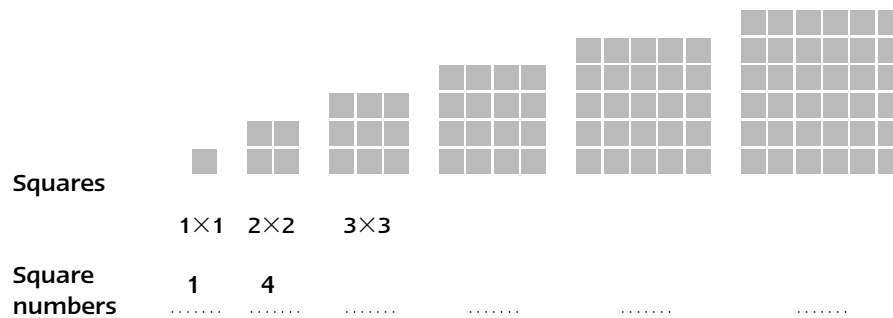


UNIT 1

SECTION 1: SQUARE NUMBERS

DIRECT TEACHING POINTS

- Quickly revise odd and even numbers. You need to demonstrate the link between square numbers and their spatial arrangements. Pupils need to have this visual picture.



- Star Challenge 2 is an activity that pupils could attempt individually and then discuss their results in pairs.
- Learning square numbers up to 10×10 can be reinforced as homework.
- Square numbers provide pupils with key facts to learn multiplication tables, for example 8×7 can be deduced from 7×7 . You need to teach this and build on it during the year.
- Discuss with pupils which square numbers they should know and when it is appropriate to use a calculator to work out others.
- You can revisit square numbers regularly in mental sessions.



square number

Square numbers

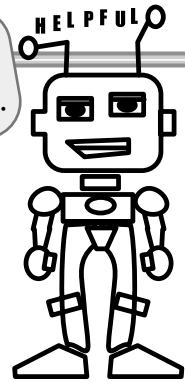
1 The first ten square numbers

Complete:

The first ten square numbers are

1, 4,,,,,,,,

Learn square numbers like 5×5 , 7×7 .



2 More square numbers



Complete:

The second square number = 4

The fourth square number = 16

The sixth square number =

The tenth square number =

Work out:

The thirteenth square number =

The 45th square number =

3 Squaring numbers

This is a table of numbers and their squares.

Fill in the gaps:

Numbers	2	3	7	9		12	0			4	6			11
Squares	4	9	49		25			1	64			4	100	

Square numbers



1

Calculator squares search



9-10 correct 1 star

Complete the square numbers:

1 \times = 16

5 \times = 225

9 squared = 900

2 \times = 64

6 \times = 484

10 n squared = 7921

3 \times = 144

7 squared = 25

- what is the
value of n ?

4 \times = 169

8 squared = 841



2

Sums of two squares



19-20 correct 2 stars
15-18 correct 1 star

Squares are:

1	4	9	16
25	36	49	64
100	121	144	.....

Write each number below as the sum of two squares.

2 = 1 + 1

17 = +

20 = +

5 = 1 + 4

50 = +

25 = +

13 = 4 + 9

80 = +

125 = +

18 = 9 + 9

65 = +

85 = +

8 = +

74 = +

61 = +

10 = +

104 = +

169 = +

106 = +

145 = +

26 = +

52 = +

202 = +

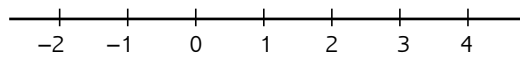
313 = +

UNIT 1

SECTION 2: SIMPLE SEQUENCES

DIRECT TEACHING POINTS

- There are many opportunities within this section to teach and consolidate mental addition and subtraction strategies, for example, adding and subtracting 9.
- Counting on and back in equal steps from zero helps reinforce multiples and multiplication facts.
- Practise this work orally with written exercises used as consolidation as appropriate.
- Demonstrate to pupils the patterns in our number system.
 $6 + 5$ $16 + 5$ $96 + 5$ are basically the same calculation.
- Use a number line, extended below zero, as a visual prompt.



- Pupils find counting back more difficult than counting on. It needs more practice.



*sequence add subtract
minus multiple*

Simple sequences

1

Counting on and back in 6s



Extend each sequence by counting on or back in 6s:

1	6	12	18	.....	.....	.....	.....
2	21	27	33	.....	.....	.....	.....
3	50	56	.....	.....	.....	.....	.....
4	60	54	48	.....	.....	.....	.....
5	100	94	.....	.....	.....	.....	.....
6	52	46	.....	.....	.....	.....	.....
7	27	21	15	.....	.....	-3	.....
8	20	14	.....	.....	.....	.....	.....

2

Counting on and back in 9s



Extend each sequence by counting on or back in 9s:

1	9	18	27	.....	.....	.....	.....
2	29	38	.....	.....	.....	.....	.....
3	63	54	.....	.....	.....	.....	.....
4	65	56	.....	.....	.....	.....	.....
5	27	18	.....	.....	-9	.....	.....
6	30	21	.....	.....	-6	.....	.....
7	50	41	.....	.....	.....	.....	.....
8	6	-3	.....	.....	.....	.....	.....

Simple sequences

3

Rules for counting on and back



What is the rule?

Extend each sequence:

1	Rule: add 8	4	12	.....	.....	.....	.....	.....
2	Rule: add	5	12	.....	.....	.....	.....	.....
3	Rule: add	21	27	.....	.....	.....	.....	.....
4	Rule: subtract 9	83	74	65	.....	.....	.....	.....
5	Rule:	78	70	62	.....	.....	.....	.....
6	Rule:	-2	2	.....	.....	.....	.....	.....
7	Rule:	18	29	.....	.....	.....	.....	.....
8	Rule:	50	75	100	.....	.....	.....	.....

STAR CHALLENGE

3

From sequences to rules



What is the rule?

Extend each sequence:

50-52 correct 2 stars
42-49 correct 1 star

1	Rule:	43	51	.....	.....	.....	83	.....
2	Rule:	34	45	.....	.....	.....	89	.....
3	Rule:	150	.....	.....	225	250	.....	.....
4	Rule:	5	30	55	.....	.....	.....	.....
5	Rule:	90	81	72	.....	.....	.....	.....
6	Rule:	-3	3	.....	15	.....	.....	33
7	Rule:	-30	-21	-12	.....	.....	.....	24
8	Rule:	7	13	.....	.....	.....	.....	43

Simple sequences



Rules and patterns



All correct 1 star

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90

1 Look at the column with 8 at the top.
What is the rule connecting this sequence of numbers?

.....

2 Start with 8.
Circle each number that is made by adding 7 onto the last number.

.....

3 Describe the pattern made by the numbers you have circled.

.....

UNIT 1

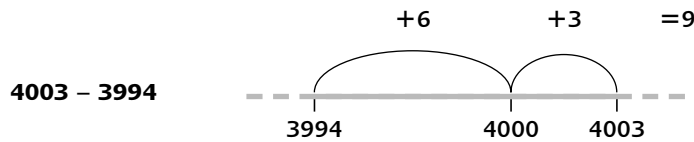
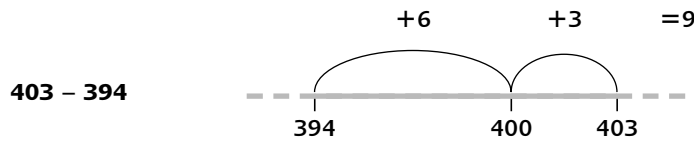
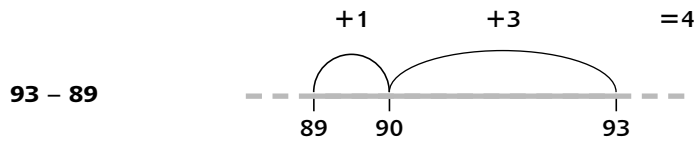
SECTIONS 3 AND 4: MENTAL ADDITION AND SUBTRACTION

DIRECT TEACHING POINTS

These sections introduce work that needs to be continually practised during the term: addition and subtraction of two 2-digit numbers mentally.

- Pupils need to be secure in recalling addition and subtraction facts to 20.
- Counting orally forward and back over 10, 100 and 1000 boundaries can help consolidate mental work on differences.

For example:



- A prerequisite to the introduction of written calculations is for pupils to be able to add and subtract a pair of two-digit numbers mentally.
- You will need to teach each stage then consolidate. You can teach progression in mental arithmetic strategies by using examples like these:

$43 + 30$ do this by adding 10s

$56 - 20$ do this by subtracting 10s

$43 + 8$ deduce from $13 + 8$ or $(43 + 7) + 1$

$43 - 8$ deduce from $13 - 8$ or $(43 - 3) - 5$

$43 + 32$ break this down into $(43 + 30) + 2$ or $(40 + 30) + (3 + 2)$

$54 + 27$ break this down into $(54 + 20) + 7$ or $(50 + 20) + (4 + 7)$

$86 + 47$ break this down into $(86 + 40) + 7$ or $(80 + 40) + (6 + 7)$

$93 - 27$ break this down into $(93 - 20) - 7$

$64 + 39$ break this down into $(64 + 40) - 1$

no regroup

over 10s boundary

over 10s, 100s boundary

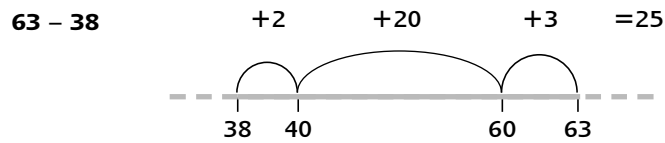
across 10s boundary

compensate

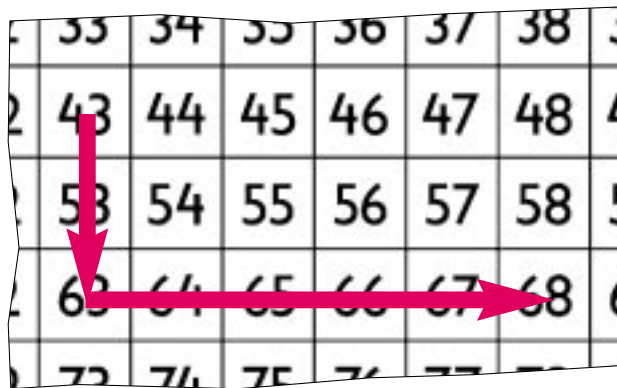
UNIT 1



- Extend this work to cover multiples of 10 and simple decimals.
 $280 + 640$ $720 - 180$ $2.7 + 4.6$ $7.3 - 2.7$
- Include examples of money $£60 + £3.80$ $£7.20 - £3.80$
 and measures $5.5 \text{ m} - 2.8 \text{ m}$
- Demonstrate the use of an empty number line as a support for pupils' mental calculations.



- The visual image on a hundred square is a support for some pupils.



$$43 + 25 = 68$$

- Pupils need to progress so that they are not dependent on the number line or hundred square.



add addition sum
subtract minus take away difference

Mental addition

1

Adding and subtracting in your head



Write down the answers to each of these:

1 $27 + 10 = \dots\dots$

5 $23 + 8 = \dots\dots$

9 $48 - 20 = \dots\dots$

2 $68 + 7 = \dots\dots$

6 $61 + 30 = \dots\dots$

10 $74 - 7 = \dots\dots$

3 $72 + 20 = \dots\dots$

7 $93 - 20 = \dots\dots$

11 $86 - 50 = \dots\dots$

4 $37 + 8 = \dots\dots$

8 $48 - 9 = \dots\dots$

12 $97 - 8 = \dots\dots$

2

Adding pairs of numbers in your head



Example

Work out $45 + 36$

$$45 + 30 = 75$$

$$\text{and } 75 + 6 = 81$$



$$40 + 30 = 70$$

$$\text{and } 5 + 6 = 11$$

$$70 + 11 = 81$$

Which way do you like best?

Write down the answers to each of these:

1 $23 + 35 = \dots\dots$

5 $74 + 28 = \dots\dots$

9 $19 + 21 = \dots\dots$

2 $37 + 42 = \dots\dots$

6 $65 + 33 = \dots\dots$

10 $55 + 37 = \dots\dots$

3 $42 + 34 = \dots\dots$

7 $27 + 43 = \dots\dots$

11 $44 + 48 = \dots\dots$

4 $61 + 27 = \dots\dots$

8 $25 + 35 = \dots\dots$

12 $48 + 67 = \dots\dots$

Mental subtraction

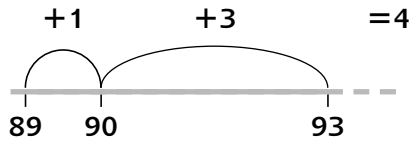
1

Subtracting across the tens boundary



Example

Work out $93 - 89$ by counting on. Use an empty number line.



$$93 - 89 = 4$$

1 $54 - 49 =$

2 $83 - 76 =$

3 $75 - 68 =$

4 $46 - 34 =$

Now do it in your head!

5 $53 - 44 = \dots$

7 $101 - 97 = \dots$

9 $36 - 25 = \dots$

6 $86 - 79 = \dots$

8 $84 - 78 = \dots$

10 $97 - 85 = \dots$

Mental subtraction

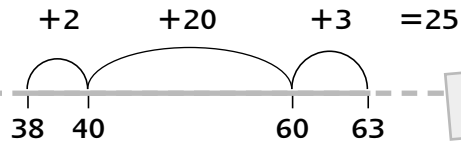
2

Bigger jumps across the tens boundaries



Example

Work out $63 - 38$ by counting on. Use an empty number line.



1 $74 - 49 =$

2 $95 - 36 =$

3 $63 - 16 =$

4 $63 - 34 =$

5 $84 - 39 =$

6 $105 - 67 =$

Work these out in your head.

7 $82 - 45 = \dots$

9 $76 - 39 = \dots$

11 $54 - 36 = \dots$

8 $83 - 55 = \dots$

10 $75 - 37 = \dots$

12 $71 - 47 = \dots$

Mental subtraction

3

Subtracting across the
hundreds boundary

1 $204 - 192 =$

2 $510 - 499 =$

3 $706 - 690 =$

4 $612 - 595 =$

5 $602 - 588 = \dots$

7 $311 - 295 = \dots$

9 $415 - 397 = \dots$

6 $305 - 299 = \dots$

8 $702 - 691 = \dots$

10 $904 - 895 = \dots$

4

Subtracting across the
thousands boundary

1 $3004 - 2995 =$

2 $7010 - 6992 =$

3 $8006 - 7990 =$

4 $9009 - 8998 =$

5 $1011 - 997 = \dots$

7 $3004 - 2990 = \dots$

9 $6012 - 5980 = \dots$

6 $2005 - 1997 = \dots$

8 $5010 - 4994 = \dots$

10 $3015 - 2990 = \dots$

Mental subtraction

STAR CHALLENGE
5

Counting on mixture



12-15 correct 2 stars
8-11 correct 1 star

Work these out in your head.

1 $65 - 42$

5 $525 - 475$

9 $540 - 460$

2 $312 - 280$

6 $721 - 570$

10 $86 - 68$

3 $95 - 59$

7 $82 - 55$

11 $650 - 580$

4 $72 - 23$

8 $73 - 37$

12 $842 - 798$

STAR CHALLENGE
6

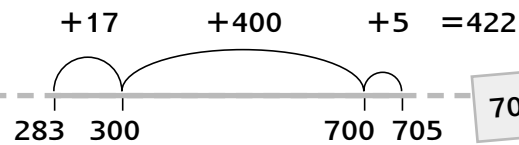
Bigger jumps across the hundreds boundaries



9 correct 2 stars
7-8 correct 1 star

Example

Work out $705 - 283$
by counting on. Use
an empty number line.



$705 - 283 = 422$

1 $435 - 190$

3 $265 - 88$

5 $535 - 275$

2 $620 - 370$

4 $810 - 493$

6 $825 - 295$

Now do these in your head.

7 $420 + 199$

8 $651 + 592$

9 $922 - 688$

Unit 1 Answers

Section 1

Square numbers

1 The first ten square numbers

1, 4, 9, 16, 25, 36, 49, 64, 81, 100

2 More square numbers

4, 16, 36, 100, 169, 2025

3 Squaring numbers

2	3	7	9	5	12	0	1	8	4	6	2	10	11
4	9	49	81	25	144	0	1	64	16	36	4	100	121

Section 2

Simple sequences

1 Counting on and back in 6s

1	6	12	18	24	30	36	42
2	21	27	33	39	45	51	57
3	50	56	62	68	74	80	86
4	60	54	48	42	36	30	24
5	100	94	88	82	76	70	64
6	52	46	40	34	28	22	16
7	27	21	15	9	3	-3	-9
8	20	14	8	2	-4	-10	-16

Unit 1 Answers

Simple sequences

continued

2 Counting on and back in 9s

1	9	18	27	36	45	54	63
2	29	38	47	56	65	74	83
3	63	54	45	36	27	18	9
4	65	56	47	38	29	20	11
5	27	18	9	0	-9	-18	-27
6	30	21	12	3	-6	-15	-24
7	50	41	32	23	14	5	-4
8	6	-3	-12	-21	-30	-39	-48

3 Rules for counting on and back

1	add 8	4	12	20	28	36	44	52
2	add 7	5	12	19	26	33	40	47
3	add 6	21	27	33	39	45	51	57
4	subtract 9	83	74	65	56	47	38	29
5	subtract 8	78	70	62	54	46	38	30
6	add 4	-2	2	6	10	14	18	22
7	add 11	18	29	40	51	62	73	84
8	add 25	50	75	100	125	150	175	200

Section 3

Mental addition

1 Adding and subtracting in your head

1	37	5	31	9	28
2	75	6	91	10	67
3	92	7	73	11	36
4	45	8	39	12	89

Unit 1 Answers

Section 3

Mental addition

continued

2 Adding pairs of numbers in your head

1	58	5	102	9	40
2	79	6	98	10	92
3	76	7	70	11	92
4	88	8	60	12	115

Section 4

Mental subtraction

1 Subtracting across tens boundary

1	5	5	9	9	11
2	7	6	7	10	12
3	7	7	4		
4	12	8	6		

2 Bigger jumps across the tens boundaries

1	25	5	45	9	37
2	59	6	38	10	38
3	47	7	37	11	18
4	29	8	28	12	24

3 Subtracting across the hundreds boundary

1	12	5	14	9	18
2	11	6	6	10	9
3	16	7	16		
4	17	8	11		

4 Subtracting across the thousands boundary

1	9	5	14	9	32
2	18	6	8	10	25
3	16	7	14		
4	11	8	16		

Unit **1** Answers

Star Challenge answers



Calculator squares search

9–10 correct 1 star

1 $4 \times 4 = 16$

6 $22 \times 22 = 484$

2 $8 \times 8 = 64$

7 $5 \text{ squared} = 25$

3 $12 \times 12 = 144$

8 $29 \text{ squared} = 841$

4 $13 \times 13 = 169$

9 $30 \text{ squared} = 900$

5 $15 \times 15 = 225$

10 $n = 89$



Sums of two squares

19–20 correct 2 stars
15–18 correct 1 star

$2 = 1 + 1$

$17 = 1 + 16$

$20 = 16 + 4$

$5 = 1 + 4$

$50 = 1 + 49$

$25 = 16 + 9$

or $25 + 25$

$13 = 4 + 9$

$80 = 64 + 16$

$125 = 121 + 4$

$18 = 9 + 9$

$65 = 1 + 64$

$85 = 81 + 4$

$8 = 4 + 4$

$74 = 49 + 25$

$61 = 36 + 25$

$10 = 1 + 9$

$104 = 100 + 4$

$169 = 144 + 25$

$106 = 81 + 25$

$145 = 1 + 144$

$26 = 25 + 1$

or $64 + 81$

$52 = 36 + 16$

$202 = 81 + 121$

$313 = 144 + 169$

Unit 1 Answers

Star Challenge answers

continued



3 From sequences to rules

50-52 correct 2 stars
 42-49 correct 1 star

1	add 8	43	51	59	67	75	83	91
2	add 11	34	45	56	67	78	89	100
3	add 25	150	175	200	225	250	275	300
4	add 25	5	30	55	80	105	130	155
5	subtract 9	90	81	72	63	54	45	36
6	add 6	-3	3	9	15	21	27	33
7	add 9	-30	-21	-12	-3	6	15	24
8	add 6	7	13	19	25	31	37	43



4 Rules and patterns

All correct 1 star

1 add 9

2

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90

3 sloping lines going down to the left



5 Counting on mixture

12-15 correct 2 stars
 8-11 correct 1 star

1	23	4	49	7	27	10	18
2	32	5	50	8	36	11	70
3	36	6	151	9	80	12	44



6 Bigger jumps across the hundreds boundaries

9 correct 2 stars
 7-8 correct 1 star

1	245	4	317	7	619
2	250	5	260	8	1243
3	177	6	530	9	234