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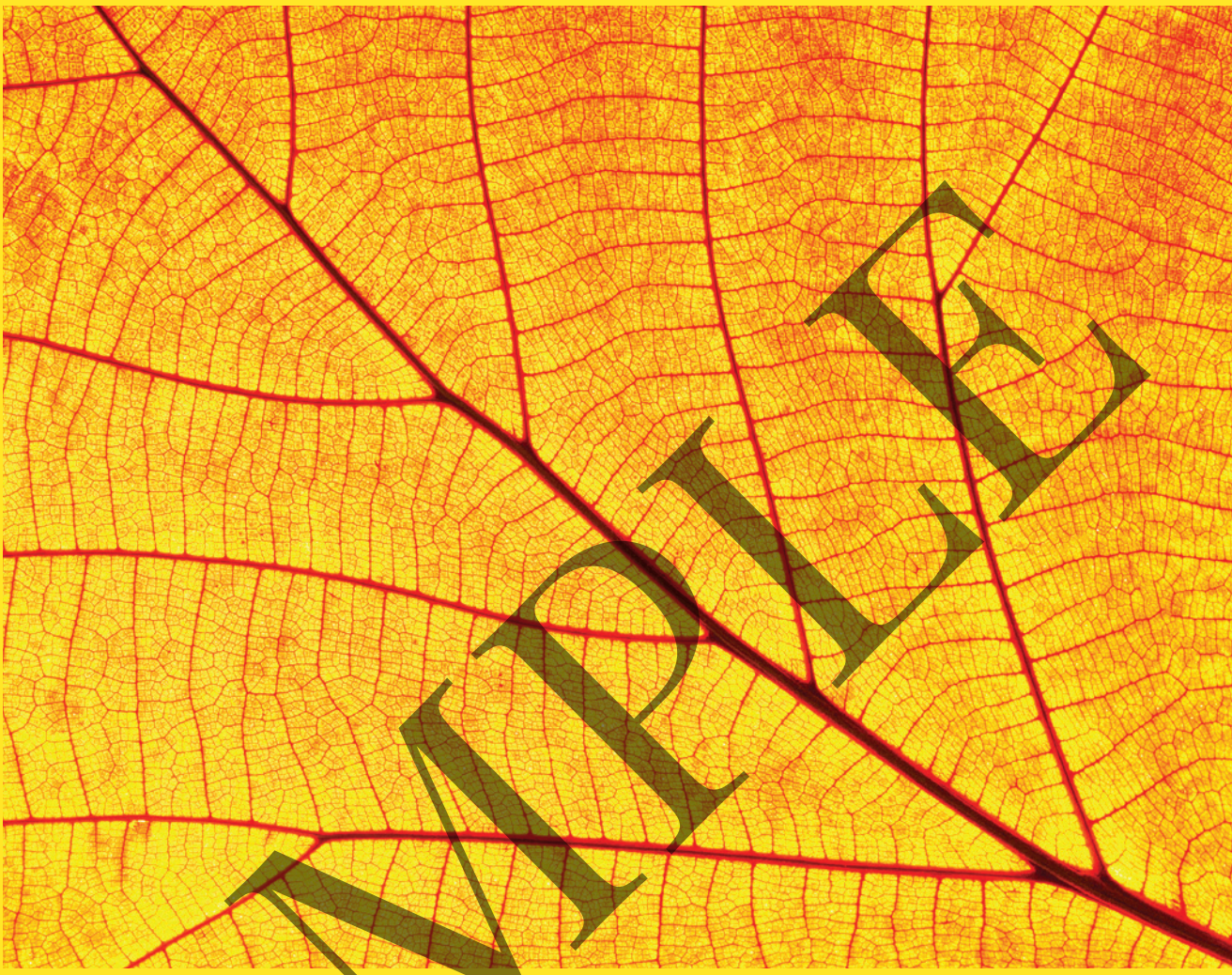

PEARSON EDEXCEL INTERNATIONAL GCSE (9–1)

MATHEMATICS A

Exam Practice Book

David Turner, Ian Potts

eBook included

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Exam Practice Book

David Turner
Ian Potts

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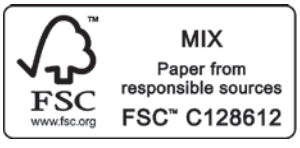

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ABOUT THIS BOOK

This Exam Practice Book is written for students following the Pearson Edexcel International GCSE (9–1) Maths A Higher Tier specification. It can be used to accompany the two Student Books available for the course.

The book contains ten units of work each containing five sections in the topic areas: *Number, Algebra, Graphs, Shape and Space, Sets, Handling Data* and *Sequences*. Each section contains a Basic Skills Exercise to reinforce topics and an Exam Practice Exercise containing exam style questions. There is a particular focus on higher order problem solving and reasoning skills.

The book also contains four Examination Practice Papers, modelled on past papers, to help prepare students for the exam.

Each unit opens with a list of the content covered within

Basic skills exercises give practice questions to refresh and consolidate knowledge.

Language is graded for speakers of English as an additional language (EAL) with advanced maths-specific terminology highlighted and defined in the glossary at the back of the book.

Non-calculator questions highlight those questions where a calculator should not be used.

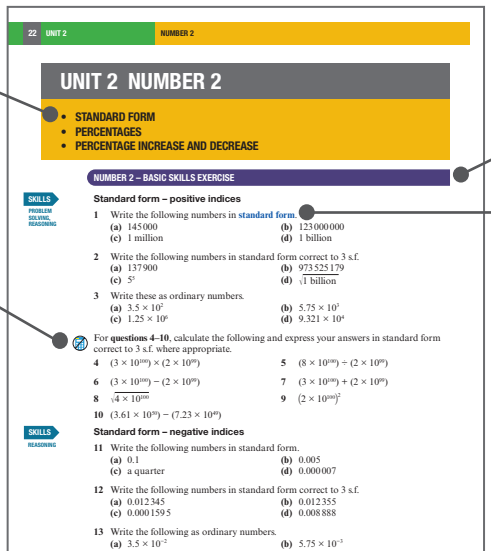
Transferable skills are highlighted to show which skills you are using and where.

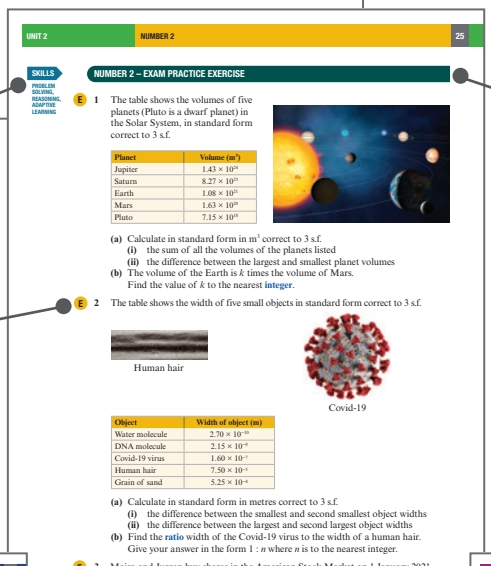
Exam practice exercises synthesise learning from the basic skills exercises in the form of more challenging exam-style questions, allowing for the best preparation possible for the exam.

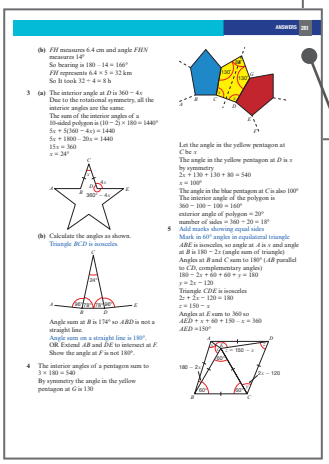
Exam-style questions are flagged so you know that these questions are similar to those you will encounter in the exam.

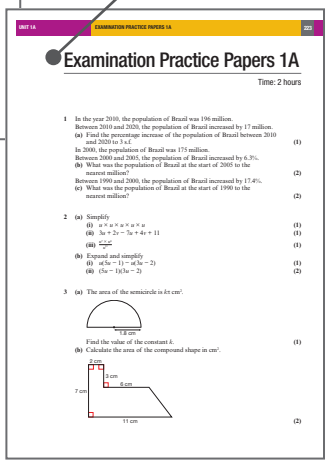
Four full *practice exam papers* give you the opportunity to practise effectively ahead of the exam.

Full worked solutions are provided at the end of the book to show you how questions are solved.









ASSESSMENT OVERVIEW

The following tables give an overview of the assessment for this course.

We recommend that you study this information closely to help ensure that you are fully prepared for this course and know exactly what to expect in the assessment.

PAPER 1	PERCENTAGE	MARK	TIME	AVAILABILITY
HIGHER TIER MATHS A Written examination paper Paper code 4MA1/1H Externally set and assessed by Pearson Edexcel	50%	100	2 hours	January and June examination series First assessment June 2018
PAPER 2	**PERCENTAGE**	**MARK**	**TIME**	**AVAILABILITY**
HIGHER TIER MATHS A Written examination paper Paper code 4MA1/2H Externally set and assessed by Pearson Edexcel	50%	100	2 hours	January and June examination series First assessment June 2018

ASSESSMENT OBJECTIVES AND WEIGHTINGS

ASSESSMENT OBJECTIVE	DESCRIPTION	% IN INTERNATIONAL GCSE
AO1	Demonstrate knowledge, understanding and skills in number and algebra: • numbers and the numbering system • calculations • solving numerical problems • equations, formulae and identities • sequences, functions and graphs	57–63%
AO2	Demonstrate knowledge, understanding and skills in shape, space and measures: • geometry and trigonometry • vectors and transformation geometry	22–28%
AO3	Demonstrate knowledge, understanding and skills in handling data: • statistics • probability	12–18%

ASSESSMENT SUMMARY

The Pearson Edexcel International GCSE (9–1) in Mathematics (Specification A) **Higher Tier** requires students to demonstrate application and understanding of the following topics.

NUMBER

- Use numerical skills in a purely mathematical way and in real-life situations.

ALGEBRA

- Use letters as equivalent to numbers and as variables.
- Understand the distinction between expressions, equations and formulae.
- Use algebra to set up and solve problems.
- Demonstrate manipulative skills.
- Construct and use graphs.

GEOMETRY

- Use the properties of angles.
- Understand a range of transformations.
- Work within the metric system.
- Understand ideas of space and shape.
- Use ruler, compasses and protractor appropriately.

STATISTICS

- Understand basic ideas of statistical averages.
- Use a range of statistical techniques.
- Use basic ideas of probability.

Students should also be able to demonstrate **problem-solving skills** by translating problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes.

Students should be able to demonstrate **reasoning skills** by

- making deductions and drawing conclusions from mathematical information
- constructing chains of reasoning
- presenting arguments and proofs
- interpreting and communicating information accurately.

CALCULATORS

Students will be expected to have access to a suitable electronic calculator for both examination papers. The electronic calculator to be used by students attempting **Higher Tier** examination papers (1H and 2H) should have these functions as a minimum:

$+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, brackets, x^y, $x^{\frac{1}{y}}$, $\bar{x}$, Σx, Σfx, standard form, sine, cosine, tangent and their inverses.

PROHIBITIONS

Calculators with any of the following facilities are prohibited in all examinations:

- databanks
- retrieval of text or formulae
- QWERTY keyboards
- built-in symbolic algebra manipulations
- symbolic differentiation or integration.

FORMULAE SHEET – HIGHER TIER

Arithmetic series

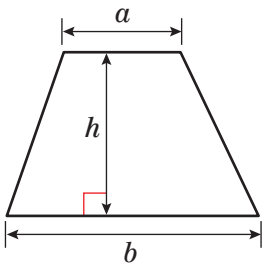
Sum to n terms, $S_n = \frac{n}{2}\,[2a + (n-1)d]$

The quadratic equation

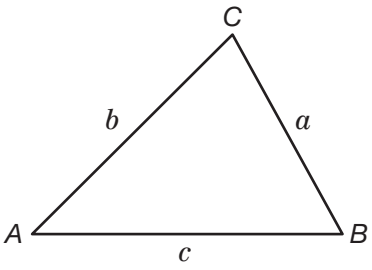
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Area of trapezium $= \frac{1}{2}(a + b)h$



Trigonometry



In any triangle ABC

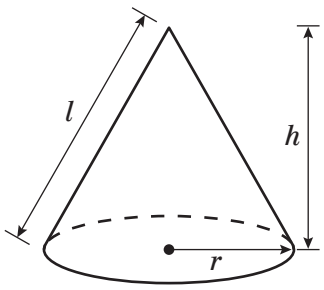
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

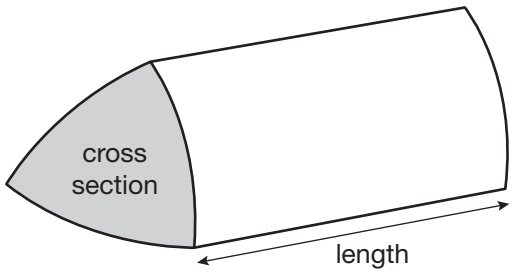
Area of triangle $= \frac{1}{2}ab\sin C$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$

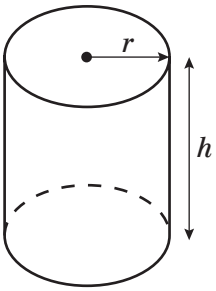


Volume of prism
= area of cross section × length



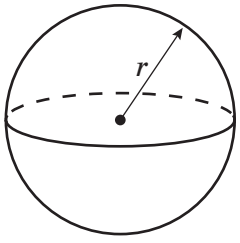
Volume of cylinder $= \pi r^2 h$

Curved surface area of cylinder $= 2\pi r h$



Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



UNIT 1 NUMBER 1

- EQUIVALENT FRACTIONS
- SIMPLIFYING FRACTIONS
- FOUR RULES OF FRACTIONS
- DIRECTED NUMBER
- BIDMAS
- SIGNIFICANT FIGURES AND DECIMAL PLACES

NUMBER 1 – BASIC SKILLS EXERCISE

Do NOT use your calculator for this exercise. You need a good knowledge of numerical fractions to be able to work out algebraic fractions, which cannot be done on a calculator.

Equivalent fractions

1 Find the value of x.

(a) $\frac{3}{4} = \frac{x}{3.6}$ **(b)** $\frac{3}{7} = \frac{24}{x}$

(c) $3\frac{1}{4} = \frac{x}{8}$ **(d)** $2\frac{5}{6} = \frac{34}{x}$

2 Show that $4\frac{1}{3}$, $\frac{52}{12}$ and $\frac{6.5}{1.5}$ all represent the same number.

SKILLS ANALYSIS

Simplifying fractions

3 Write as fractions or **mixed numbers** in their lowest terms (simplest form)

(a) $\frac{28}{84}$ **(b)** $\frac{210}{441}$

(c) $\frac{41}{12}$ **(d)** $\frac{156}{42}$

(e) $\frac{0.4}{14}$ **(f)** $\frac{2}{3.6}$

SKILLS PROBLEM SOLVING

Four rules of fractions

For questions 4–8 show that

4 $\frac{8}{9} \times 3\frac{1}{2} \div 2\frac{1}{3} = 1\frac{1}{3}$

5 $4\frac{2}{3} - 2\frac{1}{2} + 1\frac{3}{4} = 3\frac{11}{22}$

6 $\frac{0.12}{32} \div \frac{0.024}{7.2} = 1\frac{1}{8}$

7 $\frac{1}{4} - \left(\frac{1}{4} \times \frac{1}{4}\right) + \left(\frac{1}{4} \div \frac{1}{4}\right) = 1\frac{3}{16}$

8 $\dfrac{4}{2 + \dfrac{2}{3+4}} = 1\frac{3}{4}$

Directed number

9 Work out

(a) $-4 + 12$
(b) $-4 - 12$
(c) -4×12
(d) $-4 \div 12$
(e) -4×-12

SKILLS
INTERPRETATION

BIDMAS

10 Work out

(a) $12 - 3 \times 3$
(b) $8 \div 2(2 + 2)$
(c) $8 \div 2 \times 2$
(d) $4(3^2 + 2) - 12 \div 2$
(e) $\sqrt{(3(4 + 2^2) - 8)}$
(f) $(12 + (4^2 \div 8)) \div (3 \times 2^2 - 5)$

SKILLS
INTERPRETATION

Significant figures and decimal places

11 Write each of these correct to 3 **significant figures** (s.f.).

(a) 12 340
(b) 12 350
(c) 12 349
(d) 438 599
(e) 54 999
(f) 0.012 95
(g) 1.012 95
(h) 0.009 999

12 Write each of these correct to 3 **decimal places** (d.p.).

(a) 2944
(b) 1.2949
(c) 1.2951
(d) 1.200 49
(e) 0.100 499
(f) 340.0054
(g) 0.9995
(h) 0.000 499

SKILLS

PROBLEM SOLVING, ANALYSIS, INTERPRETATION

NUMBER 1 – EXAM PRACTICE EXERCISE

Do NOT use your calculator for this exercise. You need a good knowledge of numerical fractions to be able to work out algebraic fractions, which cannot be done on a calculator.

E 1 **(a)** Show that $4\frac{2}{3} \div 3\frac{5}{9} - 1\frac{3}{8} = -\frac{1}{16}$

(b) Hayat, Karim and Ferhana shared a pizza.

Hayat ate $\frac{1}{4}$ of the pizza.

Karim ate $\frac{2}{7}$ of the pizza.

Ferhana ate $\frac{3}{14}$ of the pizza.

(i) Who ate the most? You must show **working** to justify your answer.

(ii) Show that $\frac{1}{4}$ of the pizza remained.

E 2 **(a)** Write the number 0.001 854 8 correct to

(i) 3 d.p.

(ii) 3 s.f.

(iii) 2 d.p.

(iv) 2 s.f.

(b) Pedro wrote $\frac{9}{2} - \frac{25}{10} = \frac{9-25}{2-10} = \frac{-16}{-8} = 2$

The answer is correct, but the method is wrong.

(i) Find one mistake Pedro made.

(ii) Show clearly how to work it out correctly.

E 3 **(a)** Show that $1 \div 2 \times (5^2 \div 4 - 6 \times 3^2 \div 2^3) = -\frac{1}{4}$

(b) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

Work out f as a fraction when $u = 2\frac{2}{3}$ and $v = 1\frac{1}{5}$

Give your answer as a fraction in its simplest form.

E 4 **(a)** There are $187\frac{1}{2}$ ml of hand sanitiser left in a dispenser.

The dispenser gives $3\frac{1}{8}$ ml of sanitiser each time it is pressed.

How many times can the dispenser be pressed before the sanitiser runs out?

(b) Part of a train timetable is shown in the table.

Station	Departure time
Granada	13:18
Antequera	14:30
Sevilla	16:06

Show that the journey time from Granada to Antequera is $\frac{3}{7}$ of the journey time from Granada to Sevilla.

E 5 **(a)** In a school, $\frac{5}{11}$ of the students are in the lower school while the rest are in the upper school.

$\frac{7}{12}$ of the upper school play football.

$\frac{3}{10}$ of the lower school play football.

Show that $\frac{5}{11}$ of the students at the school play football.

Show each stage of your working.

(b) At a prom, $\frac{23}{45}$ of the students are in year 12 while the rest are in year 13.

$\frac{5}{12}$ of the students wear glasses.

What is the smallest possible number of students at the prom?
Show each stage of your working.

UNIT 1 ALGEBRA 1

- SIMPLIFYING ALGEBRAIC EXPRESSIONS
- SOLVING EQUATIONS

ALGEBRA 1 – BASIC SKILLS EXERCISE

Simplifying algebraic expressions

For questions **1–8**, **simplify** each expression as much as possible.

1 $2xy + 2xz$
2 $3xy - xy$
3 $5a + 5 + 5a$
4 $a + 6b - a + b$
5 $3a \times 3b$
6 $a^3 \times 7a^2$
7 $a \times 5a^2 \times a^3$
8 $(2a)^3 \times (3a)^2$

For questions **9–12**, **expand** the brackets and simplify as much as possible.

9 $6(2a - b)$
10 $4(3a + 4b)$
11 $-(2a + b - a)$
12 $8b - 2(a + b)$

SKILLS
REASONING

Solving equations

For questions **13–18**, solve for t.

13 $3t - 1 = 14$
14 $2t + 9 = 5$
15 $1 - 2t = 7$
16 $1 - \frac{t}{3} = 4$
17 $\frac{t}{7} = 7$
18 $\frac{7}{t} = 7$

For questions **19–22**, solve for y.

19 $3(y - 2) = -12$
20 $4(y + 3) = 8$
21 $3\left(y + \frac{1}{2}\right) = 6$
22 $5(y - 1) = 4$

For questions **23–26**, solve for z.

23 $5z + 6 = 2z + 3$
24 $3z - 1 = 7z - 9$
25 $3 + 2z = 18 - 3z$
26 $2 - 4z = 1 - 5z$

For questions **27–30**, solve for x.

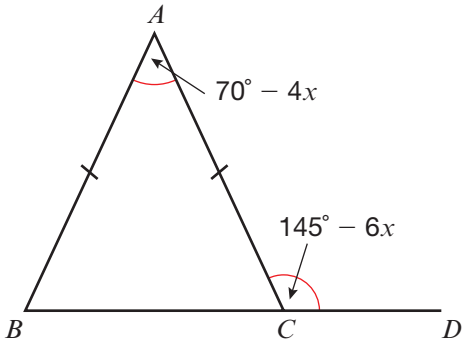
27 $2(x + 5) - (x + 4) = 8$
28 $4(x + 2) - 5(x - 3) = 24$
29 $5(2x + 3) - 3(4x - 1) = 12$
30 $3(3x + 2) - 5(2x - 2) = 7(3x - 4)$

SKILLS
PROBLEM SOLVING, REASONING

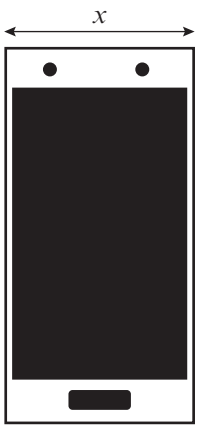
ALGEBRA 1 – EXAM PRACTICE EXERCISE

E **1** The **sum** of three **consecutive**, even numbers is 648.
The smallest number is x.
(a) Form an equation in x.
(b) Solve your equation to find the three numbers.

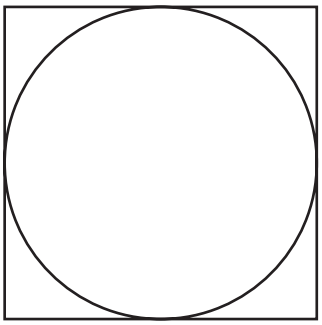
E **2** The diagram shows a triangle ABC.
$AB = AC$
BCD is a straight line.
(a) Form an equation in x.
(b) Solve your equation and find the size of each angle in the triangle.



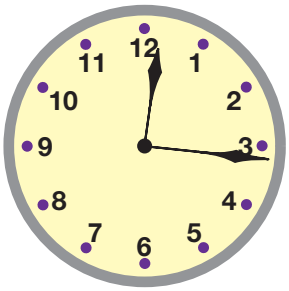
E **3** The length of a mobile phone is twice the width.
There is a border around the screen.
The border is 1.5 cm wide at the top and bottom.
The border is 0.25 cm wide at the sides.
The **perimeter** of the screen is 32 cm.
Let the width of the phone be x cm.
(a) Form an equation in x.
(b) Hence find the area of the screen in cm^2.



E **4** A piece of wire is 30 cm long.
It is cut into two unequal pieces.
One piece is bent into a circle.
The other is bent into a square enclosing the circle, as shown in the diagram.
Find the length of each piece of wire in cm to 3 s.f.



E **5** **(a)** Find the first time after 12:00 that the hands of a clock are at right angles.
Let x be the number of minutes after 12:00.
Give your answer to the nearest second.
(b) At 12:00 the hands of a clock are directly in line.
Find the first time after 12:00 that the hands of a clock are directly in line again.
Give your answer to the nearest second.



UNIT 1 GRAPHS 1

- GRADIENT OF A STRAIGHT LINE
- PLOTTING STRAIGHT-LINE GRAPHS
- STRAIGHT-LINE CONVERSION GRAPHS

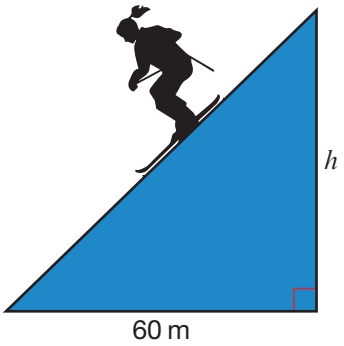
GRAPHS 1 – BASIC SKILLS EXERCISE

SKILLS
PROBLEM SOLVING

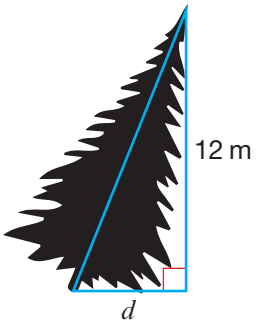
Gradient of a straight line

1 Find the **gradient** of the straight line joining A to B when
(a) A is $(-1, -2)$ and B is $(2, 4)$
(b) A is $(-5, -1)$ and B is $(-1, -3)$

2 A ski slope has a gradient of $\frac{3}{4}$
Work out the value of h.



3 This tree is leaning with gradient 18.
Work out the value of d.



4 The lift in the Spinnaker Tower at Portsmouth, England, is not vertical.
The top of the lift is 100 m above the ground but 350 cm off the vertical.
What is the gradient of the lift?
Give your answer to 3 s.f.

5 The gradient of the line joining $A(p, 2)$ to $B(6, -3)$ is $-\frac{1}{2}$
Find the value of p.

6 Do the points $A(-1, -3)$, $B(2, 3)$ and $C(92, 185)$ lie on a straight line?
Justify your answer.

7 The points $A(-2, 5)$, $B(1, 1)$ and $C(49, p)$ lie on a straight line.
Find the value of p.

8 The line joining the points $A(1, q)$ to $B(2, 8)$ has twice the gradient of the line joining $C(1, -2)$ to $D(3, q)$.
Find the value of q.

SKILLS
REASONING

Plotting straight-line graphs

9 Which of these points lie on the line $y - 5x + 3 = 0$?
$A(3, 12)$ $B(-5, -26)$ $C(0, 3)$ $D(-52, 263)$

10 This table of values for a straight-line graph contains one mistake in the y-values. Find and correct the mistake.

x	-2	0	2	4	6
y	5	2	1	-1	-3

11 Find the values of a, b and c in this table of values for a straight-line graph.

x	-3	a	0	1	3	c
y	11	8	2	-1	b	-10

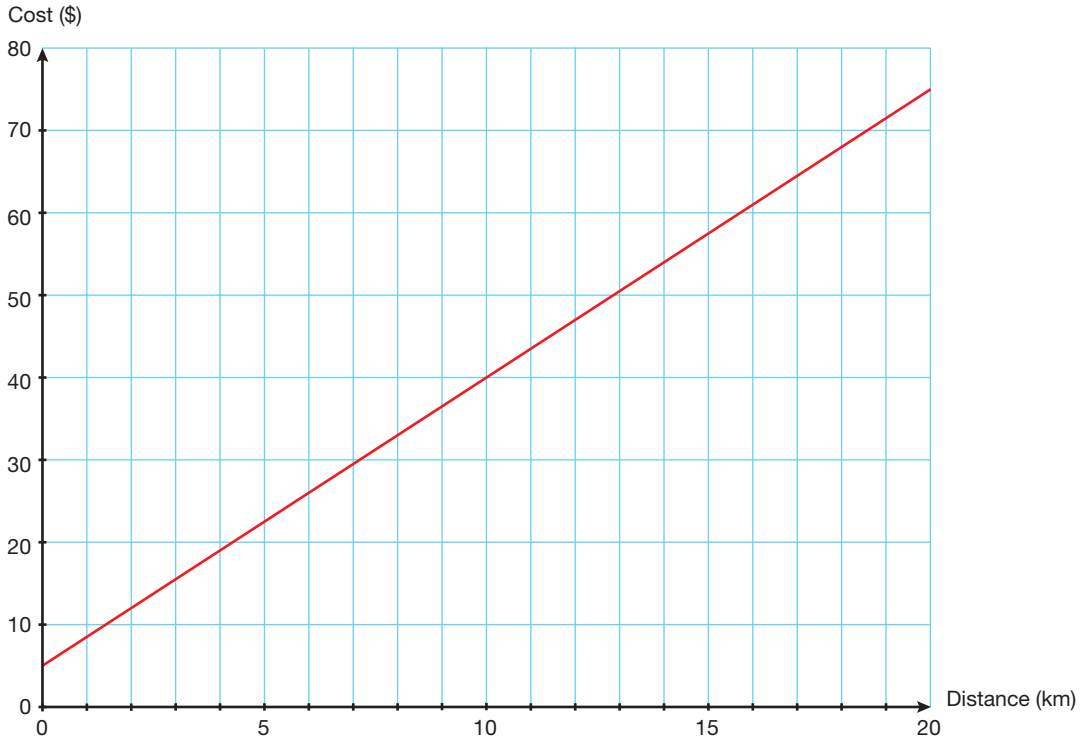
12 **(a)** Make a table of values for $y = 3 - 2x$ and $2y - x + 2 = 0$ using $x = \{-2, 0, 2, 4\}$ and then draw both graphs on one set of axes for $-2 \leq x \leq 4$
(b) Write down the gradient and y-**intercept** of both graphs.
(c) Write down the intersection point of the two graphs.

SKILLS
INTERPRETATION

Straight-line conversion graphs

13 One kilogram (kg) is approximately equal to 2.2 pounds (lb) weight.
(a) Use this information to draw a conversion graph from kg to lb for $0 \leq$ kg ≤ 5
(b) Use your graph to convert
(i) 3.5 kg to lb
(ii) 4 lb to kg

14 The graph shows the cost, $\$C$, for a taxi ride plotted against the distance, d km, travelled.



(a) What is the cost for a taxi ride of 16 km?

(b) A taxi ride cost \$30.
What was the distance travelled?

(c) Kobe is 6 km from home and has \$20. If they take a taxi as far as they can and then walk the rest of the way home, how far will they have to walk?

SKILLS

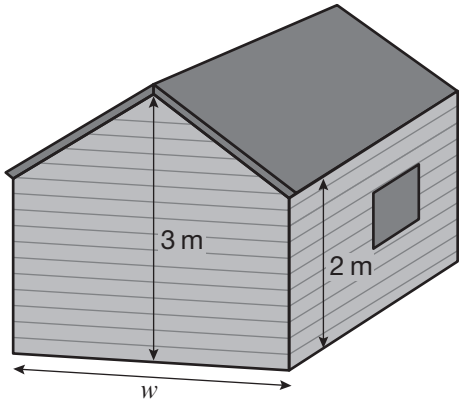
PROBLEM SOLVING, REASONING, INTERPRETATION, ADAPTIVE LEARNING

GRAPHS 1 – EXAM PRACTICE EXERCISE

E **1** **(a)** A shed has the dimensions shown in the diagram.

The roof has a gradient of $\frac{1}{3}$

Find w, the width of the shed.



(b) The straight line joining the points $(p - 1, p - 9)$ and $(p + 7, 5p - 9)$ has a gradient of $\frac{1}{2}$

Find the value of p.

E **2** The points $A(-16, -10)$, $B(29, 20)$, $C(45, -12)$ and $D(0, -42)$ form the **vertices** of a **quadrilateral**.

(a) Use gradients to prove that $ABCD$ is a **parallelogram**.

(b) Show that the line AB does not pass through the origin.

E **3** Jodie's new phone contract costs £20 every month.
The first 300 minutes of calls every month are free.
Each month, after the first 300 minutes of calls she is charged per minute.
The formula for the cost, £C, against the time, t minutes, of calls per month is

$C = 20$ for $0 \leq t \leq 300$, $C = 0.02t + 14$ for $t > 300$

(a) Complete the table and then draw a graph of C against t for $0 \leq t \leq 1800$

t (mins)	0	300	1000	1800
C(£)				

(b) How much is she charged per minute if she makes more than 300 minutes of calls in a month?

(c) One month Jodie's bill read: 'Call time: 16 hours 40 minutes: cost £38.50.'
Should Jodie complain?
Give a reason for your answer.

E **4** In 1980 the area of the Arctic Sea ice was 7.7×10^6 km^2.
The area was decreasing by 86 000 km^2 each year.

The formula for the area of Arctic Sea ice, y km^2, x years after 1980 is given by $y = mx + c$.

(a) Find the value of the constants m and c.

(b) Complete the table and then draw the graph of y against x for $1980 \leq x \leq 2000$

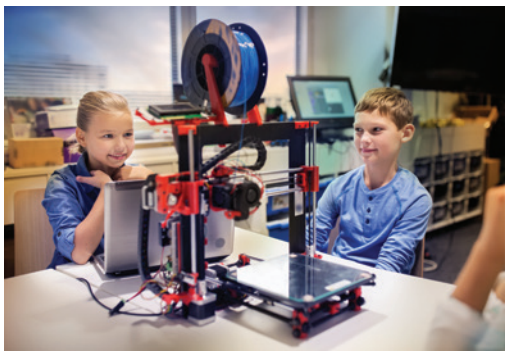
x (years after 1980)	0	20	40
y (area in km^2)			

(c) Use the graph to find

(i) the area of sea ice in the year 2000 in km^2

(ii) the year when the area of sea ice was 5×10^6 km^2

E **5** Lily has bought a 3D printer.
This uses a thin plastic wire (filament) wound onto a reel.



An empty reel with no filament weighs 200 g.
A full reel with 330 m of filament weighs 1.2 kg.

(a) Complete the table and then draw a conversion graph for the length, L m, of filament against the weight, W g, of a reel for $200 \leq W \leq 1200$

Weight, W (g)	200	1200
Length, L (m)		

(b) Use your graph to find

(i) the length of filament on a reel that weighs 900 g

(ii) the weight of a reel with 100 m of filament on it

(c) Write down the formula connecting L and W in the form $L = mW + c$, where m and c are constants.

UNIT 1 SHAPE AND SPACE 1

- ANGLE PROPERTIES
- POLYGONS
- SIMILAR TRIANGLES
- CONSTRUCTIONS

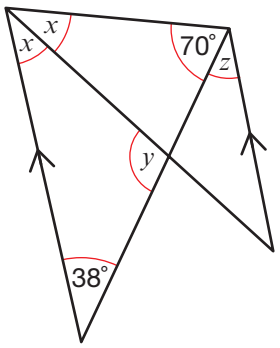
SHAPE AND SPACE 1 – BASIC SKILLS EXERCISE

SKILLS
REASONING

Angle properties

For questions 1–4, calculate the size of each lettered angle.

1



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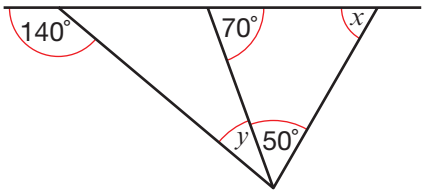

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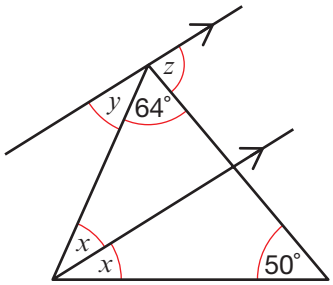

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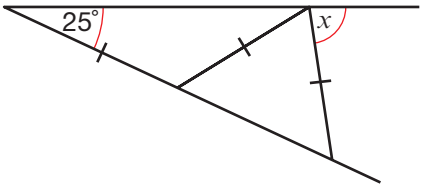
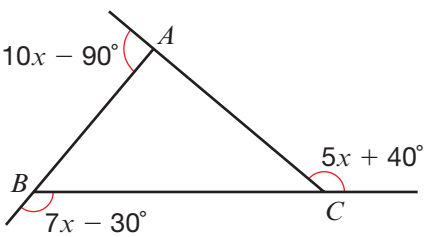


5 A triangle ABC has **exterior angles** as shown.

(a) Find the value of x.

(b) Show that ABC is an isosceles triangle.

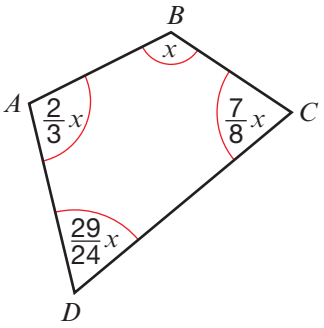


SKILLS
REASONING

6 The **interior angles** of a quadrilateral $ABCD$ are shown in the diagram.

(a) Find the value of x.

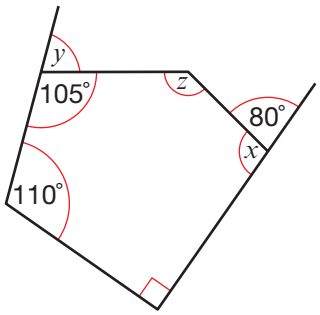
(b) Show that the quadrilateral is a **trapezium**.



7 Find the smallest angle between the hands of a clock at 20:06.

Polygons

8 Calculate the values of x, y and z.

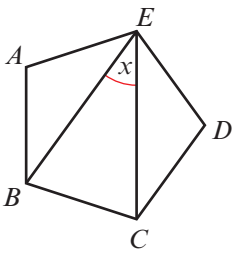


SKILLS
REASONING

9 $ABCDE$ is a regular pentagon.

(a) Find angle x.

(b) Prove that AB is parallel to CE.
Give reasons for each step of your working.



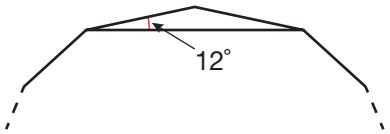
10 A regular **polygon** has 20 sides. Find the size of the interior angle.

11 The sum of the interior angles of a regular polygon is 3060°. How many sides does it have?

12 The diagram shows part of a regular polygon.

(a) Find the number of sides of the polygon.

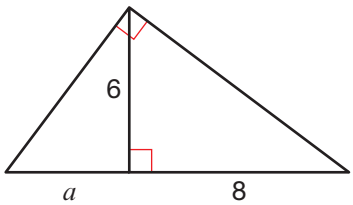
(b) Find the sum of the interior angles.



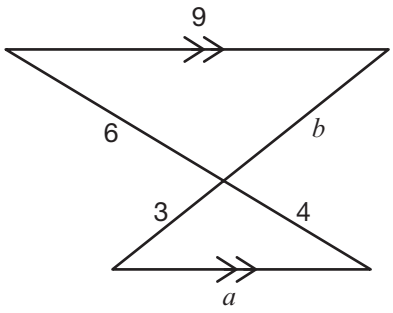
SKILLS
REASONING

Similar triangles

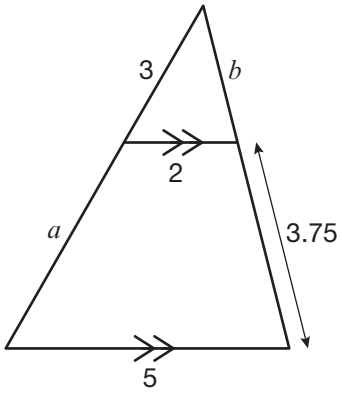
13 Calculate a.



14 Calculate a and b.



15 Calculate a and b.



Constructions

In questions 16–18, use a ruler and compasses only and show all construction lines.

16 **(a)** Construct the triangle ABC where $AB = 10$ cm, $AC = 12$ cm and $BC = 8$ cm.
(b) Construct the bisector of angle A, and extend it to meet BC at the point D.
(c) Measure DC.

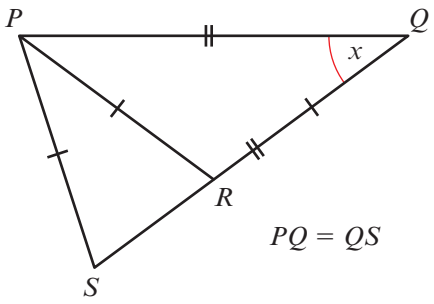
17 **(a)** Draw the line segment $AC = 8$ cm and construct the perpendicular bisector of AC.
(b) Hence draw the rhombus $ABCD$ that has diagonal $AC = 8$ cm and diagonal $BD = 12$ cm.
(c) Measure the side length of the rhombus.

18 In a game, a clue is buried within a triangle formed by an Oak tree (O), an Apple tree (A) and a Plum tree (P). $OA = 16$ m, $AP = 18$ m and $OP = 20$ m.
(a) Construct a scale drawing of the triangle OAP using a scale of 1 cm to 2 m.
(b) The clue, C, is equidistant from the A and P and 12 m from O.
Find the distance of the clue from P.

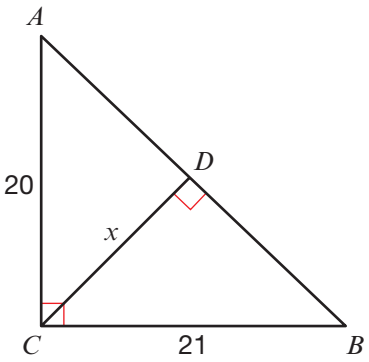
SKILLS
PROBLEM SOLVING, REASONING

SHAPE AND SPACE 1 – EXAM PRACTICE EXERCISE

E **1** **(a)** PQS is an isosceles triangle with $PQ = QS$.
PRS is another isosceles triangle with $PR = PS$.
Find the value of x.

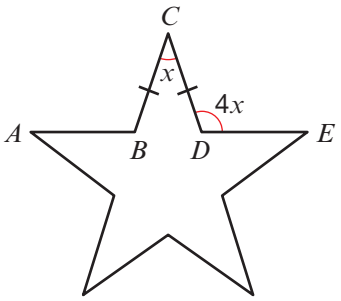


(b) The diagram shows some **right-angled triangles**.
$AC = 20$ cm, $BC = 21$ cm
D is a point on AB such that angle $CDB = 90°$.
Use **similar triangles** to find the length marked x.
Give your answer as an **improper fraction** in its simplest terms.

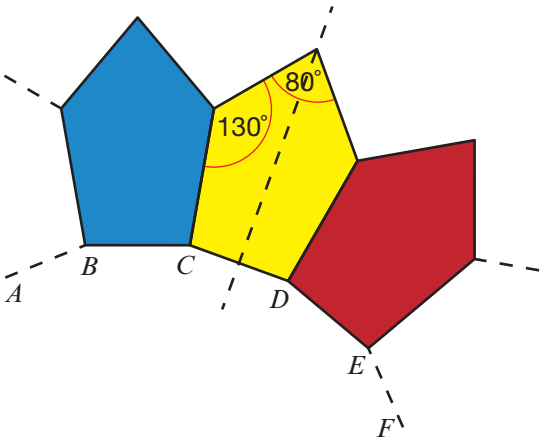


E **2** Rupinder sets sail from a harbour, H.
She sails 35 km on a **bearing** of 030° to a buoy, B.
She then sails 28 km on a bearing of 270° to her fishing grounds, F.
(a) Construct a scale drawing of her voyage using a scale of 1 cm to 5 km.
Use a ruler and **compasses** only.
You must show all your construction lines.
(b) Rupinder sails straight back to the harbour at an average speed of 4 km/h.
(i) Use a **protractor** to find the bearing she sailed on.
(ii) Use a ruler to calculate the time it took in hours.

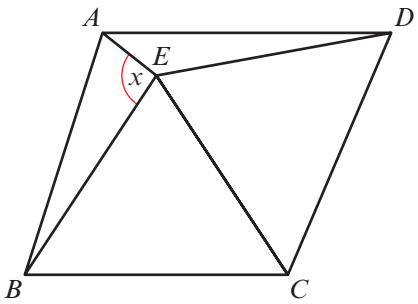
E **3** The diagram shows a star $ABCDE$.
The star has 5 vertices.
The star has **rotational symmetry** of order 5.
$BC = CD$
Angle $BCD = x$
Angle $CDE = 4x$
(a) Calculate the value of x.
(b) Show that $ABDE$ is not a straight line.



E **4** The diagram shows part of a regular polygon $ABCDEF$.
The polygon is surrounded by pentagons that have one line of symmetry.
Two interior angles of the pentagons are 130° and 80° as shown on the diagram.
Find the number of sides of the regular polygon.



E **5** $ABCD$ is a **rhombus**.
BCE is an **equilateral triangle** with E lying inside the rhombus.
Angle $AEB = x$
Prove that angle AED is 150°.
You must explain each step of your working.



UNIT 1 SETS 1

- **BASIC IDEAS**
- **VENN DIAGRAMS WITH TWO SETS**

SETS 1 – BASIC SKILLS EXERCISE

Basic ideas

1 Write down two more members of the following **sets**.
(a) {3, 6, 9, 12, …}
(b) {–1, –2, –3, …}
(c) {football, cricket, swimming, …}
(d) {Ford, Toyota, Rolls-Royce, …}

2 Use a rule to describe each set in **question 1**.

3 List these sets.
(a) {even numbers between 1 and 9}
(b) {square numbers between 2 and 20}
(c) {months of the year beginning with J}
(d) {colours on traffic lights}

4 Which of these statements are true and which are false?
(a) $3 \in$ {odd numbers}
(b) $5 \notin$ {factors of 10}
(c) lion $\notin$ {animals with four legs}
(d) triangle $\in$ {polygons}

5 Which are examples of the empty set?
(a) {square numbers between 10 and 15}
(b) {birds with four legs}
(c) {fish with teeth}
(d) {common factors of 32 and 45}

SKILLS
REASONING

Venn diagrams with two sets

6 $\mathscr{E}$ = {positive integers between 1 and 11 inclusive}, A = {multiples of 2}, B = {multiples of 4}
(a) Illustrate this information on a **Venn diagram**.
(b) List the set A' and describe it in words.
(c) What is $n(B')$?
(d) Is $B \subset A$? Explain your answer.

7 $\mathscr{E}$ = {odd numbers between 1 and 21 inclusive}, M = {multiples of 5}, F = {factors of 20}

(a) Why is $10 \in M$ false?

(b) List M.

(c) Find $n(F)$.

(d) List $M \cap F$.

8 Draw Venn diagrams to illustrate the following statements.

(a) $A \cap B = \varnothing$

(b) $A \cap B \neq \varnothing$

(c) $A \cap B = A$

(d) $A \cup B = A$

9 $\mathscr{E}$ = {A, E, I, O, U}, W = {capital letters that have straight lines in them} S = {capital letters that have curved parts in them}

(a) List the sets W, W', S and S'.

(b) Draw a Venn diagram to represent the information.

(c) What is

(i) $W \cup S$

(ii) $W \cap S$?

10 The following information was obtained about all the fast-food restaurants in a town: 6 sold tacos and burritos, 4 sold burritos only, 9 sold tacos, while 2 served neither tacos nor burritos.

(a) Draw a Venn diagram to represent all of this information.

(b) How many fast-food restaurants are there in the town?

SKILLS
PROBLEM SOLVING, REASONING

SETS 1 – EXAM PRACTICE EXERCISE

E **1** **(a)** Which of these statements are true and which are false?

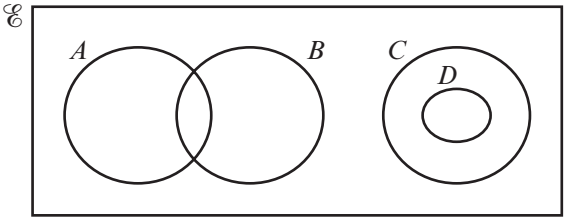
(i) circle $\in$ {polygons}

(ii) $y = x + 2 \notin$ {straight-line graphs with gradient 2}

(iii) $-1 \notin$ {solutions of $x^2 = 1$}

(iv) square $\notin$ {parallelograms}

(b) The Venn diagram shows four events A, B, C and D.



Choose a statement from the box below that correctly describes the relationship between

(i) A and C

(ii) D and C

(iii) A and B

$A \subset B$	$C \cup D = D$	$A \cap B \neq \varnothing$	$A \cup C = \mathscr{E}$	$C \cup D = C$	$A \cap C = \varnothing$

E **2** **(a)** $\mathscr{E}$ = {even integers between 1 and 15 inclusive},
A = {multiples of 4}, $n(B) = 4$, $A \cap B = \varnothing$
List $A \cup B$.

(b) $n(\mathscr{E}) = 17$, $n(D') = 9$, $C \cap D \neq \varnothing$ and $n(C' \cap D) = 6$

(i) Find $n(D)$.

(ii) Find $n(C \cap D)$.

(iii) Draw a Venn diagram to illustrate this information.

E **3** Thirty students were asked to choose either Art, or Biology, or both subjects.
Three students forgot to make a choice.
Twenty-five students chose Biology.

Use a Venn diagram to find how many students chose both subjects.

E **4** $\mathscr{E}$ = {all triangles}, I = {isosceles triangles}, R = {right-angled triangles}

(a) Draw a Venn diagram to illustrate the sets I and R.

(b) Calculate the three angles of a member of $I \cap R$.

E = {equilateral triangles}

(c) Add set E to your Venn diagram.

E **5** **(a)** $n(\mathscr{E}) = 33$

$n(A) = x$

$n(B) = 2x + 7$

$n(A \cap B) = \frac{x}{2}$

$n((A \cup B)') = 17 - x$

Find $n(A' \cap B)$.

(b) A group of students use the social media sites Beetle and Iota.

$\frac{3}{4}$ use Beetle.

$\frac{5}{24}$ use Iota only.

Two students use neither.

(i) How many students are in the group?

(ii) If $\frac{11}{24}$ use Beetle only, how many use both Beetle and Iota?