marks: 80

A CALCULATOR CAN BE USED IN THIS EXAM

Instructions:

1. Complete Name and School at the top of cover page.
2. **All questions should be attempted** and answers given in the space provided.
3. A completely correct answer may receive no marks unless all workings are shown.

1. Expand and **fully** simplify the following:

a) $3(6 - 2x)$

Answer: [2]

b) $(4x - 1)(2x + 5)$

Answer: [3]

c) $(a + b)(3a - 4b)$

Answer: [3]

2. Solve the following equations:

a) $8(y - 3) = 20$

Answer: [2]

b) $2x - 8(x - 3) = 1$

Answer: [3]

c) $16 = \frac{36}{y}$

Answer: [2]

d) $\frac{2}{x-2} = 7$

Answer: [2]

e) $\frac{2x-1}{3} = \frac{x}{8}$

Answer: [3]

f) $\frac{6}{x-1} = \frac{5}{x+4}$

Answer: [3]

g) $\frac{2x-1}{4} - \frac{x+1}{5} = 2$

Answer: [3]

3. Triangle ABC has an angle equal to 90° at C , length of side AC equal to 6cm and an angle at A equal to 30°

a) Draw a diagram, with appropriate labels and showing all the above information. The diagram does **not** need to be drawn with accurate lengths.

[3]

b) Calculate the length of side AB , giving answer to 3 significant figures.

Answer: [2]

c) Use Pythagoras' Theorem to calculate the length of side BC , giving your answer to 3 significant figures.

Answer: [3]

4. A line, **L**, passes through the points $(6,0)$ and $(-2, -4)$.

a) **By first drawing a set of axes**, illustrate the line, **L**, on a graph.

[3]

b) Calculate the gradient of **L**.

Answer: [2]

c) Determine the equation of **L**.

Answer: [3]

5. The following graph is to be drawn:

$$y = 2x^2 - 3x + 1$$

a) Complete the table:

x	-2	-1	0	1	2	3
y		6				10

[3]

b) **By first drawing a set of axes**, then plotting appropriate points based on the information in the above table, draw the graph for the values $-2 \leq x \leq 3$.

[3]

c) Using your graph, *estimate* the solutions of the equation:

$$2x^2 - 3x + 1 = 2$$

Answers: and [2]

6. **Fully** simply the following:

a) $3x^3 \times 3y^3$

Answer: [2]

b) $\frac{18y^6}{6y^3}$

Answer: [2]

c) $(8a^2b^6)^2$

Answer: [2]

d) A formula is given as $v = 72\sqrt{T + 273}$.

Calculate the value of T when $v = 1200$.

Answer: [2]

7. (a) A man is 32 years older than his son. Ten years ago he was three times as old as his son was then. By forming an appropriate equation, or equations, find and list the age of each.

Answer: [3]

- (b) A bus is travelling with 52 passengers. When it arrives at a stop, x get off and 4 get on. At the next stop one third of the passengers get off and then 3 get on. There are now 25 passengers. Find x .

Answer: [3]

8. (a) By first adding the three equations together, or otherwise, solve the equations:

$$3a + b + c = 5$$

$$a + 3b + c = -2$$

$$a + b + 3c = 7$$

Answer: [3]

- (b) Solve the equations:

$$3a + b + c + d = 4$$

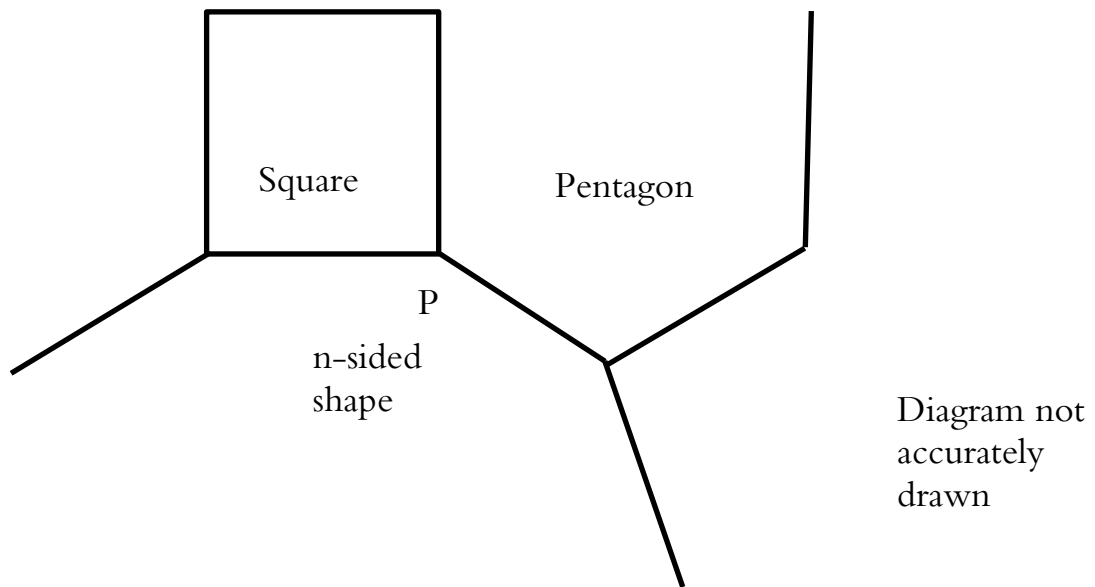
$$a + 3b + c + d = -2$$

$$a + b + 3c + d = 10$$

$$a + b + c + 3d = 0$$

Answer: [4]

9. Two sides of a regular pentagon, a square and a regular n sided polygon meet at the point P.



Find the value of n , showing your working clearly.

Answer: [3]

10. A car completes a journey in 10 minutes. For the first half of the distance the speed was 60km/h and for the second half the speed was 40km/h. How far is the journey?

Answer: [3]

11. Wallace and Gromit are waiting in a queue. There are x people behind Wallace, who is y places in front of Gromit. If there are n people in front of Gromit, how long, in terms of n , x and y , is the queue?

Answer: [3]

END OF EXAM

Paper Notes: 14+ Maths Sample Paper (14+ Maths Sample Paper)

Compiled by [SATs-Papers.co.uk](https://www.SATs-Papers.co.uk) to help you get the most from this paper.

Overview

This is a **Tonbridge School** specimen mathematics paper designed for **14+ entrance (Year 10 entry)**. It is a practice paper intended to familiarise candidates with the style and content of the school's mathematics entrance examination. The paper carries **80 marks** and must be completed within **one hour**, with calculators permitted.

The paper tests a broad range of topics expected of strong Year 9 mathematicians, including algebra (expansion, simplification, solving linear and fractional equations), coordinate geometry (gradients and equations of lines), quadratic functions (completing tables of values, graph plotting, graphical solutions), trigonometry and Pythagoras' theorem, algebraic manipulation of powers and indices, simultaneous equations in three and four variables, and a selection of problem-solving questions involving polygons, distance-speed-time, and logical reasoning.

This specimen is suitable for students preparing for selective independent school entry at 14+, particularly those targeting schools with academically demanding entrance requirements. It assumes fluency in Key Stage 3 algebra and geometry, and introduces elements (such as four-variable simultaneous equations and abstract reasoning tasks) that stretch candidates beyond standard GCSE foundation tier.

How this paper is organised

The paper comprises **11 questions** of varying length and difficulty, totalling **80 marks**. Question 1 focuses on algebraic expansion and simplification (8 marks across three parts). Question 2 contains seven equation-solving tasks (18 marks), progressing from simple linear equations to complex fractional equations. Questions 3 and 4 address trigonometry and coordinate geometry respectively (8 marks each), while Question 5 tackles quadratic graph work (8 marks).

Question 6 covers algebraic manipulation and formula rearrangement (8 marks). Questions 7 and 8 are word problems and simultaneous equations (13 marks combined). Questions 9, 10, and 11 are stand-alone problem-solving challenges involving polygon angles, distance-speed-time, and logical queue reasoning (9 marks total). Each question clearly states its mark allocation in square brackets, and candidates are instructed that full working must be shown to earn credit, even if the final answer is correct.

The paper explicitly permits calculator use, which is essential for certain trigonometric and numerical tasks. The layout is clean, with ample space provided beneath each question for working and answers.

Topics covered

- Expansion of single and double brackets, including terms with two variables (e.g. $(a + b)(3a - 4b)$)
- Solving linear equations with brackets and negative coefficients
- Solving fractional equations, including those with the unknown in the denominator
- Solving equations with algebraic fractions on both sides, requiring cross-multiplication or common denominators
- Right-angled triangle trigonometry using sine, cosine, and tangent to find unknown sides
- Application of Pythagoras' theorem in two dimensions with rounding to significant figures
- Calculating the gradient of a straight line from two coordinate pairs
- Determining the equation of a line in the form $y = mx + c$ from gradient and intercept
- Completing a table of values for a quadratic function and plotting the corresponding parabola
- Using graphs to estimate solutions to quadratic equations by reading intersection points
- Simplifying expressions involving powers and indices, including multiplication and division of algebraic terms
- Rearranging formulae involving square roots and solving for a subject within a square root
- Forming and solving simultaneous equations from word problems involving ages and real-world contexts
- Solving systems of three linear equations in three unknowns by elimination or substitution
- Solving systems of four linear equations in four unknowns, requiring systematic elimination
- Calculating interior angles of regular polygons and applying angle sum properties at a point
- Distance-speed-time problems with split journeys at different speeds, requiring equation setup and solving
- Abstract logical reasoning involving positions in a queue, expressed algebraically

How to use this paper for revision

- Practise expanding double brackets systematically using the grid method or FOIL to avoid sign errors, particularly when dealing with negative terms or two different variables.
- When solving fractional equations, always multiply through by the lowest common denominator early to clear fractions, then solve the resulting linear equation step by step.
- For trigonometry questions, draw and label a clear diagram first, marking the right angle, the given angle, and the sides you know and need to find, then choose the correct ratio (SOH-CAH-TOA).
- In coordinate geometry, always subtract coordinates in a consistent order when calculating gradient: rise over run, $(y_2 - y_1) / (x_2 - x_1)$.
- When plotting quadratic graphs, calculate at least five or six points to capture the curve's shape, and plot carefully on graph paper using a smooth freehand curve through the points.
- For simultaneous equations in three or more variables, label your equations clearly and use elimination systematically, combining pairs to remove one variable at a time.
- In word problems, define your variables explicitly before forming equations, and check that your final numerical answers make sense in the original context.

Common mistakes to avoid

- Forgetting to distribute the multiplier to every term inside brackets, especially the second term, leading to incomplete expansions such as writing $3(6 - 2x)$ as $18 - 2x$ instead of $18 - 6x$.
- Sign errors when expanding expressions with subtraction, particularly in $(4x - 1)(2x + 5)$, where students often write $+5$ instead of -5 for the constant term after combining like terms.
- Incorrectly manipulating fractional equations by cross-multiplying only one side, or forgetting to multiply every term by the denominator, resulting in lost terms.
- Confusing which trigonometric ratio to use, for example using sine when cosine is required, because students do not carefully identify the opposite, adjacent, and hypotenuse relative to the given angle.
- Rounding intermediate steps too early in multi-step calculations, which compounds rounding errors and produces a final answer outside acceptable tolerance when three significant figures are required.
- Misreading the graph when estimating solutions, particularly if grid lines are not carefully followed, or giving only one solution when a quadratic equation has two roots.

Exam technique

Allocate your **one hour** carefully across the **11 questions**. Spend roughly one minute per mark as a guideline, so a 3-mark question should take about three minutes. Start with the questions you find most straightforward (likely Questions 1 and 2) to build confidence and bank marks early, then tackle the more demanding problem-solving tasks (Questions 7, 9, 10, 11) once you have secure foundations.

Always show full working, even for questions where the answer seems obvious. The rubric explicitly states that a correct answer without working may receive no marks, so write out each algebraic step, label your diagrams, and make your reasoning transparent. Use your calculator efficiently for trigonometric values and arithmetic, but write down the intermediate expressions before substituting numbers, so that method marks are clear.

If you become stuck on a multi-part question, attempt the earlier parts and move on. Many questions are structured so that later parts do not depend on earlier ones, or you can still earn method marks by setting up the correct approach even if arithmetic errors creep in. In the final five minutes, check that you have attempted every question and

that numerical answers are given to the specified accuracy (e.g. three significant figures).

What to revise alongside this paper

Alongside this paper, revise **factorising quadratic expressions** and **solving quadratic equations by factorisation or the quadratic formula**, as these are natural extensions of the quadratic graph work in Question 5. Strengthen your skills in **algebraic proof** and **forming expressions from geometric or real-world contexts**, since Questions 9, 10, and 11 require translating verbal descriptions into algebraic setups.

Ensure confidence with **rearranging formulae** where the subject appears more than once or is inside a function (square root, fraction), as Question 6(d) tests this. Practise **exact trigonometric values** for 30° , 45° , and 60° angles, and work on **Pythagoras in three dimensions** if you are preparing for schools that extend these concepts further.

For stretch, explore **systems of equations with more than three variables**, **parametric and vector equations of lines**, and **optimisation problems** involving quadratic models. These topics appear in GCSE higher tier and IGCSE extended mathematics, and provide excellent preparation for the most demanding independent school 14+ papers.

Key terms

Expansion, Simplification, Linear equation, Fractional equation, Cross-multiplication, Pythagoras' theorem, Trigonometry, Gradient, Equation of a line, Quadratic function, Parabola, Table of values, Simultaneous equations, Elimination, Substitution, Interior angle, Regular polygon, Distance-speed-time

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Name: School:



TONBRIDGE SCHOOL

Test for Entrance into Year 10: Specimen B

MATHEMATICS

Time allowed: 1 hour

Total Marks: 80

A CALCULATOR CAN BE USED IN THIS EXAM

Instructions:

1. Complete “Name” and “School” section at the top of cover page
2. **All questions should be attempted** and answers given in the space provided
3. No additional paper, including graph paper, is required.

1. Expand and **fully** simplify the following:

a) $4(5 - 3x)$

Answer: [2]

b) $(2x - 1)(x + 5)$

Answer: [3]

c) $(x + y)(2x - 3y)$

Answer: [3]

2. Solve the following equations:

a) $4(x - 3) = 20$

Answer: [2]

b) $2x - 4(x - 3) = 1$

Answer: [3]

c) $12 = \frac{36}{x}$

Answer: [2]

d) $\frac{2}{x+1} = 5$

Answer: [2]

e) $\frac{2x-1}{3} = \frac{x}{5}$

Answer: [3]

f) $\frac{2}{x-1} = \frac{5}{x+4}$

Answer: [3]

g) $\frac{2x-1}{3} - \frac{x+1}{5} = 2$

Answer: [3]

h) $2x^2 = 512$

Answer: [3]

3. Triangle ABC has an angle equal to 90° at C , length of side AC equal to 5cm and length of side AB equal to 9cm.
- a) Draw a diagram, with appropriate labels and showing all the above information. The diagram does **not** need to be drawn with accurate lengths.

[3]

- b) Calculate the length of side BC , giving your answer to 3 significant figures

Answer: [2]

- c) Calculate the size of angle ABC , giving your answer to 3 significant figures

Answer: [3]

4. A line, **L**, passes through the points $(4,0)$ and $(-1,-2)$.

a) **By first drawing a set of axes**, illustrate the line, **L**, on a graph.

[3]

b) Calculate the gradient of **L**.

Answer: [2]

c) Determine the equation of **L**.

Answer: [4]

5. a) Solve the simultaneous equations

$$3u - 2v = 17$$

$$5u - 3v = 28$$

$$u = \dots\dots\dots \quad v = \dots\dots\dots \quad [4]$$

6. The following graph is to be drawn

$$y = 2x^2 - 3x$$

a) Complete the table

x	-2	-1	0	1	2	3
y		5				9

[3]

b) **By first drawing a set of axes**, then plotting appropriate points based on the information in the above table, draw the graph for the values $-2 \leq x \leq 3$

[3]

c) Using your graph, *estimate* the solutions of the equation

$$2x^2 - 3x = 1$$

Answers: and [2]

7. **Fully** simply the following:

a) $2m + 3m$

Answer: [1]

b) $3y^3 \times 3y^3$

Answer: [2]

c) $\frac{9y^6}{3y^2}$

Answer: [2]

d) $(4a^2b^6)^2$

Answer: [3]

8. A car journey of 380 km takes 4 hours. Part of this journey is on a motorway at an average speed of 110 km per hour; the remainder of the journey is on country roads at an average speed of 70 km per hour.

a) Write this information as a pair of simultaneous equations

Answer: [3]

b) Solve these simultaneous equations to find how many kilometres of the journey is spent on the motorway.

Answer:km [3]

9. a) A formula is given as $v = u + at$

Calculate the value of t when $v = 12, u = -3, a = 5$

Answer: [2]

b) A formula is given as $h = \sqrt{a^2 + b^2}$

Calculate the values of a when $h = 13, b = 5$

Answer: [3]

c) A formula is given by $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

Calculate the value of u when $f = 5, v = 6$

Answer: [3]

END OF PAPER

Paper Notes: 14+ Maths Sample Paper (14+ Maths Sample Paper)

Compiled by [SATs-Papers.co.uk](https://www.SATs-Papers.co.uk) to help you get the most from this paper.

Overview

This is a **specimen mathematics paper** for **Year 10 entrance** at **Tonbridge School**, designed to assess students seeking to enter the school at **14+**. The paper carries **80 marks** and must be completed within **one hour**, with calculator use explicitly permitted throughout. It tests core GCSE-level algebraic manipulation, equation solving, coordinate geometry, trigonometry, and problem-solving skills that bridge Key Stage 3 and early GCSE content.

The paper comprises **nine multi-part questions** covering expansion of brackets, linear and fractional equations, simultaneous equations, right-angled triangle trigonometry, straight-line graphs, quadratic functions, algebraic simplification, and substitution into formulae. Most questions progress in difficulty across their sub-parts, with earlier sections testing mechanical fluency and later parts requiring multi-step reasoning or the synthesis of two techniques.

This specimen is particularly useful for students preparing for selective independent school entrance at 14+, offering insight into the mathematical standard expected at schools such as Tonbridge. The paper rewards precision, clear working, and familiarity with algebraic conventions. Students aiming for grammar school or maintained sixth-form entry at 16+ will also find it valuable, as it models the fluency and problem-solving depth expected in top-tier selective admissions.

How this paper is organised

The paper opens with straightforward **algebra**: expansion of single and double brackets, followed by a substantial section on **solving equations** that accounts for **21 marks** across eight sub-questions. These range from simple one-step rearrangements through to multi-step fractional equations and an exponential problem. Question 3 introduces **right-angled trigonometry**, requiring diagram sketching, Pythagoras, and inverse trigonometric functions, worth 8 marks in total.

Question 4 shifts to **coordinate geometry**: plotting a line, calculating gradient, and determining its equation, worth 9 marks. Question 5 examines **simultaneous equations** by elimination, while Question 6 involves completing a quadratic table of values, plotting the curve, and using the graph to estimate solutions, totalling 8 marks. Question

7 tests **algebraic manipulation** of indices, and Question 8 presents a real-world speed-distance-time problem requiring simultaneous equations, worth 6 marks.

The final question tests **substitution into formulae** and rearrangement, including Pythagoras and the lens formula. Each question is clearly labelled with individual mark allocations in square brackets, and ample space is provided for working. The layout is clean and uncluttered, with no extraneous diagrams or distractions.

Topics covered

- Expansion of single brackets and distribution of negative terms
- Expansion of double brackets (FOIL method) involving two variables
- Solving linear equations with brackets and negative coefficients
- Solving equations involving fractions and reciprocals
- Cross-multiplication to solve rational equations with unknowns in the denominator
- Solving equations with exponential terms by factorising or taking square roots
- Pythagoras' theorem in right-angled triangles with missing side calculation
- Trigonometric ratios (sine, cosine, tangent) and inverse functions to find angles
- Calculating the gradient of a straight line from two coordinate points
- Determining the equation of a line in the form $y = mx + c$
- Solving simultaneous linear equations by elimination or substitution
- Completing a table of values for a quadratic function and plotting a parabola
- Using a quadratic graph to estimate solutions graphically
- Simplifying expressions involving powers: addition of like terms, multiplication and division of indices
- Raising a power to a power and squaring a product
- Forming and solving simultaneous equations from a word problem involving distance, speed, and time
- Substituting numerical values into formulae and rearranging to find an unknown
- Manipulating formulae involving reciprocals and solving for a specified variable

How to use this paper for revision

- Practise expanding brackets systematically: distribute every term in the first bracket by every term in the second, then collect like terms carefully to avoid sign errors.
- When solving equations with fractions, multiply through by the lowest common multiple of all denominators early to clear fractions and simplify working.
- For right-angled triangle problems, always sketch and label a diagram first, marking the hypotenuse, opposite, and adjacent sides relative to the angle in question.
- To find the equation of a line, calculate the gradient using $(y_2 - y_1) \div (x_2 - x_1)$, then substitute one point into $y = mx + c$ to solve for c .
- When plotting a quadratic graph, calculate each y -value by substituting carefully: check signs, square before multiplying, and work step by step.
- Revise the laws of indices: $x^a \times x^b = x^{a+b}$, $x^a \div x^b = x^{a-b}$, and $(x^a)^b = x^{ab}$. Write out each step when simplifying to avoid confusion.
- For simultaneous equations, decide whether elimination or substitution is quicker; elimination is often cleaner when coefficients are small or easily matched.

Common mistakes to avoid

- Forgetting to distribute the negative sign when expanding brackets like $4(x - 3)$ or $-4(x - 3)$, leading to incorrect signs in the final expression.
- Dividing only one term by a common factor when solving equations, rather than dividing every term on both sides of the equals sign.
- Confusing sine, cosine, and tangent: remember SOH-CAH-TOA and identify opposite, adjacent, and hypotenuse relative to the angle you are working with.
- Calculating gradient incorrectly by subtracting coordinates in the wrong order or mixing up x and y differences; always use $(y_2 - y_1) \div (x_2 - x_1)$ consistently.
- Forgetting to use inverse trigonometric functions (\sin^{-1} , \cos^{-1} , \tan^{-1}) when finding an angle from a ratio; pressing \sin instead of \sin^{-1} on the calculator.
- Failing to simplify index expressions fully: for example, stopping at $9y^6 \div 3y^2 = 3y^{6-2}$ without completing the subtraction to $3y^4$.
- Rounding intermediate values too early in multi-step problems, which compounds error; work with exact fractions or full calculator displays until the final answer.

Exam technique

Allocate roughly **6 to 7 minutes per question** on average, though some (like the quadratic graph) will take longer and others (like simplifying $2m + 3m$) should take

seconds. Tackle questions in order initially, but if you find yourself stuck on a multi-part question, move on and return later; partial marks are available for each sub-part, so completing four parts of Question 2 is better than grinding away on one difficult fractional equation.

Show all working clearly, even for straightforward algebra: examiners award method marks for correct processes, and if your final answer is wrong, clear working can still earn most of the marks. Use the mark allocations as a guide to how much detail is expected: a [1]-mark question typically requires a single step, while a [3]-mark question expects intermediate stages to be visible.

For graph work, plot points accurately and use a ruler for straight lines; a wobbly curve or misaligned axis can cost marks, and rough sketches in trigonometry or coordinate geometry questions should still be clearly labelled. Check units in word problems and ensure your final answer matches what the question asks for (for example, kilometres, not hours, in Question 8b). Use any remaining time to revisit questions where you have left blanks or to verify arithmetic in questions carrying higher marks.

What to revise alongside this paper

Students should consolidate **factorising quadratics** and completing the square, as these underpin the algebraic fluency tested here and will be required in later GCSE topics such as solving quadratic equations algebraically. Revise **forming equations from word problems**, particularly involving ratios, percentages, and real-world contexts like speed and distance, to build confidence in translating prose into mathematical statements.

Practise **transformations of graphs** and recognising the effect of coefficients in $y = ax^2 + bx + c$, as this deepens understanding of the parabola sketched in Question 6. Extend trigonometry skills to include **sine and cosine rules** for non-right-angled triangles, and explore **circle theorems** and bearings, which often appear in selective school papers at this level.

Strengthen calculator skills: ensure fluency with fraction and power buttons, inverse trigonometric functions, and storing intermediate results in memory to maintain accuracy. Work through similar specimen or past papers from other independent schools to familiarise yourself with the variety of question styles and difficulty levels encountered in 14+ entrance mathematics.

Key terms

Expansion, Simplify, Like terms, Linear equation, Simultaneous equations, Elimination, Substitution, Pythagoras' theorem, Hypotenuse, Trigonometric ratio, Gradient, y-intercept, Quadratic function, Parabola, Table of values, Index laws, Reciprocal, Rearrange, Substitution into formulae, Significant figures

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