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ANSWERS
lift-out in centre of book

Sample pages

Missing numbers

Each of the four shapes ▭, ⬭, △ and ◇ represents a mathematical operation (e.g. + 7 or × 5).

Find the rule governing each shape, fill these in and work out what the missing numbers are.

		RULE		RULE		RULE		RULE	
1	5	▭	10	⬭	40	△	32	◇	16
2	9	▭	14	⬭	56	△	48	◇	24
3	10	▭	___	⬭	___	△	___	◇	26
4	11	▭	___	⬭	___	△	___	◇	___
5	___	▭	12	⬭	___	△	___	◇	___
6	___	▭	___	⬭	44	△	___	◇	___
7	___	▭	___	⬭	___	△	24	◇	___
8	___	▭	___	⬭	___	△	28	◇	___
9	___	▭	___	⬭	___	△	___	◇	10
10	___	▭	___	⬭	___	△	___	◇	36
11	___	▭	___	⬭	___	△	___	◇	6
12	___	▭	___	⬭	___	△	___	◇	7
13	___	▭	___	⬭	___	△	___	◇	$7\frac{1}{2}$
14	___	▭	___	⬭	___	△	___	◇	$6\frac{1}{2}$

Sample pages

Secret rules

In each exercise there is a secret rule connecting the numbers in the first row with those in the second row. First discover the rule and then find the missing numbers.

1

									RULE
4	7	3	2	10	8	5	11	13	
5	11	3	1						

2

7	10	5	4	3	2	9	11	8	
50	101	26	17						

3

4	5	8	2	7	10	3	9	11	
22	27	42	12						

4

8	3	2	7	4	10	5	6	12	
22	7	4	19						

5

8	3	10	7	4	2	5	1	6	
21	11	25	19						

6

4	2	9	6	5	3	8	7	10	
9	1	64	25						

7

2	5	7	3	8	6	4	11	1	
17	44	62	26						

8

4	7	8	6	5	3	2	10	9	
12	18	20	16						

9

6	3	9	5	4	1	2	10	7	
15	6	24	12						

10

6	3	9	5	4	1	2	10	12	
30	6	72	20						

Sample pages

Square puzzles

Can you find the values of the letters A, B, C, D and E in these squares? The sum of each row and column is given, and only the numbers 1, 2, 3, 4 and 5 are used. One letter value is given for each square.

1

E	D	A	10
B	A	C	10
D	C	B	6
8	8	10	

A	B	C	D	E
				4

4			10
			10
			6
8	8	10	

2

B	C	D	6
E	A	C	10
C	B	E	8
8	9	7	

A	B	C	D	E
5				

			6
	5		10
			8
8	9	7	

3

C	A	D	8
A	B	E	9
D	C	C	11
8	10	10	

A	B	C	D	E
				4

			8
		4	9
			11
8	10	10	

4

A	B	C	11
D	E	A	6
B	C	D	12
10	10	9	

A	B	C	D	E
				1

			11
	1		6
			12
10	10	9	

5

E	B	D	10
D	A	C	10
C	E	B	6
9	9	8	

A	B	C	D	E
4				

			10
	4		10
			6
9	9	8	

Sample pages

Find three numbers

In each group of equations I am thinking of three numbers □, △ and ○. You can find my three numbers by using the clues given.

1
○ + □ = 14
○ − □ = 4
○ + 1 = △
□ + □ = △

2
△ + □ = 19
△ − □ = 3
○ + △ = □ + 4
○ + ○ + 6 = □

3
□ + □ = △
△ − □ = 6
○ + ○ = □ + □ + □
○ + □ = △ + 3

4
△ + △ + △ = □
□ + △ = 16
△ + △ + = ○
○ + ○ + ○ = □ + □

5
△ + △ + △ = ○ + ○
△ + ○ = 10
□ ÷ ○ = △

6
△ − ○ = ○ + 2
△ + ○ = 11
□ ÷ ○ = △

7
○ − △ = 2
○ + △ = 10
○ × ○ = □
□ ÷ △ = 9

8
○ + ○ + 1 = △
△ + ○ = 13
△ − ○ = 5
□ ÷ △ = ○

9
△ × □ = ○
△ − □ = 1
△ × △ = ○ + 5
○ − △ = 15

10
△ × △ × △ = □
○ − △ = 5
○ × △ = □ − △
□ = ○ + ○ + ○ + △

Sample pages

What's my pattern?

If you were asked to complete the pattern: 1, 2, 4, … you could do it in a number of ways.

Sequence	Pattern
1, 2, 4, 8, 16, 32	Times 2
1, 2, 4, 7, 11, 16 1 2 3 4 5	Add 1, add 2, add 3 …, or differences increasing by 1
1, 2, 4, 5, 7, 8 1 2 1 2 1	Differences 1 and 2, or 2 patterns: 1, 4, 7 … and 2, 5, 8 …
1, 2, 4 , 8, 10, 20	Times 2, add 2
1, 2, 4, 5, 10, 11	Add 1, times 2

Complete the patterns below in as many different ways as you can, writing down the next three terms for each one.

1 1, 3, 9 ____ , ____ , ____ or ____ , ____ , ____ or ____ , ____ , ____

2 1, 4, 5 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

3 1, 3, 6 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

4 2, 3, 5 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

5 1, 1, 2 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

6 1, 4, 9 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

7 2, 4, 6 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

8 3, 4, 6 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

9 $\frac{1}{2}$, 1, $1\frac{1}{2}$ ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

10 0, 1, 10 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

11 3, 6, 12 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

12 1, 5, 25 ____ , ____ , ____ ____ , ____ , ____ ____ , ____ , ____

Sample pages

Magic squares

1 Complete these squares so that in each one every row, column and diagonal has the same sum.

a

$2\frac{1}{2}$		
5	3	
		$3\frac{1}{2}$

b

		$\frac{1}{4}$
		2
$1\frac{3}{4}$		$\frac{3}{4}$

c

$\frac{1}{3}$		
	$1\frac{1}{3}$	$\frac{2}{3}$
		$2\frac{1}{3}$

d

		$1\frac{4}{5}$
2	$1\frac{1}{5}$	
$\frac{3}{5}$		

e

$1\frac{1}{2}$	$1\frac{1}{4}$	$2\frac{1}{2}$
	$1\frac{3}{4}$	

f

		0·2
	0·5	
0·8	0·3	

g

0·7		
	0·6	
0·9		0·5

h

	0·7	
	0·9	0·5
	1·1	1

Sample pages

2 What are my two numbers if:

a the sum of the two numbers is 5·2 and their difference is 0·4? _____ _____

b the sum of the two numbers is 7·5 and their difference is 0·5? _____ _____

c the sum of the two numbers is 7·5 and their difference is 0·1? _____ _____

d the sum of the two numbers is 7·5 and their difference is 1·0? _____ _____

e the sum of the two numbers is 4·5 and their product is 5? _____ _____

f the sum of the two numbers is 6·5 and their product is 9? _____ _____

g the sum of the two numbers is 6·5 and their product is 5·5? _____ _____

h the sum of the two numbers is 6·5 and their product is 0·64? _____ _____

i the sum of the two numbers is 4·2 and their product is 4·4? _____ _____

j the sum of the two numbers is 4·2 and their product is 0·8? _____ _____

Decimal challenges

Colour in the bubble next to the answer.

1 Four of the following are equal. Which is different?

A ◯ 0·02 **B** ◯ $\frac{1}{50}$ **C** ◯ 5% of 1 **D** ◯ 20 thousandths **E** ◯ 1% of 2

2 If Sam scored 19 out of 20 in a game, which of the following is not his score?

A ◯ $\frac{95}{100}$ **B** ◯ 0·19 **C** ◯ $\frac{19}{20}$ **D** ◯ 95% **E** ◯ 0·95

3 Which is closest to 0·7?

A ◯ 67% **B** ◯ 75% **C** ◯ 0·6 **D** ◯ 0·74 **E** ◯ 0·629

4 David recorded the lowest temperatures over five days in winter. Which temperature was the coldest?

A ◯ 10·3°C **B** ◯ 10·33°C **C** ◯ 10·033°C **D** ◯ 10·03°C **E** ◯ 10·30°C

5 Which is the smallest of the following numbers?

A ◯ 89·9 **B** ◯ 89·09 **C** ◯ 89·90 **D** ◯ 89·99 **E** ◯ 89·009

6 $8\frac{1}{2}$% as a decimal is:

A ◯ 0·0805 **B** ◯ 0·85 **C** ◯ 8·5 **D** ◯ 0·0085 **E** ◯ 0·085

7 The simplest form of expressing 0·625 as a fraction is:

A ◯ $\frac{625}{1000}$ **B** ◯ $\frac{125}{200}$ **C** ◯ $\frac{5}{8}$ **D** ◯ $\frac{3}{4}$ **E** ◯ $6\frac{1}{4}$

8 Which of the following numbers remains unchanged in value when the zero is removed?

A ◯ 2·490 **B** ◯ 350 **C** ◯ 6·04 **D** ◯ 20·73 **E** ◯ 108·7

9 Which of the following decimal expressions is equivalent to the sum of: $\frac{2}{10}$ and $\frac{6}{1000}$?

A ◯ 0·26 **B** ◯ 0·206 **C** ◯ 0·0206 **D** ◯ 0·2006 **E** ◯ 0·026

10 Which is the largest?

A ◯ 0·74 **B** ◯ 0·735 **C** ◯ 0·7168 **D** ◯ 0·70001 **E** ◯ 0·7399

11 The recurring decimal 0·166666... when expressed as a fraction is equivalent to:

A ◯ $\frac{1}{16}$ **B** ◯ $\frac{1}{3}$ **C** ◯ $\frac{1}{6}$ **D** ◯ $\frac{16}{100}$ **E** ◯ $\frac{1666}{10\,000}$

12 Which is the smallest?

A ◯ 0·5 **B** ◯ $(0{\cdot}5)^2$ **C** ◯ 0·05 **D** ◯ $(0{\cdot}5)^3$ **E** ◯ $(0{\cdot}05)^2$

Sample pages

True or false?

Here are 60 number sentences. Check each one carefully to see whether it is true or false. Colour in the appropriate bubble for your answer.

		True	False			True	False
1	$(3 + 4) + 5 = 3 + (4 + 5)$	◯	◯	**2**	$(3 \times 4) + 5 = 3 \times (4 + 5)$	◯	◯
3	$(2 \times 3) \times 4 = 2 \times (3 \times 4)$	◯	◯	**4**	$(5 - 3) + 2 = 5 - (3 + 2)$	◯	◯
5	$(8 - 3) \times 2 = 8 - (3 \times 2)$	◯	◯	**6**	$(4 + 8) \times 2 = 4 + (8 \times 2)$	◯	◯
7	$3 \times 7 = 7 \times 3$	◯	◯	**8**	$4 \div 2 = 2 \div 4$	◯	◯
9	$(5 - 3) - 2 = 5 - (3 - 2)$	◯	◯	**10**	$(24 \div 6) - 4 = 24 \div (6 - 4)$	◯	◯
11	$(3 \times 10) \div 2 = 3 \times (10 \div 2)$	◯	◯	**12**	$6 \div 3 = 6 \times \frac{1}{3}$	◯	◯
13	$\frac{1}{2}$ of $14 = 14 \div 2$	◯	◯	**14**	$\frac{1}{2}$ of $20 = 20 \times \frac{1}{2}$	◯	◯
15	$\frac{1}{2}$ of $4 + \frac{1}{2}$ of $6 = \frac{1}{2}$ of $(4 + 6)$	◯	◯	**16**	$\frac{1}{2}$ of $12 + \frac{1}{2}$ of $4 = \frac{1}{2}$ of 16	◯	◯
17	$\frac{1}{4}$ of $12 + \frac{1}{4}$ of $12 = \frac{1}{2}$ of 12	◯	◯	**18**	$\frac{1}{4}$ of $16 + \frac{1}{4}$ of $16 = \frac{1}{2}$ of 16	◯	◯
19	$2^2 = 2 \times 2$	◯	◯	**20**	$3^2 + 4^2 = 5^2$	◯	◯
21	$2^2 + 3^2 = (2 + 3)^2$	◯	◯	**22**	$4^3 = 4 \times 4 \times 4$	◯	◯
23	$4^3 - 4^2 = 4$	◯	◯	**24**	$4^3 \div 4^2 = 4$	◯	◯
25	$9^2 - 2^2 = (9 - 2) \times (9 + 2)$	◯	◯	**26**	$10^2 - 5^2 = (10 - 5) \times (10 + 5)$	◯	◯
27	$9^2 - 3^2 = 6 \times 12$	◯	◯	**28**	$8^2 - 2^2 = 6 \times 10$	◯	◯
29	$7^2 - 3^2 = 4^2$	◯	◯	**30**	$100^2 - 1^2 = 101 \times 99$	◯	◯
31	$4 \times 9 - 4 \times 4 = 4 \times (9 - 4)$	◯	◯	**32**	$(12 - 5) \times 2 = 12 \times 2 - 5 \times 2$	◯	◯
33	$8 \times 3 - 5 \times 3 = (8 - 5) \times 3$	◯	◯	**34**	$3 \times 4 + 2 \times 4 = (3 + 2) \times 4$	◯	◯
35	$99 \times 7 + 99 \times 3 = 99 \times (7 + 3)$	◯	◯	**36**	$(30 \div 5) + (20 \div 5) = 50 \div 5$	◯	◯
37	$(30 \div 5) - (20 \div 5) = 10 \div 5$	◯	◯	**38**	$(12 \div 4) + (8 \div 4) = (12 + 8) \div 4$	◯	◯
39	$(20 \div 2) + (12 \div 2) = (20 + 12) \div 2$	◯	◯	**40**	$(3 + 4)^2 = 3^2 + 4^2 + 2 \times 3 \times 4$	◯	◯
41	$(5 + 2)^2 = 5^2 + 2^2$	◯	◯	**42**	$(5 + 2)^2 = 5^2 + 2^2 + 2 \times 5 \times 2$	◯	◯
43	$\frac{1}{3} < \frac{1}{4}$	◯	◯	**44**	$(\frac{1}{2})^2 < \frac{1}{4}$	◯	◯
45	$(\frac{1}{2})^2 < \frac{1}{2}$	◯	◯	**46**	$(\frac{2}{3})^2 > \frac{2}{3}$	◯	◯
47	$(\frac{3}{4})^2 < \frac{3}{4}$	◯	◯	**48**	$(\frac{2}{3})^2 < \frac{2}{3}$	◯	◯
49	$(\frac{1}{3} + \frac{1}{4})^2 < \frac{1}{2}$	◯	◯	**50**	$(3\frac{1}{2})^2 = 3 \times 4 + \frac{1}{4}$	◯	◯
51	$(4\frac{1}{2})^2 = 4 \times 5 + \frac{1}{4}$	◯	◯	**52**	$(5\frac{1}{2})^2 = 5 \times 6 + \frac{1}{4}$	◯	◯
53	$0{\cdot}4 < 4{\cdot}0$	◯	◯	**54**	$(0{\cdot}2)^2 = 0{\cdot}4$	◯	◯
55	$0{\cdot}4 \times 0{\cdot}3 = 1{\cdot}2$	◯	◯	**56**	$(0{\cdot}5)^2 = 0{\cdot}25$	◯	◯
57	$\triangle^2 = \triangle \times \triangle$	◯	◯	**58**	$(\triangle + \bigcirc) + \square = \triangle + (\bigcirc + \square)$	◯	◯
59	$\triangle^2 + \bigcirc^2 = (\triangle + \bigcirc)^2$	◯	◯	**60**	$\triangle - \bigcirc - \square = \triangle - (\bigcirc + \square)$	◯	◯

Sample pages

Fraction fun

In these equations, some of the digits or fractions have been replaced by squares. Can you find the missing numbers?

1 $\frac{1}{2} \times \square = 10$

2 $\square \times 40 = 20$

3 $\frac{1}{3} \times \square = 4$

4 $\square \times 15 = 3$

5 $\frac{1}{10} \times \square = 5$

6 $\square \times 40 = 8$

7 $\square \times 24 = 4$

8 $\frac{1}{3} \times \square = 12$

9 $\frac{1}{5} \times \square = 5$

10 $\frac{1}{4} \times \square = 4$

11 $\frac{1}{4} \times \square = 6$

12 $\square \times 32 = 8$

13 $\square \times 27 = 9$

14 $\square \times 24 = 12$

15 $\square \times 24 = 8$

16 $\frac{2}{5} \times 20 = \square$

17 $\frac{3}{5} \times 45 = \square$

18 $\frac{3}{4} \times \square = 30$

19 $\frac{3}{4} \times \square = 12$

20 $\frac{3}{5} \times \square = 12$

21 $\frac{\square}{5} \times 20 = 8$

22 $\frac{\square}{10} \times 60 = 18$

23 $\frac{\square}{3} \times 12 = 8$

24 $\frac{\square}{4} \times 24 = 18$

25 $\frac{\square}{5} \times 25 = 15$

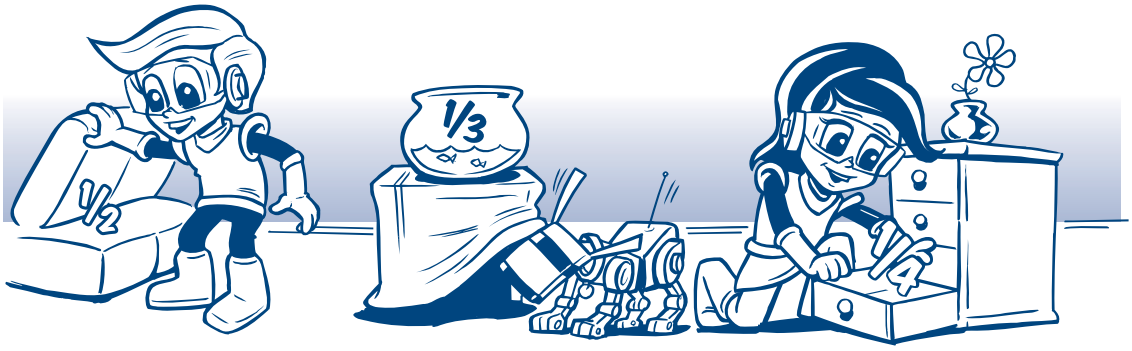
26 $\frac{3}{10} \times \square = 30$

27 $\frac{3}{10} \times \square = 12$

28 $\frac{3}{\square} \times 40 = 12$

29 $\frac{3}{\square} \times 40 = 30$

30 $\frac{3}{\square} \times 30 = 9$



Sample pages

Fraction challenges

1 In this exercise, each statement gives the clue to a number. (It could be a fraction.) Find the number in each case.

a $\frac{1}{2}$ the number is 8. _____

b $\frac{1}{4}$ of the number is 8. _____

c $\frac{3}{4}$ of the number is 12. _____

d $\frac{2}{3}$ of the number is 18. _____

e $\frac{2}{7}$ of the number is 14. _____

f $\frac{9}{10}$ of the number is 90. _____

g $\frac{3}{5}$ of the number is 30. _____

h $\frac{4}{3}$ of the number is 24. _____

i $\frac{1}{2}$ the number plus 5 is the same as the number itself. _____

j $\frac{1}{2}$ the number plus 8 is the same as the number itself. _____

k If you halve the number and subtract 4, the answer is 2. _____

l If you double the number and subtract $\frac{1}{2}$, the answer is 2. _____

m If you double the number and add $\frac{1}{2}$, the answer is 2. _____

n If you add the number to double its own value, the answer is 1. _____

o If you multiply the number by 4 and add 5, the answer is 7. _____

2 Find two numbers whose sum is 1 and whose difference is $\frac{1}{2}$. _____

3 Find two numbers whose sum is 1 and whose difference is $\frac{1}{3}$. _____

4 Find two numbers whose sum is 2 and whose difference is 1. _____

5 Find a fraction whose square is greater than itself. $\square^2 > \square$ _____

How many solutions can you find? _____

6 Find a fraction whose square is smaller than itself. $\square^2 < \square$ _____

How many solutions can you find? _____

Sample pages

Egyptian fractions

The Egyptians wrote all their fractions so that they had a numerator of 1. For example examine these fractions and their Egyptian equivalents.

$$\frac{3}{4} = \frac{1}{2} + \frac{1}{4} \qquad \frac{2}{3} = \frac{1}{2} + \frac{1}{6}$$

Note the easiest way to do this is to use equivalent fractions so that:

$$\frac{2}{3} = \frac{4}{6} = \frac{3}{6} + \frac{1}{6} = \frac{1}{2} + \frac{1}{6}$$

7 Write the following fractions as their Egyptian equivalents.

a $\frac{5}{8}$ _____

b $\frac{6}{10}$ _____

c $\frac{5}{6}$ _____

d $\frac{7}{10}$ _____

e $\frac{7}{12}$ _____

f $\frac{11}{15}$ _____

Find the fraction

1 In the following equations, some numbers have been replaced with different shapes. Find the value of each shape.

a $\frac{2}{\square} = \frac{\square}{8}$ _____ **b** $\frac{2}{\bigstar} = \frac{\bigstar}{18}$ _____ **c** $\frac{3}{\bigcirc} = \frac{\bigcirc}{12}$ _____

d $\frac{3}{\diamond} = \frac{\diamond}{27}$ _____ **e** $\frac{4}{\#} = \frac{\#}{36}$ _____ **f** $\frac{2}{\bigcirc} = \frac{\bigcirc}{32}$ _____

g $3 \times \frac{1}{\square} = 1$ _____ **h** $\bigcirc \times \frac{1}{5} = 1$ _____

i $\frac{\odot}{\square} \times \frac{2}{5} = 1$ _____ **j** $\frac{4}{\bullet} \times \frac{\blacksquare}{7} = 1$ _____

2 **a** Find the average of $\frac{1}{2}$ and $\frac{1}{3}$. _____

b Find the average of $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{6}$. _____

3 Find the square root of:

a $2\frac{1}{4}$ _____ **b** $5\frac{1}{16}$ _____ **c** $1\frac{7}{9}$ _____

4 Express each of the following as a simple fraction in lowest terms.

a $1 \div (1 \div \frac{1}{3})$ _____ **b** $1 \div (1 \div \frac{1}{5})$ _____ **c** $1 \div (1 \div \frac{3}{5})$ _____

d $\dfrac{1}{1 + \frac{1}{2}}$ _____ **e** $\dfrac{1}{1 + \dfrac{1}{1 + \frac{1}{2}}}$ _____ **f** $\dfrac{1}{2 + \frac{1}{2}}$ _____

g $\dfrac{1}{2 + \dfrac{1}{2 + \frac{1}{2}}}$ _____ **h** $\dfrac{1}{1 + \dfrac{1}{1 - \frac{1}{4}}}$ _____

5 Simplify each fraction. Draw a box around the greatest and a circle around the least fraction in each group.

a $\frac{3}{4}$ $\frac{3+1}{4+1}$ _____ $\frac{3+2}{4+2}$ _____ $\frac{3+3}{4+3}$ _____ $\frac{3-2}{4-2}$ _____

b $\frac{5}{2}$ $\frac{5+1}{2+1}$ _____ $\frac{5+2}{2+2}$ _____ $\frac{5+3}{2+3}$ _____ $\frac{5-1}{2-1}$ _____

c $\frac{3}{8}$ $\frac{3+1}{8+1}$ _____ $\frac{3+2}{8+2}$ _____ $\frac{3+12}{8+12}$ _____ $\frac{3-2}{8-2}$ _____

Sample pages

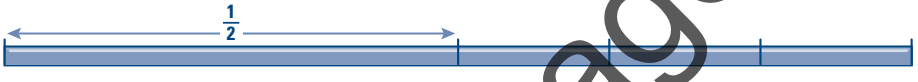
Spending money

1 Jordon had a sum of money. In each question below (with the use of a diagram) work out how much he started with if:

a After he spent $\frac{1}{2}$ of the original sum on a present, and he put $\frac{1}{2}$ of the remainder in the bank he had $12 left. _____

b After he spent $\frac{1}{3}$ of his money on a present, and he put $\frac{1}{2}$ of the remainder in the bank he had $24 left. _____

c After he spent $\frac{1}{2}$ on a present, and he put $\frac{1}{3}$ of the remainder in the bank, he had $12 left. _____



d After he spent $\frac{1}{2}$ on a present, he put $\frac{1}{3}$ of the remainder in the bank and then he spent $\frac{1}{2}$ of what is left at the movies. He now had $8 left. _____

e After he spent $\frac{1}{3}$ of his money on a present, and he spent $\frac{1}{4}$ of the remainder on a book, he has $36 remaining. _____

2 Gina spent $\frac{1}{3}$ of her money on a present. Next she spent $\frac{1}{4}$ of the remainder on a book. If she spent $\frac{1}{3}$ of what is left at the movies she still had $16 left.

a How much did Gina spend at the movies? _____

b How much did Gina have at the start? _____

3 Justin spent $\frac{1}{4}$ of his money on a present. Next he spent $\frac{1}{6}$ of the remainder on a book. He has $50 remaining.

a How much was the book? _____

b How much money did Justin have at the start? _____

Sample pages