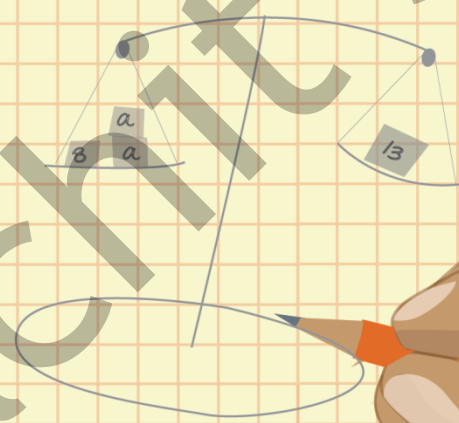
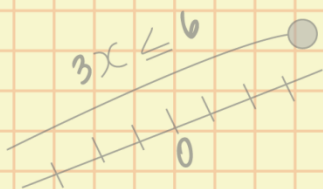


$$x + 3 = 7$$
$$x = 4$$

y	y	y	10
46			
$3x = 36$			

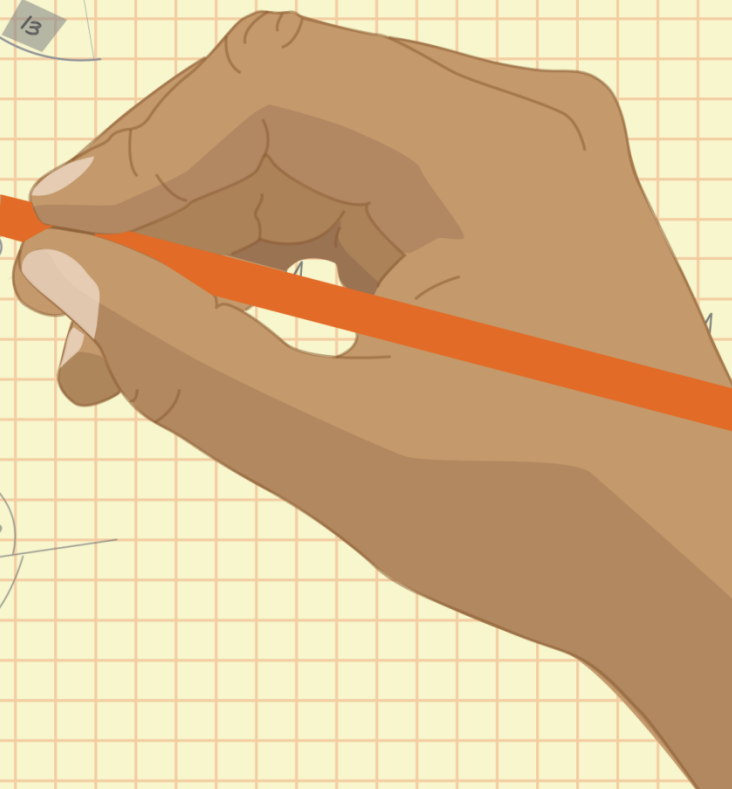
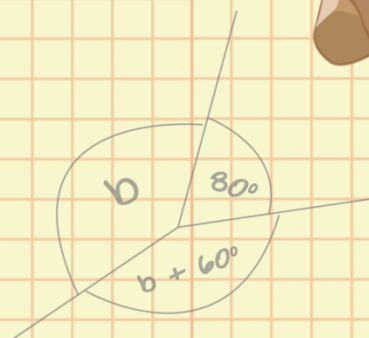
Understanding Equations at year 7

$$13p - 7 > 19$$
$$13p > 26$$
$$p > 2$$



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

$$b + b + 60 + 80 = 360$$
$$2b + 140 = 360$$
$$2b = 220$$
$$\underline{\underline{b = 110}}$$



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Introduction

Aims

The aims of this pack are to employ year 7 students' knowledge from primary school, and from Teachit maths teaching pack *Understanding algebra at year 7*, to build solid foundations for their understanding of linear equations and inequalities throughout KS3 and 4. Both flow diagrams and bar models are considered, with the main emphasis on the balance method for solving equations. For many fluency activities, it will be possible to use whichever method suits.

These are not whole lessons; instead, there are 25 mix-and-match activity worksheets with a summative assessment at the end, giving teachers the flexibility they need to tailor this content to their students and teaching style. They are split into the following sections:

Sections

One: Short tasks. These can be used as starters, plenaries or stand-alone tasks.

Two: Developing concepts. These PowerPoint resources are intended to be led by the teacher to advance students' learning.

Three: Developing fluency. These activities comprise opportunities to practise concepts met in section two and some are there to challenge the most confident learners.

Four: Homework tasks. These can also be used as independent tasks within lessons.

Five: Assessment. A summative assessment covering all content, split into two sections: Equations [35 marks] and Inequalities [15 marks].

Each section is further split into: teaching notes (📖), activities and answers sections (✅❌).



Objectives

The learning objectives for this pack are taken from the national curriculum for KS3. In the teaching notes, objectives for each activity are stated.

Students should be able to:

1. **Algebraic manipulation.** Use and manipulate algebra with the correct notation. This work is covered in the Teachit maths teaching pack
2. **Algebraic vocabulary.** *Understanding algebra at year 7.* Understand and be able to interpret the meaning of vocabulary within this topic.
3. **Solve equations with the unknown on one side**
4. **Solve equations with the unknown on both sides**
5. **Solve equations containing single brackets**
6. **Represent inequalities**
7. **Solve inequalities**
8. **Modelling**

Support and challenge

Most of the resources will be accessible to most students, with some requiring teacher input. Challenge questions within activities are clearly shown by a darker shaded background. Resources 2.5 *Linear equations* and 3.7 *The Rhind mathematical papyrus* are aimed at those students who are confident with the subject.

For students who need extra practice, links are given to other Teachit maths resources that may help.



Ideas for discussion:

- Included in the teaching notes for each resource in sections 1, 2 and 3 is a non-exhaustive list of ideas for class discussion. Many will be familiar but they are there as a guide or brief reminder.



Vocabulary

Below is a word bank of vocabulary used in this pack. Some words will be well known to students; many will be new or misremembered from KS2. Resources in the pack promote the use of correct mathematical terminology throughout, and teaching notes contain specific vocabulary for each activity.

To find practical approaches to develop students' comprehension of this vocabulary, look no further than the maths section of our OUP resource [*Closing the Word gap*](#), available free on Teachit maths.

Algebra, algebraic, balance, bar model, bracket, coefficient, constant, equal, equation, evaluate, expand, expression, flow diagram, formula, integer, inverse, inverse operation, isolate, linear, multiply out, negative, operator, positive, simplify, solution, solve, substitute, substitution, term, unknown, value, variable.

Note: task-specific vocabulary can appear in the teaching notes of some activities but not here, where it is not used widely throughout the pack.

3.5 Forming and solving equations



Aim

In this resource, students are challenged to create equations, collect like terms, simplify and solve equations. Students will need to use their knowledge from other areas of mathematics: geometry, number, statistics and problem solving.



Objectives covered:

1. Algebraic manipulation
2. Algebraic vocabulary
3. Solving equations with the unknown on one side
4. Solving equations with the unknown on both sides
5. Solving equations containing single brackets
8. Modelling

Support and challenge

Resources 2.2 *Flow diagrams*, 2.3 *Bar models* and 2.4 *Algebraic manipulation* will support this activity. Students with lower attainment may need recaps of the other topics included in this resource. All of these are in the KS2 curriculum. Some students may need support with the vocabulary.

Questions with extra challenge are shaded a darker colour.



Ideas for discussion:

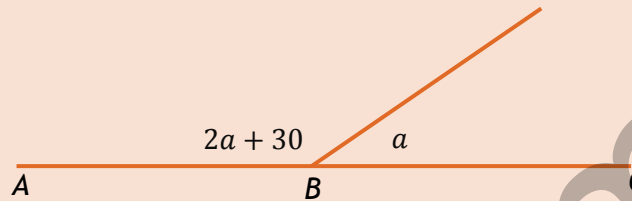
- Recap angle facts: angles in a straight line, degrees in a right angle, degrees in a circle.
- Recap area and perimeter of a rectangle and area of a triangle.
- Recap mean and median.
- How to break down the problem. Use the steps in questions 1-3 to prompt.
- Students may find it easier to add expressions in a column.
- Vocabulary: algebraic equations, angle, circle, collect like terms, consecutive numbers, degrees, expression, integer mean, median, perimeter, rectangle, right angle, simplify, straight line, solve, sum, value.

3.5 Forming and solving equations

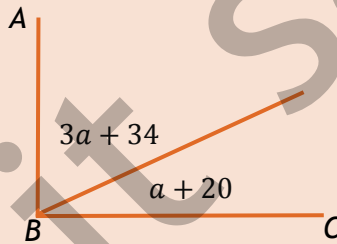
In questions 1-3:

- Form an algebraic equation using facts you know about angles.
- Collect and simplify any like terms.
- Solve the equation.
- Find the size of each angle - all angles are in degrees.

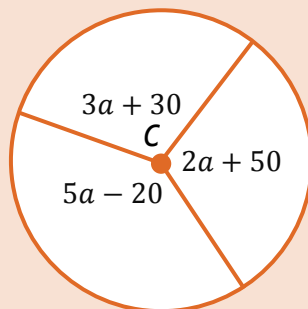
1. ABC is a straight line.



2. Angle ABC is a right angle.



3. C is the centre of a circle.

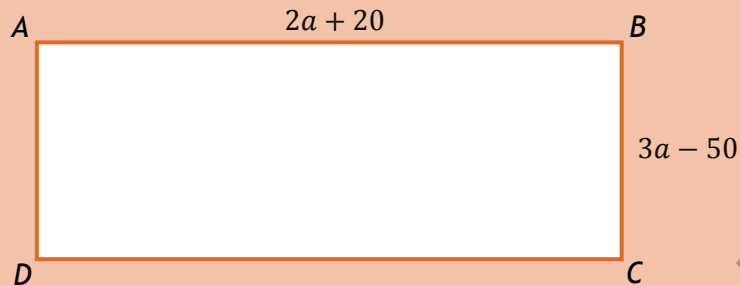


4. The **sum** of the four numbers $3a$, $2a - 5$, $3(a + 2)$ and $4(a - 1)$ is 141.
Form an equation from this information. Then find the value of each number.

5. Find the **value** of a if $\frac{a}{8} + \frac{1}{4} = \frac{7}{8}$.

6. The **mean** of the five numbers $2a + 1$, $3a - 2$, $4a + 4$, $a - 5$ and $2a - 4$ is 6.
Form an equation to find a and use your answer to find their median value.

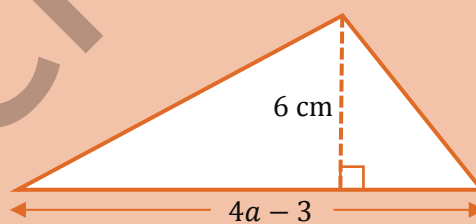
7. $ABCD$ is a rectangle.
Its perimeter is 140 cm. Use this information to find its area.



8. Anusha is a years old. Her friend Dhilan is 3 years older and her cousin Ben is twice as old as Dhilan. The total of their ages is 53 years.
- Write an expression in terms of a to represent Dhilan's age.
 - Write an expression in terms of a to represent Ben's age.
 - Form an equation for their total age.
 - Collect like terms and simplify the equation.
 - Solve the equation.
 - How old are Anusha, Dhilan and Ben?

9. a is a positive **integer**. The sum of a and its next three **consecutive** numbers is 498. Find the value of all four numbers.

10. The area of the triangle below is 27 cm^2 . Find a and use it to find the length of its base.



3.5 Forming and solving equations



1. a. $2a + 30 + a = 180$ b. $3a + 30 = 180$ c. $a = 50$
d. $2a + 30 = 130^\circ$
2. a. $3a + 34 + a + 20 = 90$ b. $4a + 54 = 90$ c. $a = 9$
d. $3a + 34 = 61^\circ, a + 20 = 29^\circ$
3. a. $3a + 30 + 2a + 50 + 5a - 20 = 360$ b. $10a + 60 = 360$ c. $a = 30$
d. $3a + 30 = 120^\circ, 2a + 50 = 110^\circ, 5a - 20 = 130^\circ$
4. $12a - 3 = 141 \Rightarrow a = 12, 3a = 36, 2a - 5 = 19, 3(a + 2) = 42, 4(a - 1) = 44$
5. $a = 5$
6. $a = 3$, so the numbers are $-2, 2, 7, 7, 16$ and the median is 7.
7. $2(2a + 20 + 3a - 50) = 140 \Rightarrow 10a - 60 = 140 \Rightarrow a = 20$.
Then, area = $(2 \times 20 + 20) \times (3 \times 20 - 50) = 600 \text{ cm}^2$.
8. a. $a + 3$
b. $2(a + 3)$
c. $a + a + 3 + 2(a + 3) = 53$
d. $4a + 9 = 53$
e. $a = 11$
f. Anusha is 11, Dhilan is 14 and Ben is 28.
9. 123, 124, 125, 126
10. $a = 3 \Rightarrow$ base length is 9 cm.

3.6 Problem solving



$$a = 3, b = 2, c = 7, d = 12, e = 12, f = 10$$

1. Mean = $\frac{46}{6} \approx 7.67$, median = $\frac{10+7}{2} = \frac{17}{2} = 8.5$, mode = 12, range = $12 - 2 = 10$
2. 12 red, 5 green and 3 blue balls
 $P(\text{green}) = \frac{5}{20}$, $P(\text{red or blue}) = \frac{12+3}{20} = \frac{15}{20}$, $P(\text{yellow}) = 0$
3. $5a - 5 = 10, 2(c + 1) = 16 \Rightarrow$ Rectangle area is $10 \times 16 = 160 \text{ cm}^2$
 $2(3b - 1) = 10, e + f = 22 \Rightarrow$ Triangle area is $\frac{10 \times 22}{2} = 110 \text{ cm}^2$
 $3e - 1 = 35, 2d - 3 = 21, f = 10 \Rightarrow$ Trapezium area is $\frac{35+21}{2} \times 10 = 280 \text{ cm}^2$