Unit 12: Problem solving and efficient methods

My way, your way!

→ pages 20–22

1. 55 − 27 = 28 (or possibly 27 + 28 = 55). There are 28 girls.

2. 19 + 49 = 68 (or 49 + 19 = 68). The shopkeeper sells 68 apples in total.

3. 78 − 37 = 41 (or possibly 37 + 41 = 78). Stacey's mum is 41 years older than Stacey.

4. 32 − 12 = 20 (or possibly 12 + 20 = 32). 'Starry Night' is 20 minutes long.

5. Kimi gets 32p change.

Reflect

Oskar has £75 in total. Children could have used a range of methods, such as counting on in tens or adding tens and ones.

Using number facts

→ pages 23–25

1. Missing numbers as follows:
   a) 53   63
        73   27
   b) 91   41
        71   13

2. Children should have matched:
   30 + 5 ➜ 20 + 15
   50 + 5 ➜ 30 + 25
   60 + 5 ➜ 50 + 15
   90 + 5 ➜ 60 + 35

3. 48 g

4. Children should have completed the calculations and matched them to descriptions as follows:
   75 + 7 = 82 ➜ one less
   65 + 8 = 73 ➜ 10 less
   75 + 18 = 93 ➜ 10 more
   65 + 19 = 84 ➜ one more
   45 + 38 = 83 ➜ equal to

5. 20

Reflect

The difference between the missing numbers is 20. Children might have explained how they knew in different ways, e.g.

When you add the first number to 45 you get 60. When you add the second number to 45 you get 80, which is 20 greater than 80. This means the second number must be 20 greater than the first number.

I worked out that the missing numbers are 15 and 35, and the difference between 15 and 35 is 20.

Using number facts and equivalence

→ pages 26–28

1. Children should have written the calculations into the table as follows:
   Correct: 32 + 30 = 62, 58 − 20 − 10 − 10 − 10 = 8
   Incorrect: 2 + 45 = 65, 17 + 53 = 60, 75 − 15 = 90, 40 − 40 = 40

2. Children should have written 58 + 4 = 62, although some children might have written 58 + 40 = 98.

3. a) Answers may vary but children should have been able to justify their choice, e.g.

   No, it is not the most efficient way. Since 100 is a round number it is easy to find the difference between 76 and 100 by counting from 76 to 100, jumping on to the next ten.

   No, it is not the most efficient way. This column method involves lots of exchange so it will be more efficient to use a mental method.

   b) Children could have used different methods, e.g. Counting backwards from 100 in ones and tens (in either order) using a number line.

4. Sofia knows that 45 + 30 is 75. 29 is one less than 30 so 45 + 29 will be one less than 75. So, Sofia should have subtracted 1 from 75, not added 1.

Reflect

The correct answer is 60.

Children might explain the errors in different ways, e.g.

Someone might get the wrong answer of 50 if they used a column method incorrectly. When they added the ones (7 and 3), they would get 10 ones. This would need to be exchanged for 1 ten. This ten then needs to be added to the 4 tens and 1 ten. It looks like they forgot to add this ten.

Someone might get the answer 34 if they subtracted 13 from 47 rather than adding it.

Using a 100 square

1. a) 59
   b) 36
   c) 82
   d) 14

2. a) 49
   b) 64
   c) 20
   d) 10

3. Missing numbers:
   a) 43
   b) 29
   c) 80
   d) 57

4. a) Children should have drawn two more jumps of 10, from 37 to 47 and from 47 to 57. They then need to jump 8, possibly in 1s, or possibly jumping 3 from 57 to 60, and then another 5 from 60 to 65.
   $27 + 38 = 65$
   b) On the 100 square and the number line, children should have jumped back 1 ten from 52 to 42 and then 4 ones, from 42 to 38 (or a 2 from 42 to 40, and another 2 from 40 to 38). Some children might have counted back the 1s before the 10.
   $52 - 14 = 38$

5. Children might notice different patterns in the shaded numbers, e.g.

As you move down the rows, the 10s digits go up by 1 and the 1s digits go down by 1.

The 10s and 1s digits add up to 9.

Reflect

$12 + 43 = 55$

Children should have noticed that they get the same answer if they swap the numbers around within the addition calculation, that is: $43 + 12$ gives the same answer as $12 + 43$.

Getting started

1. $9 + 2 = 11$ or $2 + 9 = 11$, $7 - 6 = 1$

2. There are many different ways to complete the number sentences e.g.

$7 + 9 = 16$, $0 + 16 = 16$, $10 + 6 = 16$

$1 + 1 + 14 = 16$, $3 + 5 + 8 = 16$, $10 + 2 + 4 = 16$

3. a) 36
   b) 98

4. a) $6 + 8 + 3 = 17$ (numbers could have been added in any order)
   The bag of sweets costs 17p.
   b) $9p + 8p + 6p = 23p$ (prices could have been added in any order)
   c) There are two possible answers (prices could have been added in any order):
   $9p + 8p + 3p + 3p = 23p$
   $8p + 6p + 6p + 3p = 23p$

5. For the first calculation, children could have written any single digit into the first box. They should have written the bond to 16 in the second box. E.g.
$40 + 16 = 56$, $41 + 15 = 56$, $45 + 11 = 56$ or $49 + 7 = 56$

For the second calculation, the following answers are possible: $65 = 8 + 57$, $65 = 18 + 47$, $65 = 28 + 37$, $65 = 38 + 27$, $65 = 48 + 17$, $65 = 58 + 7$

Reflect

The ? can only be 14, but children could have filled the grid in a number of ways, e.g.

1	9	10
7	5	12
8	14	

3	7	10
5	7	12
8	14	

8	2	10
0	12	12
8	14	

Methods for completing the grid could have varied.

It is sensible to start by completing one known bond, for example writing a pair of numbers that total 10 into the first row. Once two numbers have been placed in this way, the other numbers must be written in to give the correct totals for the remaining rows and columns.

In some cases, children may have started with a number bond that will not work, for example placing 9 and 1 in that order in the first row. In these case, they will have needed to start again, trying a different number bond.

Missing numbers

→ pages 35–37

1. a) 8 + 12 = 20, 12 + 8 = 20 (in either order)
   20 − 12 = 8, 20 − 8 = 12 (in either order)
   b) 35 + 16 = 51, 16 + 35 = 51 (in either order)
   51 − 16 = 35, 51 − 35 = 16 (in either order)

2. a) 46 − 27 = 19 (some children could have written
   27 + 19 = 46)
   b) 53 + 39 = 92 or 39 + 53 = 92

3. Missing numbers:
   a) 21
   b) 25
   c) 34
   d) 68

4. The first number must end in 1. The second box
   should have been completed with the tens digit of the
   first number plus 2. Some of the possible solutions
   are: 1 + 23 = 24, 11 + 23 = 34, 21 + 23 = 44, 31 + 23 = 54

Reflect

Answers will vary depending on the calculation and
method chosen, e.g.

32 + 18 = 50: I worked out 50 subtract 18 by counting
back 10 from 50 and then 8 from 40. I got the answer 32
so 32 + 18 = 50.

81 − 35 = 46: I found the difference between 46 and 81
by drawing a number line and jumping back from 81
to 46.

Mental addition and subtraction (1)

→ pages 38–40

1. a) 12 + 5 = 17, 22 + 5 = 27, 32 + 5 = 37, 52 + 5 = 57
   92 + 5 = 97, 72 + 5 = 77
   b) 27 − 4 = 23, 37 − 4 = 33, 57 − 4 = 53
   The final calculation could have answered in a
   number of ways, e.g.
   87 − 4 = 83
   97 − 14 = 83
   107 − 24 = 83

2. Children should have put a cross by the calculations:
   45 + 3 = 47, ?2 + 4 = 38, 26 + 2 = 29, 64 − 3 = 62

3. a) 34   44
   54   74
   44
   b) 62   52
   43   23
   50

4. a) 84
   b) 53
   c) 61
   d) 33

5. Children should have been able to justify their choice,
   e.g.
   I would choose Poppy's method because the numbers
   68 and 75 are close together so it is efficient to use a
   counting method to find the difference.

Reflect

Answers will vary depending on the calculation and
method chosen by each child, e.g.

34 + 4 = 38: I know that 4 + 4 = 8, and 34 is 3 tens more
than 4.

34 + 20 = 54: I started with 34 and added 2 tens to get
to 54.

79 − 5 = 74: I know that 9 − 5 = 4 so 79 − 5 will be 74.

79 − 55 = 24: I just worked out 79 − 5 = 74, and this
answer will be 50 less.

Mental addition and subtraction (2)

→ pages 41–43

1. 35   25
   51   18
   56   17
   96   13

2. a) To work this out, I can add 20 and then subtract 2.
   78 + 20 − 2 = 96.
   b) To work this out, I can add 60 and then subtract 1.
   26 + 60 − 1 = 85.

3. a) 32
   b) 13
   c) 41
   d) 74

   Children could have explained their method in
   different ways, e.g.

   I subtracted 1 from each number. This meant that the
   first number ended in 9 so it was easy to subtract the
   second number part by part. When you change the
   numbers in a subtraction by the same amount the
   difference remains the same.

4. Children should have matched:
   35 + 19 ➜ 34 + 20
   90 − 55 ➜ 89 − 54
   40 − 27 ➜ 39 − 26
   47 + 18 ➜ 45 + 20

5. 65 − 39 = 26

Reflect

Children could have explained methods in different ways, e.g.

Adding 18: Add 20 and then subtract 2.

Subtracting 19: Subtract 20 and then add 1 back on.

Efficient subtraction

1. a) 78
   b) 17
   c) 3

2. a) 41
   b) 64
   c) 12
   d) 0

3. a) 92 – 80 = 12. Tilly has 12 stamps.
   b) 71 – 44 = 27 (or possibly 44 + 27 = 71). Marek's score is 27 points.

4. 38   40
   39   41

   Children should have noticed that the answers increase by 1 (from left to right, by row).

5. No. Maryam's method is not efficient as she has had to do a lot of crossing out.

   Children could have suggested several alternatives, e.g.

   Find the difference between 76 and 68 by counting up from 68 to 76.

Reflect

Children could have suggested different methods. E.g.

82 – 4 = 78: Start at 82 and count back 2 to 80 and then another 2 to 78.

82 – 75 = 7: Find the difference between 82 and 75 by starting at 75 and jumping up to 82. This involves a jump of 5 from 75 to 80 and then a jump of 2 from 80 to 82, so the answer is 7.

82 – 29 = 53: Work out 82 – 30 = 52 and then add 1 to the answer to get 53.

Solving problems – addition and subtraction

1. a) 45p
   b) 100p – 45p = 55p. He will get 55p change.

2. a) 27
   b) 18

3. 27 – 11 = 16 (or possibly 11 + 16 = 27). 16 children like rugby more than tennis.

4. Cooper spends more because the badge costs more than the party blower.

   Alternatively, children could have found the totals and written:

   Cooper spends more because 47p is more than 32p.

5. Fruit salad 72p, fruit juice 13p.

Reflect

Children could have written any story to represent one of the calculations e.g.

28 + 6 = 34: There are 28 Year 2 children in class but then 6 children from Year 1 join the class for a story. How many children listen to the story?

28 – 6 = 22: There are 28 children in the Year 2 class. 6 children are away with a stomach bug. How many Year 2 children are at school?

Solving problems – multiplication and division

1. 12

2. 40

3. 6

4. 45

5. 30

Reflect

Children could have written any correct word problem for one of the calculations, e.g.

4 × 10 = 40. It costs £10 for an adult to go to the cinema. How much will it cost for 4 adults?

40 ÷ 10 = 4. A group of adults pay £40 altogether to watch a film in the cinema. Cinema tickets cost £10 for each adult. How many adults are in the group?

Solving problems using the four operations

1. Different answers are possible, e.g.
   10 + 10 = 20, 17 + 3 = 20
   15 − 5 = 10, 100 − 90 = 10
   4 × 5 = 20, 1 × 20 = 20
   30 ÷ 3 = 10, 100 ÷ 10 = 10

2. Zac has 67p left.

3. 25 sweets are left.

4. Tia has 40 m left to swim.

5. There are 3 two pence coins in his other hand.

Reflect

Children could have written any word problem that needs both steps e.g.

There are 18 sweets. Sam and Tomasz share the sweets equally between them. Sam eats 5 of his sweets. How many sweets does Sam have left?

End of unit check

My journal

First I work out that, since there are 10 boxes of 4 oranges, there must be 40 oranges.

Then I see how many 5s there are in 40.

I got the answer 8.

Power play

There are 2 + 2 tens and 6 + 4 ones. So the total is 20 + 20 + 10. They have 50 pieces of bread in total.

Together, they drop 10 + 3 + 7 pieces, which makes 20 pieces. 50 − 20 = 30. In total, 30 pieces are left now.

The 5 birds each get an equal share of 30. Share 30 out, 1 group of 5 at a time. You can do this 6 times, so there are 6 pieces for each bird.

Or: 30 ÷ 5 = 6

3 × 6 = 18

3 of the birds get 18 pieces altogether.