

# 1 Calculations

## Section 1: Basic calculations

### HOMEWORK 1A

**Solve these problems using written methods. Set out your solutions clearly to show the methods you chose.**

- How many 12-litre containers can be completely filled from a tanker containing 783 litres?
- A train is travelling at a constant 64 mph.
  - How far does it travel in  $1\frac{1}{2}$  hours?
  - How long does it take to travel 336 miles?



#### Tip

64 mph means the train travels 64 miles each hour.

- A train starts a journey with 576 people on board.  
 At the first station 23 people get on, 14 get off.  
 At the second station 76 people get off and no one gets on.  
 At the third station a further 45 people get on.  
 How many people are on the train after the third station?
- The table shows the height of the world's five highest mountains.

Mountain	Height in m
Mount Everest	8848
K2	8611
Kangchenjunga	8586
Lhotse	8516
Makalu	8485

- How much higher is Mount Everest than Makalu?
- What is the smallest difference in height between any two mountains?
- A climber has climbed to the top of Lhotse. How much higher would she need to climb if she was climbing K2?

- What is the product of 19 and 21?
- Which of the following pairs of numbers have a difference of 37 and a product of 2310?
  - 23 and 60
  - 66 and 35
  - 77 and 30
  - 33 and 70

### HOMEWORK 1B

- The temperature one day in Aberdeen is  $3^{\circ}\text{C}$ . Overnight the temperature drops by  $11^{\circ}\text{C}$ . What is the temperature overnight?
- Calculate.
  - $13 - 4 + 8$
  - $-5 + 9 - 6$
  - $-27 + (-12) - 18$
  - $-4 - 3 - 7$
  - $-8 - (-5) + 3$
- Simplify.
  - $-2 \times -5 \times -3$
  - $8 \times -4 \times 7$
  - $-48 \div 12$
  - $424 \div -8$
  - $-3 \times 8 \times -2$
  - $-8 \times -6 \times -4 \times 3$
  - $-144 \div -8$
  - $-225 \div -15$



#### Tip

Make sure you know the rules for multiplying and dividing by negative numbers.

- Simplify.
  - $\frac{40}{8}$
  - $\frac{63}{-9}$
  - $\frac{-81}{-9}$
  - $\frac{-200}{8}$
  - $\frac{-360}{-9}$

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- 5 Start with the number  $-5$  and complete the table. Use your previous answer each time.

Start	$-5$
$\times 6$	$=$
$+ (-3)$	$=$
$+ 28$	$=$
$\times -2$	$=$
$- (-7)$	$=$
$\times 3$	$=$

- 6 Hilary's small business account has £489 in the bank on a Sunday night.

Calculate the missing amounts.

Day	Spends	Deposits	Balance
Monday	£456	£745	
Tuesday		£398	$-\text{£}100$
Wednesday	£1109		£33

- 7 The Marianas Trench is the deepest part of the ocean, being 10911 m deep.
- What is the difference in height from the top of Mount Everest (see Q4 in Homework 1A) to the bottom of the Marianas Trench?
  - If a mountain the height of Mount Everest was formed at the bottom of the trench, how far below sea level would the summit of the mountain be?
- 8 Here is a set of integers  $\{-7, -5, -1, 2, 7, 11\}$ .
- Find two numbers with a difference of 7.
  - Find two numbers with a product of  $-7$ .
  - Find three numbers with a sum of 4.

Section 2: Order of operations  
**HOMEWORK 1C**

- 1 Simplify.
- |                              |                             |
|------------------------------|-----------------------------|
| a $6 \times 11 + 4$          | b $6 \times (11 - 2)$       |
| c $5 + 11 \times 2$          | d $(3 + 12) \times 4$       |
| e $25 + 6 \times 3$          | f $8 \times 3 \div (4 + 2)$ |
| g $(14 + 7) \div 3$          | h $43 + 2 \times 8 + 6$     |
| i $24 \div 4 \times (8 - 5)$ | j $16 - \frac{8}{2} + 5$    |

- 2 Use the numbers listed to make each number sentence true.

a  $\square - \square \div \square = \square$       1, 18, 6, 4  
 b  $\square - \square \div \square = \square$       8, 7, 3, 2  
 c  $\square \div (\square - \square) - \square = \square$       2, 3, 4, 7, 15



**Tip**

Learn the rules about order of operations.

Section 3: Inverse operations

**HOMEWORK 1D**

- 1 Find the additive inverse of each of these numbers.  
 a 7   b 6   c 200   d  $-7$    e  $-21$    f  $-36$
- 2 By what number would you multiply each of these to get an answer of 1?  
 a 4   b 12   c  $-5$    d  $\frac{1}{2}$    e 7   f  $\frac{1}{8}$
- 3 Use inverse operations to check the results of each calculation.  
 Correct those that are incorrect.  
 a  $6247 - 1907 = 4340$    b  $2487 - 1581 = 816$   
 c  $7845 - 2458 = 547$    d  $4588 + 2549 = 7137$
- 4 Use inverse operations to find the missing values in each of these calculations.  
 a  $\square + 564 = 729$       b  $\square + 389 = 786$   
 c  $\square - 293 = 146$       d  $132 \times \square = -3564$   
 e  $-8 \times \square = 392$       f  $\square \div 30 = 4800$

Chapter 1 review

- 1 Bonita and Kim travel for  $3\frac{1}{2}$  hours at 48 km/h.  
 They then travel a further 53 km.  
 What is the total distance they have travelled?
- 2 On a page of a newspaper there are eight columns of text.  
 Each row contains a maximum of 38 characters (spaces between words count as characters).  
 Each column has a total of 168 rows.

2 Shapes and solids

- a What is the maximum number of characters that can appear on a page?
  - b The average word length is six characters and each word needs a space after it. Estimate the number of words that can fit on a page.
- 3 A theatre has seats for 2925 people. How many rows of 75 is this?
- 4 Two numbers have a sum of  $-12$  and a product of  $-28$ . What are the numbers?
- 5 Jadheja's bank account was overdrawn. She deposited £750 and this brought her balance to £486.  
 By how much was her account overdrawn to start with?

# 2 Shapes and solids

## Section 1: 2D shapes

### HOMEWORK 2A

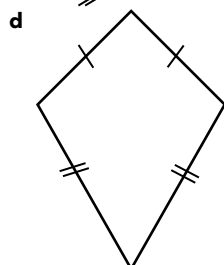
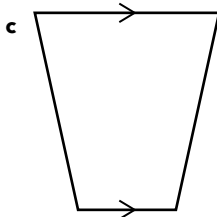
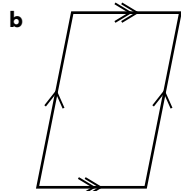
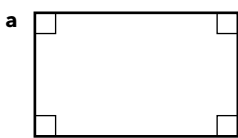
- 1 What is the correct mathematical name for each of the following shapes:
- a plane shape with four sides
  - b polygon with six equal sides
  - c polygon with five vertices and five equal internal angles
  - d plane shape with ten equal sides and ten equal internal angles?



**Tip**

Learn the names of shapes and which are regular and which are irregular.

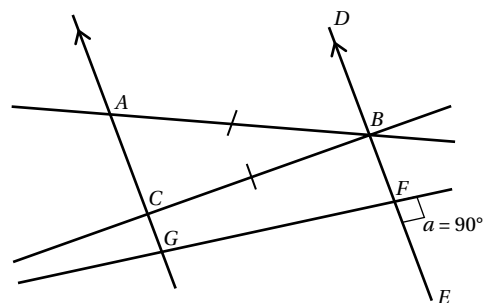
- 2 What are the names of the following shapes?



- 3 Name the shape given the following properties:
- a four-sided shape with two pairs of equal and opposite sides but no right angles
  - b four-sided shape with only one pair of parallel sides
  - c triangle with two equal angles
  - d triangle with all sides and angles equal
  - e four-sided shape with two pairs of equal and adjacent sides.

### HOMEWORK 2B

- 1 Look at this diagram.  
 Say whether the following statements are true or false.



- a  $AG$  is parallel to  $DE$ .
- b  $ABC$  is an isosceles triangle.
- c  $DE$  is perpendicular to  $BC$ .
- d  $AG$  is perpendicular to  $GF$ .
- e  $AB$  is perpendicular to  $AG$ .
- f  $AB$  and  $GF$  are parallel.

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- 2 Draw and correctly label a sketch of each of the following shapes:
- triangle  $ABC$  with a right angle at  $A$  and  $AB = AC$
  - quadrilateral  $PQRS$  with two pairs of opposite equal angles, none of which are right angles, and two pairs of opposite equal sides with different lengths
  - quadrilateral  $ABCD$  where  $AB$  is parallel to  $CD$  and angle  $ABC$  is a right angle.

## Section 2: Symmetry

### HOMEWORK 2C

- 1 How many lines of symmetry do the following shapes have:
- square
  - kite
  - regular hexagon
  - equilateral triangle?

**Tip**

Line symmetry cuts a shape in half so that one side is a mirror image of the other.

- 2 Give an example of a shape that has rotational symmetry of order:
- 2
  - 3
  - 4
- 3 Which of the following letters have rotational symmetry of order greater than 1?

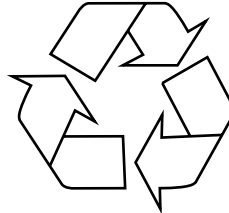
N I C K

**Tip**

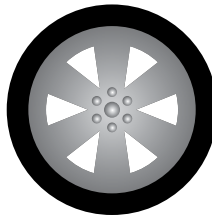
Rotational symmetry is when the shape looks exactly the same after a rotation.

- 4 What is the order of rotational symmetry for each of these pictures?

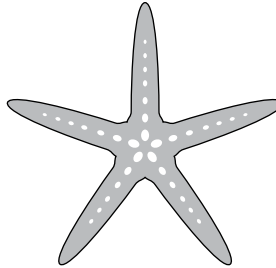
a



b



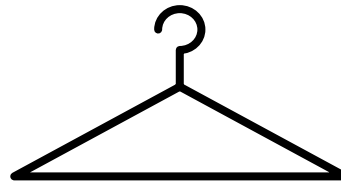
c



## Section 3: Triangles

### HOMEWORK 2D

- 1 What type of triangle do you see in this coat hanger? Explain how you decided without measuring.

**Tip**

Learn the properties of the different types of triangle.

- 2 a What type of triangle is this?



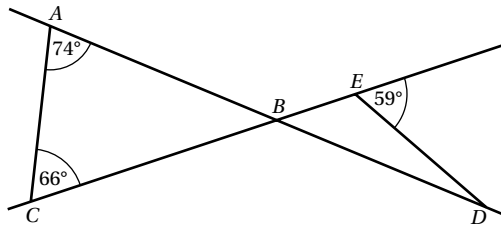
- b Explain why this triangle cannot be isosceles.

- 3 State whether the following triangles are possible. How did you decide?
- side lengths 6 cm, 8 cm, 10 cm
  - side lengths 12 cm, 4 cm, 5 cm
  - side lengths 7 cm, 11 cm, 5 cm
  - side lengths 35 cm, 45 cm, 80 cm

- 4 Two angles in a triangle are  $27^\circ$  and  $126^\circ$ .

- What is the size of the third angle?
- What type of triangle is this?

- 5 Look at the diagram below.



Work out the following:

- a angle  $ABC$    b angle  $BED$    c angle  $BDE$ .



Tip

Use the properties of triangles and angles to answer this question.

- 6 An isosceles triangle  $PQR$  with  $PQ = QR$  has a perimeter of 80 cm. Find the length of  $PQ$  if:
- $PR = 24$  cm
  - $PR = 53$  cm

## Section 4: Quadrilaterals

### HOMEWORK 2E



Tip

Make sure you learn the names and properties of all the quadrilaterals.

- 1 Identify the quadrilateral from the description.

There may be more than one correct answer.

- All sides are equal.
- Diagonals cross at right angles.
- One pair of sides is parallel.
- Two pairs of sides are parallel and equal in length.

- 2 Molly says that all four-sided shapes have at least one pair of equal or parallel sides.

Is she right?

- 3 A kite  $ABCD$  has an angle  $ABC$  of  $43^\circ$  and the opposite angle  $ADC$  of  $75^\circ$ .

What size are the other two angles?

- 4 One pair of triangles has the angles  $36^\circ$ ,  $54^\circ$  and  $90^\circ$ , while another pair has the angles  $24^\circ$ ,  $66^\circ$  and  $90^\circ$ . The length of the shortest side in each of the four triangles is the same.

Imagine all four triangles placed together so that the right angles meet at the same point.

- What shape has been formed?
- What are the sizes of the four angles of this new shape?

- 5
- Write down the names of all the quadrilaterals.
  - Which quadrilaterals have at least two equal sides?
  - Which quadrilaterals have at least one pair of parallel sides?
  - Which quadrilaterals have rotational symmetry of order 1?

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## Section 5: 3D objects

## HOMEWORK 2F

- 1 Sketch an example of each of the following solids:
- cylinder
  - cuboid
  - hexagonal prism
  - square-based pyramid.



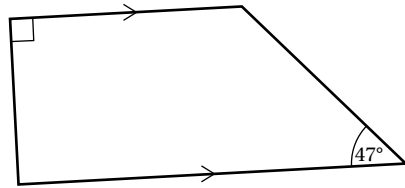
## Tip

Try to visualise the solid.

- 2 What is the difference between a square and a cube?
- 3 Compare a cuboid and a rectangular-based pyramid. How are they alike? How are they different?
- 4 Name a solid that has four flat faces.
- 5 Which solids fit the following descriptions:
- 6 vertices, 9 edges and 5 faces
  - 5 faces, 5 vertices and 8 edges
  - 24 edges, 16 vertices and 10 faces?

## Chapter 2 review

- 1 True or false?
- A triangle with two equal angles is called isosceles.
  - A cuboid has 8 vertices, 6 faces and 10 edges.
  - A pair of lines that meet at precisely  $90^\circ$  are described as perpendicular.
  - Every square is a rhombus.
  - Every rectangle is a parallelogram.
  - Every square is a rectangle.
- 2 Describe all the symmetrical features of a rectangle.
- 3 Find the unknown angles in this trapezium.



## 3 2D representations of 3D shapes

## Section 1: 3D objects and their nets

## HOMEWORK 3A

- 1 What shape/s are the faces of these solids:
- cube
  - pentagonal-based pyramid
  - pentagonal prism
  - cylinder
  - trapezoidal prism?

- 2 Complete the following by filling in appropriate words or phrases.

The net of a solid is a \_\_\_\_\_ drawing that shows how the \_\_\_\_\_ of the solid are joined to each other so that they can be folded up into the solid.

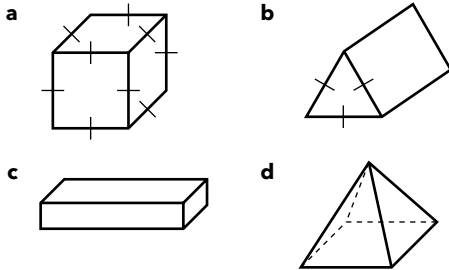
You can form a 3D object by \_\_\_\_\_ the net along the \_\_\_\_\_.

When you draw the net of a solid, you need to think about:

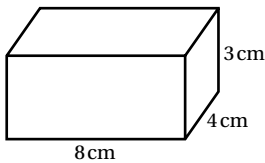
- how many \_\_\_\_\_ it has
- what \_\_\_\_\_ the faces are
- how the faces are \_\_\_\_\_.

3 2D representations of 3D shapes

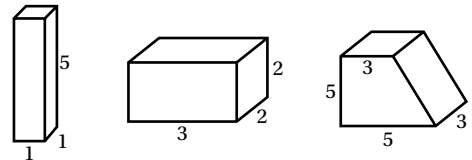
- 3 Sketch a possible net for each of the following solids.



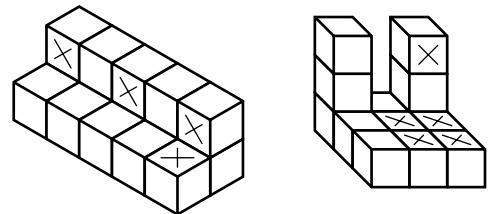
- 4 Draw an accurate net of this cuboid and use it to build a model of the object.



- 3 Draw these shapes on isometric grid paper. The dimensions are given as distances between the dots on the paper.

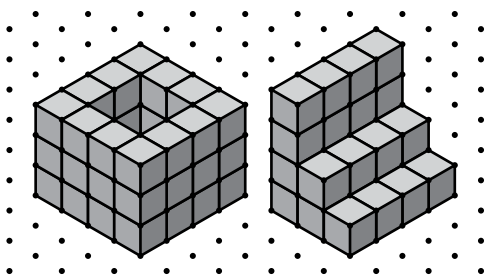


- 4 Redraw each of these solids on an isometric grid showing what they would look like if the blocks marked with an X were removed from the shape.



Section 2: Drawing 3D objects  
**HOMEWORK 3B**

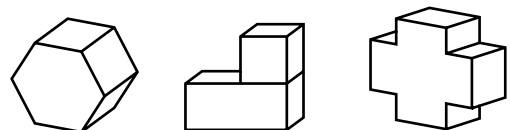
- 1 Assuming no blocks are missing, how many blocks would you need to build each of the following solids?



- 2 A prism has a cross-section in the shape of an isosceles triangle with a base of 6 cm and a height of 4 cm. The distance between the triangular end faces is 8 cm.
- Draw this 3D object without using a grid.
  - Label the diagram to show the dimensions.
  - Sketch a possible net of the object.

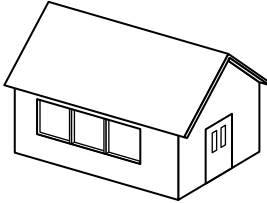
Section 3: Plan and elevation views  
**HOMEWORK 3C**

- 1 Sketch each of the following objects as they would appear in a plan view and a front elevation:
- a box of cereal
  - a tin of food
  - your desk.
- 2 Draw a plan view, front elevation and side elevation from the right of each of the following solids.



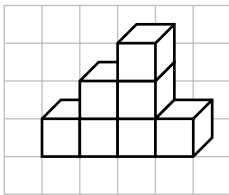
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- 3 Draw the plan, front elevation and side elevation from the right of this building.

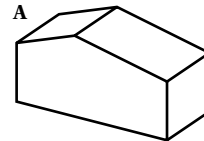


Chapter 3 review

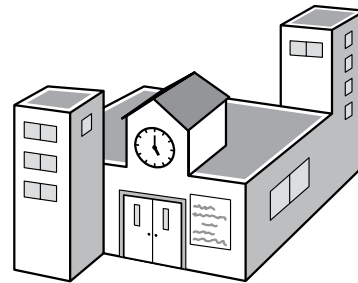
- 1 Sketch and label the net of:  
 a a cube with edges 4 cm long  
 b a cuboid with a square face of side 2 cm and a length of 4 cm.
- 2 This solid has been drawn on a squared grid. Redraw it on an isometric grid.



- 3 a Draw this solid on an isometric grid. Show the hidden edges on your diagram.  
 b Draw the plan view, front elevation and side elevation from the right.



- 4 This is a view of a public library building.  
 a What solids can you identify in the construction?  
 b Draw the plan, front and side elevations of the building.



# 4 Properties of whole numbers

## Section 1: Reviewing number properties

### HOMEWORK 4A

- 1 Write down the factors of the following numbers:  
 a 24      b 36      c 81      d 53
- 2 Look at the numbers in this list:  
 4    15    8    25    7    16    12    9  
 6    23    36    96    27    3    1
- Choose and write down the numbers in the list that are:
- a odd              b even              c prime  
 d square        e cube              f factors of 12  
 g multiples of 4

- h common factors of 24 and 36  
 i common multiples of 3 and 4.



Tip

Learn the words for different types of number.

- 3 Write down:
- a the next four odd numbers after 313  
 b the first four consecutive even numbers after 596  
 c the square numbers between 40 and 100 inclusive  
 d the factors of 43  
 e four prime numbers between 30 and 50  
 f the first five cube numbers  
 g the first five multiples of 7  
 h the factors of 48.



- 4 Say whether the results will be odd or even or could be either:
- the product of two odd numbers
  - the sum of two odd numbers
  - the difference between two odd numbers
  - the square of an even number
  - the product of an odd and an even number
  - the cube of an even number.

### HOMEWORK 4B

- 1 Write these sets of numbers in order from smallest to biggest.
- 476 736 458 634 453 4002
  - 1707 1770 1708 1870 1807
  - 345 543 453 354 534 435
  - 245, 54, -245, -254, -2004, 205
- 2 What is the value of the 6 in each of these numbers?
- 46
  - 673
  - 265
  - 16877
  - 64475
  - 1654782
  - 6035784
- 3 What is the biggest and smallest number you can make with each set of digits?
- Use each digit only once in each number.
- 3, 0 and 7
  - 6, 5, 1 and 9
  - 2, 3, 5, 0, 6 and 7
  - What is the difference between the biggest and smallest numbers in each question?
- 4 Place the symbol =, < or > in each box to make each statement true.
- $4 \square 5$
  - $3 + 5 \square 8$
  - $9 \square 3 + 2$
  - $3 - 7 \square - 2$

### Section 2: Prime factors

#### HOMEWORK 4C

- 1 Identify the prime numbers in each set.
- 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
  - 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110



#### Tip

Remember each number has a unique set of prime factors.

- 2 Express the following numbers as a product of their prime factors.

Use the method you prefer. Write your final answers using powers.

a 48   b 75   c 81   d 315   e 560  
 f 2310   g 735   h 1430   i 32   j 625  
 k 864

- 3 A number is expressed as  $13 \times 23 \times 7$ .  
 What is the number?

### Section 3: Multiples and factors

#### HOMEWORK 4D

- 1 Find the lowest common multiple (LCM) of the given numbers.
- 12 and 16   b 15 and 20   c 12 and 20
  - 24 and 30   e 3, 4 and 6   f 5, 7 and 10
- 2 Find the highest common factor (HCF) of the given numbers.
- 18 and 24   b 36 and 48   c 27 and 45
  - 14 and 35   e 21 and 49   f 36 and 72
- 3 Find the LCM and the HCF of the following numbers using prime factors.
- 28 and 98   b 75 and 20   c 144 and 24
  - 54 and 12   e 214 and 78
- 4 Amjad has two long pieces of timber.  
 One piece is 64 m, the other is 80 m.  
 He wants to cut the long pieces of timber into shorter pieces of equal length.  
 What is the longest he can make each piece?



#### Tip

Think carefully – is it the HCF or the LCM you need to find?

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- 5 Two desert flowers have a cycle of 11 and 15 years respectively when they are in bloom. How many years are there between the occasions when they bloom simultaneously?
- 6 Rochelle has 20 pieces of fruit and 55 sweets to share among the pupils in her class. Each student gets the same number of pieces of fruit and the same number of sweets. What is the largest possible number of students in her class?

## Chapter 4 review

- 1 Is 243 a prime number? Explain how you worked out your answer.
- 2 Find the HCF and the LCM of 18 and 45 by listing the factors and multiples.
- 3 Express 675 as a product of prime factors, giving your final answer in power notation.
- 4 Determine the HCF and LCM of the following by prime factorisation.  
 a 64 and 104                      b 54 and 80

## 5 Introduction to algebra

## Section 1: Using algebraic notation

## HOMEWORK 5A

- 1  $5x$ ,  $3x^2$  and  $7y$  are the three terms of an expression. Write down the expression (it doesn't matter which operations you use).
- 2 Write an expression for the following statements using the conventions for algebra.



## Tip

Remember: letters represent numbers.

- a A number  $x$  is multiplied by 4 and has 3 added to it.
- b A number  $x$  is multiplied by 2 and added to  $y$  multiplied by 5.
- c A number  $x$  is squared and 7 is subtracted from this. This is then multiplied by 3.
- d A number  $x$  is cubed and added to a number  $y$  squared. Then this is all divided by 2.
- e A number  $x$  has 2 subtracted from it and

the result is divided by 3.

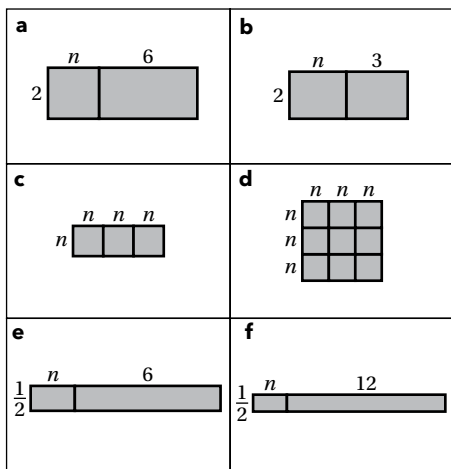
- 3 Match these statements to their correct algebraic expression.

A number $x$ is multiplied by 2 and has 7 added to it. The result is divided by 3.	$3x - 7$
A number $x$ is squared, then multiplied by 3 and added to a number $y$ , multiplied by 7.	$x^2 + 3x$
A number $x$ is multiplied by 3 and has 7 taken from the result.	$3x^2 + 7y$
A number $x$ is added to a number $y$ and the result is multiplied by 3.	$\frac{2x + 7}{3}$
A number $x$ is squared and then added to the original number multiplied by 3.	$3(x + y)$

- 4 Simplify these expressions.

- a  $5 \times 2x$       b  $3a \times 2$       c  $x \times (-5)$   
 d  $3x \times 6y$     e  $3a \times 5b$       f  $-3p \times 3q$   
 g  $16x \div 4$     h  $25y \div 5$       i  $32a^2 \div 4$   
 j  $4 \times 15p \div 20$  k  $27x \div (3 \times 3)$  l  $24y \div (4 \times 2)$

- 5 Write an expression to represent the area of each of these rectangles.



**HOMEWORK 5B**

- 1 Given that  $p = 4$  and  $q = 5$ , find the value of these expressions.  
**a**  $4p + 2q$    **b**  $2p - q$    **c**  $3pq$    **d**  $2q + 3p$
- 2 Find the value of each expression when  $e = -2$  and  $f = 6$ .  
**a**  $3e + 2f$    **b**  $-4ef$    **c**  $\frac{100}{e}$    **d**  $6 - 5ef$
- 3 Given that  $x = 4$  and  $y = 3$ , evaluate the following expressions.  
**a**  $3(2x + 3y)$    **b**  $-2(x + 2y)$   
**c**  $3y(2x - y)$    **d**  $5(10 - 2y)$

Section 2: Simplifying expressions

**HOMEWORK 5C**



**Tip**

You cannot add unlike terms, such as  $3a$  to  $4b$ , unless you know the values of  $a$  and  $b$ .

- 1 Which of the following pairs are like terms? Collect where possible.  
**a**  $10x$  and  $4a$    **b**  $8b$  and  $-3b$   
**c**  $9m$  and  $6n$    **d**  $-8xy$  and  $-5y$

- e**  $6pq$  and  $-3p$    **f**  $10x^2$  and  $5x^2$   
**g**  $7x^2$  and  $-7x^2$    **h**  $6x^2$  and  $-2x$   
**i**  $3a^2bc$  and  $4a^2bc^2$

- 2 Write these expressions in their simplest form by collecting like terms.

- a**  $3a + 6b - 7a + 4b$   
**b**  $6a + 9b - 5a - 8b$   
**c**  $4ab + 5b^2 + 7ab - 7b^2$   
**d**  $4m^2 - mn^2 + mn^2 + 6mn$   
**e**  $8cd^3 - 24cd^3 + 5cd^3$   
**f**  $4st^2 - 4s^2t + 7s^2t + 5st^2$

- 3 Copy and complete.

- a**  $4a + \square = 10a$    **b**  $7b - \square = 6b$   
**c**  $12mn + \square = 15mn$    **d**  $17pq + \square = 8pq$   
**e**  $9x^2 - \square = 12x^2$    **f**  $8m^2 - \square = -m^2$   
**g**  $6ab - \square = -2ab$

- 4 Copy and complete.

- a**  $6a \times \square = 18a$    **b**  $7b \times \square = 14b$   
**c**  $4a \times \square = 12ab$    **d**  $7m \times \square = 28mn$   
**e**  $-4b \times \square = 12b^2$    **f**  $6m \times \square = 12m^2n$

- 5 Cancel to the lowest terms to simplify.

- a**  $\frac{6x}{2}$    **b**  $\frac{4a}{12}$    **c**  $\frac{-16m}{24}$   
**d**  $\frac{14x^2}{21}$    **e**  $\frac{9ab}{a}$    **f**  $\frac{4xy}{12xy}$

Section 3: Multiplying out brackets

**HOMEWORK 5D**

- 1 Expand the brackets and collect any like terms to simplify the following.

- a**  $3(a + 4) - 9$    **b**  $4(a - 3) + 2$   
**c**  $6(b + 4) - 10$    **d**  $4(e - 6) + 17$   
**e**  $3(x - 7) - 4$    **f**  $3a(2a + 5) + 8a$   
**g**  $3b(4b - 7) - 6b$    **h**  $3a(4a + 7) + 5a^2$   
**i**  $5b(4b - 5) - 9b^2$

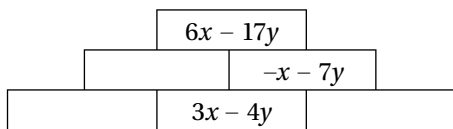


**Tip**

Multiply everything inside the bracket by the number outside.

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- 2 Expand and collect like terms for each expression.
- a  $3(x + 2) + 4(x + 5)$     b  $3(4a - 1) + 4(3a - 2)$   
 c  $4(c + 6) - 3(c + 7)$     d  $4(a - 3) - 3(a + 4)$   
 e  $x(x - 5) + 2(x - 7)$     f  $5q(q + 3) - 5(q + 2)$   
 g  $2y(y + 5) - y(2y + 3)$     h  $2x(x - 5) + x(x - 3)$
- 3 Find the missing expressions for the empty boxes.



Tip

Each box is made by adding together the two boxes immediately below it.

Section 4: Factorising expressions

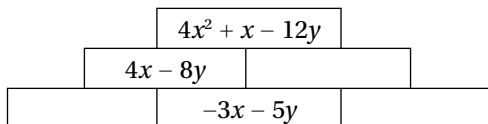
HOMEWORK 5E

- 1 Factorise.
- a  $6e + 3f$                       b  $20v + 35w$   
 c  $hj - hk$                       d  $n^2 - 4n$
- 2 Factorise.
- a  $fg + 3f$                       b  $8cd - 6c^2$   
 c  $15ef + 10f^2$                   d  $3gh + 5g - 4g^2$
- 3 Factorise.
- a  $4(3 + 2d) + c(3 + 2d)$     b  $m(1 - n) - 2(1 - n)$   
 c  $8c(2 + d) - 3(2 + d)$

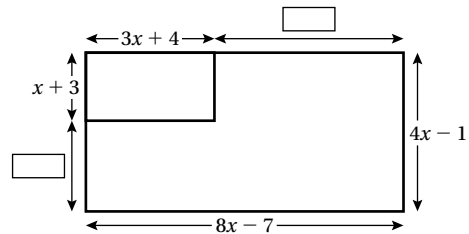
Section 5: Using algebra to solve problems

HOMEWORK 5F

- 1 Complete the pyramid by finding the missing expressions.



- 2 A large rectangle contains a smaller rectangle.



- a Write an expression for each of the unknown lengths.  
 b Write an expression for the perimeter of the small rectangle.  
 c Write an expression for the perimeter of the large rectangle.  
 d Write an expression for the perimeter of the compound shape formed by removing the small rectangle from the large one.



Tip

In a magic square all the rows and columns add up to the same value

- 3 a Copy and complete this magic square, filling in the missing expressions.

$3n + 8$	$3n - 13$	$3n + 2$
	$3n - 1$	

- b Write an expression for the magic number.
- 4 Which of the following are always true, and which are only sometimes true?  
 If the answer is sometimes, state when it is true.

	Always true	Sometimes true when...
$x + 4 = 7$		
$3x - 4 = 4 - 3x$		
$2x - 4 = 2y - 4$		
$3(n - 4) = 3n - 12$		
$x^2 + 3x + 4 = 4 + x(x + 3)$		

### Chapter 5 review

- The expression  $6(x + 3) - 4(x - 3)$  simplifies to  $a(x + b)$ . Work out the values of  $a$  and  $b$ .
- Simplify the following expressions fully by collecting like terms where possible.
  - $4(x + 3) + 8x - 5x + 12 + 7x$
  - $4(x - 3) + 3(x - 4)$
  - $2x(x - 3) + 3x - x^2$
  - $\frac{21x^3}{3x} + \frac{6x^3}{x}$
  - $2x(3x + 8) - 8x$
  - $4a(4a - 3) - 4b$
  - $4a(5a - 6) + 3a^2$
  - $3x(4x - 5) - 5x^2$
- Which of these are identities?
  - $6x + 4 = 3x + 2$
  - $5xy + 3 = 3 + 5xy$
  - $x^2 = 2x$
  - $x(y + 7) = xy + 7x$



**Tip**

Remember an identity in  $x$  is true for all values of  $x$ .

- Dots are arranged to represent the perimeter of a square, as in the diagram below:
 

```

            . . . . .
            .       .
            .       .
            .       .
            .       .
            . . . . .
            
```

If  $n$  is the number of dots on a side, show that the total number of dots can be expressed as  $4(n - 1)$  or  $4(n - 2) + 4$ ,  $4n - 4$  or  $2(n - 2) + 2n$

## 6 Fractions

### Section 1: Equivalent fractions

#### HOMEWORK 6A

- Complete each statement to make a pair of equivalent fractions.



**Tip**

Equivalent fractions are fractions with the same value, e.g.  $\frac{1}{2} = \frac{2}{4}$

- $\frac{3}{4} = \frac{\square}{12}$
- $\frac{1}{3} = \frac{250}{\square}$
- $\frac{1}{4} = \frac{\square}{200}$
- $\frac{2}{3} = \frac{18}{\square}$
- $\frac{3}{5} = \frac{36}{\square}$
- $\frac{\square}{8} = \frac{36}{16}$
- $\frac{7}{4} = \frac{28}{\square}$
- $\frac{20}{14} = \frac{50}{\square}$

- Write each mixed number as an improper fraction.

- $3\frac{1}{2}$
- $4\frac{2}{3}$
- $5\frac{4}{5}$
- $3\frac{2}{5}$
- $7\frac{2}{7}$
- $5\frac{1}{6}$
- $6\frac{2}{9}$
- $11\frac{6}{7}$

- Rewrite each fraction as an equivalent mixed number.

- $\frac{13}{3}$
- $\frac{8}{3}$
- $\frac{11}{5}$
- $\frac{7}{5}$
- $\frac{15}{13}$
- $\frac{15}{7}$
- $\frac{14}{3}$
- $\frac{24}{7}$

- Which fraction in each of these pairs is the biggest?



**Tip**

Use equivalent fractions.

- $\frac{2}{9}$  and  $\frac{1}{4}$
- $\frac{2}{3}$  and  $\frac{3}{5}$
- $\frac{3}{8}$  and  $\frac{7}{15}$
- $\frac{2}{7}$  and  $\frac{6}{21}$
- $\frac{3}{4}$  and  $\frac{9}{15}$
- $\frac{20}{50}$  and  $\frac{4}{10}$
- $\frac{8}{24}$  and  $\frac{3}{9}$
- $\frac{12}{9}$  and  $\frac{120}{99}$

- Reduce the following fractions to their simplest form.

- $\frac{3}{18}$
- $\frac{5}{20}$
- $\frac{50}{75}$
- $\frac{7}{21}$
- $\frac{8}{10}$
- $\frac{12}{28}$
- $\frac{48}{36}$
- $\frac{64}{96}$

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- 6 Write the following fractions in order, smallest first:
- $$\frac{3}{5} \quad \frac{3}{8} \quad \frac{2}{7} \quad \frac{4}{9} \quad \frac{2}{3} \quad \frac{7}{20}$$

Section 2: Operations with fractions

HOMEWORK 6B



Tip

Remember that any whole number can be expressed as a fraction over 1.

- 1 Work these out without using a calculator. Show all your working and give your answers in their simplest form.

a  $\frac{3}{5} \times \frac{3}{8}$                       b  $\frac{5}{11} \times \frac{5}{7}$   
 c  $\frac{3}{5} \times 45$                       d  $\frac{7}{9} \times \frac{7}{10}$   
 e  $2\frac{4}{7} \times 3\frac{1}{2}$                       f  $\frac{9}{20} \times 2\frac{7}{9}$



Tip

Change mixed numbers into improper fractions.

- 2 Work these out without using a calculator. Give your answer in its simplest form.

a  $\frac{1}{4} \times \frac{3}{7} \times \frac{5}{9}$                       b  $\frac{2}{5} \times \frac{5}{8} \times \frac{3}{10}$   
 c  $\frac{1}{3} \times \frac{3}{4} \times \frac{6}{11}$                       d  $\frac{5}{9} \times \frac{3}{11} \times \frac{9}{10}$   
 e  $\frac{4}{25} \times \frac{-3}{4} \times \frac{-5}{8}$                       f  $\frac{8}{15} \times \frac{10}{21} \times \frac{7}{12}$

- 3 Work these out without using a calculator. Give your answer in its simplest form.

a  $\frac{2}{5} + \frac{1}{2}$     b  $\frac{1}{2} + \frac{1}{8}$     c  $\frac{2}{3} - \frac{3}{5}$     d  $12 - \frac{1}{6}$   
 e  $\frac{11}{2} - \frac{7}{5}$     f  $2\frac{3}{7} + 4\frac{1}{3}$     g  $2\frac{2}{5} - 1\frac{2}{3}$     h  $3\frac{7}{9} - 2\frac{5}{7}$



- 4 Work these out without using a calculator. Give your answer in its simplest form.

a  $\frac{1}{8} \div \frac{5}{9}$     b  $\frac{2}{11} \div \frac{2}{7}$     c  $\frac{4}{7} \div \frac{3}{8}$     d  $\frac{-5}{11} \div \frac{-1}{3}$   
 e  $\frac{3}{5} \div 2\frac{1}{4}$     f  $2\frac{1}{4} \div \frac{3}{5}$     g  $3\frac{1}{2} \div 1\frac{1}{3}$     h  $1\frac{5}{6} \div 3\frac{3}{7}$



Tip

Change mixed numbers into improper fractions.



- 5 Work these out without using a calculator. Give your answer in its simplest form.

a  $3 + \frac{2}{5} \times \frac{2}{5}$                       b  $3\frac{3}{4} - (2\frac{1}{4} - \frac{4}{15})$   
 c  $\frac{5}{7} \times (\frac{1}{3} + 5 \div \frac{2}{5}) + 4 \times \frac{2}{7}$   
 d  $5\frac{7}{8} + (7\frac{1}{3} - 5\frac{2}{9})$   
 e  $\frac{5}{7} \times \frac{1}{3} + \frac{3}{5} \times \frac{1}{3}$   
 f  $(7 \div \frac{3}{7} - \frac{4}{9}) \times \frac{1}{5}$

HOMEWORK 6C

- 1 Shamso buys a packet of mixed nuts and raisins that weighs 6 kg. She notices that  $\frac{3}{8}$  of the contents are raisins.

How many kilograms of nuts are there?

- 2 Josh eats 12 bananas each week. Tara eats  $2\frac{1}{4}$  times as many.

How many bananas do they eat in total?

- 3  $\frac{11}{24}$  of the people in a UK athletics team are from England,  $\frac{3}{12}$  are from Wales,  $\frac{1}{6}$  are from Scotland and the rest are from Northern Ireland.

- a What fraction of the team are from Northern Ireland?  
 b Which country has the smallest number of team members?

- 4 There are  $2\frac{1}{4}$  equally sized cakes left over after a party. These are shared out equally between six people.  
 What fraction does each person get?
- 5 A tank contains  $56\frac{1}{3}$  litres of juice. How many containers holding  $\frac{5}{6}$  of a litre can be completely filled from the tank?

### Section 3: Fractions of quantities

#### HOMEWORK 6D

- 1 Calculate.
- a  $\frac{5}{6}$  of 12                      b  $\frac{2}{9}$  of 45
- c  $\frac{3}{4}$  of 36                        d  $\frac{7}{12}$  of 144
- e  $\frac{4}{9}$  of 180                        f  $\frac{1}{8}$  of 96
- g  $\frac{1}{2}$  of  $\frac{3}{7}$                             h  $\frac{2}{7}$  of  $\frac{3}{14}$
- i  $\frac{4}{5}$  of  $4\frac{1}{2}$



#### Tip

To find a fraction of a quantity you need to divide by the denominator and then multiply by the numerator.

- 2 Calculate the following quantities.
- a  $\frac{3}{4}$  of £48                      b  $\frac{3}{5}$  of £220
- c  $\frac{2}{5}$  of £45                        d  $\frac{2}{3}$  of £27
- e  $\frac{1}{2}$  of 7 potatoes                f  $\frac{3}{4}$  of  $2\frac{1}{2}$  cups of sugar
- g  $\frac{1}{4}$  of  $4\frac{2}{3}$  cakes                h  $\frac{2}{3}$  of 5 hours
- i  $\frac{1}{3}$  of  $2\frac{3}{4}$  hours                j  $\frac{3}{4}$  of 6 hours

- 3 Express the first quantity as a fraction of the second. Give your answer in its simplest form.
- a 6p in £1  
 b 25 cm of a 3 m length  
 c 15 mm of 30 cm  
 d 40 minutes in 8 hours  
 e 4 minutes per hour  
 f 175 m of a kilometre



#### Tip

Make sure both quantities are in the same units.

- 4 The floor area of a rectangular hall is  $54\text{ m}^2$ . The dance floor is 3 m wide and 4 m long.  
 What fraction of the floor area is the dance floor?

### Chapter 6 review

- 1 Simplify.
- a  $\frac{12}{60}$                       b  $\frac{18}{108}$                       c  $4\frac{9}{36}$
- 2 Write each set of fractions in ascending order. Show all your working.
- a  $\frac{3}{4}, \frac{7}{9}, \frac{2}{3}, \frac{5}{6}$                       b  $\frac{14}{5}, \frac{11}{4}, 2\frac{1}{2}, 2\frac{3}{10}$
- 3 Evaluate.
- a  $\frac{1}{4} + \frac{3}{7}$                       b  $\frac{4}{7} \times \frac{3}{5}$                       c  $\frac{5}{9} \div \frac{3}{7}$
- d  $4\frac{2}{9} + 1\frac{1}{6}$                       e  $6\frac{3}{10} - 3\frac{2}{5}$                       f  $\frac{3}{7}$  of  $\frac{2}{3}$
- g  $\frac{2}{9} \times \frac{2}{11} \times 3$                       h  $96 \div \frac{3}{8}$                       i  $\frac{1}{6}$  of  $5\frac{2}{7}$
- 4 Simplify.
- a  $(\frac{5}{8} \div \frac{15}{4}) + (\frac{4}{9} \times \frac{3}{8})$                       b  $3\frac{3}{4} \times (\frac{5}{8} + \frac{5}{6})$
- 5 Lisa has  $15\frac{1}{2}$  litres of water. How many bottles containing  $\frac{3}{4}$  of a litre can she fill?
- 6 At a Fun day there are 5 litres of ice cream to be sold in cones. If each cone holds at least  $\frac{2}{25}$  of a litre of ice cream, what is the maximum number of cones that can be made?