Unit 11
Addition and subtraction, problems and checking solutions

Five daily lessons

National **Numeracy** *Strategy*

Year 6
Autumn term

Unit Objectives
Year 6

• Find a difference by counting up; add or subtract the nearest multiple of 10 100 or 1000, then adjust.	Page 41
• Use informal pencil and paper methods to support, record or explain additions and subtractions.	Pages 49, 51
• **Extend written methods to column addition and subtraction of numbers involving decimals.**	Pages 49, 51
• **Identify and use appropriate operations to solve word problems involving numbers and quantities.**	Pages 75, 82-89
• Check with the inverse operation when using a calculator.	Page 71

Link Objectives

Year 5

- Find differences by counting up through next multiple of 10 100 or 1000.
- Extend written methods to column addition/subtraction of two integers less than 10 000.
- Use all four operations to solve simple word problems involving numbers and quantities.
- Check with the inverse operation when using a calculator.

Year 7

- **Consolidate and extend mental methods of calculation to include decimals, fractions and percentages.**
- **Solve word problems.**
- **Check a result by considering whether it is the right order of magnitude and by working the problem backwards.**

(Key objectives in bold)

This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Resource sheet 11.1 (OHT 11.1)
- Resource sheet 11.2 (OHT 11.2)
- Calculators
- Whiteboards
- Timer
- Related Key Stage 2 national test questions

department for education and skills

Planning sheet	Day One	Unit 11 *Addition and subtraction, problems and checking solutions*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary

Round whole numbers to the nearest 10, 100, 1000.

VOCABULARY
nearest
boundary
range
less than or equal to

RESOURCES
Whiteboards

Teaching Activities

- Read out numbers for children to round to nearest 10 or 100

  e.g. 137 to nearest 10
  437 to nearest 100.

  Children to record and show their answers on whiteboards.

  Discuss how they know.

- Repeat with numbers rounded to nearest 1000

  e.g. 4772 to nearest 1000.

  Ask children to give any number which is 140 to the nearest 10; 400 to the nearest 100.

- Repeat for other cases and highlight the range of answers for each case

  e.g. for nearest 100.
  $0 \leq$ difference ≤ 50

Main Teaching

Objectives and Vocabulary

Find a difference by counting up and add/subtract a multiple of 10, 100, 1000, then adjust.

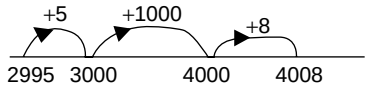
VOCABULARY
estimate
multiple

Teaching Activities

- Write 4008-2995 on the board.

Q How would you estimate the answer?

Collect answers and discuss the strategy used. Record on the board using an empty number line.



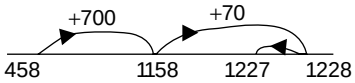
and relate to the expanded column representation, talking through each step.

```
  4008
− 2995
     5  (3000)
 1000  (4000)
     8  (4008)
  1013
```

- Set children the calculation 7014-4839. Record, using both methods, on whiteboards, estimating the answer first. Collect responses and compare the steps the children used.

- Write 458 + 769 on the board. Estimate then work out the answer using an empty number line.

  Collect answers and record on the board as



- Set children some examples to practise. They should use both empty number lines, and vertical method.

- Discuss answers and compare methods. Correct misunderstandings.

Plenary

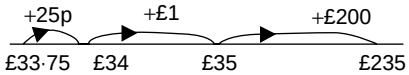
Teaching Activities / Focus Questions

- Write on the board:

  Shahil had £235 pocket money saved. He bought a computer game for £33.75. How much does he have left?

Q What calculation do we have to do?

Estimate first, then calculate.




```
  £235
− £ 33·75
    0·25  (£34)
    1·00  (£35)
  200·00  (£235)
 £201·25
```

Q What do we need to remember when calculating using pounds and pence?

Extend the word problem to include an example of adjusting using decimals. Write on board:

The temperature in London was 23°C at midday. At night it dropped by 8·9°C. What was the night temperature?

Work through questions as above.

Ask children to discuss and compare the different methods.

By the end of the lesson children should know how to:

- **Work out by counting up from the smaller to the larger number: 8000 − 2785 is 5 + 10 + 200 + 5000 = 5215;**
- **Use pencil and paper methods to support, record or explain calculations, achieving consistent accuracy. Discuss, explain and compare methods;**
- **Where calculations are set out in columns, know that unit should line up under units, and so on.**

(Refer to supplement of examples, section 6, pages 41, 49-51.)

Planning sheet	Day Two	Unit 11 *Addition and subtraction, problems and checking solutions*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary

Find pairs of multiples of 50 with sum of 1000; decimals with sum of 1, 10.

VOCABULARY
multiples
complement

RESOURCES
Whiteboards

Teaching Activities

- Give children a blank 3×3 grid, and ask them to put in multiples of 50 up to 1000.

  Call out multiples of 50; children have to find the complement to 1000 and cover the correct answer with a counter (or just cross out). Stop when a child gets 3 in a row, the winner having to repeat the number sentence for his final answer
  e.g. $250 + 750 = 1000$.

- Now ask children for the complement to 1 of 0.2 (call this two tenths), and show how they will be using the same strategies as with whole numbers.

- Repeat for complements to 10, of e.g. 3.5, 7.3 etc.

Main Teaching

Objectives and Vocabulary

Use informal pencil and paper methods to support, record or explain addition and subtraction.

Extend written methods to column addition and subtraction of numbers involving decimals.

VOCABULARY
estimate
convert
adjust

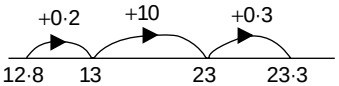
Teaching Activities

- Write on the board:

  The classroom is 12·8m long and the corridor is 23·3m long. What is the difference in their length? Ask:

Q How can we use an empty number line to help?

Estimate by rounding to whole numbers. Work through solution with class



and write out the expanded written method emphasising the need to align the decimal points.

```
  23·3                    23·3
– 12·8          or      12·8
   0·2  (13)              0·2 (13)
  10·0  (23)             10·3 (23·3)
   0·3  (23·3)           10·5
  10·5
```

Remind children to write answer with units. Difference in length is 10·5m. Say that not every step needs to be recorded as shown in the right hand solution.

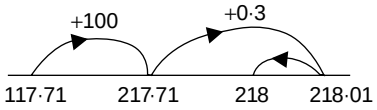
- Set the class similar problems to work on. Emphasise the estimation and careful recording.

  Collect responses and correct any errors or misunderstandings.

- Write on board:

  $218\text{m} - 117.71\text{m} = \Delta\text{m}$

Show how this calculation may need an adjustment and can be recorded as:




```
  218
– 117·71
  100·00    (217·71)
    0·30    (218·01)
    0·01    (218·00)
  100·30
    0·01
  100·29m
```

- Write on board:

  I need 686cm of wire for the classroom curtain and 17·5m for the hall curtains. How much wire do I need? Remind children to look at consistency of units in questions. Write on board 686cm = ? m and get them to convert.

Q How would you estimate the answer?

```
   6·86    Working from
+17·50     left to right
  23·00
   1·36
  24·36
```

Need 24·36m of wire.

Emphasise that working from left to right, you add the whole numbers before the decimals.

Set the class similar problems to work on. Collect responses and correct any errors or misunderstandings.

Plenary

Teaching Activities / Focus Questions

- Ask the class:

Q Which pairs of numbers have a difference of 13.5?

Q What type of calculation could we do to find a difference?

Show children that a good starting point is to partition the 13.5 into 13 and 0.5. Select a number to begin with and write it at one end of an empty number line, (.e.g. 4)

One possible pair of numbers is 4 and 17.5. Ask for other pairs:

HOMEWORK – Find pairs of numbers that have a difference of 39·3 and record findings using informal pencil and paper methods.

By the end of the lesson children should be able to:

- **Use the chosen method, add, or subtract, two or more decimal fractions with up to three digits and either one or two decimal places. Know that decimal points should line up under each other.**

(Refer to supplement of examples, section 6, pages 49, 51.)

Planning sheet	Day Three	Unit 11 *Addition and subtraction, problems and checking solutions*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Use number facts and place value for mental addition and subtraction. VOCABULARY complement RESOURCES Resource sheet 11.1/ OHT 11.1 Resource sheet 11.2/ OHT 11.2	• Review homework. • Show the class the Resource sheet 11.1 or 11.2. Point to a number on the board e.g. 64·2 and ask the children for the number that needs to be added to it to make it up to the next 100 e.g. 64·5 + □ = 100 (Board 1) 413·6 + □ = 500 (Board 2) Discuss their mental calculation strategies.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Solve money or 'real life' word problems. Choose appropriate operations/calculation methods. Explain working. Check calculations using inverse operations. VOCABULARY operation difference inverse RESOURCES Whiteboards	• Write on the board the ferry fares: Adult £ 5·45 Child £ 2·75 Car £15·12 Van £17·45 Minibus £19·50 Tell children to calculate the difference in cost between the fare for a van and a minibus and to show their answers on a whiteboard. Get the children to calculate, recording their answers on their whiteboards, and checking using inverse. **Q** What is the difference between the fare for an adult and the fare for a child? Invite one child to tell the class the calculation that is used for 'difference' and another to work through the calculation on the board. **Q** What is the difference between the ferry fare for a minibus and the fare for a car? How does that differ if there is an adult in each vehicle? After a suitable length of time, discuss together. **Q** What answers have you found? **Q** What methods have you used? • Now ask children to look at this question – How much does it cost for 2 adults in a car to travel on the ferry? **Q** What operation is required? **Q** Can you do it mentally? Go through methods together, including checking. • Children work through these problems in pairs, recording answers, and checking. – How much does it cost for a car with 3 adults, and a minibus with 2 adults and 6 children? – How much more does it cost for a minibus than a car? – A family of 2 adults and 3 children will be travelling by car. How much change will they get from £50? Discuss together methods and solutions.

Plenary

Teaching Activities / Focus Questions

• Show the children a variety of addition / subtraction calculations.

Q Which would you do
a) mentally?
b) written?
c) with a calculator?

It is not necessary to work out the answers.

By the end of the lesson children should be able to:

- **Choose the appropriate operation(s) to solve word problems;**
- **Begin to decide when addition or subtraction calculations can be done mentally or with pencil and paper or a calculator;**
- **Check the calculation by using the inverse operation.**

(Refer to supplement of examples, section 6, page 75.)

Planning sheet	Day Four	Unit 11 *Addition and subtraction, problems and checking solutions*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Use known facts to consolidate and derive additional multiplication and division facts. VOCABULARY inverse double halve multiple RESOURCES Whiteboards Timer	• Write on board: I know $24 \times 6 = 144$ **Q** What else do you know? • Collect and record different responses on a web diagram. Encourage a) inverses e.g. $144 \div 6 = 24$ b) doubles and halves e.g. $48 \times 3 = 144$ $48 \times 6 = 288$ c) x / ÷ 10,100 e.g. $240 \times 6 = 1440$ $2.4 \times 6 = 14.4$ • Divide the class into teams. Give each team a whiteboard. Say I know that $42 \div 7 = 6$. Give the teams 30 seconds to write as many related multiplication and division facts on their whiteboards. Give a point for every correct answer. Repeat.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Solve money or 'real life' word problems. Choose appropriate operations/ calculation methods. Explain working. Check calculations using inverse operations. VOCABULARY calculation method reasonableness inverse	• Remind children of the ferry fares from the previous lesson. Adult £ 5·45 Child £ 2·75 Car £15·12 Van £17·45 Minibus £19·50 Say that in some questions you are given the answer and you have to work back to find out the question. Write on the board: One adult and two children travel on the ferry. They pay £28.40. What sort of vehicle are they in? Discuss with the children how to identify the relevant information from within the question. **Q** What do you have to decide? (Can I do it mentally, or do I need a written method?) Demonstrate a child's method on the board, e.g. Adult £ 5·45 Child £ 2·75 Child £ 2·75 £ 9·00 £ 1·80 £ 0·15 £10·95 Total cost £28·40 adult and children's fares −£10·95 £ 0·95 (£11·00) £17·00 (£28·00) £ 0·40 (£28·40) £17·45 They are in a van which cost £17·45. Explain that this method of recording is precise but long. Ask the children to find double £2.75 in their heads. Record the answer £5.50 on the board. Then ask what £5.50 plus £5.45 is to see that they could have answered this part mentally with jottings. Ask what £10.95 is to the nearest £. Ask what £28.40 subtract £11 is; record £17.40 and to check; and adjust with +5p to get £17.45. Emphasise how their mental methods can be used to calculate. Ensure that children do not forget to go back to the question after they have completed the calculation to check that they have provided the answer, in this case the name of the vehicle not just the cost. • Children now work through for example, the following problems, checking the answer using inverse operations: – Two adults and 4 children travel on the ferry. They pay £41.40. What sort of vehicle are they in? – How much change does a group of 8 adults in a minibus get from £100? – On Tuesday evening there were 5 cars, 2 vans and 3 minibuses on the ferry. How much had they paid altogether? – A group of 10 adults and 20 children get a 10% reduction. How much to they pay?

Plenary

Teaching Activities / Focus Questions

• As a class, discuss methods and solutions, referring back to the question asked, and the reasonableness of answers.

Move on to looking at checking calculations.

• Write on the board
$628 \times 36 = 18\,627$.

Ask whether the children think this correct or not? Encourage them to look at the last digits and the number of digits.

Q How do you recognise if a number is an exact multiple of?:
100 – last two digits 00
10 – last digit is 0
2 – last digit is 0, 2, 4, 6, 8
3 – sum of digits is divisible by 3
5 – last digit is 0 or 5
4 – last two digits divisible by 4

Discuss the following calculations; asking

Q Why can't this be correct?

$27 \times 8 = 215$
$34 \times 13 = 4042$
$15 \times 25 = 380$

Write an explanation for one of them, saying how you know.

By the end of the lesson children should be able to:

- **Choose the appropriate operation(s) to solve word problems;**
- **Decide whether calculations can be done mentally or with pencil and paper;**
- **Check the calculation;**
- **Explain and record how the problem was solved.**

(Refer to supplement of examples, section 6, page 75.)

Planning sheet	Day Five	Unit 11 *Addition and subtraction, problems and checking solutions*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary

Use known number facts to derive and consolidate multiplication and division facts.

VOCABULARY
patterns of calculations
derive

Teaching Activities

- Write on board:

  $5000 \div 500 = \square$

  Get children to say the answer to this and generate answers to:

  $5000 \div 500 = \square$
  $5000 \div 50 = \square$
  $5000 \div 5 = \square$
  $5000 \div 0{\cdot}5 = \square$
  $5000 \div 0{\cdot}05 = \square$

  Ask questions like:

  Q How can we use $5000 \div 500 = 10$ to help us with the other questions?

  Q What happens when a whole number is divided by a number less than 1?

  Write on board:

  $16 \div 0{\cdot}5 = 32$

  Ask if this is correct? Write on board:

  $16 \div 2 = 8$ $\quad$ $16 \times \square = 8$
  $16 \div 1 = 16$ $\quad$ $16 \times \square = 16$
  $16 \div 0{\cdot}5 = 32$ $\quad$ $16 \times \square = 32$
  $16 \div 0{\cdot}25 = \square$ $\quad$ $16 \times \square = 64$

  Discuss patterns of calculations.

Main Teaching

Objectives and Vocabulary

Check calculations using inverse operations, including with a calculator.

RESOURCES
Calculators

Teaching Activities

- Write on the board:

  $4{\cdot}8 \div 5 = 0.96$
  half of $8{\cdot}1 = 4{\cdot}05$
  $786 \div 38 = 20{\cdot}68$

  Q How can we check these answers?

  Identify inverse operations for each of the above and write on the board:

  $0{\cdot}96 \times 5 =$
  $4{\cdot}05 \times 2 =$
  $20{\cdot}68 \times 38 =$

- Give out calculators and get children in pairs to work out each of the above.

  Ask why the 3rd calculation does not give 786 exactly.

  Establish that 20·68 was an approximate answer to $786 \div 38$, and do it.

  Emphasise the importance of using inverse operations as a means of checking especially when using a calculator.

  Discuss how to find the unknown numbers:

  $\square - 4.7 = 11.5$
  $\square \div 0.5 = 7.2$
  $\square \times 0.09 = 4.32$

  Now ask the children use a calculator to work out the answers.

  Discuss briefly.

- Give children further examples to be solved and correct misunderstandings.

Plenary

Teaching Activities / Focus Questions

- Write on board:

  $38{\cdot}68 \div \square = 4{\cdot}3$

  Ask children to find an approximate answer.

  Q Will the answer be < or > 10?

  Repeat for $2568 \div \square = 48$

  Q Will the answer be nearer to 5, 50 or 500?

  Use the calculator to find the missing number.

  Discuss the meaning of the answer (53.5) in the context of money.

By the end of the lesson children should be able to:

- **Calculate by doing the inverse operation, using a calculator.**

(Refer to supplement of examples, section 6, page 73.)

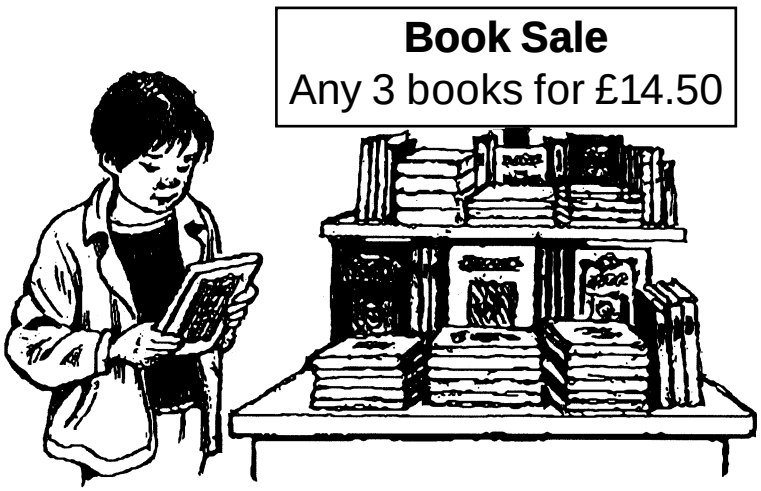
64·5	43·2	37·6	19·3
98·8	10·3	88·8	2·4
288·5	377·6	722·5	132·6
411·5	642·3	501·1	938·7

413·6	204·9	0·25	0·05
38·5	191·7	27·75	27·09
19·8	101·9	56·66	136·81
1·3	73·4	34·99	212·48

Related Key Stage 2 national test questions

2001 Test A

14



Lee bought these **three books** in the sale for **£14.50.**

How much money did he save altogether compared to the **full price** of the books?

Show your **method.** You may get a mark.

£

14

2 marks

Total

2001 Test A

16 Calculate **1025** – **336**

16

1 mark

2001 Test B

21 Write in the missing number.

404.09 ÷ ☐ = 8.5

21

1 mark

2000 Test A

2 Write in the missing numbers.

150 + ☐ = 500

2a

1 mark

172 − ☐ = 60

2b

1 mark

2000 Test A

5 Calculate **369** + **251**

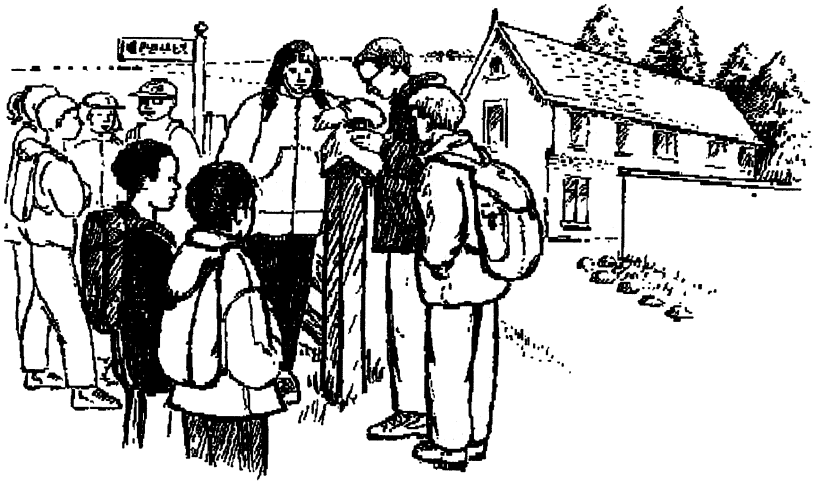
5

1 mark

Total

2000 Test A

7



This table shows the numbers of children who went walking, sailing or climbing at an outdoor centre.

	May	June	July
walking	25	80	75
sailing	15	42	50
climbing	18	27	23

How many children went **sailing** in **May, June** and **July** altogether?

7a

1 mark

How many **more** children went **walking** in **June** than **climbing** in **June?**

7b

1 mark

Total

2000 Test A

11 Circle **two** numbers which **add** to make **0.12.**

0.1 0.5 0.05 0.7 0.07 0.2

11

1 mark

2000 Test A

21 Calculate **8.6** – **3.75**

21

1 mark

2000 Test B

2 Circle the number which is **nearest in value to 750.**

570 699 810 852 1050

2

1 mark

2000 Test B

4 Write in the missing number.

60 + 99 + ☐ = 340

4

1 mark

Total

2000 Test B

7

Write **two numbers,** each **greater than 100,**
to complete this subtraction.

				−				=	2	0	8

7

1 mark

2001 Test B

6

Here are some number cards.

4		**4**		**4**						
	9		**9**		**9**					

Use **five of the number cards** to make this correct.

				+						
				5		**4**		**8**		

6

2 marks

Total

2002 Test A

11 Mr Singh buys paving slabs to go around his pond.

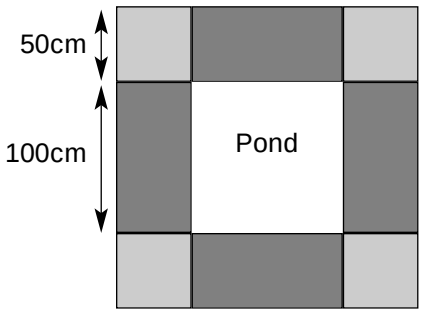
PAVING SLABS

£1.95 each — Square slabs

50cm by 50 cm

£3.50 each — Rectangular slabs

100cm by 50cm



He buys 4 rectangular slabs and 4 square slabs.

What is the total cost of the slabs he buys?

Show your **method.** You may get a mark.

£

11a

2 marks

Mr Singh says,

'It would cost more to use square slabs all the way round.'

Explain why he is correct.

. . . . . .

. . . . . .

. . . . . .

11b

1 mark

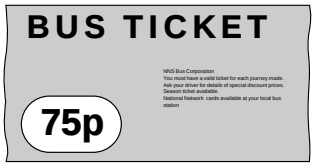
Total

2002 Test A

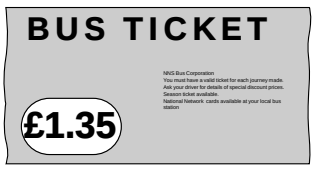
4 Asif, Vicky and Nita go to town by bus.

This is what they pay.

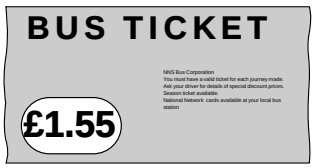
Asif



Vicky



Nita



How much **more** does **Nita** pay than **Asif**?

4a

1 mark

Vicky then takes **another** bus from town to visit her auntie.

She pays **90p** on this bus.

How much has Vicky paid **altogether** for her two bus tickets?

4b

1 mark