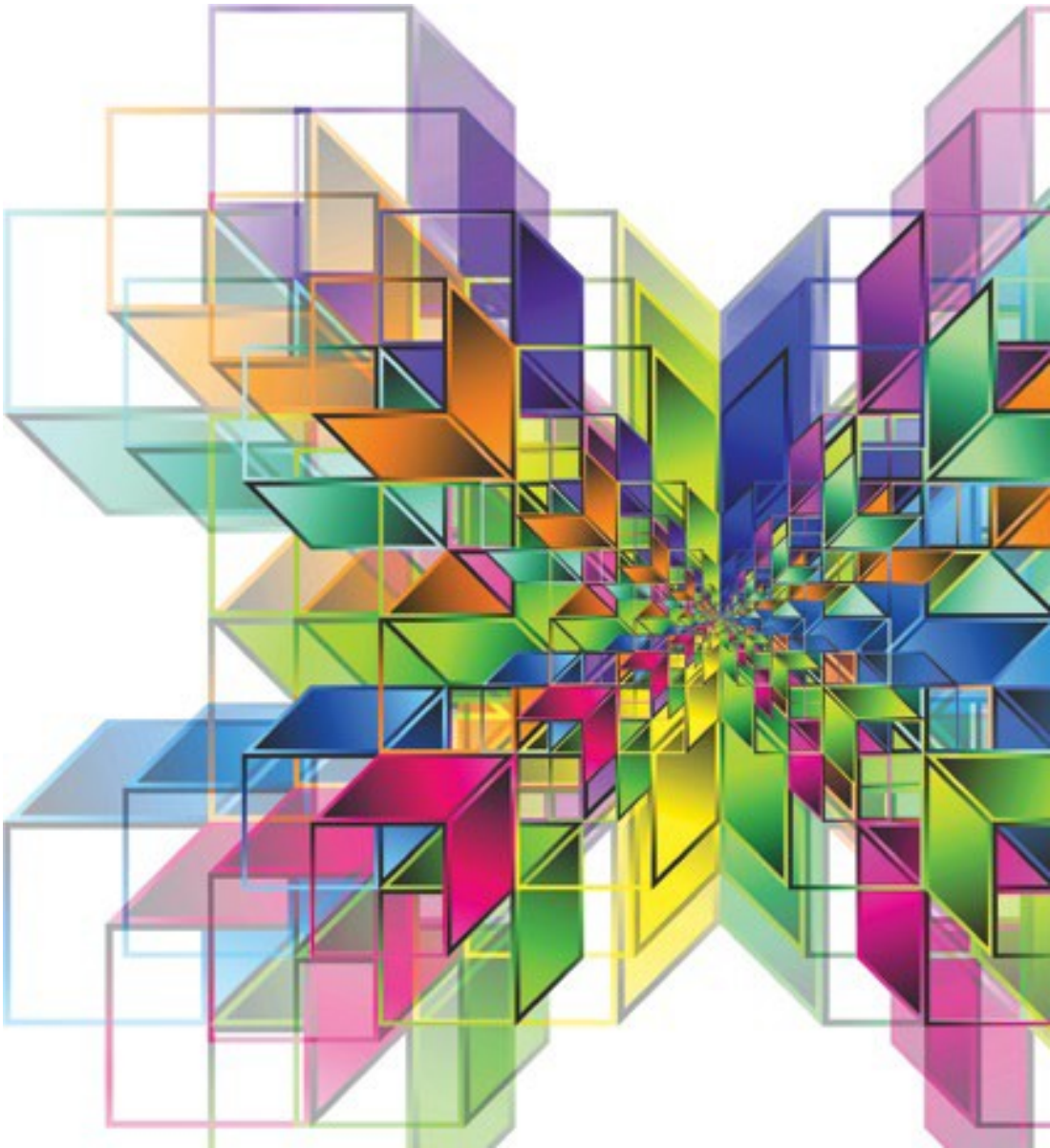
GCSE
MATHEMATICS

Key Stage 3 – 4 Bridging the Gap
Teacher Guide



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Overview

This Teacher Guide is designed to support teaching and learning for the cohorts of students who have studied the current (2007) Key Stage 3 Programme of Study and are preparing for the new Mathematics GCSE (8300 specification).

Whilst the new (2013) Key Stage 3 Programme of Study is designed to enable smooth progression to the new GCSE, the current scheme of work has identifiable differences in both content and style which may lead to some gaps in the preparation of students who are in Year 8 in 2014-15 and/or in Year 9 in 2014-15 or 2015-16. Students in Year 7 from 2014-15 onwards will study the new Key Stage 3 Programme of Study; however, there are some highlighted areas within this document which may be relevant to these cohorts too.

This Teacher Guide identifies the differences in content and potential gaps in knowledge that students may experience, and also addresses preparation for two key aspects in the learning of mathematics in the new GCSE: problem solving and proof.

This guide is not designed to give an overview of the new GCSE as this information can be obtained from All About Maths

Section 1: The New Key Stage 3 Programme of study

The main differences between the current (2007) and new (2013) Programmes of Study for Key Stage 3 are listed below.

Theme	Current Programme of Study	New Programme of Study
Curriculum Aims	All young people will become: • Successful learners who enjoy learning, make progress and achieve; • Confident individuals who are able to live safe, healthy and fulfilling lives; • Responsible citizens who make a positive contribution to society.	All pupils: • Become fluent in the fundamentals of mathematics; • Reason mathematically by following a line of enquiry; • Can solve problems by applying their mathematics to a variety of routine and non-routine problems.
Other information	Key concepts listed are: • Competence – including applying and communicating mathematics and selecting appropriate mathematical tools; • Creativity – constructing new knowledge, posing questions and solving unfamiliar problems. • Applications of mathematics – including using mathematics as a tool and being aware of the historical and cultural roots • Critical understanding – knowing that mathematics is abstract and the limitations and scope of mathematics. Key processes listed are: • Representing- including variables, symbols, diagrams and models • Analysing – reasoning inductively, making generalisations and interpreting patterns • Interpreting and evaluating – being aware of the strength of evidence, considering assumptions made and relating findings to the original context • Communicating and reflecting – clearly communicating findings and considering alternative solutions	No key concepts or processes are listed. There is reference to: • ICT – teachers making suitable judgements about when ICT should be used; • Spoken language – developing mathematical vocabulary and presenting mathematical justifications

Range and Content	Content is listed under the headings: • Number and algebra (AT2) • Geometry and Measures (AT3) • Statistics (AT4) National curriculum levels are described for each of the attainment targets (AT), with AT1 defined as: Mathematical processes and applications.	Content is listed under the headings: • Number • Algebra • Ratio, proportion and rates of change • Geometry and Measures • Probability • Statistics There are no attainment targets or national curriculum levels.

Section 2: Subject knowledge gaps in progression from Key Stage 3 to GCSE

2.1 Minor changes

In preparing students for the new GCSE specification, there are some areas where only minor changes have occurred. These are summarised below. It is likely that current school schemes of work and teaching resources could be amended easily to accommodate these changes. In some cases, the change will involve teachers emphasizing specific aspects within their teaching or making slight adaptations to the way a topic is delivered.

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Mathematical symbolism	Awareness of the symbols $=, \neq, <, >, \leqslant, \geqslant$ Previously listed under linear equations on current PoS. Teachers should emphasize correct and fluent use of these symbols.	Number section	N1
Financial Mathematics	Some basic knowledge of financial terms e.g. debit, credit, balance. These are mentioned in section 1.3 and in 'calculations and manipulations with rational numbers' section of number and algebra of the current PoS. Providing an increased emphasis on financial terminology and contexts within questions will be beneficial.	Solve Problems section	N2
Factors, multiples and primes	Fluency in identifying prime numbers and being aware of HCF and LCM are important preparation for the new GCSE. Some experience of prime factorisation would also be beneficial e.g. factor trees. This is not stressed in the current PoS.	Number section	N4
Listing strategies	Emphasis on strategic listing and the need to be systematic is required. Not listed explicitly in current PoS but likely to have been addressed in probability experiments in current schemes of work.	Probability section	N5
Powers and roots	Increased emphasis on what a power is and some experience of working with and calculating powers. Not listed explicitly in current PoS but likely to have been covered e.g. students will probably have met squares up to 15 x 15 or used powers during prime factor decomposition.	Number section	N6, N7

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Exact answers	Students will benefit from having an awareness of the fact that a fractional answer can be more exact than an answer given in decimal form. This can be embedded where it naturally arises, for example when giving answers as a multiple of pi.	Not listed	N8, G17
Standard Form	Students need a good working knowledge of powers and place value in order to access standard form at GCSE.	Number section	N9
Rounding during calculations	This is not mentioned in the current or new KS3 PoS. Students need to be made aware of the need to round only the final answer and to keep all digits up to that point. This should be embedded into teaching strategies throughout all topics at KS3.	Not listed	N15
Fractional coefficients	Students should be encouraged to avoid writing coefficients as decimals automatically – fractions are more accurate. This is not listed in the current PoS.	Algebra	A1
Simplifying answers unprompted	Students should be encouraged to simplify all answers, particularly those involving algebra, without being prompted to do so. This can be embedded in teaching of all topics throughout KS3.	Not listed	A1
Vocabulary expression, equation, formula, inequality, terms, factors and the word 'identity'	Some familiarity with the correct terminology for algebra would be expected prior to starting a GCSE course. This is not included in the current PoS. Correct use of terminology should be stressed.	Algebra	A3, A6
Compare lengths, areas and volume using ratio notation	Not explicitly listed in 2007 PoS. At a basic level, students would benefit from being aware that physical measurements can be expressed in relation to each other using ratio.	Not listed	R12

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Derive and use angle sum of a triangle	See also Section 3. Not listed in 2007 PoS. Students need to be aware of the idea of formal proof rather than informal verification of a rule. It would be beneficial if students had some exposure to this prior to GCSE.	Geometry and Measures	G3, G6
Vocabulary of 2D shapes	Students should use the correct words when working with shapes e.g. rhombus not diamond. This is not explicitly mentioned in PoS but students would benefit from opportunities to become familiar with the terminology listed in GCSE specification reference G4 being emphasized when they arise during KS3.	Geometry and Measures	G4
Vocabulary of circles	Students should use the correct words when working with circles and parts of circles. This is not explicitly mentioned in the current PoS but students would benefit from opportunities to become familiar with the terminology listed in the GCSE specification reference G9 being emphasized when they arise during KS3.	Not listed	G9
Terminology relating to solid shapes	Not explicitly mentioned in current PoS though students may know these terms. Euler's formula investigation would be a good activity to give KS3 students this introduction to the terminology. It would be helpful if students knew the terms vertices (vertex), edges and faces prior to starting a GCSE course.	Not listed	G12
Knowing exact trigonometric ratios	Not explicitly mentioned in current PoS and not all students will have actually studied trigonometry at KS3. For students who are going to study trigonometry at KS3, an awareness that some 'special' angles have exact values for sin, cos or tan and to have come across these before would be beneficial.	Not listed	G21
Frequency trees	Not listed in current PoS and new to GCSE specification. It would be helpful for students to see these at KS3.	Not listed	P1
Probability terminology	Terminology such as exhaustive events, mutually exclusive event, independent / dependent events is not listed in current PoS; theoretical probability and experimental probability are listed but would benefit from emphasis prior to starting GCSE course.	Not listed	P4, P5, P8

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Inferring properties of a population from a sample	Not listed in current PoS. Understanding what is meant by 'population' and 'sample' is good prior knowledge before starting a GCSE course. Being aware of the notion of making statements about a population based on a sample would be beneficial.	Not listed	S1, S5
Statistical terminology	Not listed in current PoS. Being aware of the terms primary data, secondary data, discrete data, continuous data would be useful prior to starting a GCSE course	Not listed	S4
Bivariate Data	Not listed on current PoS. Describing a relationship between two variables would be useful prior knowledge, using basic scatter graphs and describing the pattern observed.	Statistics	S6

2.2 Major changes

In preparing students for the new GCSE specification, there are some areas where considerable amendment will need to be made to current Key Stage 3 schemes of work and teaching materials. In some cases, completely new material will need to be built into current schemes of work to ensure students have the relevant pre-requisite knowledge to progress to the new GCSE specification.

As indicated below, where a topic is completely new, AQA are developing stand-alone 'pockets' of teaching materials to support schools in embedding the new content into their schemes of work. These 'pockets' will be available on the All About Maths website. The way in which these materials could be built in to the Key Stage 3 study of students in Year 8 in 2014-15, and/or Year 9 in 2014-15 or 2015-16 are discussed in Section 5.

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Pocket 1: Working with fractions in ratio problems. Express a multiplicative relationship between two quantities as a ratio Relate ratios to fractions and to linear functions	Need a clear understanding of the difference between ratio and fractions and know, for example, that $\frac{1}{4}$ and 1:4 are not the same. Whilst fractions and ratio are addressed separately in the current PoS, it is the relationship between the two formats that is a new emphasis. Knowing a number of ways to work with the concepts of ratio and proportion, other than simply dividing an amount in a given ratio, is important in the new GCSE specification and some prior experience of this is needed.	Ratio, proportion and rates of change	N10, N11, R6, R8
Pocket 2: Function notation	This is not listed in 2007 PoS. Students may be used to 'function machines' and so conceptually understanding what a function is, but it is unlikely they will be aware of the formal f(x) notation; however, some familiarity with function notation would be desirable prior to starting the GCSE course	Not listed	A7
Pocket 3: Graphs in real contexts	Not explicitly listed in current PoS; however, the new GCSE references kinematics, acceleration and speed – whilst it is possible that KS3 students will have met these in maths or science, it cannot be assumed. Graphs in financial contexts are also mentioned for GCSE so some prior knowledge of these would be beneficial.	Not listed	A14, A15

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Pocket 4: Iterative methods for solving equations numerically	Only trial and improvement is mentioned as a numerical approach and no other iterative methods are referred to in current PoS. Students progressing to the higher tier would benefit from being aware of the idea of a numerical approach to solving equations and having a basic awareness of an iterative formula	Not listed	A20, R16
Pocket 5: Using set notation and number lines to represent solution to an inequality. Venn diagrams	Set notation not listed in current PoS and students are unlikely to be familiar with it. Number lines are likely to be a familiar concept and it is likely they could easily adapt prior knowledge to representing the solution of an inequality. Awareness of Venn diagrams and basic usage is essential prior to commencing a GCSE course and this sits naturally with an the introduction to set notation. Tree diagrams might be introduced at a basic level too.	Set notation Not listed Venn diagrams in Probability	A22, P6
Pocket 6: Triangular, square and cube numbers and the terms 'arithmetic progression' and 'geometric progression'. Fibonacci and quadratic sequences	Specific named sequences not listed in current PoS. Awareness of well-known sequences would be beneficial. Correct terminology of 'arithmetic progression' useful but not essential prior to starting GCSE. Knowing there are other ways to generate a sequence than those with the same difference each time is important.	Algebra	A24, A25
Pocket 7: Solve problems involving direct and inverse proportion including graphical and algebraic representations	Not explicitly listed in current PoS and unlikely to have been a specific focus. Knowing a number of ways to work with the concepts of ratio and proportion, other than simply dividing an amount in a given ratio, is important in the new GCSE specification and some prior experience of this is needed. Curved graphs only needed for students progressing to higher tier.	Ratio, proportion and rates of change	R10, R13, R14, R15

Topic	Content Outline	New KS3 PoS reference	New GCSE specification reference
Pocket 8: Growth and decay	Not listed in current PoS but possibly students would have come across the ideas in science lessons. The concept of quantities which might grow or decay in a mathematical fashion and being aware of some real life quantities of this type would be beneficial prior to starting a GCSE course.	Not listed	R16
Pocket 9: Vectors	Not listed in current PoS but may be familiar to students from physics / science lessons. Being aware of the basics of vectors and how they are represented as columns and in diagram form would be highly desirable prior to commencing a GCSE course.	Not listed	G24, G25

Section 3: Building a conceptual understanding of proof through Key Stage 3

Assessment Objective 2 (AO2) for the new GCSE states that students should be able to reason, interpret and communicate mathematically. This includes constructing chains of reasoning to achieve a given result and presenting arguments and proofs. This section provides an overview of the types of activities that could be built into lessons in order to develop these skills in students, not just in algebraic topics but across all areas of the Programme of Study.

Activity 1

Is a good starting point to promote this style of mathematical thinking at Key Stage 3 by asking students to categorise mathematical statements into 'always true', 'sometimes true' and 'never true'. They must be able to justify their decision. This can be adapted to fit various topics and can be used as a card sort or in a single, more demanding question forming a plenary at the end of a lesson. The important factor here is that students understand that they need to test several examples before a conclusion can be made. Even then, in many cases 'always true' and 'never true' cannot be mathematically proven as they have not tried every possible value. This forms an interesting discussion point with students.

Activity 2

Introduces the use of algebraic terms to represent specific types of numbers. Once students are confident with these they will be ready to attempt some more formal mathematical proofs.

Activity 3

Provides a good progression from Activity 2, requiring students to use the algebraic terms that are now familiar and use these to produce a formal algebraic proof. Number tricks are a good extension of Activity 3, for example:

Think of a number

Multiply it by 2

Add 10

Divide by 2

Subtract the number you originally thought of

Tell students you know that their answer is 5.

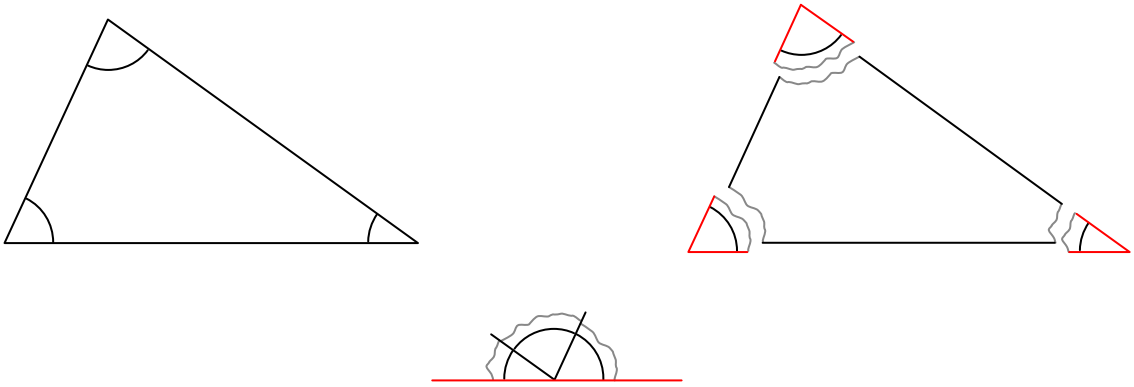
By working together in small groups and generalising using algebraic terms as demonstrated in Activities 2 and 3, students should start to reason why this 'magic trick' will always work. They can then be encouraged to explain using mathematics and words. Further work can be to develop their own magic tricks to try on friends and family.

Activity 4

Is designed to help students prove that angles in a triangle add to 180°. This proof requires knowledge of angles in parallel lines.

A good starting point here is to demonstrate that the angles in a triangle make a straight line by using a triangle cut out of a piece of A4 paper and tearing off the corners, show the students that the three angles fit together perfectly to make a straight line.

Students can try this for themselves using various sizes of triangle.



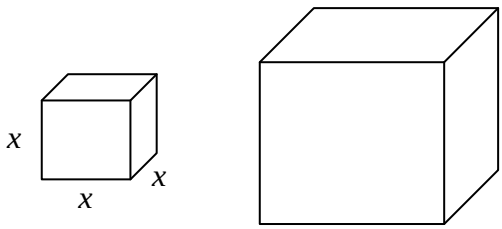
The difference between this demonstration (which may not be exact) and a formal proof can be drawn out of the discussion here.

Activity 5

Considers proving the sum of the interior angles in a quadrilateral and a pentagon; prior to this, students will need to understand that the exterior angles of any polygon add to 360°. A good visual demonstration of this can be seen here:

http://www.mathsisfun.com/geometry/exterior-angles-polygons.html

The table below provides further ideas of how proof style questions can be introduced at various stages of the KS3 Programme of Study and the new GCSE specification reference is also given:

Topic	Proof style questions	Notes	New GCSE specification reference
Sequences	Show that 127 is a term in the sequence 3, 7, 11, 15, 19, 23….	Although 'show that…' is not categorically a mathematical proof, it encourages the way of thinking that is required for the new GCSE.	A25
Algebraic expressions	You are given that $6(x - 4) + 2(x + 6) = 4(2x - 3)$ (a) Show that the equation works for $x = 2$ (b) Prove the identity $6(x - 4) + 2(x + 6) \equiv 4(2x - 3)$	The new GCSE requires students to understand the terms equation and identity.	A3, A4, A6
Percentage multipliers	Prove that increasing any number by 20% then decreasing this amount by 10% is the same as increasing the original number by 8%		R9, R16
Volume scale factors	Show that increasing the side length of a cube by a scale factor of 3 increases the volume by a scale factor of 27 	Depending on the ability of the group, more or less information can be given on the diagrams or the diagrams can be left out altogether.	R12, G16
Averages	Prove that the mean of any 5 consecutive integers is the same as the median. Is this the same for any number of consecutive integers?		S4
Pythagoras' Theorem	Some nice visual proofs for Pythagoras' theorem can be found here: http://www.mathsisfun.com/pythagoras.html		G6, G20

Activity 1: True, Sometimes True, Never True

Print and cut out the cards. 

Each group of students should have one set of cards to classify.

Students must look at each statement and decide whether it is always true, sometimes true or never true. They must be able to justify their answer with examples.

The product of two negative numbers is positive	All multiples of 4 are even
A prime number is always odd	The square of a number is negative
The sum of two numbers is greater than their difference	When you multiply by 10, you put a zero at the end

Activity 2

Print and cut out the cards. 

Give one set blue of cards to each pair/group of students. Hold back the pink cards.

Letting n represent any number, students must come up with an algebraic term for each type of number described on the blue cards.

Choose when it is appropriate to give out the pink cards. They can be just to check solutions if the group is progressing well, or they can be used as a card sort where students must then check by substituting a number of values for n before coming up with a structured explanation for each match.

An even number	$2n$
An odd number	$2n + 1$
A square number	n^2
A multiple of 3	$3n$
2 consecutive numbers	$n, (n + 1)$
2 consecutive square numbers	$n^2, (n + 1)^2$

Activity 3

Algebraic terms can be used to generalise types of numbers.

Here are some examples, where all values are integers:

An even number	$2n$
An odd number	$2n + 1$
A square number	n^2
A multiple of 3	$3n$
3 consecutive numbers	$n, (n + 1), (n + 2)$
3 consecutive square numbers	$n^2, (n + 1)^2, (n + 2)^2$

To prove a mathematical statement, we cannot possibly try every number so we have to generalise using an algebraic term.

Using the terms above, prove the following statements:

1 The sum of two consecutive numbers is odd.

2 The sum of three consecutive numbers is a multiple of 3.

3 Three consecutive even numbers add to make a multiple of 6.

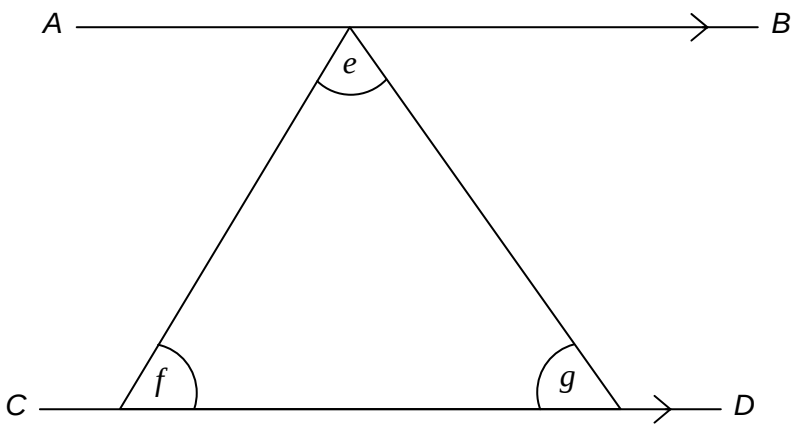
4 The product of two odd numbers is odd.

5 The sum of two consecutive square numbers is odd.

Activity 4

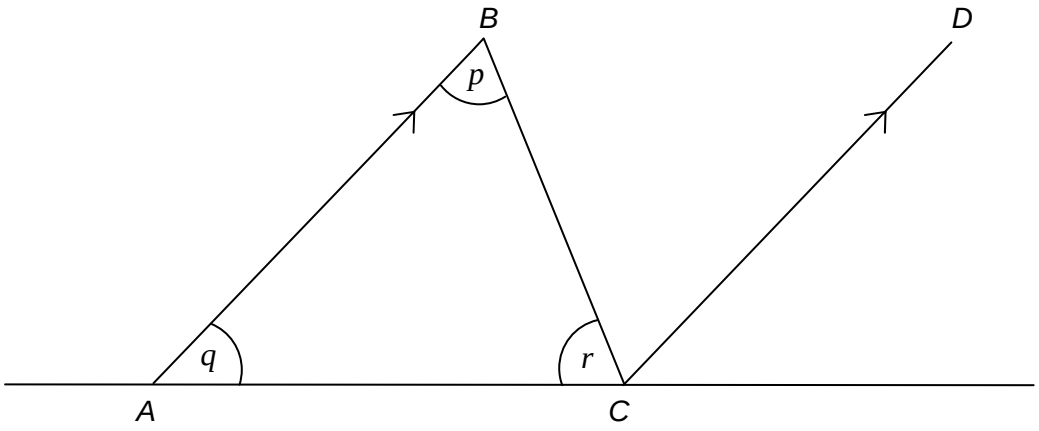
In the diagrams below, *AB* and *CD* are parallel

1



How can this diagram **prove** that angles in a triangle add to 180°?

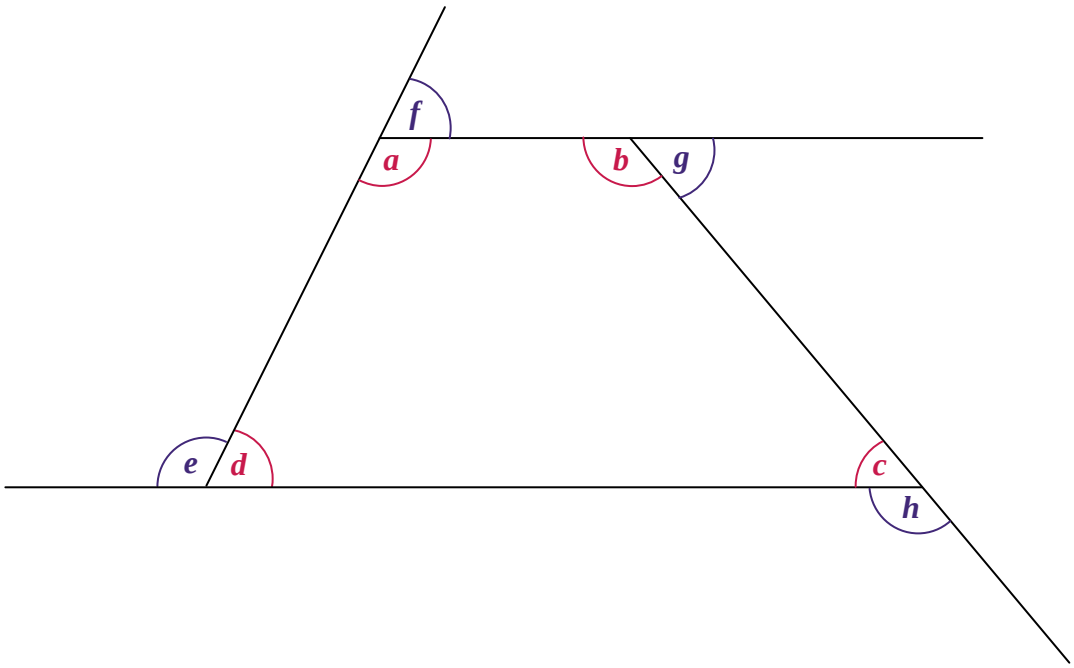
2



How can this diagram **prove** that angles in a triangle add to 180°?

Activity 5

1 The quadrilateral below is made from straight lines that have been extended to show the external angles.

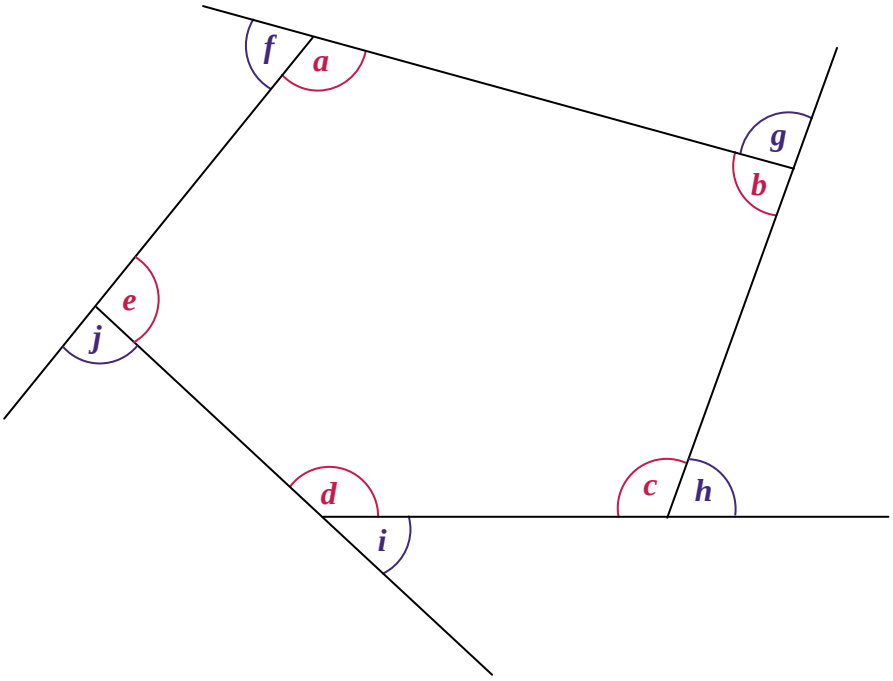


(a) Work out the sum of all the angles a to h.

(b) Work out the sum of the exterior angles e, f, g and h.

(c) Hence, work out the sum of the interior angles a, b, c and d.

2 The pentagon below is made from straight lines that have been extended to show the external angles.



Using the fact that the exterior angles in any polygon add to 360°, can you prove that the interior angles add to 540°?

Section 4: Support for embedding problem solving within the Key Stage 3 mathematics curriculum

The new GCSE Assessment Objectives have an increased focus on the development of problem solving skills. This section provides some direct links to quality resources and activities that could be built into lessons in order to develop skills in problem solving across all areas of the Programme of Study. The specific areas of subject content relevant to each activity are given in **bold text**.

The National STEM Centre e-library has a large selection of resources from a number of contributors. The resources are categorised so finding something specific is simple.
http://www.nationalstemcentre.org.uk/elibrary/

A number of the resources detailed below are taken directly from the National STEM Centre e-library.

- ## Durham Maths Mysteries:

  http://www.nationalstemcentre.org.uk/elibrary/collection/1160/durham-maths-mysteries

  A collection of seven mathematical investigations covering the topics of **number, ratio, algebra, shape and probability**. Each activity consists of a set of cards with statements that students must consider and use to solve a problem. These are particularly good for encouraging discussions and developing reasoning skills. For example:

  ### The Directed Numbers Mystery

  Is a number activity that can be used to reinforce students' understanding of **negative numbers** by considering where numbers are placed on a 3 by 3 grid. This is a particular area that causes confusion and encouraging students to discuss and reason with this activity at KS3 will be beneficial.

  http://www.nationalstemcentre.org.uk/elibrary/resource/5379/directed-numbers-mystery

  ### The Ratio and Proportion Mystery

  Requires students to apply their knowledge of **fractions, percentages and ratio** to work out which student should receive a maths award. This activity is particularly useful in preparing students for the new strand of the GCSE Ratio, Proportion and Rates of Change which is also now a distinct strand in the new KS3 PoS.

  http://www.nationalstemcentre.org.uk/elibrary/resource/5383/ratio-and-proportion-mystery

- ## SMILE (Secondary Maths Individualised Learning Experiment) Cards and Resources:

  http://www.nationalstemcentre.org.uk/elibrary/collection/44/smile-cards

  These were originally created as a series of problem solving questions and activities that students would work through, creating their own individualised programme. The cards and booklets contain probing mathematical questions and open ended activities as well as problems that can focus on a specific area of mathematics. Although these are not particularly aesthetically pleasing as they are scanned copies of aged documents, the content is very useful.

  The three documents contained within the Ratio Pack http://www.nationalstemcentre.org.uk/elibrary/resource/7859/ratio are very beneficial for students to use in preparation for the new GCSE.

  Pack 2 contains a good activity called Jeans (2067) about scaling production in a manufacturing company. This encompasses application of **basic numeracy skills, ratio, proportion and percentages.** Pack 2 also contains an activity called Pythagoras Dissection (2052), a nice investigation looking at the dissection of a square to demonstrate **Pythagoras' Theorem** and the

ratios involved.

- ## The DfE Standards Unit:

http://www.nationalstemcentre.org.uk/elibrary/collection/282/improving-learning-in-mathematics

The Improving Learning in Mathematics resources were originally designed for post 16 use but are now a firm favourite with secondary teachers. The resources use active learning approaches that encourage mathematical thinking and discussion amongst the students and full teacher support and guidance is provided within the Standards Unit resource as a whole. For example:

Understanding Mean, Median and Mode S4

Contains a card sort requiring students to match tables of averages to bar charts. The quality of this resource is within the guidance provided in the document. Probing questions and strategic hints are suggested and if used can ensure that students develop problem solving skills focussed on **averages and statistical representation**.

http://www.nationalstemcentre.org.uk/elibrary/resource/2041/understanding-mean-median-mode-and-range-s4

Interpreting Charts S5

Contains card sorts requiring students to match pie charts, bar charts and box and whisker diagrams with a strong focus on their understanding of averages and measures of spread. Again, there are exemplar questions which will encourage mathematical discussion amongst the group. This activity can be used to **introduce box and whisker diagrams and pie charts** or can be used once students have an understanding of statistical representation.

http://www.nationalstemcentre.org.uk/elibrary/resource/2055/interpreting-bar-charts-pie-charts-box-and-whisker-plots-s5

- ## Nuffield AMP Practical Explorations:

http://www.nuffieldfoundation.org/applying-mathematical-processes/nuffield-amp-practical-explorations

The Nuffield Foundation website contains some very good problem solving and applied mathematics activities that are presented in a very easy to follow manner with detailed teacher guidance. Two areas of the site that are of relevance to enhancing the problem solving skills of KS3 students are Nuffield AMP Investigations and Nuffield AMP Practical Explorations. For example:

Beach Guesthouse

Is a two lesson activity where students must manage a guesthouse and room the guests by considering receptionists notes, booking requests and room plans. This is a lovely activity that does not require any specific mathematical skills but really develops students' **logic and decision making abilities.**

http://www.nuffieldfoundation.org/applying-mathematical-processes/beach-guesthouse

Every second counts

Is a two or three lesson activity where students must work out how far they can travel from the classroom in exactly one hour. This is a good application of **reading from tables and plan drawings** and has good cross curricular links that can be built upon.

http://www.nuffieldfoundation.org/applying-mathematical-processes/every-second-counts

- ## Bowland Maths:

  http://www.bowlandmaths.org.uk/

  Bowland Maths has a large number of engaging classroom projects that develop students problem solving and reasoning skills. They focus on real life scenarios that students can relate to and the resources are detailed and easy to follow. For example:

  Dance Star is a project where students investigate different dance styles and look at the mathematics involved. There is good application of students understanding of **angles, symmetry, transformations and coordinates.**

  http://www.bowlandmaths.org.uk/projects/dancestar.html

  Mission Rainforest has students working to save a rainforest from deforestation by planning a mission that will expose illegal activities being carried out by large companies without being detected. Pupils will use their skills of calculating **area, perimeter and volume as well as interpreting scale drawings and plans and elevations.**

  http://www.bowlandmaths.org.uk/projects/rainforest.html

- ## AQA 90 Problems booklet

  http://aqamaths.aqa.org.uk/attachments/5592.pdf

  This booklet was developed to support the teaching of the AQA GCSE pilot in Additional Mathematics and the requirement for students to be competent solving mathematical problems. Although created for the GCSE content, it has 90 short problem solving questions that can be used or adapted for the KS3 Programme of Study.

  These are good to use as a starter, plenary or homework activity.

Section 5: Models for progression from Key Stage 3 to the new GCSE

This section outlines some possible ways in which schools could adapt their current schemes of work to facilitate smooth transition for the Year 7 (2014 - 15 onwards), Year 8 (2014 - 15) and Year 9 (2014 - 15 and 2015 - 16) cohorts from Key Stage 3 to the new GCSE.

Cohort	Strategies for progression
Year 7 (2014 - 15 onwards)	Year 7 cohorts will commence a new Key Stage 3 scheme of work linked to the new Key Stage 3 Programme of Study. Content indicated 'not listed' in sections 2.1 and 2.2 above should be embedded within the new scheme of work – these items are not on the new Key Stage 3 Programme of Study but form useful preparation for the new GCSE.
Year 8 (2014 - 15)	Adapt current Year 8 scheme of work to: • include opportunities for problem solving throughout the year; • include opportunities for students to engage with proof of an increasingly formal nature; • include the 'pockets' of new subject content – if progressing to the three year AQA Route Map in Year 9, students would benefit from working on all of these 'pockets' in Year 8; otherwise the 'pockets' could be spread across Years 8 and 9, prior to commencing the two year AQA Route Map in 2016-17.
Year 9 (2014 - 15)	Commence the three year GCSE AQA Route Map. Take the opportunity in the yellow 'revision and review' sections to cover the content of the 'pockets' or new content which students will not have covered in the current Key Stage 3 Programme of Study. or Adapt current Year 9 scheme of work to: • include opportunities for problem solving throughout the year; • include opportunities for students to engage with proof of an increasingly formal nature; • include the 'pockets' of new subject content – these could be dispersed at relevant points throughout the year or could be joined to form a mini scheme of work for students to complete in the summer term, as preparation for starting the two year AQA Route Map in Year 10.

Year 9 (2015-16)	Commence three year GCSE AQA Route Map or Adapt current Year 9 scheme of work to: • include opportunities for problem solving throughout the year; • include opportunities for students to engage with proof of an increasingly formal nature; • include the 'pockets' of new subject content that were not covered in Year 8.

Activity Answers

Activity 1

Always True:

The product of two negative numbers is positive

All multiples of 4 are even

Sometimes True:

All prime numbers are odd

The sum of two numbers is greater than their difference

When you multiply by 10, you put a zero on the end

Never True:

The square of a number is negative

Activity 3

1 $n + (n + 1) = 2n + \mathbf{1}$

2 $n + (n + 1) + (n + 2) = 3n + 3 = \mathbf{3}\,(n + 1)$

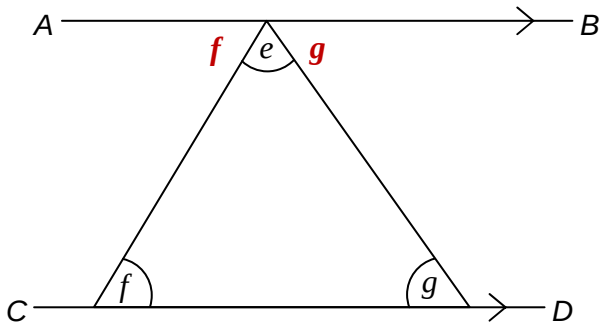
3 $2n + (2n + 2) + (2n + 4) = 6n + 6 = \mathbf{6}\,(n + 1)$

4 $(2n + 1)(2n + 3) = 4n^2 + 8n + 3 =$ even + even + 3 = odd

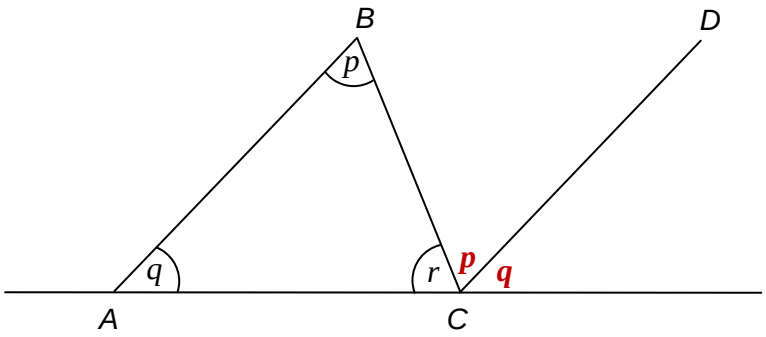
5 $n^2 + (n + 1)^2 = 2n^2 + 2n + 1 = 2(n^2 + n) + 1 =$ even + 1 = odd

Activity 4

1 Alternate angles are equal and angles on a straight line add to 180°



2 Alternate angles are equal (p) and corresponding angles are equal (q) and angles on a straight line add to 180°



Activity 5

1 **(a)** $180 \times 4 = 720°$

(b) $360°$

(c) $720 - 360 = 360°$

2 $(180 \times 5) - 360 = 540°$

SP/04/15