Introduction

The *Key Stage 3 Mathematics* series covers the new National Curriculum for Mathematics (*The National Curriculum*, DFE, January 1995, 0 11 270894 3). Detailed curriculum references are provided. Each pack is designed to be flexible and can be used in a variety of ways:

- A complete course for Level 5 – The worksheets can be used to provide complete coverage of: Number and Algebra; Shape, Space and Measures; and Handling Data. The problem-solving tasks provide experience for the pupils in Using and Applying Mathematics.
- Individual lessons – The teacher can explain the tasks and provide the worked examples, either on the board, as overhead transparencies or as photocopied sheets for the students. Students should then attempt the exercises.
- Teacher's lesson notes – The notes and examples are useful for new teachers and can form the basis of lesson plans.
- Absent students – The notes, examples and exercises can be used by students during long-term absence or to help students catch up after absence.
- Teacher's absence – If a teacher is absent, a double-sided worksheet (notes and examples on one side, exercises on the other) can be provided for students. This will allow the students to continue with learning the curriculum.
- Examination revision – The notes and examples can be issued to students shortly before the examination for revision purposes.

The pack includes:

- Notes and worked examples
- Exercises
- Coursework tasks for AT1 – Using and Applying Mathematics
- Examination papers containing National Curriculum-type questions
- Using and Applying Mathematics problem-solving tasks
- Pupil's record form
- Answers.

Using the notes and examples

Pupils should fold the worksheet so that the answers cannot be seen. They can then read the notes, try the questions, and then check their answers.

Exam papers

Each paper is set on four sides of A4 paper. This will allow each exam paper to be placed on one sheet of A3, in order to remove the onerous task of writing and stapling exam papers. If both papers are set, the contents of Number and Algebra, Shape, Space and Measures, and Handling Data will have been covered at Level 4.

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

Each question is related to a specific part of the National Curriculum as indicated on the chart on pages 59 and 60.

It is also possible to use each exam paper as homework sheets in preparation for the end of Key Stage 3 examinations.

Pupil's record form

This allows the success of pupils to be recorded using the results of the exercises and exam questions. Either a tick/cross system or a mark system may be used.

Using and Applying Mathematics

Two problem-solving activities are provided. 'Chequers' on page 47 and 'Squares on a chessboard' on page 48. Solutions are given at the back of the pack.

End of term activities

The puzzles 'Shape up' on page 49 and 'Crossword puzzle' on page 50 are included for enjoyment. Solutions are given at the back of the pack.

Stafford Burndred
October 1995

Exam paper 1

Time allowed: 1 hour

1 Do not use a calculator.

Work out the answer 78000 ÷ 100.

Explain how you worked out the answer.

2 Do not use a calculator.

5.32 x 8 = 42.56

Use this information to work out the answer to:

a 5.32 x 8000

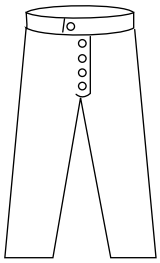
b 53.2 x 80

3 Here are the temperatures on seven days in January.
The temperatures are given in degrees Celsius.

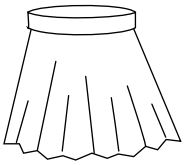
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
-6°C	-2°C	3°C	0°C	-1°C	5°C	1°C

Place the days in order of temperature. Coldest day first, warmest last.

4 a What is the total cost of the following? Show your working.



Trousers £13.95



Skirt £28

Bag of sweets 30p

b How much change would there be from £100?

5 Two classes in a school decide to raise money for charity. The youngest class set themselves a target of £30. The oldest class set themselves a target of £50. After one week the youngest class has collected 3/5 of its target. The oldest class has collected 32% of its target.

a How much has the youngest class collected?

b How much has the oldest class collected?

c Which class collected most and by how much?

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

6 Do not use a calculator. Show all your working.

a A farmer has 397 chicken pens with 28 chickens in each pen. How many chickens does he have?

b 847 apples are picked by a class of 26 pupils. The apples are shared equally. How many apples does each pupil receive and how many apples are left over?

7 Do not use a calculator. Show all of your working.

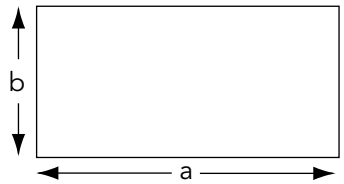
By approximating 397 and 28 check your answer to Question 6a.

8 David has y sweets.
Sarah has 5 more sweets than David.
Paul has twice as many sweets as Sarah.

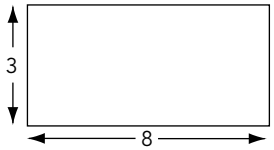
a Complete this:
David has y sweets.
Sarah has _____ sweets.
Paul has _____ sweets.

b If David has 12 sweets
i How many sweets does Sarah have? _____
ii How many sweets does Paul have? _____
iii How many sweets do the three children have altogether? _____

9 The perimeter of a rectangle is worked out using the formula 2 (a + b), where a is the length of a rectangle and b is the width of a rectangle.



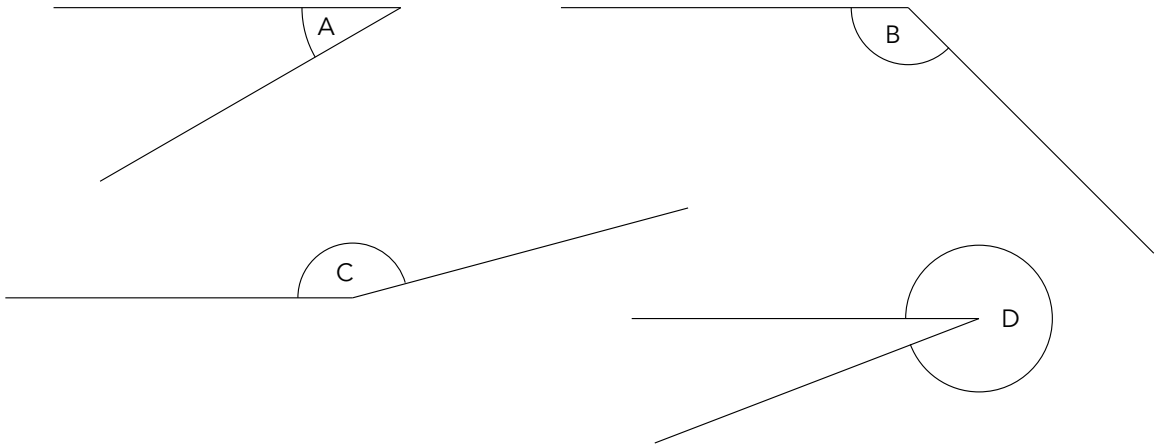
a What is the perimeter of this rectangle?



b The perimeter of this rectangle is 28.
The length is 10. What is the width?

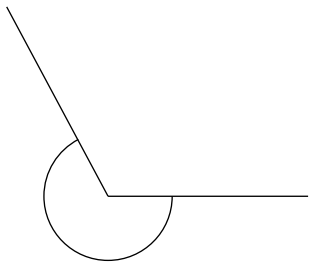
10 John used a protractor to measure these angles. These are his answers. Tick or cross his answers. If an answer is wrong write down the correct answer.

Angle	Size	Tick/Cross	Correct Answer
A	30°		
B	135°		
C	196°		
D	346°		



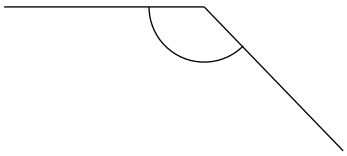
11 Choose the appropriate word to describe these angles. Choose from Acute, Reflex, Right, Obtuse.

a



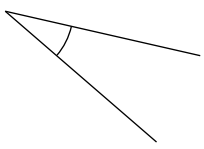
_____ Angle

b



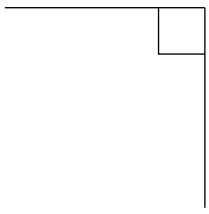
_____ Angle

c



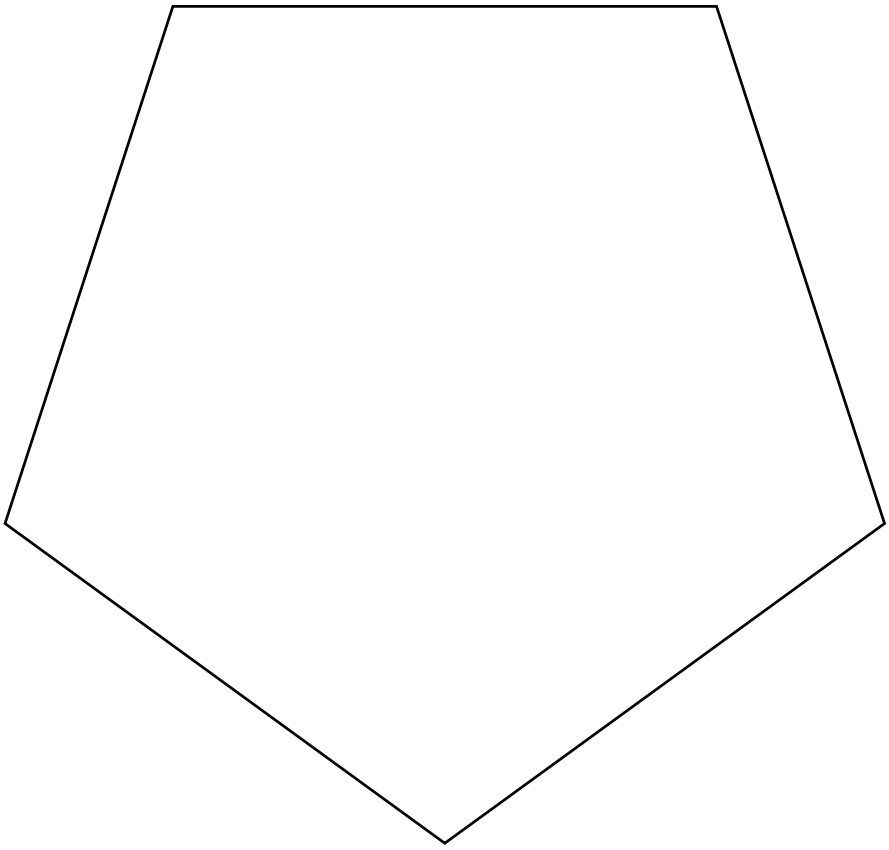
_____ Angle

d

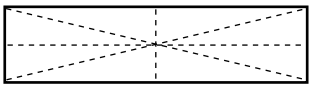


_____ Angle

12 Use dotted lines to draw all of the axes of symmetry of this shape.



13 David says this rectangle has four axes of symmetry.



a What mistake has he made?

b Show the axes of symmetry correctly.

c Draw a shape with four axes of symmetry.

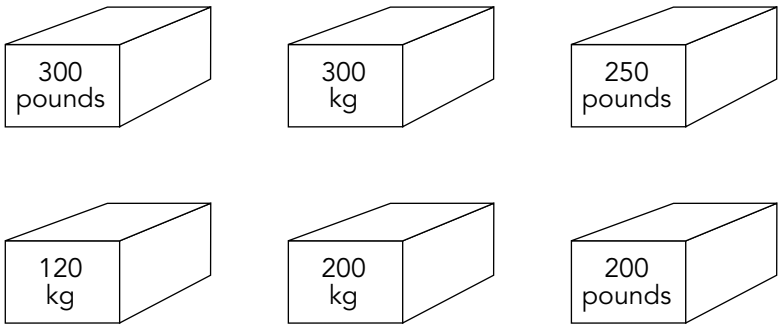
Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

Exam paper 2

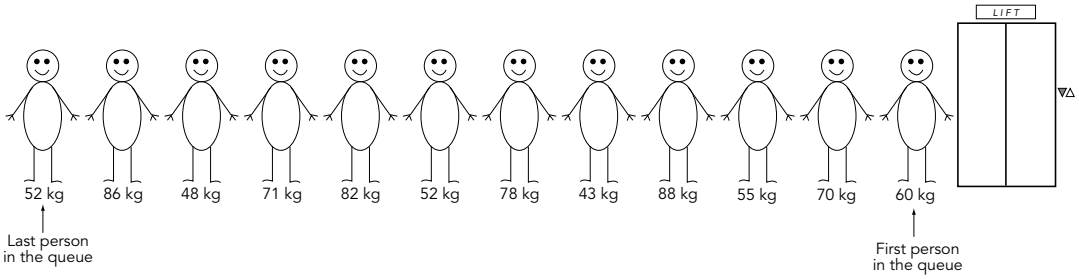
Time allowed: 1 hour

1 A van can carry a maximum of 1000 kilograms. One kilogram is just over two pounds.

Can the van carry all of these crates? Explain how you worked out the answer.



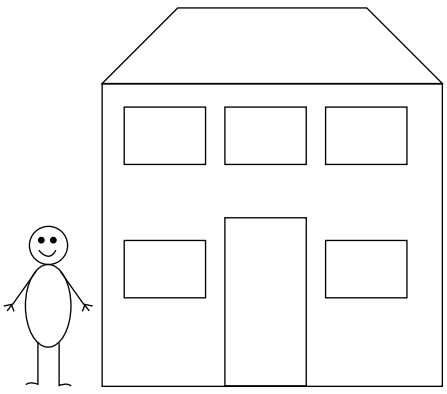
2 A lift can carry a maximum of 0.6 tonnes. The following people are in a queue:



Can they all fit into the lift? If not, how many are left behind?

3 Mr Evans is standing by a house.

Estimate the height of the house.



4 A football team played 10 matches. They scored the following number of goals:

3, 0, 1, 1, 4, 2, 3, 1, 0, 4

a John said the team scored a mean average of 4.35 goals per match. Explain how you know he is wrong.

b Jayne said the team scored a mean average of 0.97 goals per match. Explain how you know she is wrong.

c What is the mean average per match?

5 These are the science test results (out of 10) for Michael and Paul.

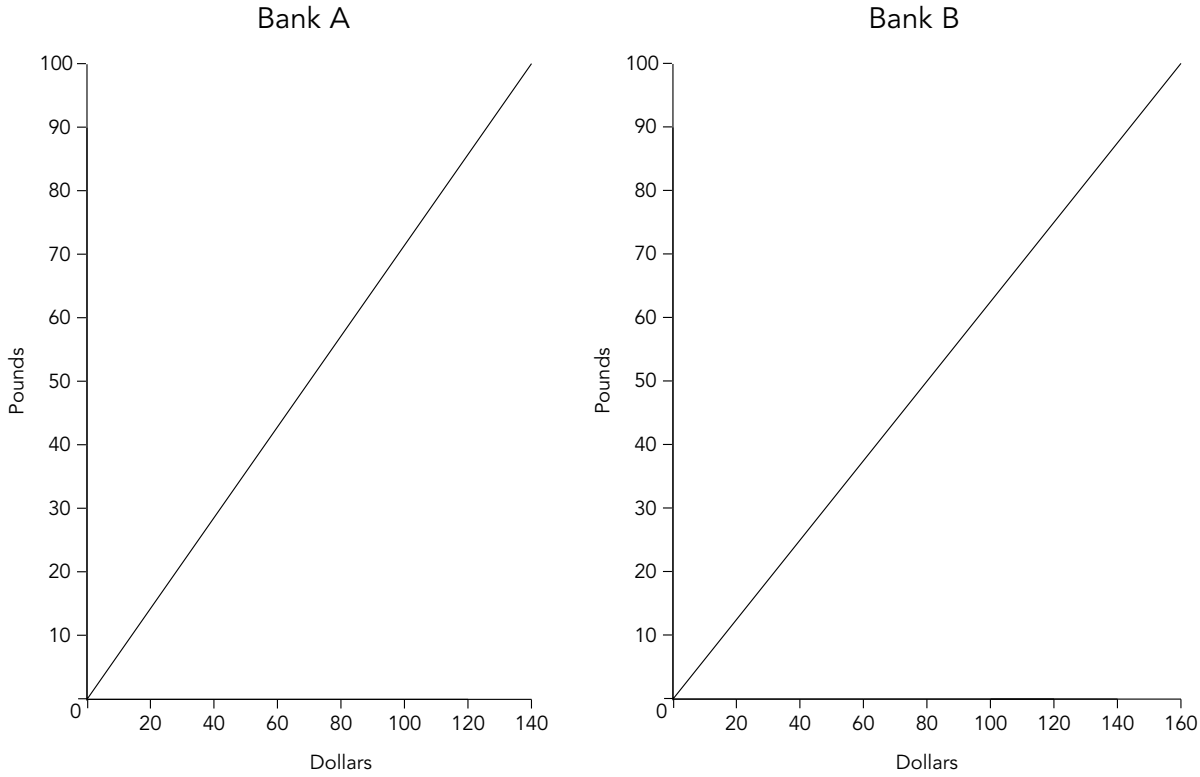
Test	1	2	3	4	5	6	7	8	9	10
Michael's marks	7	6	8	5	7	6	5	8	7	8
Paul's marks	2	9	5	7	8	10	1	10	8	10

Use the range and mean to compare their marks.

a What do the marks tell you about (i) Michael, (ii) Paul?

b The school has to pick one of the boys for an inter-schools science quiz. Who do you pick and why?

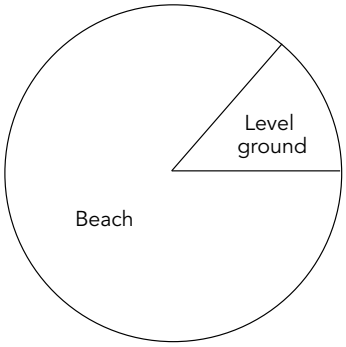
6 Two banks change pounds into dollars.



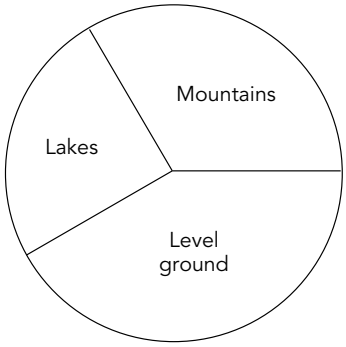
a Change £50 into dollars. How much do you get at (i) Bank A, (ii) Bank B?

b Change $130 into pounds. How much do you get at (i) Bank A, (ii) Bank B?

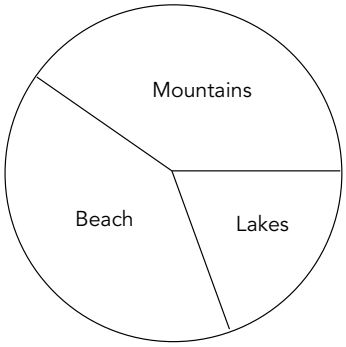
7 a John wants an active holiday. He likes climbing, walking and yachting. He hates the beach. Sarah wants a relaxing holiday with plenty of sunbathing on the beach. Paul wants to be close to the beach. He also wants some mountains and scenery. Use these pie charts to choose a suitable holiday for each person. Give reasons for your choice.



Holiday A

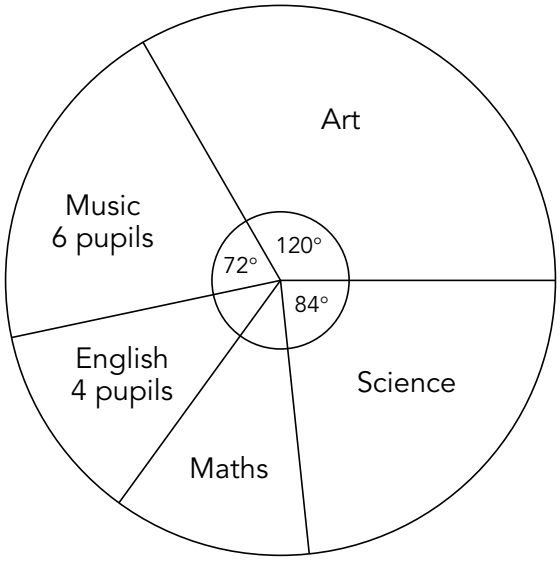


Holiday B



Holiday C

b This pie chart shows the favourite lessons of 30 pupils.



i Which of the five subjects is the most popular?

ii Which of the five subjects is the least popular?

iii How many people chose Art?

iv How many people chose Science?

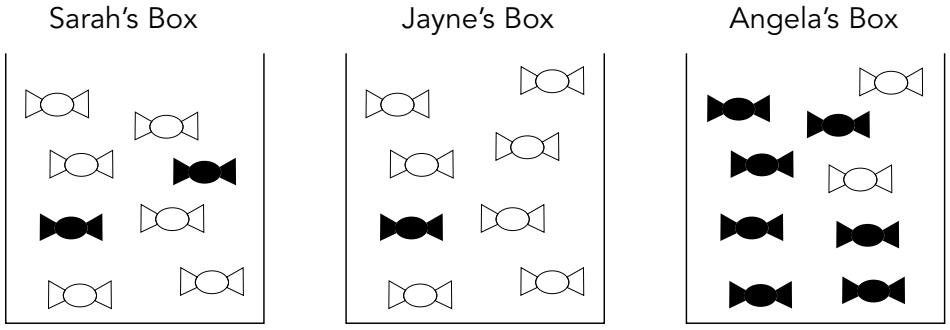
v What is the angle for English?

vi What is the angle for Maths?

vii How many people chose Maths?

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

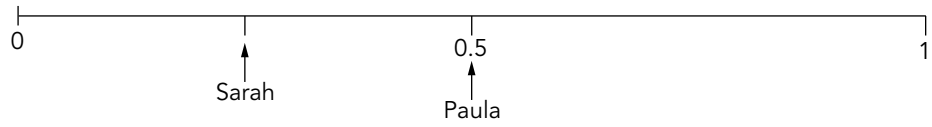
8 Sarah, Jayne and Angela each have a box containing black and white sweets. Each girl is blindfolded and asked to choose a sweet from her own box.



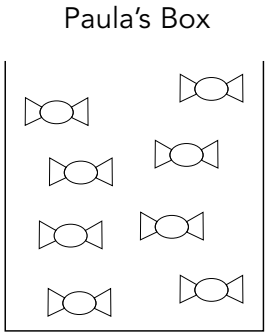
Sarah's chance of choosing a black sweet is shown on this probability line.

a Draw an arrow to show Jayne's chance. Label this J.

b Draw an arrow to show Angela's chance. Label this A.



c Paula's chance of choosing a black sweet is shown on the probability scale. Colour some of the sweets black to show this.



9 We can estimate probability by:

Method A Carrying out a survey to collect data.

Method B Carrying out an experiment.

Method C Using equally likely outcomes.

Which method would you choose to decide the probability of:

a the captain of the football team being selected by putting eleven names in a hat and picking out one name?

b a pupil at school liking Maths?

c the chance of a drawing pin landing point up?

National Curriculum references

Number and Algebra Level 5	Topic title	Exam paper	Question
Pupils use their understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000.	Multiplying and dividing whole numbers by 10, 100 and 1000 Multiplying and dividing decimals by 10, 100 and 1000	1 1	1 2
They order, add and subtract negative numbers in context.	Ordering, adding and subtracting negative numbers	1	3
They use all four operations with decimals to two places.	Addition, subtraction, multiplication and division of decimals to 2 decimal places	1	4
They calculate fractional or percentage parts of quantities and measurements, using a calculator where appropriate.	Calculating fractional and percentage parts of quantities and measurements	1	5
Pupils understand and use an appropriate non-calculator method for solving problems that involve multiplying and dividing any three-digit by any two-digit number.	Non-calculator methods for long multiplication and division	1	6
They check their solutions by applying inverse operations or estimating using approximations.	Checking using inverse operations and estimating using approximations	1	7
They construct, express in symbolic form, and use simple formulae involving one or two operations.	Symbolic form Using simple formulae	1 1	8 9

Shape, Space and Measures Level 5			
When constructing models and when drawing or using shapes, pupils measure and draw angles to the nearest degree, and use language associated with angle.	Measuring and drawing angles Using language associated with angles	1 1	10 11
They identify all the symmetries of 2-D shapes.	Symmetry of 2-D shapes – 1 Symmetry of 2-D shapes – 2	1 1	12 13
They know the rough metric equivalents of Imperial units still in daily use and convert one metric unit to another.	Rough metric equivalents of Imperial units still in daily use Converting one metric unit to another	2 2	1 2
They make sensible estimates of a range of measures in relation to everyday situations.	Making sensible estimates of measures in everyday situations	2	3

Handling Data Level 5	Topic title	Exam paper	Question
Pupils understand and use the mean of discrete data.	Using the mean of discrete data	2	4
They compare two simple distributions, using the range and one of the measures of average.	Comparing two simple distributions using range and mean, median or mode	2	5
They interpret graphs and diagrams, including pie charts, and draw conclusions.	Using and drawing conclusions from graphs Using and drawing conclusions from pie charts	2 2	6 7
They understand and use the probability scale from 0 to 1.	Using the probability scale from 0 to 1	2	8
Pupils find and justify probabilities, and approximations to these, by selecting and using methods based on equally likely outcomes and experimental evidence, as appropriate. They understand that different outcomes may result from repeating an experiment.	Justifying probabilities by equally likely outcomes and experimental evidence	2	9

Pupil's record form

Name: _____ Form: _____

Teacher: _____ Test marks: _____

	Exercises completed	Exam paper	Exam questions answered
Number and Algebra			
Multiplying and dividing whole numbers by 10, 100, 1000	☐	1	1 ☐
Multiplying and dividing decimals by 10, 100, 1000	☐	1	2 ☐
Ordering, adding and subtracting negative numbers	☐	1	3 ☐
Addition, subtraction, multiplication and division of decimals to 2 places	☐	1	4 ☐
Calculating fractional and percentage parts of quantities and measurements	☐	1	5 ☐
Non-calculator methods for long multiplication and division	☐	1	6 ☐
Checking using inverse operations and estimating using approximation	☐	1	7 ☐
Symbolic form	☐	1	8 ☐
Using simple formulae	☐	1	9 ☐
Shape, Space and Measures			
Measuring and drawing angles	☐	1	10 ☐
Using language associated with angles	☐	1	11 ☐
Symmetry of 2-D shapes – 1	☐	1	12 ☐
Symmetry of 2-D shapes – 2	☐	1	13 ☐
Rough metric equivalents of Imperial units still in daily use	☐	2	1 ☐
Converting one metric unit to another	☐	2	2 ☐
Making sensible estimates of measures in everyday situation	☐	2	3 ☐
Handling Data			
Using the mean of discrete data	☐	2	4 ☐
Comparing two simple distributions			
Using range and mean, median or mode	☐	2	5 ☐
Using and drawing conclusions from graphs	☐	2	6 ☐
Using and drawing conclusions from pie charts	☐	2	7 ☐
Using the probability scale from 0 to 1	☐	2	8 ☐
Justifying probabilities by equally likely outcomes and experimental evidence	☐	2	9 ☐

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

Answers

Multiplying and dividing whole numbers by 10, 100, 1000 (page 4)

1	a	210	b	16 000	c	560 000
	d	2 400 000	e	180 000	f	3000
2	a	40	b	20	c	30
	d	400	e	80	f	500
3	600		4	420 000	5	5600
6	90		7	4 kg	8	90
9	90 000		10	1500	11	300 000
12	13000		13	25	14	20
15	14 000					

Multiplying and dividing decimals by 10, 100, 1000 (page 6)

1	a	32.6	b	326	c	3260
2	a	483	b	4830	c	48 300
3	a	85.32	b	853.2	c	8532
4	a	1.32	b	13.2	c	132
5	a	0.7	b	7	c	70
6	a	30.5	b	305	c	3050
7	a	203	b	2030	c	20 300
8	a	0.68	b	6.8	c	68
9	a	0.02	b	0.2	c	2
10	a	38.7	b	3.87	c	0.387
11	a	500	b	50	c	5
12	a	0.368	b	0.0368	c	0.00368
13	a	0.72	b	0.072	c	0.0072
14	a	0.013	b	0.0013	c	0.00013
15	a	3.62	b	0.362	c	0.0362
16	a	4.087	b	0.4087	c	0.04087
17	a	0.386	b	0.0386	c	0.00386
18	a	70.04	b	7.004	c	0.7004
19	32		20	0.286	21	187.2
22	128 730 m		23	0.08 litres	24	b
25	a		26	b	27	b
28	a		29	b	30	b

Ordering, adding and subtracting negative numbers (page 8)

1	a	220 m	b	240 m	c	280 m
2	a	20 m	b	40 m	c	240 m
	d	540 m	e	1040 m		

3	a	-8, -6, -2, 0, 3	b	-5, -2, 1, 3, 8		
	c	-3, -2, 0, 4, 6	d	-10, -7, -3, 2, 4		
4	a	-1	b	-8	c	-3
	d	2	e	-10	f	-5
	g	-3	h	-7	i	5
5	a	10 m or -10 m	b	100 m or -100 m	c	70 m or -70 m
	d	300 m or -300 m	e	100 m or -100 m	f	50 m or -50 m

Addition, subtraction, multiplication and division of decimals (page 10)

1	42.83		2	130.01	3	85.2
4	5.08		5	6.92	6	4.07
7	3.192		8	219.3	9	0.1072
10	130		11	14	12	1940
13	6.942		14	52.32	15	5.32
16	62.23		17	5.456	18	12.33
19	a	1.8	b	28.8	c	2.25
	d	4.158	e	3.339	f	4.752
	g	1.44	h	0.027	i	0.36
20	a	1.96	b	0.35	c	0.364
	d	0.042	e	0.0084	f	0.0119
21	a	0.76	b	0.026	c	0.0006
	d	0.042	e	0.01	f	0.002

Calculating fractional and percentage parts of quantities and measurements (page 12)

1	a	6	b	161/2 km	c	137/8 t
	d	£9.75	e	£15.75		
2	a	12	b	158 g	c	4.62 cm
	d	£4.40	e	£1.80		
3	a	18.55	b	1.4 m	c	1.33 kg
	d	£2.03	e	£1.645		
4	a	39	b	2.028 cm	c	8.112 km
	d	£42.12	e	£3.12		
5	a	£14	b	£5.60	c	£1.64
6	a	£1.08	b	£4.80	c	£2.31
	d	£1.32				
7	a	£119.60	b	£10.14	c	£4.16
8	a	£70	b	£64.75	c	£94.50

Non-calculator methods for long multiplication and division (page 14)

1	19 968	2	26 128	3	24 651
4	28 028	5	11 396	6	36 585
7	28 r 7	8	43 r 9	9	52 r 10
10	20 r 22	11	17 r 21	12	13 r 33

13 a 8892 b 25 992 c 65 664
14 a 1241 b 2336 c 6132
15 2244 16 36, 6 over 17 24, 3 over
18 48, 3 over 19 8760 20 27, 11 over

Checking using inverse operations and estimating using approximation (page 16)

1 correct 2 incorrect 3 incorrect
4 correct 5 incorrect 6 correct
7 correct 8 incorrect 9 120 000
10 £160 11 20 12 18 000
13 £3200

Symbolic form (page 18)

1 x + 2 2 x - 7 3 5y
4 15z 5 40c 6 1/2s
7 x + y 8a lw 8b 2l + 2w
9 Z/5 10 4, 6 11a 17
11b 13 12 8 13 14
14 12 15 5

Using simple formulae (page 20)

1 a 10 b 12 c 12
d 3 e 20 f 18
g 16 h 18
2 a 6 b 4 c 24
d 17.5 e 28 f 7.5
g 30 h 31.5 i 24
j 110.5
3 a 14 b 21 c 40
d 48 e 22 f 11
g 28 h 25
4 a 24 b 30

Measuring and drawing angles (page 22)

2 a 42° b 123° c 24°
d 249° e 137° f 331°
3 x 50° y 80° z 50°

Rough metric equivalents of Imperial units still in daily use (page 30)

1 c 2 b 3 d
4 a 5 e 6 b
7 d 8 c

Converting one metric unit to another (page 32)

1	a	3	b	4.8	c	3.25
	d	200	e	380	f	1242
	g	70	h	23		
2	a	5	b	3.2	c	0.87
	d	3.28	e	0.07	f	3800
	g	725	h	600		
3	a	4.7	b	5.273	c	0.68
	d	0.503	e	2800	f	3680
	g	304	h	30		
4	a	3.728	b	0.685	c	0.4
	d	3.02	e	0.058	f	2
	g	0.368	h	0.26		
5	a	4	b	3.2	c	4.2
	d	3.28	e	6	f	0.3
	g	8.52	h	0.023		
6	a	500	b	380	c	60
	d	42	e	7	f	35
	g	0.6	h	7.5		
7	a	30	b	80	c	120
	d	24	e	65	f	7
	g	3.2	h	0.4		
8	a	3	b	2.7	c	3.654
	d	4.53	e	0.87	f	0.684
	g	2.03	h	0.04		

Using the mean of discrete data (page 36)

1	a	4.3	b	3
2	a	13.4	b	5
3	a	152.6	b	42
4	a	46.75	b	20
5	a	2.75	b	5
6	a	29.2	b	9
7	a	40.1	b	7
8	a	70.2	b	29
9	a	2.375	b	4
10	a	58.4	b	31

Comparing two simple distributions using range and mean, median or mode (page 38)

1 Brown Range 52 Mean 45 Median 39.5. Green Range 92 Mean 47.67 Median 53

2 Smith Range 14 Mean 72.875 Median 73. Jones Range 22 Mean 74.7 Median 73

3 Sarah Range 18 Mean 71.4. Tracy Range 52 Mean 65.6

Using and drawing conclusions from graphs (page 40)

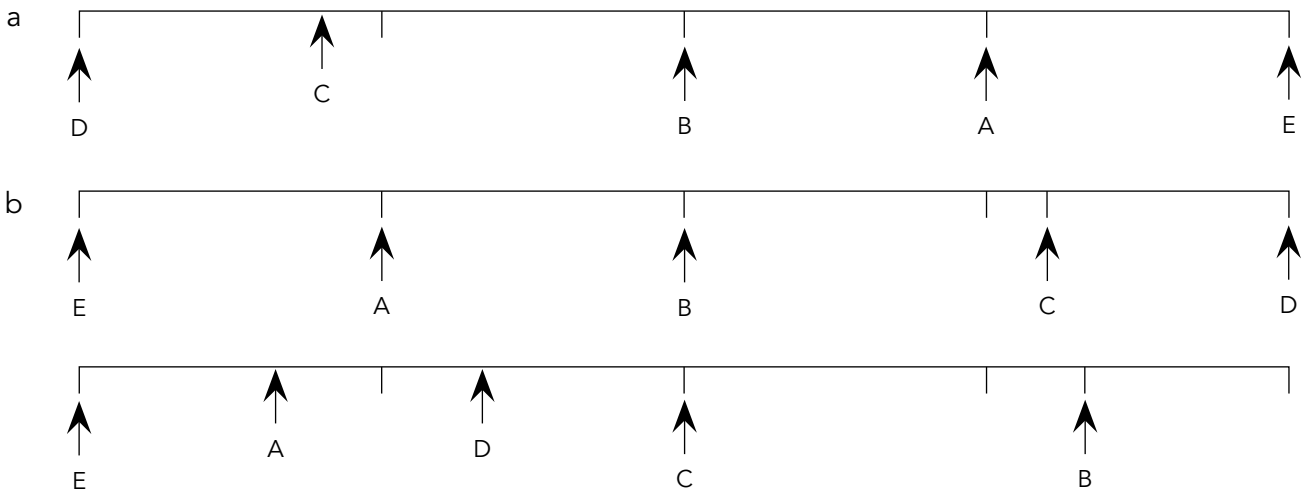
1 a 6-9 b 12-15 c 8-10
d 3-5 e 1-3
2 a 3.5-4.5 b 5-6 c 1-2
d 5.5-6.5 e 3-4
3 14-16 4 4-5 5 85-95
6 7-10 7 5-6 8 34-38
9 115-125 10 45-50 11 50-60
12 140-160

Using and drawing conclusions from pie charts (page 42)

1 4 2 10 3 105°
4 3 5 45° 6 Fishing
7 England 8 44 9 12
10 32° 11 104° 12 26

Using the probability scale from 0 to 1 (page 44)

1



Justifying probabilities by equally likely outcomes and experimental evidence (page 46)

2 250 7 HH, HT, TH, TT
8 HHH, HHT, HTH, HTT, THH, THT, TTH, TTT
9 ABC, ACB, BAC, BCA, CAB, CBA
10 EFGH, EFHG, EGFH, FEGH, FEHG, FHEG

Chequers (page 47)

1 225 Black, 225 White 2 323 Black, 323 White
3 851 Black, 850 White 4 1872 Black, 1872 White

Row	Column	Number of black squares	Number of white squares
Even Even Odd	Even Odd Even	$\frac{\text{Row x column}}{2}$	$\frac{\text{Row x column}}{2}$
Odd	Odd	$\frac{\text{Row x column + 1}}{2}$	$\frac{\text{Row x column - 1}}{2}$

Squares on a chessboard (page 48)

8 by 8 board

1 8 by 8 squares
4 7 by 7 squares
9 6 by 6 squares
16 5 by 5 squares or $1^2+2^2+3^2+4^2+5^2+6^2+7^2+8^2=204$
25 4 by 4 squares
36 3 by 3 squares
49 2 by 2 squares
64 1 by 1 squares
204

10 by 10 board 385 **15 by 15 board** 1240

n by n board $1^2+2^2+3^2+4^2+\ldots\ldots\ldots (N-3)^2+(N-2)^2+(N-1)^2+N^2$

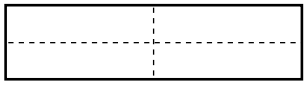
Crossword puzzle (page 50)

Solution to the crossword puzzle:

Down 1 Hole, 2 Bill, 4 Boss, 7 Less

Across 3 Hill, 4 Bell, 5 His, 6 Sole, 8 Sell

Exam paper 1 (page 51)

1	780	(3 marks)
2	a 42 560 b 4256	(2 marks each)
3	Mon, Tue, Fri, Thu, Sun, Wed, Sat	(2 marks)
4	a £42.25	(2 marks)
	b £57.75	(1 mark)
5	a £18 b £16 c Youngest £2 more	(2 marks each)
6	a 1116 b 32 and 15 over	(2 marks each)
7	12 000	(1 mark)
8	a y + 5	(1 mark)
	2y + 10	(2 marks)
	b i 17 ii 34 iii 63	(1 mark each)
9	a 22	(2 marks)
	b 4	(3 marks)
10	A ✔ B ✔	(1 mark each)
	C 165° Approx D 339° Approx	(2 marks each)
11	a REFLEX b OBTUSE c ACUTE d RIGHT	(1 mark each)
12	5 axes	(2 marks)
13	a Diagonals should not be drawn	(1 mark)
	b 	(1 mark)
	c Any shape with 4 axes of symmetry	(2 marks)
		Total 50 marks

Exam paper 2 (page 55)

1	Yes. Some explanation eg change pounds to kilograms				
	eg 150 + 300 + 125 + 120 + 200 + 100 = 995 kg				(3 marks)
2	3 left				(3 marks)
3	4 – 5 m				(1 mark)
4	a Team never scored more than 4 goals				(2 marks)
	b Team only scored less than 1 goal twice				(2 marks)
	c 1.9				(2 marks)
5	a i Michael Range 3 Mean 6.7 and a valid comment				(3 marks)
	ii Paul Range 9 Mean 7 and a valid comment				(3 marks)
	b Any valid reason				(1 mark)
6	a i £70 ii £80				(1 mark each)
	b i £90 – £95 approx ii £80 – £85 approx				(1 mark each)
7	a John – Holiday B Sarah – Holiday A Paul – Holiday C				(2 marks each)
	b i Art				(1 mark)
	ii Maths				(1 mark)
	iii 10				(1 mark)
	iv 7				(1 mark)
	v 48°				(1 mark)
	vi 36°				(2 marks)
	vii 3				(1 mark)
8	a About 0.125 approx	b About 0.75	c 4 Shaded		(2 marks each)
9	a C	b A	c B		(2 marks each)
					Total 50 marks

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484

Contents

Pearson Publishing, Chesterton Mill, French's Road, Cambridge CB4 3NP Tel 01223 350555 Fax 01223 356484