

13+ PAST PAPER PACK

Oundle School 13+ Maths 2024

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EXAMINATION PAPER

Junior Entry 2024

Mathematics

Time allowed: 1 hour

Name: _____

Instructions

- Calculators are **NOT** allowed.
- Write **ALL** your working and answers on this paper. Show enough working on each question to make it clear how you reached your answer.
- Do not spend too long working on any particular question. Do not worry if you do not manage to complete every question.
- You may work in pen or pencil.

Question 1

- (a) Angela has a cookie weighing 12.3g. After taking a bite she weighs the cookie again, and it now weighs 9.47g. What was the weight of the bite of cookie Alice took?

Answer

- (b) A school buys 27 boxes of exercise books, each containing 25 exercise books. After each pupil in the school has received one exercise book there are 21 books remaining.

How many pupils are there in the school?

Answer

- (c) Chris works as a waiter with 6 other people. They share the tips fairly after each shift. If the tip jar contains £104.16 at the end of a shift, how much does Chris get?

Answer

- (d) Each month Daniel spends £674.58 on his mortgage and £197.76 on energy bills. How much are these two expenses combined?

Answer

Question 2 Work out the following, obeying the correct order of operations.

(a) $8 + 7 - 6 + 5$

Answer

(b) $2 + 3 - 4 \times 5$

Answer

(c) $1 + 2 \times 3^2$

Answer

(d) $12 - (3 - 4) \times 5$

Answer

(e) $1 - (23 - 4 \times 5)$

Answer

(f) $20 \div (2 - 4) + 202 \times 4$

Answer

Question 3 Insert one or more pairs of brackets to make the following statements correct:

(a) $4 + 3^2 + 1 \div 5 = 6$

(b) $4 + 3^2 + 1 \div 5 = 10$

Question 4 Using the fact that $34 \times 432 = 14688$, write down the missing number in each part.

(a) $34 \times 43.2 = ?$

Answer

(b) $? \times 4.32 = 14.688$

Answer

(c) $146.88 \div ? = 3400$

Answer

(d) $170 \times 432 = ?$

Answer

(e) $14688 \div ? = 17$

Answer

Question 5 You have the numbers -6 , 4 , 5 and -12 available. Any of these numbers can be used in **each** part of the question, but only once per part.

(a) What is the greatest number that can be obtained by adding two of the above numbers?

Answer

(b) What is the greatest number that can be obtained by subtracting one number from another?

Answer

(c) What is the least number that can be obtained by dividing two of the above numbers?

Answer

(d) By replacing the missing numbers, what is the greatest value of this calculation

$$(? - ?) \times ?$$

Answer

Question 6

(a) Which fraction is bigger, $\frac{3}{8}$ or $\frac{4}{11}$?

Answer

(b) Write down a fraction which is greater than $\frac{5}{13}$, but less than $\frac{6}{13}$.

Answer

(c) Calculate $\frac{2}{7} + \frac{4}{21}$.

Answer

(d) Calculate $\frac{5}{8} \times \frac{16}{25}$, remembering to simplify your answer.

Answer

(e) What is the result if $1\frac{2}{3}$ is taken from $3\frac{1}{3}$?

Answer

Question 7

In this question you may use the grid below to help you answer the questions.

A straight line passes through the points (4,3) and (12,19).

(a) (i) The point (11, a) also lies on the line. Calculate the value of a .

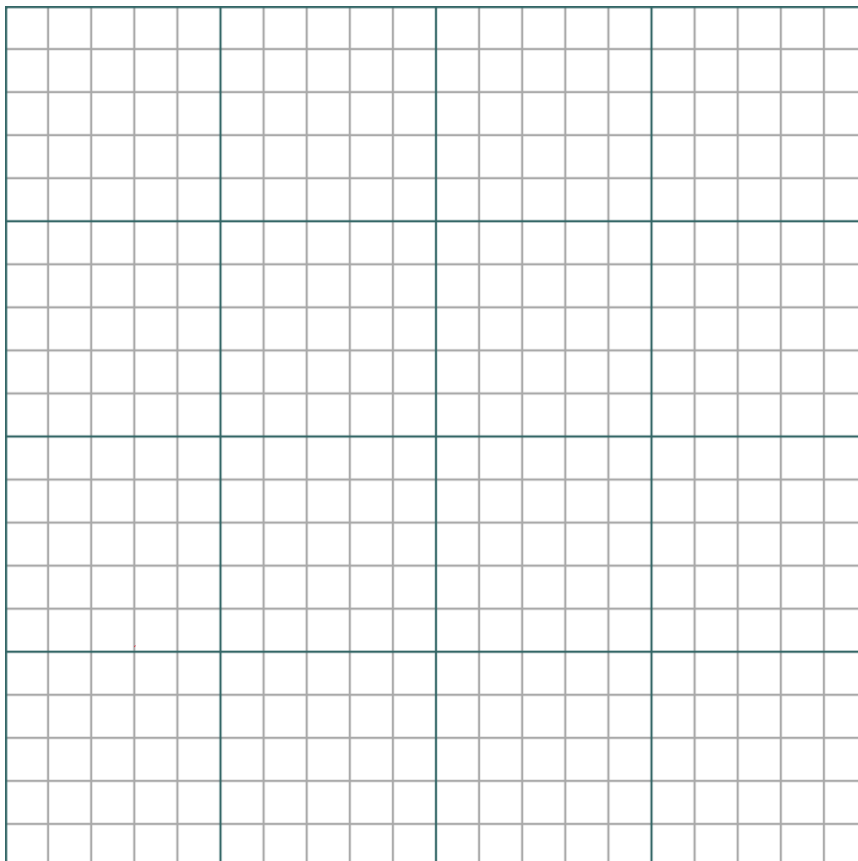
Answer

(ii) The point (b , 9) also lies on the line. Calculate the value of b .

Answer

(b) Another point (4,11) forms a triangle with (4,3) and (12,19). Find the area of the triangle.

Answer



Question 8

If it takes six horses three days to eat a bag of oats, how long will it take four horses to eat two bags of oats?

Answer

Question 9

James buys a six-pack of cola cans for £5 and sells them to his friends at 90p each. What is his percentage profit?

Answer

Question 10

A bag contains red, yellow, and green beads in the ratio 3: 2: 7. There are 24 more green beads than there are red beads. How many yellow beads are there?

Answer

Question 11

m and n are two *different, positive* whole numbers which make the following statement true

$$5m + 4n = 60$$

How many possible pairs of numbers make the statement above true?

Answer

Question 12

The symbol \otimes represents a mathematical operation between two numbers which works as follows:

Subtract the sum of the two numbers from their product

ie. $5 \otimes 7 = 5 \times 7 - (5 + 7)$
 $= 23$

For each part, write down the missing value

(a) $4 \otimes 9 = ?$

Answer

(b) $8 \otimes ? = 13$

Answer

(c) $3 \otimes (4 \otimes 6) = ?$

Answer

(d) $? \otimes (2 \otimes 5) = 17$

Answer

Paper Notes: 13+ Maths Question Paper (13+ Maths Past Paper (2024))

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 **Oundle School Junior Entry 2024 Mathematics paper**, a genuine 13+ entrance examination from Northamptonshire's Oundle School. The paper is designed for students applying for Year 9 entry and carries a **one-hour time limit**. Calculators are not permitted, making mental arithmetic and clear written working essential throughout.

The paper tests a broad range of mathematical skills expected at the end of Year 8, including decimal arithmetic, order of operations, negative numbers, fractions, ratio, coordinate geometry, and algebraic reasoning. Questions are presented as a mix of short-answer calculations and multi-step problem-solving tasks, with working space provided directly on the exam paper. The format is varied, moving from straightforward computation to more abstract reasoning challenges.

This paper suits students preparing for selective independent school entrance exams at 13+, particularly those targeting schools with strong academic expectations. The absence of calculator use and the inclusion of questions requiring logical thinking (such as Question 8's rate problem and Question 12's novel operation) make it an excellent diagnostic tool for identifying gaps in foundational maths and reasoning skills.

How this paper is organised

The paper comprises **12 questions** of varying length, totalling around 40 individual parts across the full hour. Question 1 opens with four straightforward decimal and whole-number problems (subtraction, multiplication with remainders, division, and addition). Questions 2 and 3 focus on **order of operations**, requiring students to evaluate expressions and insert brackets correctly. Question 4 tests decimal place value and multiplicative reasoning using a given fact.

Questions 5 and 6 explore negative numbers and fractions respectively, with Question 5 requiring strategic selection from a set of integers and Question 6 covering comparison, addition, multiplication, and mixed-number subtraction. Question 7 turns to **coordinate geometry**, asking students to find unknown coordinates on a line and calculate the area of a triangle, with grid paper provided for working.

Questions 8 to 12 become progressively more challenging. Question 8 is a classic **rate problem** involving horses and oats. Question 9 asks for percentage profit. Question 10 uses ratio and algebra, Question 11 requires systematic solution-finding for a linear

Diophantine equation, and Question 12 introduces a custom operation symbol, testing students' ability to follow unfamiliar notation and work backwards through equations. The paper does not indicate individual mark allocations, but the progression from routine calculation to complex reasoning is clear.

Topics covered

- Decimal arithmetic (addition, subtraction, and place-value reasoning with decimals to two places)
- Whole-number operations including multi-step problems with multiplication and subtraction
- Order of operations (BIDMAS/BODMAS) with brackets, exponents, multiplication, division, addition, and subtraction
- Negative integers (addition, subtraction, division, and strategic selection for maximum or minimum values)
- Fraction comparison using cross-multiplication or common denominators
- Fraction arithmetic including addition with different denominators, multiplication, and simplification
- Mixed-number subtraction requiring conversion to improper fractions
- Coordinate geometry (finding unknown coordinates on a linear graph and calculating triangle area on a grid)
- Ratio problems with algebraic reasoning to find unknown quantities
- Rate and proportion (unitary method applied to horses consuming oats over time)
- Percentage profit calculations from cost and selling price
- Linear Diophantine equations (finding all positive integer solutions to a two-variable equation)
- Novel mathematical operations defined symbolically, with forward and inverse application

How to use this paper for revision

- Practise **mental arithmetic** with decimals and negative numbers daily, as calculators are forbidden and speed matters under timed conditions.
- Review **BIDMAS/BODMAS** thoroughly, paying special attention to how brackets change evaluation order and how to insert them strategically.
- Work through multi-step ratio and proportion problems without a calculator, building confidence in converting ratios to equations and solving for unknowns.
- Sketch coordinate grids when tackling geometry questions, even if grid paper is provided, to visualise lines and triangles clearly before calculating.
- For unfamiliar notation (like Question 12's custom operation), write out the definition in words first, then substitute step-by-step to avoid confusion.
- Check fraction answers are fully simplified; examiners at this level expect lowest terms and may penalise unsimplified results.
- Time yourself strictly on past papers, aiming to complete all 12 questions within 55 minutes to leave five minutes for checking arithmetic.

Common mistakes to avoid

- Misapplying order of operations by adding or subtracting before multiplying or dividing, particularly when brackets or exponents are involved (Question 2).
- Forgetting to subtract both numbers when evaluating expressions like $5 \times 7 - (5 + 7)$, leading to incorrect results with custom operations (Question 12).
- Losing track of negative signs when subtracting negative numbers or dividing negatives, especially under time pressure (Question 5).
- Failing to find a **common denominator** when adding fractions like $\frac{2}{7} + \frac{4}{21}$, or attempting to add numerators and denominators separately.
- Confusing rate problems by not recognising that fewer horses take proportionally longer to eat the same amount, leading to incorrect scaling (Question 8).
- Leaving fraction answers unsimplified, particularly after multiplication, when cancellation should have been applied early to keep numbers manageable (Question 6d).

Exam technique

Begin by scanning the entire paper to identify the quickest wins. Questions 1 and 2 are largely computational and should be completed rapidly to build confidence and secure easy marks early. Allocate roughly **five minutes per question** on average, but be

prepared to spend more time on later multi-part problems like Questions 7, 11, and 12, which require deeper reasoning.

Show all working clearly, even for questions where the method seems obvious. Oundle examiners will expect to see your thought process, and partial credit may be available if your final answer is incorrect but your method is sound. For questions involving unfamiliar symbols or complex wording (such as Question 8's rate problem or Question 12's custom operation), write down what you know first and break the problem into smaller steps rather than rushing to a final answer.

Keep an eye on the clock and do not let a single difficult question consume more than eight minutes. If you are stuck, leave space and move on; you can return if time permits. Use the final five minutes to check arithmetic, particularly with decimals and fractions, and to verify that you have answered what the question actually asks. Remember that questions later in the paper often test reasoning more than calculation, so confidence with algebraic thinking and logical deduction is just as important as fluency with number work.

What to revise alongside this paper

Students should consolidate their understanding of **algebraic manipulation**, particularly solving linear equations and rearranging formulae, as these skills underpin Questions 7, 11, and 12. Familiarity with **simultaneous equations** will also help when tackling problems that require finding multiple unknowns from given constraints.

Broaden your fraction skills to include division of fractions and operations with algebraic fractions, both of which appear frequently in later 13+ papers and GCSE foundation topics. Work on **problem-solving strategies** such as working backwards, testing cases systematically, and recognising when a question requires logical reasoning rather than formulaic calculation. Questions 8, 11, and 12 are exemplars of this style.

Finally, practise interpreting novel mathematical notation and definitions, a skill tested in Question 12 and increasingly common in entrance exams for academically selective schools. Extend your study to include basic **functions** and **mappings**, which provide a formal framework for understanding operations like the one introduced in this paper.

Key terms

BIDMAS / BODMAS, Order of operations, Decimal place value, Negative integers, Fraction simplification, Common denominator, Mixed numbers, Improper fractions, Ratio, Coordinate geometry, Linear equation, Diophantine equation, Rate and proportion, Percentage profit, Custom operation

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EXAMINATION PAPER
Non Common Entrance 2024

Mathematics

Time allowed: 1 hour

Name: _____

Instructions

- Calculators are **NOT** allowed.
- Write **ALL** your working and answers on this paper. Show enough working on each question to make it clear how you reached your answer.
- Do not spend too long working on any one question. Do not worry if you do not manage to complete every question.
- You may work in pen or pencil.

Question 1

An Olympic dive is scored as follows:

Seven judges give a score out of 10; the two top and two bottom scores are ignored and the sum of the three remaining scores is calculated. This sum is then multiplied by the difficulty rating of the dive.

- (a) Tom performs a dive with a difficulty rating of 3.2 and receives the following scores from the judges:

7.5, 8.5, 7.0, 7.5, 8.5, 7.0, 9.0

Calculate Tom's total score for the dive.

Answer

- (b) Greg achieves a score of 68.55 on his dive. How many more points did Tom score?

Answer

- (c) Lauren achieved a final score of 58.8 for a dive with a difficulty rating of 2.4. What was the sum of the three judge's scores used?

Answer

Question 2 Work out the following, obeying the correct order of operations.

(a) $14 + 8 - 7 + 5$

Answer

(b) $19 - 20 \div (6 - 4 \times 2)$

Answer

(c) $5 \times 4^2 - (1 - 3)$

Answer

(d) $((3 + 2 \times 4)^2 - 7) \div 2$

Answer

Question 3

(a) Write 84 as a product of its prime factors

Answer

(b) List all the factors of 84, in ascending order

Answer

Question 4 Calculate the following. Your answers should be fully simplified and written as a mixed number where appropriate.

(a) $\frac{2}{3} + \frac{3}{7}$

Answer

(b) $\frac{3}{14} - \frac{1}{6}$

Answer

(c) $\frac{7}{24} \times \frac{16}{21}$

Answer

(d) $\frac{7}{8} \div \frac{17}{24}$

Answer

Question 5

- (a) Two security guards continuously patrol a museum, each with a different patrol route starting and ending at the same place. The first guard takes 24 minutes to patrol her route and the second guard takes 30 minutes to patrol his. If they both start patrolling at 9pm, what time will it be when the two guards meet at the start point again?

Answer

- (b) 20 chemists, 28 physicists, and 16 biologists are to be split into equal sized teams, so that each team has the same ratio of chemists, physicists and biologists. What is the maximum number of teams which can be made in this way?

Answer

Question 6

If $a = 7$, $b = -3$ and $c = 5$, find the value of the following expressions

(a) $c - ab$

Answer

(b) $\frac{ab^2}{c}$

Answer

(c) $\frac{3b}{2(a+c)}$

Answer

Question 7 Fully simplify the following algebraic expressions

(a) $7a + 4b - a - 12b$

Answer

(b) $5x - 3x - 7 + x^2 - 12$

Answer

(c) $5pq + 4p - 2q + 6p$

Answer

(d) $(3x)^2 \times 2xy$

Answer

Question 8 Solve the following equations, leaving your answers as improper fractions where necessary.

(a) $5x - 7 = 48$

Answer

(b) $\frac{3x}{4} + 2 = 8$

Answer

(c) $7(3x - 4) = -70$

Answer

(d) $4x - 5 = 43 - 10x$

Answer

(e) $\frac{5x-3}{6} = 12$

Answer

(f) $3x + \frac{2}{7} = 3 - \frac{3}{4}x$

Answer

Question 9

For the following questions you must form and solve an equation.

- (a) I think of a number, subtract fifteen, then multiply the result by 6; I now have 48.
What was the number I thought of?

Equation

Solution

- (b) Jimmy is five years older than Robert. John is three years short of being twice Robert's age. The total of their ages is 78. How old is Robert?

Equation

Solution

Question 10

A bag contains a mixture of red and yellow beads. There are 40 beads in total, and there are 4 more yellow beads than red beads.

- a) What is the ratio of red beads to yellow beads? Give your answer in its simplest form.

Answer

An equal number of red and yellow beads are added to the bag, so that there are still 4 more yellow beads than red beads. The ratio of red to yellow beads is now 13:15.

- b) How many beads were added?

Answer

Question 11

Janice bought a vase, a painting, and a desk at a car boot sale. She took the items to an antiques shop to sell them.

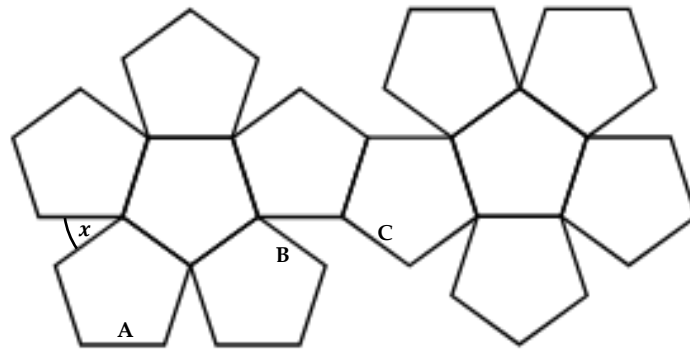
- Janice originally paid £75 for all three items.
- The vase sold for £25, which is £5 more than Janice paid for it.
- The painting cost Janice £15, but she sold it at two thirds that price.
- The desk sold for 15% more than Janice paid for it.

Calculate the overall percentage profit that Janice made.

Answer

Question 12

The diagram below shows the net of a dodecahedron, a 3D shape made up of 12 regular pentagons.



- (a) One of the edges is marked with the letter A. Mark on the diagram the edge which will line up with A when the net is folded up to make a dodecahedron. Label the edge A'.
- (b) Find the size of the angle marked x . You must state any angle rules which you use.

Answer

- (c) Determine whether the lines marked B and C are parallel. Your answer must be supported by calculations and angle reasons; a simple “yes” or “no” will receive no marks.

Answer

Paper Notes: 13+ Maths Question Paper (13+ Maths Past Paper (2024))

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 **2024 Non Common Entrance 13+ Mathematics examination paper** from **Oundle School** in Northamptonshire. The paper is designed for candidates sitting the school's internal 13+ entrance exam (for Year 9 entry) and provides an alternative to the Common Entrance route.

The paper tests a wide range of mathematical topics expected at **13+ level**, including arithmetic, algebra, fractions, prime factorisation, problem-solving with ratios and percentages, and geometric reasoning. Questions are presented as **free-response problems** requiring full working and answers to be written on the paper itself. Calculators are **not permitted**, so candidates must rely on mental arithmetic and written methods throughout.

This paper is particularly suitable for students preparing for **13+ entrance exams at independent schools** or those looking to stretch their mathematical skills at the end of Year 8. The questions demand clear working, accurate calculation, and the ability to form and solve equations from worded problems. With **one hour allowed** and twelve multi-part questions, the paper balances breadth of content with sufficient challenge for this age group.

How this paper is organised

The paper contains **twelve questions**, each broken into multiple sub-parts, and candidates are given **one hour** to complete it. Questions range from straightforward arithmetic and algebraic manipulation to multi-step problem-solving and geometric reasoning. The paper does not specify individual mark allocations, but the number of sub-parts suggests candidates should aim to spend roughly five minutes per main question.

The structure is progressive, starting with accessible questions on order of operations and prime factorisation (Questions 2 and 3) before building to more complex problems involving Olympic dive scoring, algebraic substitution, and percentage profit calculations. The final question on dodecahedron nets requires spatial reasoning and angle work with justification.

Candidates are instructed to **show all working** and write answers directly on the paper. The instructions emphasise that spending too long on any one question is inadvisable,

suggesting that moving on and returning later is a sensible strategy. The layout is clear, with ample space for working beneath each sub-question.

Topics covered

- Multi-step arithmetic problems with contextual application (Olympic dive scoring involving weighted averages and difficulty multipliers)
- Order of operations (BIDMAS/BODMAS) including expressions with nested brackets and exponents
- Prime factorisation and systematic listing of all factors of composite numbers
- Addition, subtraction, multiplication, and division of fractions with simplification and conversion to mixed numbers
- Least common multiple (LCM) and highest common factor (HCF) applied to real-world scheduling and grouping problems
- Algebraic substitution with negative numbers and evaluation of expressions involving squares and fractions
- Simplification of algebraic expressions by collecting like terms and multiplying powers
- Solving linear equations including those with brackets, fractions, and unknowns on both sides
- Forming and solving equations from worded problems (number puzzles and age problems)
- Ratios in context, including maintaining ratios when quantities change and solving ratio problems with constraints
- Percentage profit and loss calculations involving multiple transactions and overall financial outcomes
- Properties of regular pentagons, angle calculations in polygons, nets of 3D shapes (dodecahedra), and determining whether lines are parallel using angle rules

How to use this paper for revision

- Practise order of operations questions daily, ensuring you always handle brackets first, then indices, then division and multiplication (left to right), and finally addition and subtraction (left to right).
- For fraction arithmetic, become fluent in finding common denominators quickly; knowing times tables up to 12 and recognising factor pairs helps enormously.
- When forming equations from word problems, define your variable clearly at the start (e.g. 'Let x be Robert's age') and translate each sentence into an algebraic expression step by step.
- Revise the interior angle formula for regular polygons: $(n - 2) \times 180^\circ \div n$. For a regular pentagon, each interior angle is 108° , which is essential for Question 12.
- Make sure you can factorise numbers into prime factors using a factor tree and then list all factors systematically by pairing them (1 with 84, 2 with 42, etc.).
- For ratio problems, check whether the question asks for a ratio in simplest form or whether you need to scale up or down to match a given total or constraint.
- Always show full working, even for questions that seem straightforward; partial marks are often awarded for correct methods even if the final answer is wrong.

Common mistakes to avoid

- Forgetting to ignore the highest and lowest scores in the Olympic dive question before summing the middle three, leading to incorrect totals.
- Misapplying order of operations by adding or subtracting before multiplying or dividing, especially in expressions with nested brackets like Question 2(b).
- Writing 84 as 2×42 or 4×21 and stopping there, rather than continuing to express it as a product of prime factors ($2^2 \times 3 \times 7$).
- Adding fractions without finding a common denominator, or multiplying denominators together when dividing fractions instead of flipping and multiplying.
- Treating algebraic terms like $5pq$ and pq as separate when simplifying, or incorrectly combining terms with different variables (e.g. adding $4p$ and $2q$).
- Expanding brackets incorrectly, such as writing $7(3x - 4)$ as $21x - 4$ instead of $21x - 28$, by forgetting to multiply every term inside the bracket.
- Setting up ratio equations incorrectly when the difference between parts is given rather than the total, or confusing 'ratio of red to yellow' with 'ratio of yellow to red'.

Exam technique

Begin by skimming the entire paper to identify which questions look most straightforward and which will require more thought. Tackle the questions you find easiest first to build confidence and secure marks quickly, then return to the more challenging multi-step problems later. With **one hour for twelve questions**, aim for roughly five minutes per question, but be flexible; some sub-parts will take 30 seconds, others may need three minutes.

For every question requiring an equation, **show your working explicitly**: define your variable, write the equation in symbols, and solve it step by step. Even if you make an arithmetic error, you can earn partial credit for a correct method. Similarly, in geometry questions like Question 12, state the angle rules you are using (e.g. 'angles on a straight line sum to 180° ' or 'interior angle of regular pentagon is 108° ') to demonstrate your reasoning.

If you get stuck on a sub-part, move on rather than letting one question consume ten minutes. You can always return if time permits. Check your answers for reasonableness: does a percentage profit of 200% make sense given the numbers in Question 11? Does your solution to an age problem yield positive, sensible ages? These quick sanity checks catch many errors.

What to revise alongside this paper

Students should revise **sequences and nth term rules**, as these often appear on 13+ papers and test similar algebraic manipulation skills. Practise **simultaneous equations**, which are a natural next step after solving single-variable linear equations and may be tested at interview or scholarship level. Work on **area and perimeter of compound shapes**, including circles and trapeziums, as these frequently accompany percentage and ratio problems in context.

For geometry, review **properties of quadrilaterals**, circle theorems (at an introductory level), and angle reasoning involving transversals cutting parallel lines. This builds the logical framework needed for Question 12(c). Ensure you are confident with **negative numbers in all operations**, including squaring negative values and substituting them into fractions, as these skills underpin Question 6.

Finally, deepen your understanding of **worded problems** by practising forming equations from a variety of contexts: distance-speed-time, money, ages, and mixtures. The more you translate English into algebra, the more fluent you become, and this is a key skill tested throughout this paper.

Key terms

Order of operations (BIDMAS/BODMAS), Prime factorisation, Common denominator, Improper fraction, Mixed number, Least common multiple (LCM), Highest common factor (HCF), Like terms, Algebraic substitution, Linear equation, Forming equations, Ratio in simplest form, Percentage profit, Regular pentagon, Interior angle, Net (of a 3D shape), Dodecahedron, Parallel lines, Alternate angles, Corresponding angles

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