

Your Guide to Maths Progress International

Create confident and numerate students
ready for the International GCSE



Every student can be a confident mathematician

That's why the Maths Progress programme was, and is, specifically founded on key principles to nurture students' confidence in maths.

The 10 evidence-based principles underpinning Maths Progress to build confidence and raise attainment are:

- ✓ Fluency
- ✓ Problem-solving
- ✓ Reflection
- ✓ Mathematical reasoning
- ✓ Progression
- ✓ Linking
- ✓ Multiplicative Reasoning
- ✓ Modelling
- ✓ Concrete-Pictorial-Abstract (CPA)
- ✓ Relevance

“ Students do say ‘I like maths’ a lot more than they used to. Maths Progress has obviously contributed to that. ”
Head of Maths*

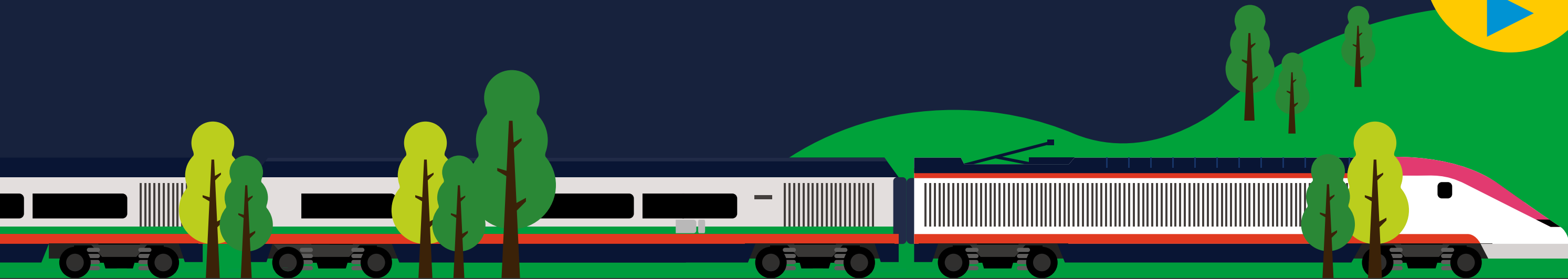
Introducing Maths Progress International

Build the foundation for International GCSE Mathematics

Building on the popular KS3 Maths course, Maths Progress International has been designed specifically for international students and provides seamless progression to Pearson Edexcel International GCSE Mathematics (9-1), as well as matched to the Pearson Edexcel iLowerSecondary Award and the UK National Curriculum.

- ✓ International GCSE preparation including practice questions.
- ✓ Relevant, accessible wording, so language isn't a barrier to learning maths.
- ✓ Appropriate cultural sensitivities and international contexts to make it relatable.
- ✓ Matched to the iLowerSecondary Award and the UK National Curriculum so you can be sure you have all you need whatever curriculum you are following.

“ My confidence has grown. ”
Year 8 Student*



* Quotations from the independent Impact Evaluation Study of KS3 Maths Progress undertaken with the Institute of Education, UCL. Read more at [pearsonglobalschools.com/MathsProgressInternational](https://www.pearsonglobalschools.com/MathsProgressInternational)

What's in Maths Progress International?

Maths Progress International includes one Student Book and one Workbook per year plus online digital resources that work together to give you all the support you need for planning, teaching, progress tracking and assessing students' progress from 11-14 and beyond.



Progress with confidence

To help your 11-14 students progress and master maths with confidence, differentiation is embedded throughout the structure of each unit in the Student Book.

- A unique mastery approach that draws on global best practice and cutting-edge research.
- Impact evaluated with a study by the Institute of Education, UCL.
- Aligns seamlessly with our International GCSE resources for a consistent 11-16 experience.



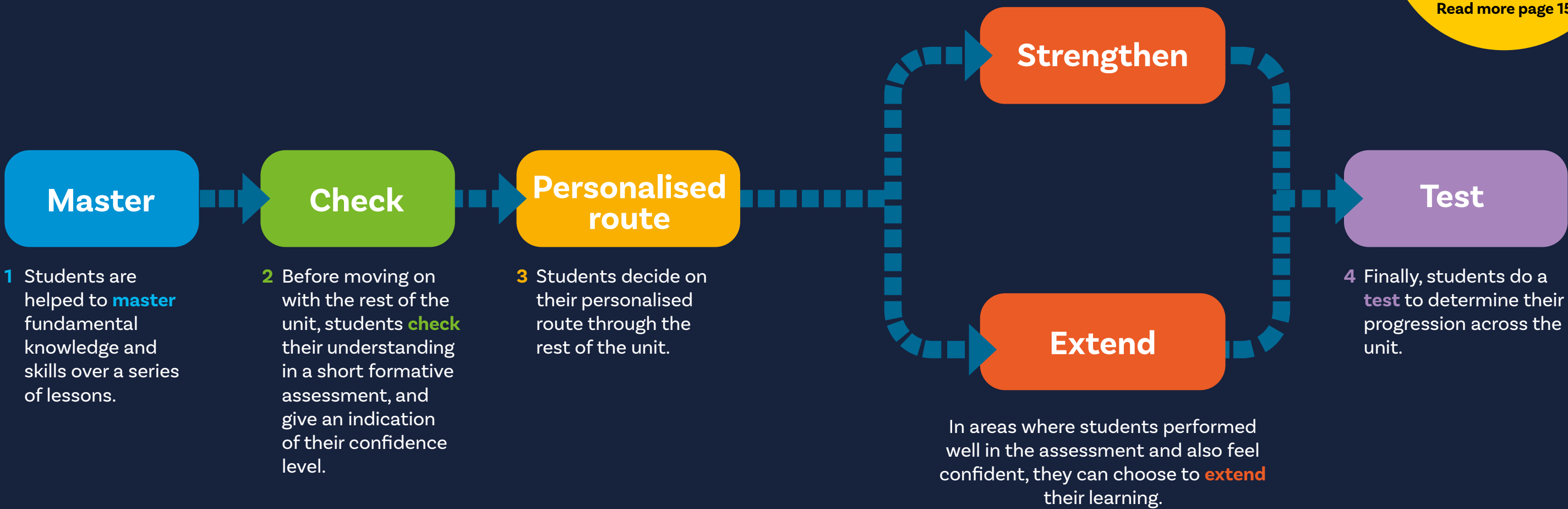
There is that clear structure embedded within each topic, and as a result the lessons have the questions building from basic skill to really advanced skill[s]. But they are open-ended - there are so many different approaches you can take.

Maths Teacher*



Did you know?

Maths Progress International is also matched to the Pearson Edexcel iLowerSecondary Award as well as providing full content from the UK curriculum. Read more page 15.



A closer look at the Student Book

Master
Where students are helped to master fundamental knowledge and skills over a series of lessons.

Check
A short formative assessment where students can check their understanding.

Lesson opener
Outlines lesson objectives and the fundamental knowledge and skills that students will master to boost confidence.

Worked examples
Provide guidance around examples of key concepts with bar models, and other pictorial representations where needed.

Key points
Explain key concepts and definitions where students need them.

Formative assessment
Questions check on students' progress and learning and provide a route to further guidance or extension.

3 Equations, functions and formulae

Master**Check P65****Strengthen P67****Extend P71****Test P75**

3.1 Simplifying algebraic expressions

You will learn to:

- Simplify expressions by collecting like terms.

Confidence

Why learn this?
Algebra is a language that people in every country in the world can understand. It doesn't need to be translated into Japanese, Spanish or any other language.

Fluency
Write these additions as multiplications:
• $5 + 5 + 5$
• $9 + 9 + 9 + 9 + 9$
• $10 + 10$
• $18 + 18 + 18 + 18 + 18$

Explore
Why do we 'simplify' in algebra?

Exercise 3.1

1 Write using index notation.
a $3 \times 3 \times 3 \times 3$
b $2 \times 2 \times 2$
c $5 \times 5 \times 5 \times 5 \times 5 \times 5$

Worked example
Simplify $x + x + x$
Think of a rod that is x cm long.
When you put three rods together the total length is $3x$ cm.
So $x + x + x = 3x$

Key point
An algebraic expression e.g. $3x + 2y$, contains numbers and letters. Each part of an algebraic expression is called a **term**.

Key point
Like terms contain the same letter (or do not contain a letter). You simplify an expression by collecting like terms.

Q3e hint
 $9x - 7x = \square$

Topic links: Order of operations, Indices

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Master P54**Check****Strengthen P67****Extend P71****Test P75**

3 Check up

Log how you did on your Student Progression Chart.

Simplifying expressions

1 Expand
a $3(x + 4)$
b $2(a - w)$
c $5(11 - x)$

2 Simplify
a $x + x$
b $4x + 7x$
c $10c - 5c$
d $4t - t$
e $7x + 2b - 5x$
f $3 \times t \times t$
g $y + 7$
h $\frac{12y}{6}$

3 Simplify
a $y \times y \times y$
b $x \times x$
c $3 \times t \times t$
d $2 \times r \times r \times r \times r \times 5$
e $5r \times r$
f $7t \times 2t$

4 Simplify
a $x^2 + 3x^2$
b $x + x^2 + x$
c $2 + x^2 + 2x^2 - 5$

5 Expand
a $x(x + 3)$
b $b(b - 2)$
c $a(10 - a)$
d $2x(3x + 1)$
e $4t(10 - 2t)$

Substitution

6 Area of rectangle = length $\times$ width.
Work out the area of a rectangle with width = 12 cm and length = 7 cm.

7 $T = 5B$ What is the value of T when $B = 12$?

8 Density = $\frac{\text{mass}}{\text{volume}}$ where mass is in kg, volume is in m^3 and density is in kg/m^3 .
Work out the density of a block with mass 20 kg and volume 4 m^3 .

9 The approximate perimeter, P , of a semicircle can be calculated using the formula $P = a + \frac{3a}{2}$.
Work out the approximate perimeter when $a = 4$ cm.

10 Use the formula $b = 10t - c$ to work out the value of b when
a $t = 3, c = 5$
b $t = 1, c = 7$
c $t = 4, c = -2$
d $t = 3, c = -4$

11 Work out the value of the expression $ab + 2c$ when $a = 2, b = 5, c = 9$.

12 What is the value of x^2 when $x = 7$?

Writing expressions and formulae

13 Mia has x stamps. Write expressions for the number of stamps each person has.
a Carl has 7 fewer than Mia.
b Onick has 12 times as many as Mia.
c Mehmet has half as many as Mia.

14 Jack is paid \$5 for each hour he babysits. Write a formula that connects the total amount he is paid, T , and the number of hours he babysits, x .

15 Write an algebraic expression for
a a more than b
b 3 more than a , multiplied by b
c a multiplied by itself
d b divided by 5.

16 A regular pentagon has 5 sides of equal length. Write a formula that connects the perimeter, P , to the length of one of the sides, a .

17 A class has 30 students. A teacher buys sweets to share between them. Write a formula that connects the number of sweets each student receives, S , and the number of sweets the teacher buys, p .

18 A square has sides a cm long. Write a formula for finding the area of the square, A , using the length of the side, a .

19 How sure are you of your answers? Were you mostly
Just guessing Feeling doubtful Confident
What next? Use your results to decide whether to strengthen or extend your learning.

Challenge

20 A pattern is made of squares and rectangles.

Pattern 1 Pattern 2 Pattern 3

Write and simplify an algebraic expression for the area of
a Pattern 1 b Pattern 2 c Pattern 3
d Pattern 10 e Pattern n .

21 Find a value of x so that
a x^2 is equal to $2x$ b x^2 is equal to x^3 .

22 $a + b = -2$ and $a - b = -6$.
 a and b are whole numbers. What are the values of a and b ?

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Warm up
Lessons begin with accessible questions designed to recap prior knowledge, and develop students' mathematical fluency in the facts and skills they will soon be using.

Hints and tips
Guide students to help build problem-solving strategies throughout the course.

Reflect
Enables students to understand their own confidence levels with a topic so they can make the decision whether to 'strengthen' or 'extend' knowledge.

A closer look at the Student Book

Hints

Support students with scaffolded guidance where they need it most.

Visual reminders

Support learning and provide a different way of looking at a problem.

Master P54 **Check P65** **Strengthen** **Extend P71** **Test P75**

3 Strengthen

You will:
• Strengthen your understanding with practice.

Simplifying expressions

1 Copy and complete.
a $p + p + p = \square p$
b $m + m + m + m = \square m$
c $d + d$
d $t + t + t + t + t$

2 Simplify.
a $2t + 3t$
b $5g + 7g$
c $10y - 3y$
d $5p - p$
e $10y + 2b + 3y$
f $6m + n + 5m$
g $4a + 3b - a$
h $3g + 2b - 3b$
i $4t + 7 - 2t$
j $4y + 8 - 2 + 3y$

3 Expand $3(2 + 4)$.

Q3 hint
 $3 \times (2 + 4)$
 $= 3 \times 2$
 $+ 3 \times 4$

4 Copy and complete.
a $2(x + 3) = \square x + \square$
b $3(x + 4) = (x + 4) + (x + 4) + (x + 4) = \square + \square$
c $4(b + 2)$
d $5(t + 3) = \square \times t + \square \times 3 = \square t + \square$
e $3(6 + a)$
f $2(r - 3) = \square \times r + \square \times -3$
g $6(10 - b)$

Q4a hint
 $x + 3$
 $x + 3$
 $x + 3$
 $x + 3$
 $x + 3$

5 Write the missing numbers.
a $6 \times 6 \times 6 = 6^{\square}$
b $5 \times 5 \times 5 \times 5 = 5^{\square}$
c $11 \times 11 = 11^{\square}$

6 Match each expression on a blue card to one on a yellow card.

Q6 hint
How many times is a multiplied by itself?

7 Copy and complete.
a $2w \times 3w =$
b $4a \times 2a =$
c $3b \times 5b =$
d $8m \times 3m =$
e $9n \times 11n =$

8 Simplify these. Which is the 'odd one out'?

a $n \times n$
b $n \times n$
c $2 \times n$
d $n \times 2$

9 Copy and complete.
a $m(m + 1) =$
b $b(b + 2) =$
c $d(3 + d) =$
d $r(r - 1) =$
e $m(m - 3) =$
f $t(10 - t) =$

10 a Complete the pattern.
 $t + t = 2t$
 $t^2 + t^2 = 2t^2$
 $t^3 + t^3 = 2t^3$
b Simplify by collecting like terms.
i $p^2 + p^2$
ii $x^3 + x^3$
iii $m^2 + m^2 + m^2$
iv $2x^2 + 3x^2$

11 Simplify by collecting like terms.
a $t^2 + t^2 + 3t = \square t^2 + \square$
b $p^3 + p + p$
c $3x + x^2 + 2x$

Q11 hint
You can only add terms with the same letters and powers.

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Strengthen

Where students who are yet to develop a solid understanding and/or don't feel confident, can strengthen their learning.

Finance

Real life maths examples put learning into context.

Problem-solving

Clearly signposted questions enable students to recognise that they need to try different strategies.

Extend

Where students who have performed well in the 'Check up' and feel confident can build on and deepen their mathematical understanding.

Master P54 **Check P65** **Strengthen P67** **Extend** **Test P75**

3 Extend

You will:
• Extend your understanding with problem-solving.

1 A square has sides of length x . Write and simplify an expression for its
a perimeter b area

2 A cube has edges of length 10 cm.

a Work out the area of one of the square faces.
b The cube is painted. Work out the total area that is painted.
Another cube has edges of length x .
c Write an algebraic expression for the area of one of the faces.
d Write an algebraic expression for the total area of all the faces.

3 **Finance** Company 1 uses the formula $C = 0.05M + 0.02T$ for calculating the cost of a mobile phone bill, where M = number of minutes of calls, T is the number of texts and C is in dollars.
a Work out the cost of bills for each of these customers.
Customer A: 10 minutes of calls, 1000 texts
Customer B: 300 minutes of calls, 20 texts
Customer C: 1000 minutes of calls
b Company 2 uses the formula $C = 0.1M + 0.01T$.
Work out the bill for each of the customers if they used this company.
c Which company should each customer use?

4 **Problem-solving** Jasmin is working out coordinates using a rule. She takes the x -coordinate and puts it into the function machine to get a y -coordinate:

x -coordinate $\rightarrow +3 \rightarrow y$ -coordinate
 x -coordinate $\rightarrow +3 \rightarrow y$ -coordinate

Work out several pairs of coordinates and plot them on a coordinate grid. Join them with a line. What do you notice? Design your own function machine and generate coordinates. Plot them and join them with a line. What do you notice?

Q4 hint
Start with $x = 0$.

5 A triangle has side length n cm. The second side is 5 less than double this. The third side is twice the length of the second. Write an expression for the perimeter of the triangle in terms of n . Simplify your expression as much as possible.

6 In the pyramid, each brick is the sum of the two bricks below. Work out the missing expressions.

7 A magician uses this number trick. Think of a number. Add 3. Multiply it by 2. Subtract double the number you first thought of. The number you have is 6. Explain the trick.

8 In a magic square the diagonals, rows and columns all sum to the same total.
a Write the numbers 1–9 in the magic square (using each number only once) so that all the diagonals, rows and columns sum to 15. Three numbers have been written for you.

b Write the algebraic expressions in the magic square so that all the rows, columns and diagonals sum to $3c$.

9 When $a = -2$ and $b = 4$ all but one of these expressions have the same value. Which is the 'odd one out'?

10 This is part of a spreadsheet a shop uses to calculate wages.

a What value will be calculated in cell D2?
b What expressions should be written in cells D3 and D4 to calculate the wages of Mr Gupta and Mrs Alam?
c The value in cell B4 is changed to £19. What value will show in cell D4?
d The expression in C5 calculates the mean number of hours worked. What is this value?
e What does the expression in cell B5 calculate?

Q7 hint
Call the unknown number ' x ' and construct an algebraic expression.

Key point
In spreadsheets * is used instead of $\times$.

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3 Unit test

- 1 To convert between hours and minutes use the formula
minutes = number of hours $\times 60$
Work out the number of minutes in 7 hours.
- 2 The formula for calculating the perimeter of a shape, P , is $P = 2a + 3b$.
Work out the value of P when $a = 5$ and $b = 7$.
- 3 Use the formula $m = \frac{c}{100}$ for converting centimetres, c , to metres, m .
Work out the value of m when $c = 325$.
- 4 Use the formula $D = \frac{n(n-3)}{2}$ to work out the value of D when $n = 4$.
- 5 Expand.
a $3(x + 4)$
b $5(x - 7)$
c $7(10 - x)$
- 6 Write an expression for
a 2 less than y
b 5 times m
c y divided by 10
d x more than y .
- 7 Angela is paid £10 more than Imogen.
Write a formula connecting the amount Angela is paid, A , and the amount Imogen is paid, I .
- 8 Write an expression for
a b multiplied by itself
b double b
c a divided by b .
- 9 Work out the value of these expressions when $p = 3$, $q = 6$.
a $2(p + 3)$
b $5(2p + q)$
- 10 Simplify by collecting like terms.
a $x + 2x$
b $6x + 2y - 3x$
c $10 + 12y + 7 - 14y$

- 11 When $a = 5$, $b = 11$ and $c = 9$ work out the value of
a $4a + 2c$
b $20 - 3a$
c $10c - 2b + a$
- 12 Use the formula $z = 2m - a$ to work out the value of z when
a $m = 3$, $a = 5$
b $m = 1$, $a = -7$
- 13 Simplify
a $r \times r \times r \times r \times r$
b $2 \times y \times 7 \times y \times y$
c $3y \times y$
d $3m \times 5m$
e $18x \times 3$
- 14 Simplify by collecting like terms.
a $3x^2 + 10x^2$
b $12x + 3x^2 - 5x$
- 15 Expand
a $x(x + 7)$
b $r(r - 5)$
c $2b(b + 5)$
d $3b(2b - 4)$
- 16 Find the value of each expression when $b = 2$ and $a = 5$
a b^2
b $b^2 - m$
c $\frac{b + 2m}{2}$
d $m^2 - b^2$
e $3(m - b)$

Challenge

- 17 Are there any values of x that make these pairs of
a $2x^2$ and $2x$
b $6x - 3$ and $3x + 6$
c $\frac{3x}{2}$ and $\frac{2x}{3}$
d $2(3x + 5)$ and $2(3x - 5)$
- 18 **Reflect** Look back at the work you have done in this unit. Find a question that you could not answer immediately, but that you worked hard at, and then answered correctly.
How do you feel when you find it difficult to answer a maths question? Write down the strategies you use to help you when you have difficulty. How do you feel when you eventually understand and get the correct answer?

Unit test

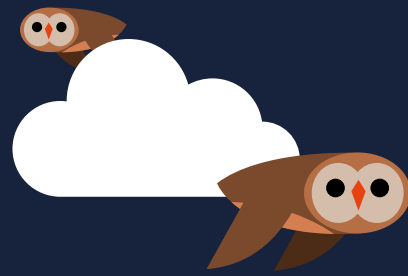
Monitoring progress

Provides a quick assessment that covers everything learned in the unit, making it easy to see where students are progressing or where additional support might be needed.

Reflect

A focus on STEM

STEM lessons focus on key science, technology, engineering and maths skills to give students the aspiration, knowledge and skills to thrive and succeed into STEM-related careers.



A closer look at the Workbook

The write-in student workbooks offer extra practice of key content along with student support, confidence checkers and progression charts, giving students the chance to reflect on their progress and take ownership of their work.



Master Check P65 Strengthen P67 Extend P71 Test P75

3.2 Writing algebraic expressions

You will learn to:

- Write expressions using four operations.

Fluency
Work out:
• 3^2
• 5^3
• 4^4

Explore
Think of a number. Double it. Add 10. Divide by 2. Subtract your original number. Try this with different numbers. What answer do you get? Why?

Why learn this?
Computers are programmed using a computer algebra system (CAS).

Exercise 3.2

- Simplify
a $2x + 3x - 5x$ b $3x^2 - 4x + 2x^2$ c $3x + 5 - 2x + 4$
- Simplify
a $y \times y$ b $b \times b \times b$ c $4 \times 2n$
d $4b \times 2b$ e $\frac{16c}{4}$
- John collects coins. He has b coins. Write an expression for how many he has when there are
a 2 more b 4 fewer c 17 more
d 5 times as many e half as many.
- Haruto is m years old. Write expressions for the ages of each of these people.
a Laila is 4 times as old as Haruto.
b Maggie is 5 years older than Haruto.
c Ami is 6 years younger than Haruto.
d Iman is half the age of Haruto.
e Rashid is 5 years older than twice Haruto's age.
f Ruth is 3 years younger than 5 times Haruto's age.

Q3a hint

Q3d hint

Q3e hint
Finding half is the same as dividing by 2.

Q5a hint
Try it with numbers. How would you write 5 more than 3?

Worked example
Write an expression for each function machine.
a Input m → $\times 2$ → $+ 3$ → Output
 $m \times 2 + 3 = 2m + 3$ *m is multiplied by 2 then 3 is added.*
b Input x → $- 2$ → $+ 3$ → Output
 $x - 2 + 3 = x + 1$ *To show that the whole expression is divided by 3 draw a long division line.*

7 Write an expression for the output of each function machine.
a $\times 3$ → $- 17$ →
b $\div 4$ → $+ 3$ →
c $\times 5$ → $\times 5$ →
d $+ 2$ → $+ 5$ →

8 A rectangle has width b . The length is 5 more than the height.

a Write an expression for the length.
b Write and simplify an expression for the perimeter.
c Calculate the perimeter of the rectangle when $b = 10$ cm.

9 Explore Think of a number. Double it. Add 10. Halve it. Take away your original number. Try this with different numbers. What answer do you get? Why? Is it easier to explore this question now that you have completed the lesson? What further information do you need to be able to answer this?

10 Reflect This lesson suggested bar modelling and function machines to help you with writing expressions. Did they help you? How? Did you use any other methods? Explain the method(s) you used.

Topic links: Order of operations, Graphs

ActiveLearn Year 7, Section 3.2

Unit 3 Equations, functions and formulae

STEM

STEM questions highlight important links to using science in real life.

Worked examples

Provide guidance around examples of key concepts with images, bar models, and other pictorial representations where needed.

Guided

Guided questions with partially worked solutions help students structure their answers.

2.1 Master Factors, primes and multiples

1 Here is a list of numbers.
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
Circle the prime numbers.

2 a Write down all the factors of
i 12 $1 \times 12 = 12$, $2 \times 6 = 12$, $3 \times 4 = 12$. Factors are 1, 2, 3, 4, 6, 12
ii 18 1×18 , $2 \times \dots$
iii 25
b Write down all of the prime factors of each number in part a.
i 2, 3
ii
iii

3 Problem-solving Simon finds all the factors of a number. This is his list.
1, 2, 3, 4, ..., 8, 10, 12, ..., 20, 24, ..., 48, ..., 80, 120, 240
What are the missing numbers?

4 a Write down all the factors of 6.
b Write down all the factors of 15.
c Write down all the factors of 15.
d What is the highest common factor (HCF) of 6 and 15?
e Find the HCF of each of these pairs of numbers.
i 8 and 20
ii 9 and 27

5 a List the first 8 multiples of 4.
b List the first 8 multiples of 8.
c Write down the common multiples of 4 and 8 that are in both lists.
d What is the lowest common multiple (LCM) of 4 and 8?

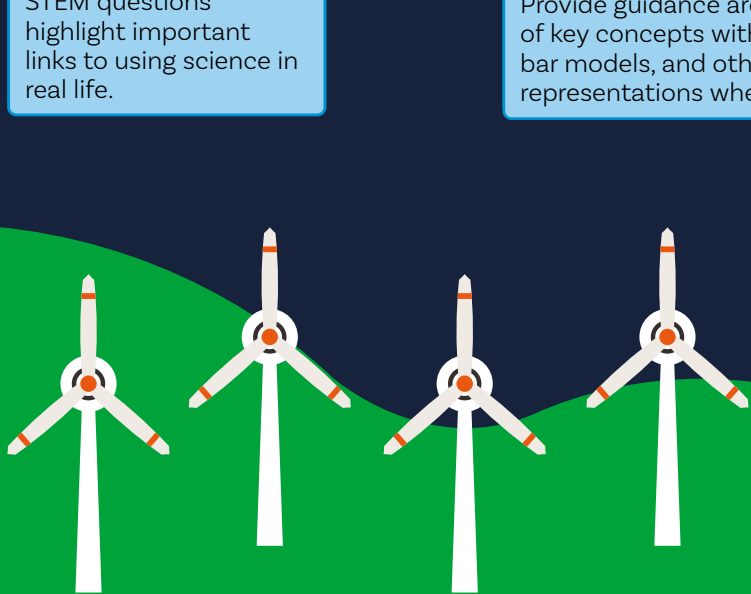
6 STEM The diagram shows two cogs.
The larger cog has 10 teeth and the smaller cog has 6 teeth.
The cogs start to turn with the black dots next to each other.
What is the smallest number of turns each cog must make before the black dots are next to each other again?

Check Tick each box as your confidence in this topic improves. ☹️ 😐 😊

Need extra help? Go to page 18 and tick the boxes next to Q1-3. Then have a go at them once you've finished 2.1-2.6.

QR codes

QR codes give students direct access to worked example videos on their phones or tablets providing crucial support for tricky questions.



Active Learn

Teaching Resources

Interactive front-of-class teaching resources that boost engagement and inspire students.

Planning

Complete support for planning and teaching with detailed teaching notes, planning guides and lesson ideas.

Assessment

Track students' progress from 11-16. It will save you time and give you confidence in your data to plan appropriate intervention.

Student Resources

Hundreds of auto-marked activities for students to use in lessons or at home to build on their learning and practice.

Progression to International GCSE

Maths Progress International offers a seamless transition for progression into Pearson Edexcel International GCSE Mathematics (9-1) and beyond.

Pearson Edexcel International GCSE (9-1) qualifications are comparable to the UK GCSE, with appropriate international content and assessment that will enable successful progression for learners.

We have a range of resources available to help you prepare your students for success in Pearson Edexcel's world class qualifications.

Find out more

pearsonglobalschools.com/internationalGCSE



Maths Progress International is also fully matched to the **Pearson Edexcel iLower Secondary award**, part of the iProgress family. From Primary through to Secondary, iProgress delivers a consistent and high-quality educational experience for students aged 5 to 19, by providing globally recognised qualifications and curriculum-matched resources at each school stage.

Based on the UK curriculum but designed with a global outlook, iProgress is a learning journey for your students from Pearson Edexcel, and includes iPrimary, iLowerSecondary, International GCSE (IG) and International A Level (IAL).



There's lots more to see online...

pearsonglobalschools.com/MathsProgressInternational

- ✓ Samples
- ✓ ActiveLearn free trial
- ✓ Request a demo
- ✓ Sign up for latest news

