Year 3

Arithmetic

Workbook

by Richard Brown

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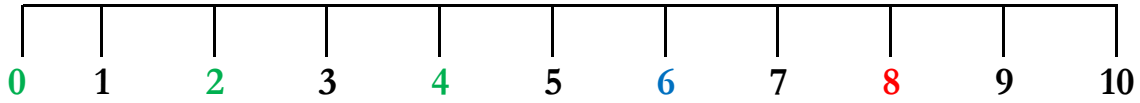
Key Language and Representations

Word Problems are the arithmetic number sentences written in a real-life reasoning and problem solving scenario.

Number Lines are used to count forwards e.g. 0, 4, 8, 12, 16, 20 and also to count backwards e.g. 30, 25, 20, 15, 10, 5.



Concrete Objects are manipulated or handled to calculate and represent a number sentence i.e. counters, multilink cubes, fraction tiles, metric rulers.

e.g. 30 + 30 = 60

Column Addition is the formal written method of adding two or more numbers together, using a vertical arrangement in a columnar format, with regrouping.

	10s	1s
	2	0
+	3	0
	4	0
	9	0

	100s	10s	1s
	200	70	4
+	100	50	8
	400	30	2
	100	10	

	100s	10s	1s
	2	7	4
	1	5	8
+	4	3	2
	1	1	

Column Subtraction is the formal written method of subtracting a smaller number from a bigger number, using a vertical arrangement in a columnar format, with regrouping.

	10s	1s
	1	5
-		4
	1	1

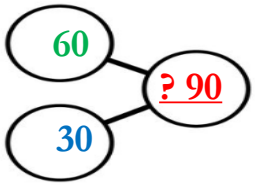
	100s	10s	1s
	600	110	
	~~700~~	~~20~~	15
-	200	40	6
	400	80	9

	100s	10s	1s
	2	9	
	~~3~~	~~10~~	10
-		9	4
	2	0	6

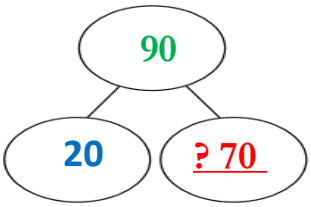
Strategy Applied refers to when a formal written method is used to calculat a number sentence e.g. 250 - 50 = 200
Explained using appropriate mathematical language, proven using concrete objects that can be handled, shown with pictorial representations visualising the calculations, to ensure a greater understanding of a mathematical concep

Part Whole Models are pictorial mathematical images to represent **varied** calculations and number sentences.

e.g. 60 + 30 = ? 90

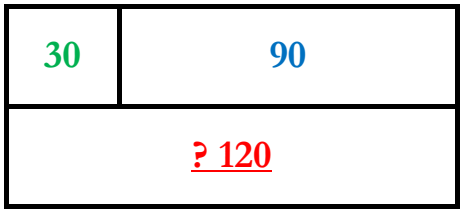


e.g. 90 - 20 = ? 70

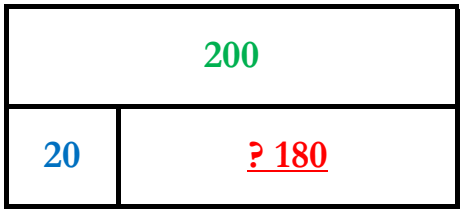


Bar Models are an image, that pictorially represents a number sentence.

e.g. 30 + 90 = ? 120

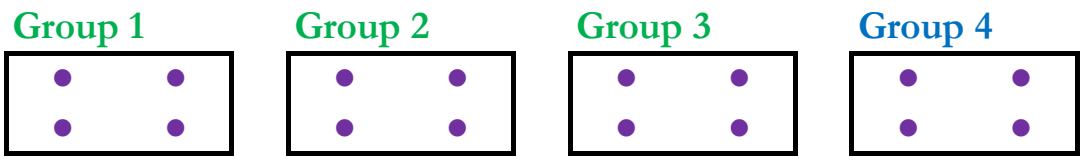


e.g. 200 - 20 = ? 180



Groups of objects represents a total number of objects shared or divided into two or more groups of an equal number of the objects.

$\frac{3}{4}$ of 16 = 12



Number Grid

0	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	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139
140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159

Multiplication Square

x	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0
1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100
11	22	33	44	55	66	77	88	99	110
12	24	36	48	60	72	84	96	108	120

Decimal Number Grid

0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9
3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9
4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9
7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9
8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9
9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9
10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9
11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9
12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9
13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9
14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9
15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9

Fraction Walls

1 Whole															
$\frac{1}{2}$								$\frac{1}{2}$							
$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$			
$\frac{1}{8}$				$\frac{1}{8}$				$\frac{1}{8}$				$\frac{1}{8}$			
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$

1 Whole					
$\frac{1}{2}$				$\frac{1}{2}$	
$\frac{1}{3}$		$\frac{1}{3}$		$\frac{1}{3}$	
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

1 Whole									
$\frac{1}{2}$					$\frac{1}{2}$				
$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$	
$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$	
$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$

How Many

The number 123 is made up of how many **100s** (hundreds), **10s** (tens) and **1s** (ones)?

1) 1 2 3 = ___

In Maths a **number** or **figure** e.g. 123, is made up of the **digits** 1, 2 and 3.
Each digit has a worth, otherwise known as its **place value**.
The number **one hundred and twenty three** is a **3-digit number**.
Each of the **digits** represents the **100s**, **10s** and **1s column place values**.

Place Value Grid

Hundreds 100s	Tens 10s	Ones 1s
1	2	3

Strategy Applied

The number **one hundred and twenty three** is represented on a **Place Value Grid** as above.

First, write 3 in the **1s** column place value, which is also how many **ones** there are in the **1s** column, 3 **ones**.

Then, write 2 in the **10s** column place value, which is also how many **tens** there are in the **10s** column, 2 **tens**.

Next, write 1 in the **100s** column place value, which is also how many **hundreds** there are in the **100s** column, 1 **hundred**.

Finally, the **Place Value Grid** above shows how many **10s** and **1s** there are, 1 **hundred**, 2 **tens** and 3 **ones**.

Test Questions

How many **100s** (hundreds), **10s** (tens) and **1s** (ones) make up each number?

1) 123 = ___

2) 246 = ___

3) 179 = ___

4) 280 = ___

5) 357 = ___

6) 468 = ___

7) 379 = ___

8) 460 = ___

9) 513 = ___

10) 682 = ___

11) 715 = ___

12) 802 = ___

13) 846 = ___

14) 937 = ___

Digit Value

What is the digit value of the **1s (**ones), **10s** (tens) and **100s** (hundreds) in the number **123**?

1) **1 2 3 =** ___

In Maths a **number** or **figure** e.g. **123**, is made up of the **digits 1**, **2** and **3**.
Each digit has a worth, otherwise known as its **place value**.
The number **one hundred and twenty three** is a **3-digit number**.
Each of the **digits** represents the **100s**, **10s** and **1s column place values**.

Place Value Grid

Hundreds 100s	Tens 10s	Ones 1s
1	2	3

Strategy Applied
The number **one hundred and twenty three** is represented on a **Place Value Grid** as above.

First, in the **1s** column the value of the digit is worked out by multiplying how many **ones** there are, **3** by 1 (**1s** column), which is **3**.

Then, in the **10s** column the value of the digit is worked out by multiplying how many **tens** there are, **2** by 10 (**10s** column), which is **20**.

Next, in the **10s** column the value of the digit is worked out by multiplying how many **hundreds** there are, **1** by 100 (**100s** column), which is **100**.

Finally, the digit value of the **100s**, **10s** and **1s** digits is **100**, **20** and **3**.

Test Questions

What is the digit value of the **1s** (ones) **10s** (tens) **and 100s** (hundreds) in each number?

1) 123 = ___

2) 246 = ___

3) 179 = ___

4) 280 = ___

5) 357 = ___

6) 468 = ___

7) 379 = ___

8) 460 = ___

9) 513 = ___

10) 682 = ___

11) 715 = ___

12) 802 = ___

13) 846 = ___

14) 937 = ___

10 and 100 More

1) 138 + 10 = ?

Word Problem

There are **one hundred and thirty eight** pencils in a container.
What is the **sum** of **ten** more**?**

Partitioning

$$\begin{array}{rrrcrrrcrrr} 1 & 0 & 0 & + & & 0 & = & 1 & 0 & 0 \\ & 3 & 0 & + & 1 & 0 & = & & 4 & 0 \\ & & 8 & + & & 0 & = & & & 8 \\ \hline & & & & & & & 1 & 4 & 8 \end{array}$$

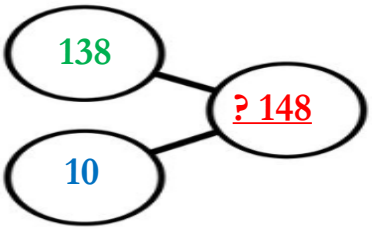
Column Addition

$$\begin{array}{rrrr} & \underline{100s} & \underline{10s} & \underline{1s} \\ & 1 & 3 & 8 \\ + & & 1 & 0 \\ \hline & 1 & 4 & 8 \end{array}$$

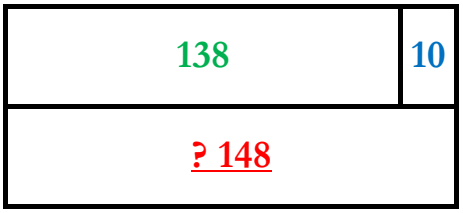
Strategy Applied

Partition both numbers into **100s**, **10s**, **1s** and add together their relative **digit values**.
138 = 100 + 30 + 8 and 10 = 10 + 0.
First, add the **100s** digit values of **one hundred** and **zero**, equal to **one hundred**.
Then, add the **10s** digit values of **thirty** and **ten**, equal to **forty**.
Next, add the **1s** digit values of **eight** and **zero**, equal to **eight**.
Then, use column addition to add the values of 100 + 40 + 8 = 148.
Finally, 138 plus 10 is equal to 148.

Part Whole Model



Bar Model



Test Questions

1) 138 + 10 = ___

2) 259 + 10 = ___

3) 399 + 10 = ___

4) 455 + 10 = ___

5) 510 + 10 = ___

6) 642 + 10 = ___

7) 167 + 100 = ___

8) 258 + 100 = ___

9) 391 + 100 = ___

10) 402 + 100 = ___

11) 551 + 100 = ___

12) 656 + 100 = ___

13) 772 + 100 = ___

14) 857 + 100 = ___

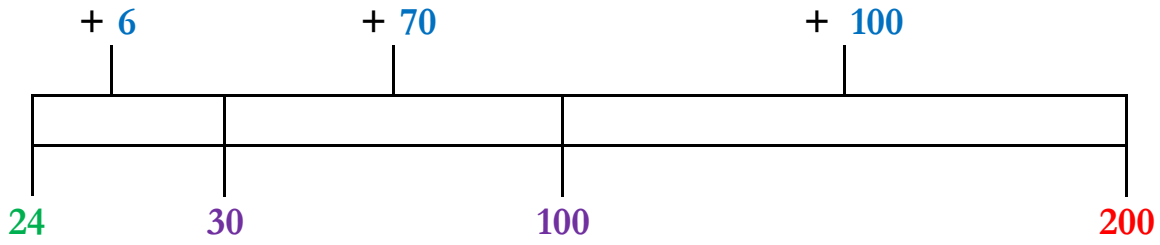
More than 100

1) 24 + ? = 200

Word Problem

Ivan has read **twenty four** pages of a sci-fi book. His book is **two hundred** pages long. How many more pages does he have **left** to read**?**

Number Line



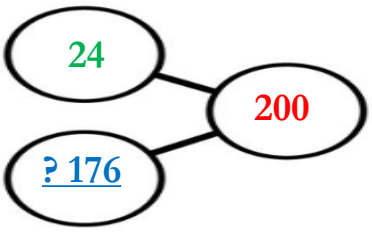
Column Addition

	100s	10s	1s
	1	0	0
		7	0
+			6
	1	7	6

Strategy Applied

Use a ruler or number grid to help when counting on.
First, draw a number line and write **twenty four** at the start and **two hundred** at the end.
Then, from **24** count on in **1s** to the next **multiple of 10s**, 25, 26, 27, 28, 29, **30**, equal to **six**.
Next, from **30** count on in **10s** to the next **multiple of 100s**, 40, 50, 60, 70, 80, 90, **100**, equal to **seventy**.
Then, from **100** count on in **100s** on to **two hundred**, equal to **one hundred**
Next, add the amounts counted on from **largest** to **smallest**, **100**, **70** and **6**.
Finally, the missing number is **176**.

Part Whole Model



Bar Model

24	? 176
200	

Test Questions

1) 24 + ___ = 200

2) 33 + ___ = 300

3) 167 + ___ = 400

4) 142 + ___ = 560

5) 230 + ___ = 600

6) 165 + ___ = 775

7) 346 + ___ = 850

8) ___ + 123 = 351

9) ___ + 135 = 562

10) ___ + 143 = 776

11) ___ + 321 = 513

12) ___ + 531 = 625

13) ___ + 341 = 676

14) ___ + 231 = 532

Bonds to 50 and 100

1) 15 + ? = 50

Number bonds to 50, means two or more numbers added together that make the number **50**.
Number bonds to 100, means two or more numbers added together that make the number **100**.

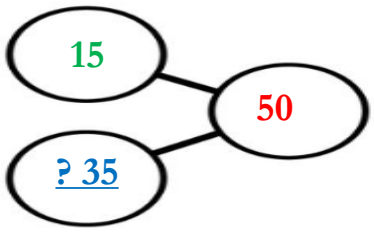
Number Grid

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

Strategy Applied

First, find and touch the number **fifteen** on a number grid.
Then, **count forwards** to the next **multiple of 10s** which is **twenty**, **5** more.
Next, **count downwards** in **multiples of 10s** on to **fifty**, one, two, three squares, which is 10, 20, **30** more.
Then, add the amounts counted on **30** and **5**, equal to **35**.
Finally, the **value** of the missing number is **thirty five**.

Part Whole Model



Bar Model

15	? 35
50	

Test Questions

1) 15 + ___ = 50

2) 24 + ___ = 50

3) 36 + ___ = 50

4) 48 + ___ = 50

5) ___ + 19p = 50p

6) ___ + 27p = 50p

7) ___ + £30 = £100

8) ___ + £50 = £100

9) ___ + 0 = 50

10) ___ + 70 = 100

11) ___ + 20 = 100

12) ___ + 50 = 100

13) ___ + 40 = 100

14) ___ + 60 = 100

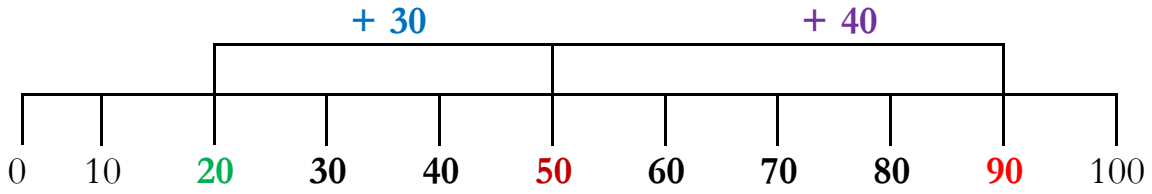
Multiple Numbers

1) 20 + 30 + 40 = ?

Word Problem

Three children have collected football stickers. **Child A** has 20 stickers, **Child B** has 30 stickers and **Child C** has 40 stickers.
How many football stickers do the children have **altogether?**

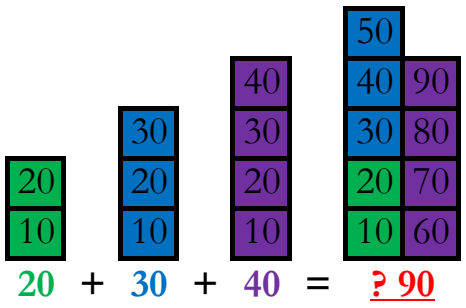
Number Line



Strategy Applied

First, find and touch the number **twenty** on the number line.
Then, **count forwards** in multiples of **10s** 10, 20, **30** more aloud in number order, whilst touching the numbers on the number line.
Next, the number counted on to should be **fifty**.
Then, **count forwards** in multiples of **10s** 10, 20, 30, **40** more aloud in number order, whilst touching the numbers on the number line.
Next, the number counted on to should be **ninety**.
Finally, **twenty** plus **thirty** plus **forty** equals **ninety**.

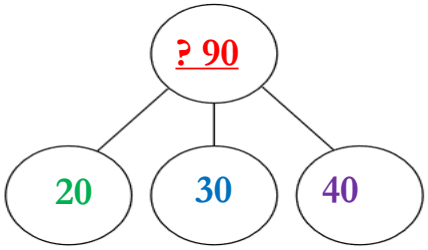
Concrete Object



Column Addition

	10s	1s
	2	0
+	3	0
	4	0
	9	0

Part Whole Model



Bar Model

20	30	40
? 90		

Test Questions

1) 20 + 30 + 40 = ___

2) 90 + 80 + 70 = ___

3) 60 + 30 + 30 = ___

4) 30 + 300 + 30 = ___

5) 100 + 400 + 200 = ___

6) 200 + 300 + 500 = ___

7) 10p + 50p + 20p = ___

8) £40 + £50 + £90 = ___

9) 20cm + 40cm + 30cm = ___

10) 40m + 50m + 60m = ___

11) ___ = 70 + 90 + 60

12) ___ = 150 + 150 + 150

13) ___ = 90 + 90 + 70

14) ___ = 600 + 200 + 100

Multiples of 4, 8, 25, 100

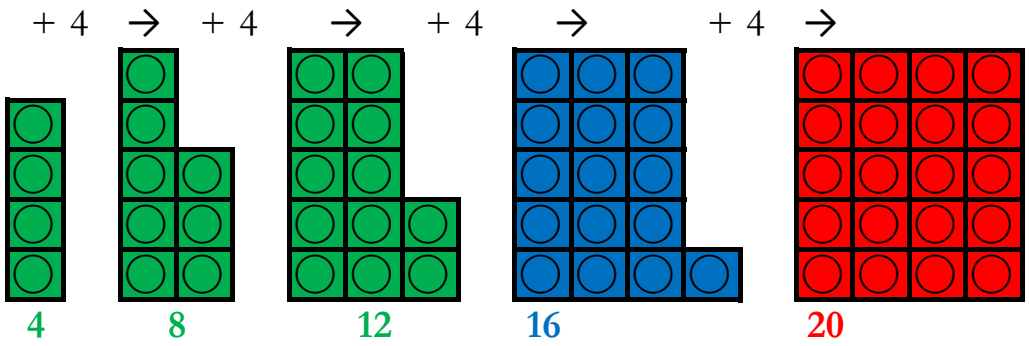
In the **number pattern** below, find the next two missing numbers.

1) **4, 8, 12, ?, ?**

Word Problem

Evelyn uses counters to make the **number pattern** of **four**, **eight** and **twelv**
She calculates the next two missing numbers in the number pattern.
How many counters will she need, to make the next **two** numbers**?**

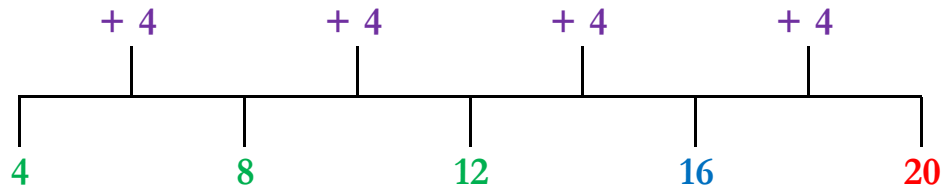
Concrete Object



Strategy Applied

Work out the **number pattern**, by finding out the **difference between** the **three** numbers.
The difference between each of the **three** numbers is known as the **rule**.
First, **count forwards** from **four** to **eight** equalling **four**, the rule is **+4**.
Then, count forwards from **eight** to **twelve** equalling **four**, the rule is **+4**.
The rule is **+4** (**count on four**) to each of the numbers in the number patter
Continue this number pattern to find the next two missing numbers.
Next, find **twelve** on the number line and count on **four** more, equal to **sixteen**.
Then, find **sixteen** on the number line and count on **four** more, equal to **twenty**.
Finally, the next two missing numbers in the number pattern are **sixteen** and **twenty**.

Number Line



Test Questions

1) 4, 8, 12, __, ___

2) 28, 32, 36, __, ___

3) 52, 56, 60, __, ___

4) 6, 10, 14, __, ___

5) 0, 8, 16, __, ___

6) 32, 40, 48, __, ___

7) 56, 64, 72, __, ___

8) 3, 11, 19, __, ___

9) 0, 25, 50, __, ___

10) 75, 100, 125, __, ___

11) 5, 30, 55, __, ___

12) 10, 35, 60, __, ___

13) 0, 100, 200, __, ___

14) 500, 600, 700, __, ___

Doubling

1) 26 + 3 + 3 = ?

Word Problem

Twenty six 1p coins are in a child's piggy bank. Two **lots of** three 1p coins are dropped into the piggy bank.
How many 1p coins are now in the piggy bank?

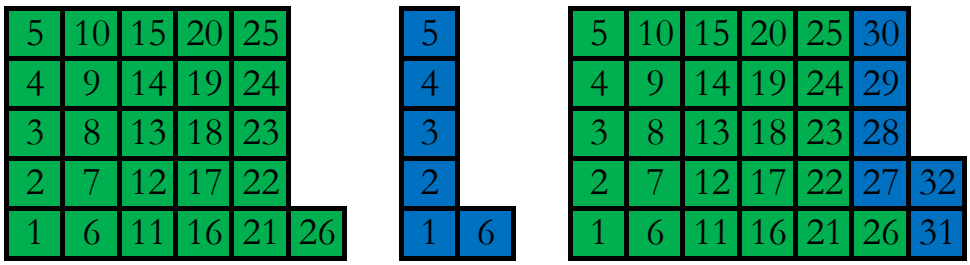
Number Grid

20	21	22	23	24	25	26 →	**27**	**28**	**29**
30	**31** →	32	33	34	35	36	37	38	39

Strategy Applied

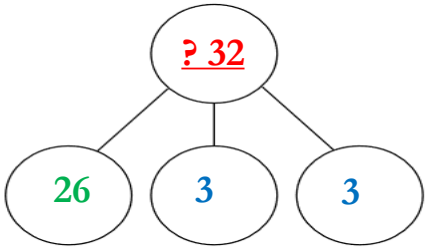
Use **doubling**, three add three **equals** six.
First, find and touch the number twenty six on a number grid.
Then, **count forwards** six more aloud in number order, whilst touching the numbers on the number grid.
Next, the number counted on to should be thirty two.
Finally, twenty six plus six equals thirty two.

Concrete Object

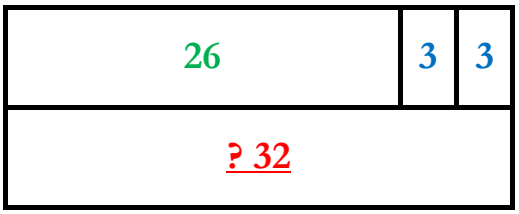


26 + 6 = ? 32

Part Whole Model



Bar Model



Test Questions

1) 26 + 3 + 3 = ___

2) 44 + 4 + 4 = ___

3) 28 + 4 + 4 = ___

4) 16 + 8 + 8 = ___

5) 40 + 8 + 8 = ___

6) 56 + 8 + 8 = ___

7) 250 + 50 + 50 = ___

8) 750 + 50 + 50 = ___

9) 200 + 100 + 100 = ___

10) 700 + 100 + 100 = ___

11) ___ = 75 + 5 + 5

12) ___ = 64 + 6 + 6

13) ___ = 550 + 75 + 75

14) ___ = 450 + 95 + 95

Expanded Column Addition

1) **274 + 158 = ?**

Word Problem

Nicholas says the total of the two 3-digit numbers will be greater than **500**.
Do you agree**?**

Step 1

	100s	10s	1s
	200	**70**	**4**
+	**100**	**50**	**8**
			2
		10	

Step 2

	100s	10s	1s
	200	**70**	**4**
+	**100**	**50**	**8**
		30	**2**
	100	**10**	

Step 3

	100s	10s	1s	
	200	**70**	**4**	
+	**100**	**50**	**8**	
	400	**30**	**2**	= 432
	100	**10**		

Strategy Applied

Step 1

In the **1s** column add **altogether**, 4 + 8, equals 12 **ones** (10 + 2).
Write 2 **ones** in the **total value** of the **1s** column.
Exchange/Regroup the 10 **ones** into 1 **ten** from the **1s** column to the **10s** column and write 10 below the **total value line** of the **10s** column.

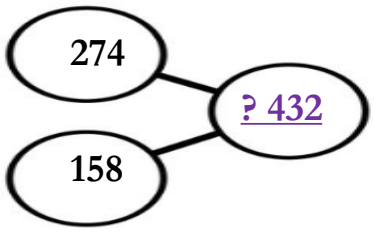
Step 2

In the **10s** column add **altogether**, 70 + 50 + 10, equals 13 **tens** (100 + 30).
Write 30 (3 **tens**) in the **total value** of the **10s** column.
Exchange/Regroup the 10 **tens** into 1 **hundred** from the **10s** column to the **100s** column and write 100 below the **total value line** of the **100s** colum

Step 3

In the **100s** column add **altogether**, 200 + 100 + 100, equals 4 **hundreds** (400).
Write 400 in the **total value** of the **100s** column.
Add **altogether** the **partitioned** values, 400 + 30 + 2.
Total value is 432.

Part Whole Model



Bar Model

274	158
? 432	

Test Questions

1) 200 + 70 + 4
+ 100 + 50 + 8

2) 200 + 30 + 7
+ 100 + 40 + 8

3) 400 + 50 + 7
+ 200 + 80 + 5

4) 400 + 70 + 9
+ 200 + 80 + 3

5) 400 + 00 + 6
+ 200 + 80 + 7

6) 400 + 60 + 0
+ 200 + 40 + 8

7) 500 + 00 + 4
+ 300 + 60 + 8

8) 500 + 40 + 0
+ 300 + 60 + 9

9) 100 + 30 + 8
+ + 90 + 4

10) 400 + 50 + 2
+ + 90 + 3

Column Addition

1) **385 + 247 = ?**

Word Problem

My number is **two hundred and forty seven** more than David's, **385**.
How much is my number**?**

Step 1

	100s	10s	1s
	3	8	5
+	2	4	7
			2
		1	

Step 2

	100s	10s	1s
	3	8	5
+	2	4	7
		3	2
	1	1	

Step 3

	100s	10s	1s
	3	8	5
+	2	4	7
	6	3	2
	1	1	

Strategy Applied

Step 1

In the **1s** column add **altogether**, 5 + 7, equals 12 **ones** (**10** + **2**).
Write **2** in the **total value** of the **1s** column.
Exchange/Regroup the **10 ones** into **1 ten** from the **1s** column to the **10s** column and write **1 ten** below the **total value line** of the **10s** column.

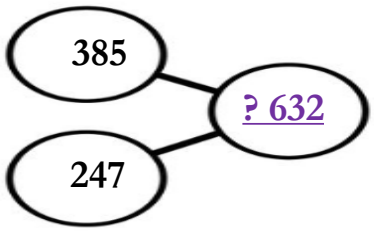
Step 2

In the **10s** column add **altogether**, 8 + 4 + **1**, equals 13 **tens** (**100** + **30**).
Write **3** in the **total value** of the **10s** column. **regroup** the 10 **tens** into **Exchange/Regroup** the **10 tens** into **1 hundred** from the **10s** column to the **100s** column and write **1 hundred** below the **total value line** of the **100s** column.

Step 3

In the **100s** column add **altogether**, 3 + 2 + **1**, equals 6 **hundreds** (**600**).
Write **6** in the **total value** of the **100s** column.
Total value is **632**.

Part Whole Model



Bar Model

385	247
? 632	

Test Questions

1) 3 8 5
+ 2 4 7

2) 2 3 7
+ 1 4 8

3) 2 3 9
2 4 4
+ 1 6 8

4) 4 5 7
+ 2 8 5

5) 4 7 9
+ 2 8 3

6) 4 5 7
2 7 9
+ 2 8 5

7) 5 4 0
+ 3 6 9

8) 4 6 0
+ 2 4 8

9) 5 4 0
3 6 0
2 0 5
+ 1 6 9

10) 5 0 4
+ 3 6 8

11) 4 0 6
+ 2 8 7

12) 1 3 8
+ 9 4

13) 4 5 2
+ 9 3

14) 3 0 4
2 0 6
9 4
+ 9 3

Find the Missing Number

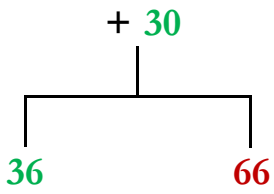
1) 42 + ? = 36 + 30

Word Problem

Group A has the **same** number of children as **Group B**.
Group A has **forty two** girls and a **number** of boys. Group B has **thirty six** girls and **thirty** boys. What is the number of boys in Group A**?**

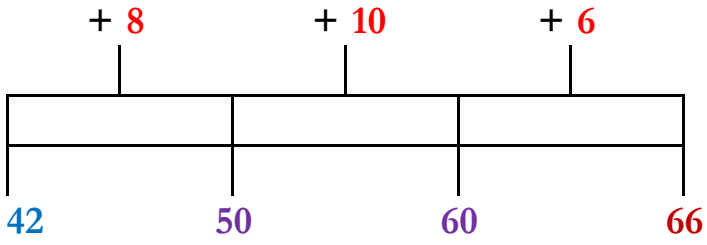
Strategy Applied

Step 1



Add together the **known number sentence**, which is 36 + 30.
First, find the 36 on a number line and **count forwards** in **multiples of 10s** 10, 20, 30 more, which is 46, 56, **66**.

Step 2



New known fact, 42 + ? = 66 .
Then, find 42 on a number line and count on to the next **multiple of 10s**, which is 50, equal to 8.

Next, from **50** count on to the **multiple of 10s** before **66**, which is **60**,
equal to **10**.
Then, from **60** count on in **multiples of 1s** up to **66**, which is equal to **6**.
Next, add **altogether** the amounts counted on, from **largest** to **smallest**
10 + 8 + 6 = 24.
Finally, the **value** of the missing number is **twenty four**.

Test Questions

1) 42 + ___ = 36 + 30

2) 76 is ___ more than 69

3) 17 + 5 + 3 = ___

4) 35seconds + ___ = 1 minute

5) 46ml + 13ml = ___

6) 30p + 85p = £1 + ___ p

7) 482ml + ___ ml = 755ml

8) 47cm + 2cm + 53cm = ___ cm

9) 285 + 31 + 9 = ___

10) What is eight hundred and fifty add twenty eight?

11) 73 + ___ = 43 + 59

12) 99 is ___ more than 78

13) 25 + 6 + 8 = ___

14) 468 + 57 + 3 = ___

10 and 100 Less

1) 258 - 10 = ?

Word Problem

Joan says when you subtract **ten** from any **number** the **digit value** of the **10s** column will not remain the same. Is it true**?** Prove it.

Partitioning

$$\begin{array}{rrrrrrrrrrr} 2 & 0 & 0 & - & & 0 & = & 2 & 0 & 0 & \\ & 5 & 0 & - & 1 & 0 & = & & 4 & 0 & \\ & & 8 & - & & 0 & = & & & 8 & + \\ \hline & & & & & & & 2 & 4 & 8 & \end{array}$$

Column Addition

100s	10s	1s
2	5	8
-	1	0
2	4	8

Strategy Applied

Partition both numbers into **100s**, **10s**, **1s** and subtract their relative **digit values**.

258 = 200 + 50 + 8 and 10 = 10 + 0.

First, subtract the **100s** digit values of **two hundred** and **zero**, equal to **two hundred**.

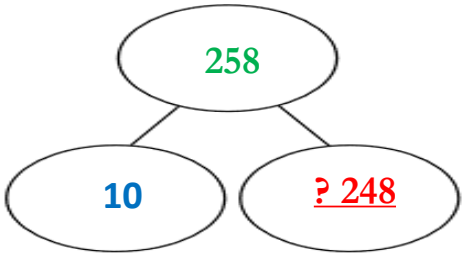
Then, subtract the **10s** digit values of **fifty** and **ten**, equal to **forty**.

Next, subtract the **1s** digit values of **eight** and **zero**, equal to **eight**.

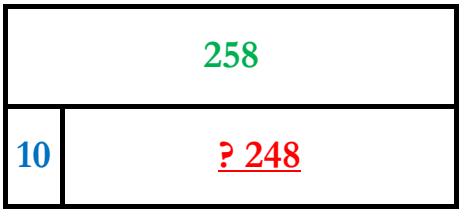
Then, use column addition to add the values of 200 + 40 + 8 = 248.

Finally, 258 minus 10 is equal to 248.

Part Whole Model



Bar Model



Test Questions

1) 258 - 10 = ___

2) 222 - 10 = ___

3) 340 - 10 = ___

4) 345 - 10 = ___

5) 489 - 10 = ___

6) 520 - 10 = ___

7) 613 - 10 = ___

8) 739 - 100 = ___

9) 869 - 100 = ___

10) 971 - 100 = ___

11) ___ = 458 - 100

12) ___ = 561 - 100

13) ___ = 699 - 100

14) ___ = 905 - 100

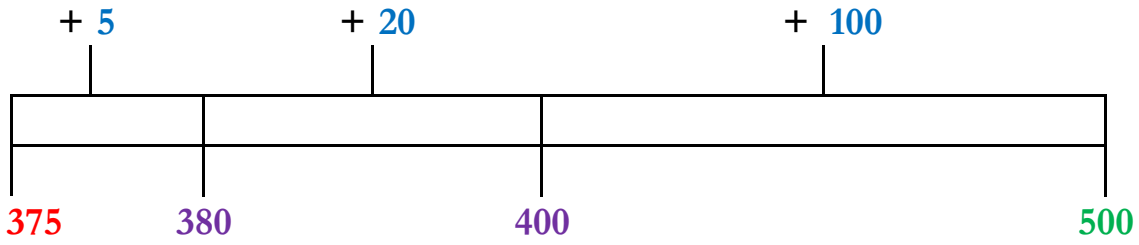
More Than 100

1) 500 - ? = 375

Word Problem

Mum has £500 to buy a new television in **Shop A** and she has £375 **left** after buying the television. How much did she spend?

Number Line



Column Addition

	100s	10s	1s
	1	0	0
		2	0
+			5
	1	2	5

Strategy Applied

Use the **inverse** of subtraction, which is addition and **count on** from the smallest number to the largest number. 375 + ? = 500

Use a ruler or number grid to help when counting on.

First, draw a number line and write **three hundred and seventy five** at the start and **five hundred** at the end.

Then, from 375 count on in **1s** to the next **multiple of 10s**, 376, 377, 378, 379, 380, equal to **five**.

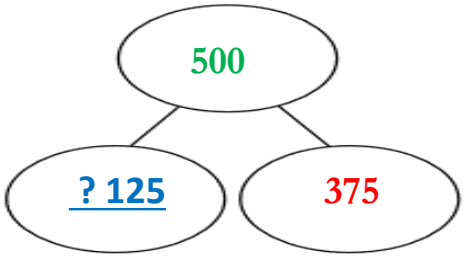
Next, from 380 count on in **10s** to the next **multiple of 100s**, 390, 400, equal to **twenty**.

Then, from 400 count on in **100s** on to 500, equal to **one hundred**.

Next, add the amounts counted on from **largest** to **smallest**, 100, 25 and 5.

Finally, the missing number is 125.

Part Whole Model



Bar Model

500	
? 125	375

Test Questions

1) 500 - ___ = 375

2) 450 - ___ = 135

3) 600 - ___ = 453

4) 751 - ___ = 500

5) 672 - ___ = 520

6) 850 - ___ = 135

7) 800 - ___ = 458

8) 952 - ___ = 500

9) 975 - ___ = 520

10) ___ - 457 = 350

11) ___ - 235 = 250

12) ___ - 184 = 560

13) ___ - 506 = 350

14) ___ - 368 = 360

Bonds to 50, 100

1) 50 - ? = 17

Number bonds to 50, means two or more numbers added together that make the number **50**.
Number bonds to 100, means two or more numbers added together that make the number **100**.

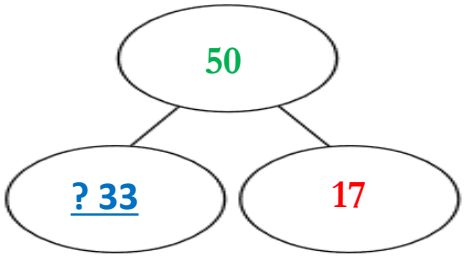
Number Grid

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

Strategy Applied

First, find and touch the number **fifty on** a number grid.
Then, **count back** to the **multiple of 10s** before the number **seventeen**, which is **twenty**.
Count upwards in **multiples of 10s** to **twenty**, one, two, three squares, which is 10, 20, **30** less.
Next, **count backwards** in **multiple of 1s** to **seventeen**, 1, 2, **3** less.
Then, add the amounts counted back **30** and **3**, equal to **33**.
Finally, the **value** of the missing number is **thirty three**.

Part Whole Model



Bar Model

50	
? 33	17

Test Questions

1) 50 - ___ = 17

2) 50 - ___ = 23

3) 50 - ___ = 32

4) 50 - ___ = 19

5) 50p - 9p = ___

6) 50p - 7p = ___

7) £100 - £___ = £23

8) £100 - £___ = £82

9) 100 - ___ = 0

10) 100 - ___ = 90

11) 100 - ___ = 40

12) 100 - ___ = 30

13) 100 - ___ = 50

14) 100 - ___ = 70

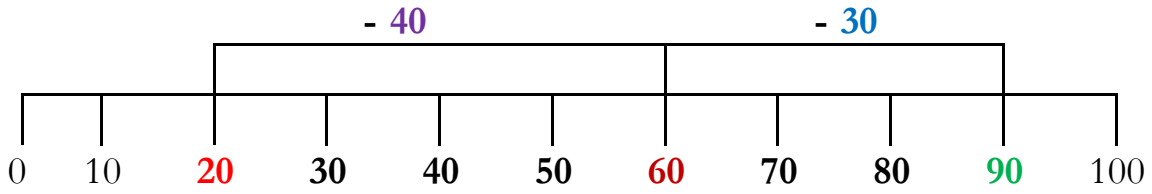
Multiple Numbers

1) 90 - 30 - 40 = ?

Word Problem

Ninety children are given a letter to attend a school trip, they must return the reply slip if they will be attending. In **wk. 1** thirty slips are returned. In **wk. 2** forty slips come back. How many children have not replied as yet?

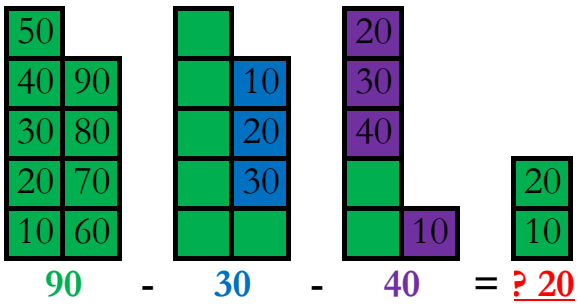
Number Line



Strategy Applied

First, find and touch the number ninety on the number line.
Then, **count backwards** in **multiples of 10s** thirty less aloud in number order, whilst touching the numbers on the number line.
Next, the number counted back to should be **sixty**.
Then, **count backwards** in **multiples of 10s** forty less aloud in number order, whilst touching the numbers on the number line.
Next, the number counted back to should be **twenty**.
Finally, ninety subtract thirty subtract forty equals twenty.

Concrete Object

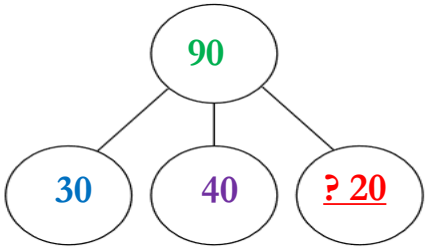


Column Subtraction

10s	1s
9	0
- 3	0
6	0

10s	1s
6	0
- 4	0
2	0

Part Whole Model



Bar Model

90		
30	40	? 20

Test Questions

1) 90 - 30 - 40 = ___

2) 90 - 10 - 50 = ___

3) 80 - 30 - 30 = ___

4) 100 - 20 - 30 = ___

5) 300 - 50 - 100 = ___

6) 500 - 300 - 20 = ___

7) 50p - 10p - 20p = ___

8) £90 - £50 - £40 = ___

9) 210cm - 40cm - 30cm = ___

10) 240m - 50m - 60m = ___

11) ___ = 170 - 90 - 60

12) ___ = 450 - 150 - 150

13) ___ = 390 - 90 - 70

14) ___ = 600 - 200 - 100

Multiples of 4, 8, 25, 100

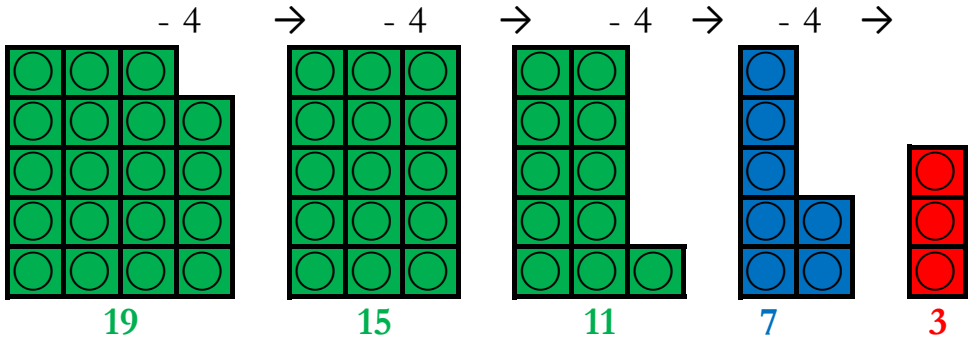
In the **number pattern** below, find the next two missing numbers.

1) **19, 15, 11, ? ?**

Word Problem

Find the **rule** to make the **number pattern** of **nineteen**, **fifteen** and **eleven**.
Find the next two **terms** by continuing the same number pattern.

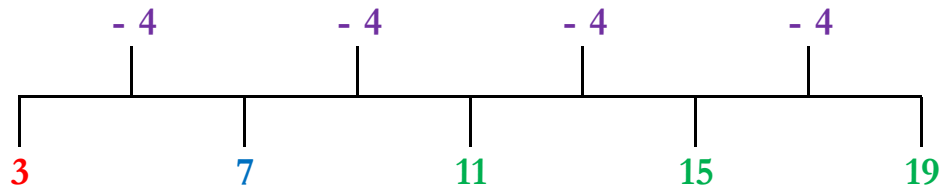
Concrete Object



Strategy Applied

Work out the **number pattern**, by finding out the **difference between** the **three** numbers.
The difference between each of the **three** numbers is known as the **rule**.
First, **count backwards** from **nineteen** to **fifteen** equalling **four**, the rule is **-4**.
Then, count backwards from **fifteen** to **eleven** equalling **four**, the rule is **-4**.
The rule is **-4** (**count back four**) to each of the numbers in the number pattern.
Continue this number pattern to find the next two missing numbers.
Next, find **eleven** on the number line and count back **four less**, equal to **seven**.
Then, find **seven** on the number line and count back **four less**, equal to **three**.
Finally, the next two missing numbers in the number pattern are **seven** and **three**.

Number Line



Test Questions

1) 19, 15, 11, ___, ___

2) 38, 34, 30, ___, ___

3) 50, 46, 42, ___, ___

4) 76, 72, 68, ___, ___

5) 51, 43, 35, ___, ___

6) 63, 55, 47, ___, ___

7) 75, 67, 59, ___, ___

8) 105, 97, 89, ___, ___

9) 100, 75, 50, ___, ___

10) 200, 175, 150, ___, ___

11) 300, 275, 250, ___, ___

12) 400, 375, 350, ___, ___

13) 741, 641, 541, ___, ___

14) 962, 862, 762, ___, ___

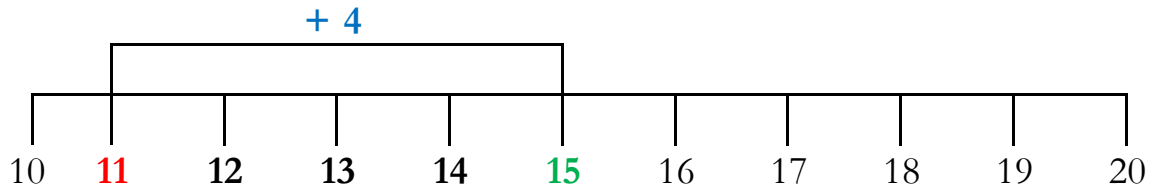
Doubling

1) 15 - 2 - 2 = ?

Word Problem

Fifteen children's toothbrushes are being given away by a dentist today.
By 11 a.m. she had given away two **lots of** two toothbrushes.
How many are left?

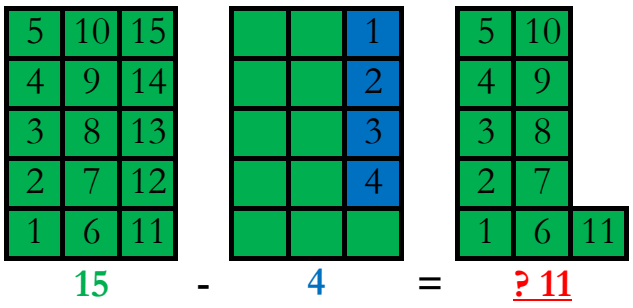
Number Line



Strategy Applied

Use **doubling**, two add two **equals** four.
First, find and touch the number fifteen on a number grid.
Then, **count backwards** four less aloud in number order, whilst touching the numbers on the number grid.
Next, the number counted back to should be eleven.
Finally, fifteen minus four equals eleven.

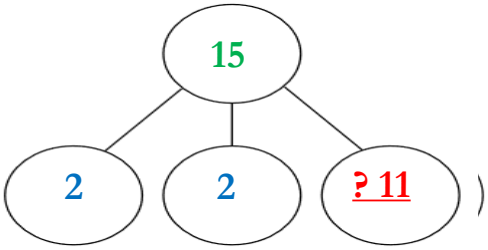
Concrete Object



Column Subtraction

	10s	1s
	1	5
-		4
	1	1

Part Whole Model



Bar Model

15		
2	2	? 11

Test Questions

1) 15 - 2 - 2 = ___

2) 22 - 5 - 5 = ___

3) 29 - 3 - 3 = ___

4) 36 - 6 - 6 = ___

5) 43 - 8 - 8 = ___

6) 57 - 7 - 7 = ___

7) 68 - 9 - 9 = ___

8) 75 - 10 - 10 = ___

9) 80 - 15 - 15 = ___

10) 90 - 11 - 11 = ___

11) ___ = 37 - 13 - 13

12) ___ = 49 - 14 - 14

13) ___ = 77 - 25 - 25

14) ___ = 98 - 30 - 30

Expanded Column Subtraction

1) **735 - 246 = ?**

Word Problem

Seven hundred and thirty five pages long, is my son's book. He has read **two hundred and forty six** pages in 2 wks. How many pages **left** to read**?**

Step 1

	100s	10s	1s
		20	
	700	~~30~~	15
-	200	40	6

Step 2

	100s	10s	1s
		20	
	700	~~30~~	15
-	200	40	6
			9

Step 3

	100s	10s	1s
	600	120	
	~~700~~	~~30~~	15
-	200	40	6
			9

Step 4

	100s	10s	1s
	600	120	
	~~700~~	~~30~~	15
-	200	40	6
	400	80	9

Strategy Applied

Step 1

In the **1s** column, 5 subtract 6, you cannot do as 5 is a **lower value** than 6.
Exchange/Regroup 1 ten into **10 ones** from the **10s** column to the **1s** column.
Cross out the 30 and write **20** above, then write the **exchanged/regrouped 1 ten** next to the 5 **ones** to make 15.

Step 2

In the **1s** column, 15 subtract 6, equals **9** (9 **ones**).
Write **9** in the **total value** of the **1s** column.
In the **10s** column, **20** subtract 40,you cannot do as **20** is a **lower value** than 40.

Step 3

Exchange/Regroup **1** hundred into **10** tens from the **100s** column to the **10s** column.

Cross out the 700 and write **600** above, then write the **exchanged/ regrouped** **1** **hundred** next to the **20** to make **120**.

Step 4

In the **10s** column, **120** subtract 40, equals **80** (8 **tens**).

Write **80** in the **total value** of the **10s** column.

In the **100s** column, **600** subtract 200, equals **400** (4 **hundreds**).

Write **400** in the **total value** of the **100s** column.

Add **altogether** the **partitioned** values, **400** + **80** + **9.**

Total value **489**.

Test Questions

1) 700 - 20 - 5
- 200 - 40 - 6

2) 400 - 50 - 7
- 200 - 40 - 8

3) 600 - 40 - 0
- 500 - 60 - 9

4) 800 - 00 - 4
- 500 - 60 - 8

5) 300 - 00 - 0
- - 90 - 4

6) 400 - 00 - 0
- - 90 - 3

Column Subtraction

1) **795 - 246** = **?**

Word Problem

A holiday costs **seven hundred and ninety five** pounds. If you pay a deposit of **two hundred and forty six** pounds. How much is **left** to pay**?**

Step 1

		8	
	7	9	15
-	2	4	6

Step 2

		8	
	7	9	15
-	2	4	6
		4	9

Step 3

		8	
	7	9	15
-	2	4	6
	5	4	9

Strategy Applied

Step 1

In the **1s** column, 5 subtract 6, you cannot do as 5 is a **lower value** than 6. **Exchange/Regroup 1 ten** into **10 ones** from the **10s** column to the **1s** column.

Cross out the 9 **tens** and write **8 tens** above, then write the **exchanged/ regrouped 1 ten** next to the 5 **ones** to make 15 **ones**.

Step 2

In the **1s** column, **15** subtract 6, equals 9 **ones** (**9**).

Write **9** in the **total value** of the **1s** column.

In the **10s** column, **8** subtract 4, equals 4 **tens** (**40**).

Write **4** in the **total value** of the **10s** column.

Step 3

In the **100s** column, 7 subtract 2, equals 5 **hundreds** (**500**).

Write **5** in the **total value** of the **100s** column.

Total value is **549**.

Column Subtraction

1) **804 - 568** = **?**

Step 1

	7		
	8	^{1}0	4
-	5	6	8

Step 2

	7	9	
	8	^{1}0	^{1}4
-	5	6	8

Step 3

	7	9	
	8	^{1}0	^{1}4
-	5	6	8
	2	3	6

Strategy Applied

Step 1

In the **1s** column, 4 subtract 8, you cannot do as 4 is a **lower value** than 8.
From the **10s** column, **regroup** 1 **ten** from the 0 **tens,** you cannot do this as the value of the **tens** is zero.
Instead, **exchange/regroup** 1 **hundred** into 10 **tens** from the **100s** column to the **10s** column.
Cross out the 8 **hundreds** and write 7 **hundreds** above, then write the **exchanged/regrouped** 1 **hundred** next to the 0 **tens** to make 10 **tens**.

Step 2

In the **10s** column, **exchange/regroup** 1 **ten** into 10 **ones** from the **10s** column to the **1s** column.
Cross out the 10 tens and write 9 **tens** above, then write the **exchanged/regrouped** 1 **ten** next to the 4 **ones** to make 14 **ones**.

Step 3

In the **1s** column, 14 subtract 8, equals 6 **ones** (6).
Write 6 in the **total value** of the **1s** column.
In the **10s** column, 9 subtract 6, equals 3 **tens** (30).
Write 3 in the **total value** of the **10s** column.
In the **100s** column, 7 subtract 5, equals 2 **hundreds** (200).
Write 2 in the **total value** of the **100s** column.
Total value is 236.

Column Subtraction

1) **300 - 94 = ?**

Step 1

	2		
	~~3~~	¹0	0
-		9	4

Step 2

	2	9	
	~~3~~	¹~~0~~	¹0
-		9	4

Step 3

	2	9	
	~~3~~	¹~~0~~	¹0
-		9	4
	2	0	6

Strategy Applied

Step 1

In the **1s** column, 0 subtract 4, you cannot do as 0 is a **lower value** than 4.
From the **10s** column, **regroup** 1 **ten** from the 0 **tens** to the **1s** column, you cannot do as the value of the **tens** is zero.
Instead, **exchange/regroup** 1 **hundred** into 10 **tens** from the **100s** column to the 10s column.
Cross out the 3 **hundreds** and write 2 **hundreds** above, then write the **exchanged/regrouped** 1 **hundred** next to the 0 **tens** to make 10 **tens**.

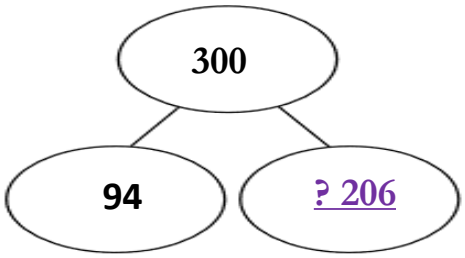
Step 2

In the **10s** column, **exchange/regroup** 1 **ten** into 10 **ones** from the **10s** column to the **1s** column.
Cross out the 10 tens and write 9 **tens** above, then write the **exchanged/regrouped** 1 **ten** next to the 0 **ones** to make 10 **ones**.

Step 3

In the **1s** column, 10 subtract 4, equals 6 **ones** (6).
Write 6 in the **total value** of the **1s** column.
In the **10s** column, 9 subtract 9, equals 0 **tens** (0).
Write 0 in the **total value** of the **10s** column.
In the **100s** column,**2** subtract 0, equals 2 **hundreds** (200).
Write 2 in the **total value** of the **100s** column.
Total value is 206.

Part Whole Model



Bar Model

300	
94	? 206

Test Questions

1) 7 9 5
- 2 4 6

2) 4 5 7
- 2 4 8

3) 6 9 3
- 2 4 4

4) 9 5 7
- 4 6 5

5) 6 7 9
- 4 8 3

6) 5 6 8
- 3 9 4

7) 8 4 0
- 5 6 9

8) 7 3 0
- 4 4 8

9) 7 5 0
- 6 5 3

10) 8 0 4
- 5 6 8

11) 6 0 6
- 4 8 7

12) 9 0 5
- 6 3 5

13) 3 0 0
- 9 4

14) 4 0 0
- 9 3

15) 2 0 0
- 8 3

Find the Missing Number

1) 450 - ? = 310 + 100

Word Problem

Train A has **four hundred and fifty** seats, more seats than **Train B**. Train B has **three hundred and ten** 2nd class seats and **one hundred** 1st class seats. How many more seats does Train A have than Train B?

Step 1

Partitioning

$$\begin{array}{rrrcrrrcrrr} 3 & 0 & 0 & + & 1 & 0 & 0 & = & 4 & 0 & 0 \\ & 1 & 0 & + & & & 0 & = & & 1 & 0 \\ \hline & & & & & & & & 4 & 1 & 0 \end{array} +$$

Column Addition

$$\begin{array}{rrr} & 3 & 1 & 0 \\ + & 1 & 0 & 0 \\ \hline & 4 & 1 & 0 \end{array}$$

First, add together the **known number sentence**, which is 310 + 100. Then, **partition** both numbers into **100s**, **10s**, **1s** and add together the relative **digit values**. 310= 300 + 10 + 0 and 100= 100 + 0 + 0. Next, as above add the partitioned digit values of each place value. Finally, 310 + 100 = 410.

Step 2

Partitioning

$$\begin{array}{rrrcrrrcrrr} 4 & 0 & 0 & - & 4 & 0 & 0 & = & & & 0 \\ & 5 & 0 & - & & 1 & 0 & = & & 4 & 0 \\ \hline & & & & & & & & & 4 & 0 \end{array} +$$

Column Subtraction

$$\begin{array}{rrr} & 4 & 5 & 0 \\ - & 4 & 1 & 0 \\ \hline & 0 & 4 & 0 \end{array}$$

New known facts 450 - ? = 410 or 450 - 410 = ?

First, subtract the **known number sentence**, which is 450 - 410 = ?. Then, **partition** both numbers into **100s**, **10s**, **1s** and subtract the relative **digit values**. 450= 400 + 50 + 0 and 410= 400 + 10 + 0. Next, as above subtract the partitioned digit values of each place value. Finally, 450 - 410 = 40.

Test Questions

1) 450 - ___ = 310 + 100

2) 35 + ___ - 18 = 27

3) 350 - ___ - 45 = 185

4) 1kg - 560g = ___

5) 1 minute 22 seconds - 42 seconds = ___

6) £800 - £___ = £700

7) 850 - 100 - 10 = ___

8) Four hundred and sixty eight subtract forty = ___

9) 76 + ___ - 35 = 65

10) 832 = 512 + 394 - ___

11) 950 - 200 - 30 = ___

12) Seven hundred and twenty eight subtract fifty = ___

13) 65 - ___ - 19 = 27

14) 732 = 610 + 357 - ___

Repeated Addition

1) 5 x 4 = ?

Word Problem

There are **five** toy boxes that have **four** toys in each box.
How many toys are there **altogether?**

Number Line

0	1	2	3	4	**5**	6	7	8	9	**10**	11	12	13	14	**15**	16	17	18	19	**20**

Strategy Applied

Five times **four** is the same as **four groups of** or **lots of five**.
First, find and touch the number **zero** on a number line.
Then, **count forwards five** more aloud in number order, whilst touching the numbers on the number line, on to the number **five**.
Next, **count forwards five** more aloud in number order, whilst touching the numbers on the number line, on to the number **ten**.
Then, **count forwards five** more aloud in number order, whilst touching the numbers on the number line, on to the number **fifteen**.
Next, **count forwards five** more aloud in number order, whilst touching the numbers on the number line, on to the number **twenty**.
Finally, **five** times **four** equals **twenty**.

Concrete Object

5	5	5	5	5	10	15	20
4	4	4	4	4	9	14	19
3	3	3	3	3	8	13	18
2	2	2	2	2	7	12	17
1	1	1	1	1	6	11	16

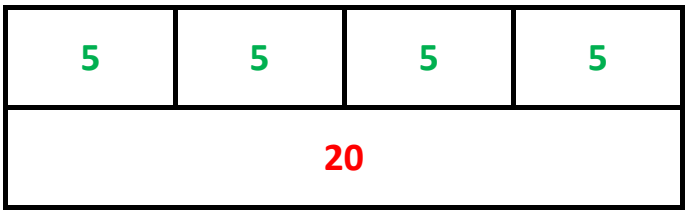
5 + 5 + 5 + 5 = ? 20

Column Addition

	10s	**1s**
		5
		5
		5
+		5
	2	0
	2	

Regroup 20 ones into 2 ten

Bar Model



Test Questions

1) 5 x 4 = ___

2) 4 x 6 = ___

3) 7 x 4 = ___

4) 8 x 3 = ___

5) 7 x 3 = ___

6) 5 x 3 = ___

7) 4 x 9 = ___

8) 3 x 3 = ___

9) 8 x 4 = ___

10) 6 x 3 = ___

11) 10 x 3 = ___

12) 2 x 11 = ___

13) 5 x 4 = ___

14) 12 x 10 = ___

Step Counting

1) 8 x ? = 40

Word Problem

One minibus holds **eight** people.
How many minibuses are needed for **forty** people**?**

Number Line

0	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

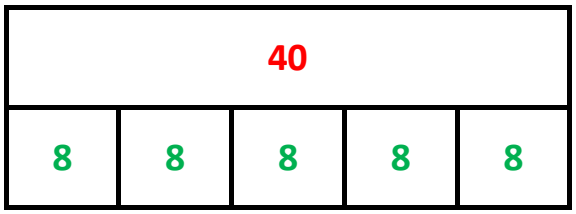
Strategy Applied

The **eight** **represents** the **value** in each group, the **multiplicand**.
The **missing number** **represents** how many **groups** there are, the **multipli**
The **forty** **represents** the **total value** of a **number of** **groups of** **eight**,
the **product**.
For **step counting** each **lot of** **eight** is **added on** one at a time up to **forty**,
expressing the **number value** as it is **counted on**.
First, find and touch the number **zero** on a number line.
Then, **count forwards** **eight** more aloud in number order, whilst touching
the numbers on the number line, on to the number **eight**.
Next, **count forwards** **eight** more aloud in number order, whilst touching
the numbers on the number line, on to the number **sixteen**.
Then, **count forwards** **eight** more aloud in number order, whilst touching
the numbers on the number line, on to the number **twenty four**.
Next, **count forwards** **eight** more aloud in number order, whilst touching
the numbers on the number line, on to the number **thirty two**.
Then, **count forwards** **eight** more aloud in number order, whilst touching
the numbers on the number line, on to the number **forty**.
Finally, **five** **lots of** **eight** equals **forty**.

Step Counting

8 → 16 → 24 → 32 → 40

Bar Model



Test Questions

1) 8 x ___ = 40

2) 5 x ___ = 45

3) 3 x ___ = 18

4) 4 x ___ = 28

5) 2 x ___ = 24

6) ___ x 2 = 14

7) ___ x 4 = 28

8) ___ x 3 = 27

9) ___ x 5 = 55

10) ___ x 8 = 16

11) 4 x 11 = ___

12) 3 x 7 = ___

13) 3 x 12 = ___

14) 4 x 7 = ___

x10

1) 7 x 10 = ?

Word Problem

At the Olympics there are ten **groups of** seven athletes from different countries competing. How many athletes are there **altogether?**

Place Value Grid

Hundreds 100s	Tens 10s	Ones 1s
		7
	7	0

Strategy Applied

Multiplying any number by ten, means that number will become **ten times as big as**.
Each **digit** in the number will move **one column place value** to the **left**.
First, write the number seven on a **place value grid**, in the **1s** column.
Then, multiply the seven by ten by writing seven in the **10s** column, as it moves **one column place value** to the **left** and becomes **ten times as big as**.
Next, in the **1s** column next to the seven cannot be left blank as it still has a **value**, write zero, a **place holder**.
Finally, seven multiplied by ten equals seventy.

Step Counting

7 → 14 → 21 → 28 → 35 → 42 → 49 → 56 → 63 → 70

Bar Model

7	7	7	7	7	7	7	7	7	7
70									

Test Questions

1) 7 x 10 = ___

2) 4 x 10 = ___

3) 17 x 10 = ___

4) 8 x 10 = ___

5) 14 x 10 = ___

6) 5 x 10 = ___

7) 15 x 10 = ___

8) 3 x 10 = ___

9) 18 x 10 = ___

10) 6 x 10 = ___

11) 10 x 22 = ___

12) 10 x 24 = ___

13) 10 x 23 = ___

14) 10 x 25 = ___

2-Digit by 1-Digit

1) 16 x 3 = ?

Word Problem

A school has to purchase new chairs for **three** classes during the summer.
Each class needs **sixteen** chairs each.
How many chairs **altogether** does the school have to buy**?**

Number Line

0	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

Partitioning

$$\begin{array}{rrcrcrr} 1 & 0 & \text{x} & 3 & = & 3 & 0 \\ 6 & & \text{x} & 3 & = & 1 & 8 \quad + \\ \hline & & & & & 4 & 8 \\ \hline \end{array}$$

Column Addition

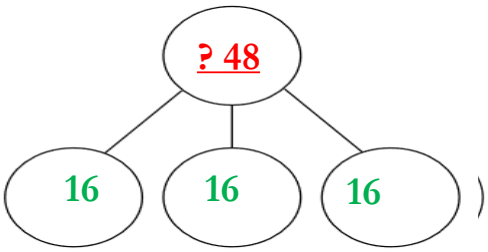
$$\begin{array}{rrr} & \underline{\text{10s}} & \underline{\text{1s}} \\ & 1 & 6 \\ + & 1 & 6 \\ & 1 & 6 \\ \hline & 4 & 8 \\ \hline & 1 & \end{array}$$

Regroup 10 ones into 1 ten.

Strategy Applied

Partition the number **sixteen** into the **digit values** of **10s** and **1s**, **10** + **6** (**multiplicand**) and multiply each digit value by **three**, the **multiplier**.
First, multiply **ten** by **three**, equal to **thirty**.
Then, multiply **six** by **three**, equal to **eighteen**.
Next, use column addition to add **thirty** and **eighteen**, equal to **forty eight**.
Finally, **sixteen** multiplied by **three** equals **forty eight**.

Part Whole Model



Bar Model

16	16	16
? 48		

Test Questions

1) 16 x 3 = ___

2) 14 x 4 = ___

3) 12 x 5 = ___

4) 24 x 2 = ___

5) 25 x 3 = ___

6) 24 x 4 = ___

7) 33 x 5 = ___

8) 37 x 2 = ___

9) 36 x 3 = ___

10) 32 x 4 = ___

11) ___ = 43 x 5

12) ___ = 54 x 6

13) ___ = 62 x 7

14) ___ = 71 x 8

Grid Method

1) 1 3 5 x 2 = ?

Word Problem

Car Park A and **Car Park B** each have **one hundred and thirty five** free parking spaces on Bank Holiday Monday.
How many free parking spaces are there **altogether?**

Grid Method

x	100	30	5
2	200	60	10

Partitioning

200 + 60 + 10 = 270

Column Addition

	100s	10s	1s
	2	0	0
		6	0
		1	0
+	2	7	0

Strategy Applied

Step 1

Partition 135 x 2 into each of their digit **values and** write them in a grid, (100 + 30 + 5) x (2).

Step 2

Multiply **5 ones** by 2, equals **10 ones**.

Step 3

Multiply **30 ones** (3 **tens**) by 2, equals **60 ones** (6 **tens**).

Step 4

Multiply **100 ones** (1 **hundred**) by 2, equals **200 ones** (2 **hundreds**).

Step 5

Use **Column Addition** to add the amounts, 10 + 60 + 200.
Total value is 270.

Test Questions

1)

x	100	30	5
2			

___ + ___ + ___ = ___

2)

x	100	80	5
3			

___ + ___ + ___ = ___

3)

x	200	40	3
4			

___ + ___ + ___ = ___

4)

x	200	50	3
5			

___ + ___ + ___ = ___

5)

x	300	60	2
6			

___ + ___ + ___ = ___

6)

x	300	70	2
7			

___ + ___ + ___ = ___

7)

x	400	10	6
8			

___ + ___ + ___ = ___

8)

x	400	20	6
9			

___ + ___ + ___ = ___

9)

x	500	0	7
3			

___ + ___ + ___ = ___

10)

x	500	8	0
4			

___ + ___ + ___ = ___

Ladder Method

1) **1 2 9 x 7 = ?**

Word Problem

Seven farmers have an equal amount of sheep, **one hundred and twenty nine**. How many sheep do all the farmers have **collectively?**

Step 1

	1	**2**	**9**
x			**7**
		6	**3**
+			

Step 2

	1	**2**	**9**
x			**7**
		6	**3**
	1	**4**	**0**
+			

Step 3

	1	**2**	**9**
x			**7**
		6	**3**
	1	**4**	**0**
+	**7**	**0**	**0**

Step 4

	1	**2**	**9**
x			**7**
		6	**3**
	1	**4**	**0**
+	**7**	**0**	**0**
			3

Step 5

	1	**2**	**9**
x			**7**
		6	**3**
	1	**4**	**0**
+	**7**	**0**	**0**
		0	**3**
	1		

Step 6

	1	**2**	**9**
x			**7**
		6	**3**
	1	**4**	**0**
+	**7**	**0**	**0**
	9	**0**	**3**
	1		

Strategy Applied

Step 1

In the **1s** column, multiply **9** by **7**, equals **63 ones** (60 + 3).
In the first line of working out, write **3** below the 7 in the **1s** column and write **6** below the 2 in the **10s** column.

Step 2

In the **10s** column**,** multiply (20) **2** by **7**, equals **140 ones** (100 + 40 + 0).
In the second line of working out, write **0** in the **1s** column, write **4** in the **10s** column and write **1** in the **100s** column.

Step 3

In the **100s** column, multiply (100) **1** by **7**, equals **700** **ones** (700 + 0 + 0)
In the third line of working out, write **0** in the **1s** column, write **0** in the **10s** column and write **7** in the **100s** column.

Step 4

Use **Column Addition** to add **altogether** , **63** + **140** + **700**.
In the **1s** column add **altogether**, 3 + **0** + **0**, equals 3 **ones** (**3**).
Write **3** in the **total value** of the **1s** column.

Step 5

In the **10s** column add **altogether**, **6** + **4** + **0**, equals 10 **tens** (**10** + **0**).
Write **0** in the **total value** of the **10s column**.
Exchange/Regroup the **10** **tens** into **1** **hundred** from the **10s** column to the **100s** column.
Write **1** **hundred** below the **total value line** of the **100s** column.

Step 6

In the **100s** column add **altogether**, **1** + **7** + **1**, equals 9 **hundreds** (**900**).
Write **9** in the **total value** of the **100s** column.
Total value is **903**.

Test Questions

1) 1 3 5 x 6 = ___

2) 3 0 4 x 8 = ___

3) 2 7 9 x 3 = ___

4) 2 5 7 x 5 = ___

5) 1 3 8 x 4 = ___

6) 2 6 0 x 8 = ___

7) 2 0 6 x 7 = ___

8) 3 4 0 x 9 = ___

Short Multiplication

1) 1 3 9 x 5 = ?

Word Problem

There are multiple boat trips going to the seaside. **Five** boats **each** carrying **one hundred and thirty nine** passengers. How many passengers are there**?**

Step 1

```
  1 3 9
x     5
-------
    5
-------
  4
```

Step 2

```
  1 3 9
x     5
-------
  9 5
-------
1 4
```

Step 3

```
  1 3 9
x     5
-------
6 9 5
-------
1 4
```

Strategy Applied

Step 1

In the **1s** column, multiply **9** by **5** , equals 45 **ones** (**40** + **5**).
Write **5** in the **total value** of the **1s** column
Exchange/Regroup the **40** **ones** into **4** **tens** from the **1s** column to the **10s** column and write **4** **tens** below the **total value line** of the **10s** column.

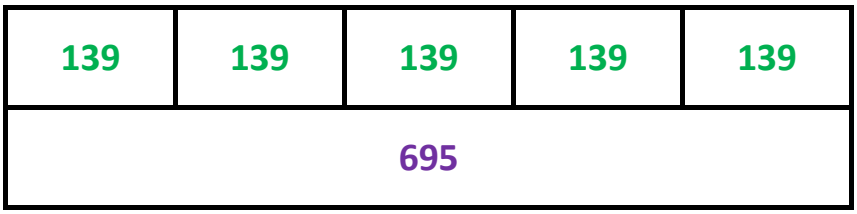
Step 2

In the **10s** column, multiply (30) **3** by **5**, equals 15 **tens** (**100** + **50**).
Add the **exchanged/regrouped** **4** **tens** (40) below, equals 19 **tens** (**100** + **90**).
Write **9** in the **total value** of the **10s** column**.**
Exchange/Regroup the **10** **tens** into **1** **hundred** from the **10s** column to the **100s** column and write **1** below the **total value line** of the **100s** column.

Step 3

In the **100s** column, multiply (100) **1** by **5**, equals 5 **hundreds** (**500**).
Add the **exchanged/regrouped** **1** **hundred** (100) below, equals 6 **hundreds** (**600**).
Write **6** in the **total value** of the **100s** column.
Total value is **695**.

Bar Model



Test Questions

1) 135 x 6

2) 137 x 8

3) 139 x 9

4) 257 x 5

5) 279 x 3

6) 468 x 4

7) 340 x 9

8) 260 x 8

9) 590 x 6

10) 304 x 8

11) 206 x 7

12) 906 x 8

13) 138 x 4

14) 452 x 3

15) 367 x 7

Find the Missing Number

1) 2 x ? = 4 x 6

Word Problem

Four pencil cases hold **six** gel pens each. A further **two** pencil cases hold exactly the **same number** of gel pens.
How many gel pens are there in each of the other **two** pencil cases**?**

Step 1

6 → 12 → 18 → 24
● ● ● ●

Strategy Applied

Step 1

Calculate the **known number sentence** 4 x 6, using **step counting**.
There are **six lots of four**,

First, find and touch the number **six** on a number grid or line and write it down as shown above.
Then, **count forwards six** more aloud in number order which is equal to **twelve**, then count forwards **six** more which is equal to **eighteen** and count forwards **six** more which is equal to **twenty four**.

Step 2

2 → 4 → 6 → 8 → 10 → 12
● ● ● ● ● ●

14 → 16 → 18 → 20 → 22 → 24
● ● ● ● ● ●

Step 2

New **known fact** 2 x **?** = 24 .

Apply **step counting** to calculate the **missing number**, the **multiplier**, by counting on in **lots of twos** up to **twenty four**.

First, find and touch the number **two** on a number grid or line and write it down as shown.

Then, **count forwards two more** aloud in number order which is equal to **four**, then **two** more equal to **six**, next **two** more equal to **eight,** then **two** more equal to **ten**, next **two** more equal to **twelve** and keep repeating this action stopping at the number **twenty four**.

Finally, there are **twelve lots of twos** make **twenty four**.

Test Questions

1) 2 x ___ = 4 x 6

2) 3 x ___ x 10 = 90

3) 4 x 12 = 8 x ___

4) 5 x ___ x 6 = 90

5) 6 x 12 = 8 x ___

6) 2 x 4 x 10 = ___

7) 2 x 7 x 5 = ___

8) ___ = 4 x 5 x 6

9) 2 x 25 = 50 - ___

10) 3 x 35 = 150 - ___

11) 400 - ___ = 3 x 27

12) 100 - ___ = 7 x 13

13) 500 - ___ = 4 x 37

14) 200 - ___ = 8 x 23

Repeated Subtraction

1) 24 ÷ 8 = ?

Word Problem

Eight seats are arranged in rows. There are **twenty four** seats in **total**.
How many rows of chairs are there**?**

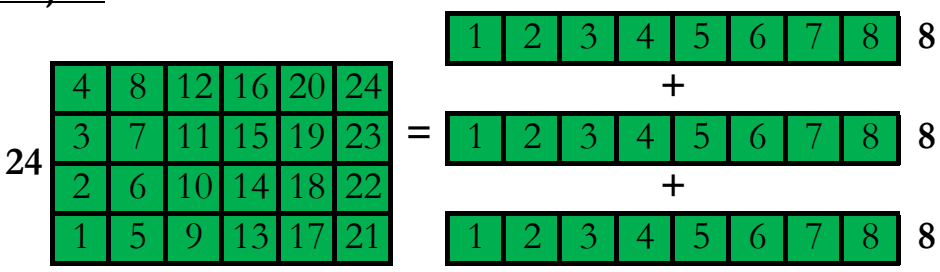
Number Line

0	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

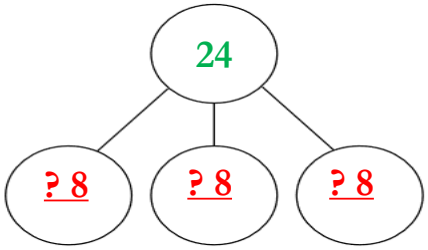
Strategy Applied

Count backwards in **lots of eights** from **twenty four** to **zero** and how many **lots of eights** counted back will be the **missing number**.
First, find and touch the number **twenty four** on a number line.
Then, **count backwards eight** less aloud in number order, whilst touching the numbers on the number line, back to the number **sixteen**.
Next, **count backwards eight** less aloud in number order, whilst touching the numbers on the number line, back to the number **eight**.
Then, **count backwards eight** less aloud in number order, whilst touching the numbers on the number line, back to the number **zero**.
Finally, the **value** of the missing number is **three**.

Concrete Object



Part Whole Model



Bar Model

24		
? 8	? 8	? 8

Test Questions

1) 24 ÷ 8 = ___

2) 66 ÷ 6 = ___

3) 56 ÷ 8 = ___

4) 14 ÷ 7 = ___

5) 88 ÷ 11 = ___

6) 50 ÷ 10 = ___

7) 15 ÷ 3 = ___

8) 36 ÷ 4 = ___

9) 21 ÷ 3 = ___

10) 96 ÷ 12 = ___

11) 20 ÷ 2 = ___

12) 90 ÷ 10 = ___

13) 70 ÷ 10 = ___

14) 55 ÷ 5 = ___

Inverse of Division

1) ? ÷ 3 = 7

Word Problem

At lunchtime, **seven** friends share out a packet of football cards **equally** between them, getting **three** cards each. How many cards were in the packet

Number Line

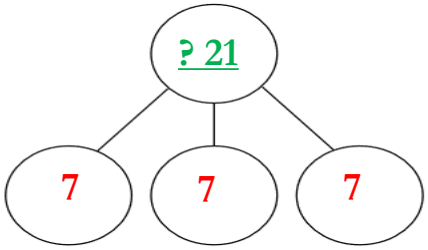
0	1	2	3	4	5	6	**7**	8	9	10	11	12	13	**14**	15	16	17	18	19
20	**21**	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

Strategy Applied

The **missing number** **represents** the **total value**, the **dividend**.
The **three** **represents** how many **groups of seven**, the **divisor**.
The **seven** **represents** the **value** in each group, the **quotient**.

Use the **inverse** of **division** which is **multiplication**, 7 x 3 = ?
Apply **step counting** to calculate the **missing number**, the **dividend**, by counting on **three** **lots of seven**.
First, find and touch the number **zero** on a number line.
Then, **count forwards seven** more aloud in number order, whilst touching the numbers on the number line, on to the number **seven**.
Then, **count forwards seven** more aloud in number order, whilst touching the numbers on the number line, on to the number **fourteen**.
Then, **count forwards seven** more aloud in number order, whilst touching the numbers on the number line, on to the number **twenty one**.
Finally, **three** groups of **seven** equals **twenty one**.

Part Whole Model



Bar Models

? 21		
7	7	7

Test Questions

1) ___ ÷ 3 = 7

2) ___ ÷ 2 = 5

3) ___ ÷ 4 = 5

4) ___ ÷ 5 = 9

5) ___ ÷ 8 = 5

6) 48 ÷ ___ = 8

7) 55 ÷ ___ = 11

8) 36 ÷ ___ = 4

9) 36 ÷ ___ = 3

10) 3 ÷ ___ = 3

11) 36 ÷ 9 = ___

12) 32 ÷ 8 = ___

13) 33 ÷ 3 = ___

14) 48 ÷ 4 = ___

÷10

1) 360 ÷ 10 = ?

Word Problem

When £360.00 in lottery ticket money is shared out **equally** among ten work colleagues. How much money do they **each** receive?

Place Value Grid

Hundreds 100s	Tens 10s	Ones 1s
3	6	0
	3	6

Strategy Applied

Dividing any number by **ten**, means that number will become **ten times as small as**.
Each **digit** in the number will move **one column place value** to the **right**.
First, write the number **three hundred and sixty** on a **place value grid**.
Then, divide the **three hundred and sixty** by **ten** by writing **three** in the **10s** column , as it moves **one column place value** to the **right**.
Next, write **six** in the **1s** column, as it moves **one column place value** to the **right**.
The **zero** in **three hundred and sixty** is in the **lowest column place value**, the **1s** and a **place holder**, it will not be divided by ten and move columns.
Finally, **three hundred and sixty** divided by **ten** is equal to **thirty six**.

Step Counting

36 ← 72 ← 108 ← 144 ← 180 ← 216 ← 252 ← 288 ← 324 ← 360

Bar Model

360									
36	36	36	36	36	36	36	36	36	36

Test Questions

1) 360 ÷ 10 = ___

2) 320 ÷ 10 = ___

3) 330 ÷ 10 = ___

4) 480 ÷ 10 = ___

5) 120 ÷ 10 = ___

6) 720 ÷ 10 = ___

7) 130 ÷ 10 = ___

8) 160 ÷ 10 = ___

9) 240 ÷ 10 = ___

10) 200 ÷ 10 = ___

11) 150 ÷ 10 = ___

12) 170 ÷ 10 = ___

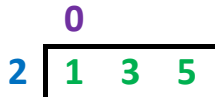
13) 230 ÷ 10 = ___

14) 190 ÷ 10 = ___

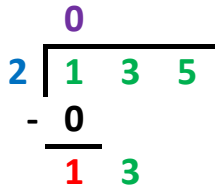
Long Division

1) 135 ÷ 2 = ?

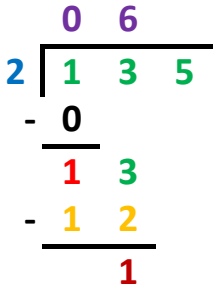
Step 1



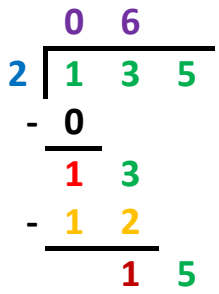
Step 2



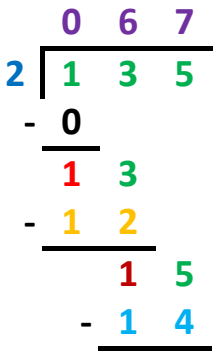
Step 3



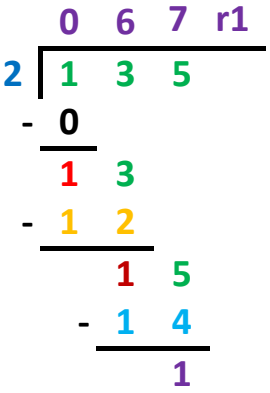
Step 4



Step 5



Step 6



Strategy Applied

Step 1

How many **lots of** 2 divide **exactly** into 1, the answer is 0. (Discuss why)
Write 0 on the line above the 1.

Step 2

Write **0** below the 1 and draw a line underneath. (Discuss why)
Then 1 subtract **0**, equals 1. Write the 1 below the **0**.
Regroup the 1 to the next **digit place value**, 3, to make 13, by writing 3 next to the 1.

Step 3

How many **lots of** 2 divide **exactly** into 13? The answer is 6 (2 x 6 = 12).
Write 6 on the line above the 3, next to the 0.
Write 12 below the 13 and draw a line underneath.
Then 13 subtract 12, equals 1. Write 1 below the 2.

Step 4

Regroup the **remainder** 1 to the next **digit place value**, 5, by writing 5 nex to the 1 to become 15

Step 5

How many **lots of** 2 divide **exactly** into 15, the answer is 7. (2 x 7 = 14).
Write 7 on the line above the 5 next to the 6.
Write 14 below the 15 and draw a line underneath.

Step 6

Then 15 subtract 14, equals 1. Write 1 below the 4.
There are no more **digits** in the number to **regroup** the 1 to. (Discuss why)
The 1 becomes a **remainder**, is written as r1 on the line above, next to the 7
Total value is 67 r1.

Test Questions

1) $2\overline{)135}$

2) $3\overline{)137}$

3) $4\overline{)132}$

4) $3\overline{)257}$

5) $4\overline{)279}$

6) $5\overline{)268}$

7) $4\overline{)340}$

8) $5\overline{)260}$

9) $6\overline{)450}$

10) $5\overline{)304}$

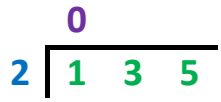
11) $6\overline{)206}$

12) $7\overline{)405}$

Short Division

1) 135 ÷ 2 = ?

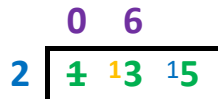
Step 1



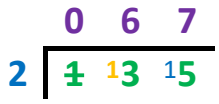
Step 2

Step 3

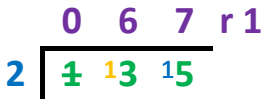
Step 4



Step 5



Step 6



Strategy Applied

Step 1

How many **lots of** 2 divide **exactly** in to 1?
The answer is 0 (Discuss why).
Write 0 on the line above the 1.

Step 2

Cross out the 1 and **regroup** the **remainder** 1 to the next **digit place value**, 3, to become 13.

Step 3

How many **lots of** 2 divide **exactly** in to 13? The answer is 6 (2 x 6 = 12), with **remainder** 1 .
Write 6 on the line above the 13.

Step 4

Regroup the **remainder** 1 to the next **digit place value,** 5, to become 15.

Step 5

How many **lots of** 2 divide **exactly** in to 15? The answer is 7 (2 x 7 = 14), with **remainder** 1.

Write 7 on the line above the 15.

Step 6

There are no more **digits** in the number to be divided by 2.

The **remainder** 1, is written as **r1** on the line above.

Total value is **67 r1**.

Test Questions

1) $2\overline{)135}$

2) $3\overline{)137}$

3) $4\overline{)132}$

4) $3\overline{)257}$

5) $4\overline{)279}$

6) $5\overline{)268}$

7) $4\overline{)340}$

8) $5\overline{)260}$

9) $6\overline{)450}$

10) $5\overline{)304}$

11) $6\overline{)206}$

12) $7\overline{)405}$

Find the Missing Number

1) 3 x 4 = 36 ÷ ?

Word Problem

Three lengths of string, each four meters long are equal to a ball of string that is thirty six meters in length, cut up in to how many equal lengths?

Step 1

3 → 6 → 9 → 12

● ● ● ●

Strategy Applied

Step 1

Out of the two number sentences, calculate the number sentence with all the **known numbers** first, 3 x 4 .

Apply **step counting** to calculate the **product** of three **times** four.

First, find and touch the number **zero** on a number grid or line and write it down as shown above.

Then, **count forwards** three more aloud in number order, whilst touching the numbers on the number line, which is equal to **three**.

Next, **count forwards** three more aloud in number order, whilst touching the numbers on the number line, which is equal to **six**.

Then, **count forwards** three more aloud in number order, whilst touching the numbers on the number line, which is equal to **nine**.

Finally, **count forwards** three more aloud in number order, whilst touching the numbers on the number line, which is equal to **twelve**.

Step 2

12 → 24 → 36

● ● ●

Step 2

If 3 x 4 = 12 , then 12 = 36 ÷ ? , as they are the **same value**
Use the **inverse** of **division**, which is **multiplication**, 12 x ? = 36
Apply **step counting** to calculate the **missing number**, by counting on in **lots of twelve** up to **thirty six**.

First, find and touch the number **twelve** on a number grid or line and write it down as shown.
Then, **count forwards twelve** more aloud in number order, whilst touching the numbers on the number line, which is equal to **twenty four**.
Next, **count forwards twelve** more aloud in number order, whilst touching the numbers on the number line, which is equal to **thirty six**.
Then, say how many **groups of twelve** were counted on up to **thirty six**.
Finally, the **value** of the missing number is **three**.

Test Questions

1) 3 x 4 = 60 ÷ ___

2) 4 x 2 = 72 ÷ ___

3) Divide thirty six by nine = ___

4) 2 x 5 = ___ ÷ 10

5) 3 x ___ = 48 ÷ 8

6) 2 x 10 = ___ ÷ 2

7) 10 x 1 = 100 ÷ ___

8) 60 ÷ ___ = 5 x 6

9) 30 ÷ ___ = 5 x 3

10) 16 ÷ ___ = 2 x 4

11) 6 ÷ ___ = 1 x 3

12) 4 ÷ ___ = 2 x 1

13) 40 ÷ ___ = 5 x 4

14) 60 ÷ ___ = 3 x 10

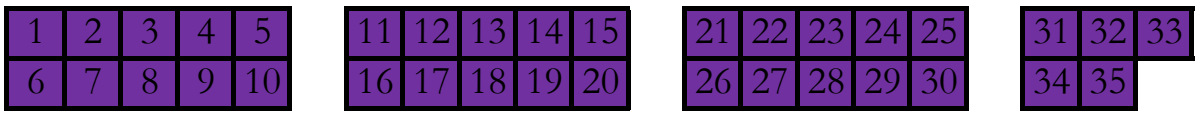
Fraction of a Quantity

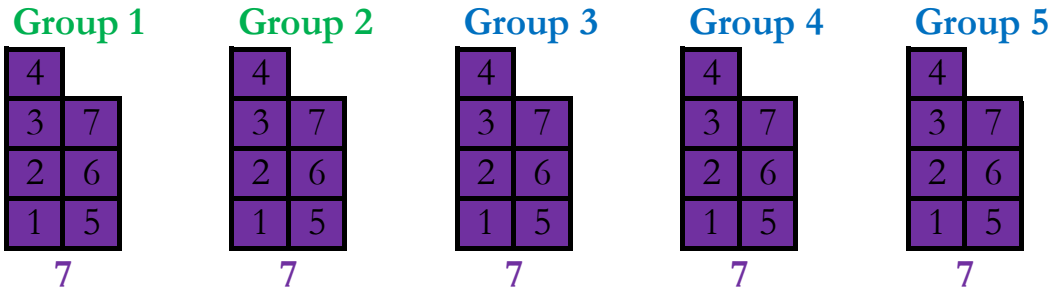
1) $\frac{2}{5}$ of 35 = ?

Word Problem

Five girls share **thirty five** multilink cubes **equally**.
How many multilink cubes will **two** of the girls have in **total?**

Concrete Object

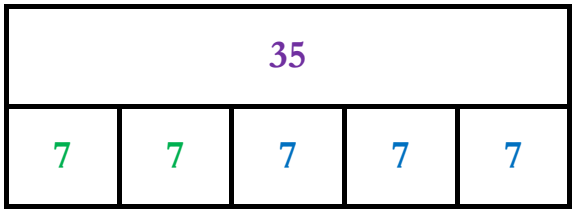




Strategy Applied

A fraction is part of a **whole** or part of **1** and a **fifth** is 1 of 5 **equal groups**.
35 is the **quantity** shared **equally** between the **total** number of **equal groups**.
5is the **denominator**, represents the **total** number of **equal groups**.
2 is the **numerator**, represents **two** of the **equal groups**.
First, pick up **thirty five** objects and place them together. Now count aloud from 1 to 35 ,to check there are only **thirty five** objects.
Then, **share** the **thirty five** objects one at a time **equally between** the **five** groups, until exactly the **same quantity** of objects are in **each** of the groups
Next, count how many objects there are **altogether** in **two groups**, there should be ten objects; **one, two, three, four, five**, **six**, **seven**, **eight**, **nine**, **ten**, **eleven**, **twelve**, **thirteen**, **fourteen**.
Finally, **two fifths** of **thirty five** equals **fourteen**.

Bar Model



Test Questions

1) $\frac{2}{5}$ of 35 = ___

2) $\frac{2}{3}$ of 15 = ___

3) $\frac{1}{4}$ of 12 = ___

4) $\frac{2}{3}$ of 30 = ___

5) $\frac{1}{2}$ of 48 = ___

6) $\frac{2}{5}$ of 25 = ___

7) $\frac{1}{3}$ of 27 = ___

8) $\frac{2}{5}$ of 30 = ___

9) $\frac{1}{2}$ of 52 = ___

10) $\frac{1}{2}$ of 36cm = ___

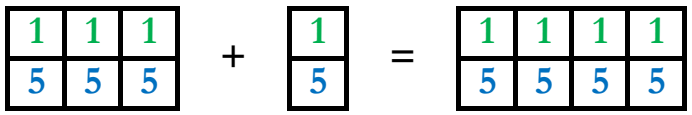
Add Fractions

1) $\frac{3}{5} + \frac{1}{5} = \frac{?}{?}$

Word Problem

Joan ate **three fifths** of Christmas Pudding and Patricia ate **one fifth** as well. Barbara would like to have some, how much has been eaten**?**

Fraction Tiles



Step 1

$\frac{3}{5} + \frac{1}{5} =$

Step 2

$\frac{3 + 1}{5} = \frac{4}{5}$

Strategy Applied

Step 1

Add two fractions with the same denominators, **three-fifths** and **one-fifths**.

The 3 represents the **numerator**.
The 5 represents the **denominator**.

$\frac{3}{5}$

The 1 represents the **numerator**.
The 5 represents the **denominator**.

$\frac{1}{5}$

Step 2

Add the **numerators** 3 + 1 equalling 4.
The **denominator** remains the **same** as 5.
The resulting fraction is **four-fifths**.

Test Questions

1) $\frac{3}{5} + \frac{1}{5} = \frac{\quad}{\quad}$

2) $\frac{2}{4} + \frac{1}{4} = \frac{\quad}{\quad}$

3) $\frac{2}{10} + \frac{7}{10} = \frac{\quad}{\quad}$

4) $\frac{4}{6} + \frac{1}{6} = \frac{\quad}{\quad}$

5) $\frac{1}{3} + \frac{2}{3} = \frac{\quad}{\quad}$

6) $\frac{1}{4} + \frac{3}{4} = \frac{\quad}{\quad}$

7) $\frac{8}{11} + \frac{2}{11} = \frac{\quad}{\quad}$

8) $\frac{3}{7} + \frac{2}{7} = \frac{\quad}{\quad}$

9) $\frac{3}{8} + \frac{3}{8} = \frac{\quad}{\quad}$

10) $\frac{1}{2} + \frac{1}{2} = \frac{\quad}{\quad}$

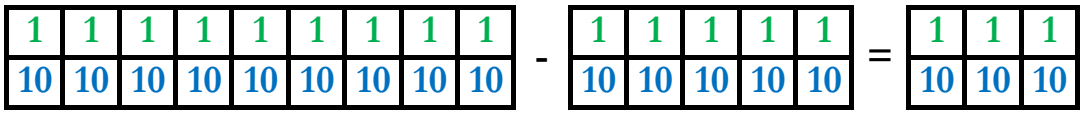
Subtract Fractions

1) $\frac{8}{10} - \frac{5}{10} = \frac{?}{?}$

Word Problem

A large pizza is cut into **ten** **equal parts** for dinner. Mum is still at work, so **two** pieces are put in the fridge for her. **Eight** pieces are left on the plate. Only **five** pieces are eaten, so how many pieces of pizza are **left** on the plate?

Fraction Tiles



Step 1

$\frac{8}{10} - \frac{5}{10} =$

Step 2

$\frac{8 - 5}{10} = \frac{3}{10}$

Strategy Applied

Step 1

Subtract two fractions with the **same denominators** and **different numerators** of **eight-tenths** and **five-tenths**.

The 8 represents the **numerator**.
The 10 represents the **denominator**.

$\frac{8}{10}$

The 5 represents the **numerator**.
The 10 represents the **denominator**.

$\frac{5}{10}$

Step 2

Subtract the **numerators** 8 - 5 equalling 3.
The **denominator** remains the **same** as 10.
The resulting fraction is **three-tenths**.

Test Questions

1) $\frac{8}{10} - \frac{5}{10} = \_\_\_$

2) $\frac{3}{4} - \frac{1}{4} = \_\_\_$

3) $\frac{8}{10} - \frac{3}{10} = \_\_\_$

4) $\frac{13}{20} - \frac{7}{20} = \_\_\_$

5) $\frac{3}{7} - \frac{1}{7} = \_\_\_$

6) $\frac{2}{3} - \frac{1}{3} = \_\_\_$

7) $\frac{14}{15} - \frac{7}{15} = \_\_\_$

8) $\frac{6}{8} - \frac{4}{8} = \_\_\_$

9) $\frac{9}{11} - \frac{7}{11} = \_\_\_$

10) $\frac{6}{8} - \frac{4}{8} = \_\_\_$

Find the Missing Number

1) $5 \div \frac{?}{} = \frac{5}{10}$

Fraction Tiles

$\frac{5}{10}$ =

1/10	1/10	1/10	1/10	1/10

Strategy Applied

Out of the two number sentences, calculate the number sentence with all the **known** numbers first, $\frac{5}{10}$

The 5 represents the **numerator**.

The 10 represents the **denominator**.

For $\frac{5}{10}$ the numerator is being **divided by** the denominator as $5 \div 10$

Therefore $5 \div 10$ is **equal** to or the **same** value as $5 \div \frac{?}{}$

Despite both **number sentences** looking different, they both represent the same calculation, **which is five** divided by **ten**. $5 \div 10$

Therefore the missing number is 10.

Test Questions

1) $5 \div \_\_\_ = \frac{5}{10}$

2) $\frac{1}{8}$ of $56 = 56 \div \_\_\_$

3) $1 - \frac{4}{5} = \_\_\_$

4) $6 \div \_\_\_ = \frac{6}{10}$

5) $8 - \_\_\_ = \frac{5}{8}$

6) $\frac{1}{4}$ of $28 = \frac{1}{2}$ of $\_\_\_$

7) $\frac{1}{2}$ of $8 = \frac{1}{4}$ of $\_\_\_$

8) $\frac{7}{10} - \_\_\_ = \frac{4}{10}$

9) $\frac{8}{8} - \_\_\_ = \frac{5}{8}$

10) $\frac{4}{5} + \_\_\_ = 1$

Answers

P. 2

1) 1 hundreds, 2 tens, 3 ones
2) 2 hundreds, 4 tens, 6 ones
3) 1 hundreds, 7 tens, 9 ones
4) 2 hundreds, 8 tens, 0 ones
5) 3 hundreds, 5 tens, 7 ones
6) 4 hundreds, 6 tens, 8 ones
7) 3 hundreds, 7 tens, 9 ones
8) 4 hundreds, 6 tens, 0 ones
9) 5 hundreds, 1 tens, 3 ones
10) 6 hundreds, 8 tens, 2 ones
11) 7 hundreds, 1 tens, 5 ones
12) 8 hundreds, 0 tens, 2 ones
13) 8 hundreds, 4 tens, 6 ones
14) 9 hundreds, 3 tens, 7 ones

P. 4

1) 100 + 20 + 3
2) 200 + 40 + 6
3) 100 + 70 + 9
4) 200 + 80 + 0
5) 300 + 50 + 7
6) 400 + 60 +8
7) 300 + 70 + 9
8) 400 + 60 + 0
9) 500 + 10 + 3
10) 600 + 80 + 2
11) 700 + 10 + 5
12) 800 + 0 + 2
13) 800 + 40 + 6
14) 900 + 30 +7

P. 6

1) 148
2) 269
3) 409
4) 465
5) 520
6) 652
7) 267
8) 358
9) 491
10) 502
11) 651
12) 756
13) 872
14) 957

P. 8

1) 176
2) 267
3) 233
4) 418
5) 370
6) 610
7) 504
8) 228
9) 427
10) 633
11) 192
12) 94
13) 335
14) 301

P. 10

1) 35
2) 26
3) 14
4) 2
5) 31p
6) 23p
7) £70
8) £50
9) 50
10) 30
11) 80
12) 50
13) 60
14) 40

P. 12

1) 90
2) 240
3) 120
4) 360
5) 700
6) 1,000
7) 80p
8) £180
9) 90cm
10) 150m
11) 220
12) 450
13) 250
14) 900

P. 14

1) 16, 20
2) 40, 44
3) 64, 68
4) 18, 22
5) 24,32
6) 56, 64
7) 80, 88
8) 27, 35
9) 75, 100
10) 150, 175
11) 80, 105
12) 85, 110
13) 300, 400
14) 800, 900

P. 16

1) 32
2) 52
3) 56
4) 32
5) 56
6) 72
7) 350
8) 850
9) 400
10) 900
11) 85
12) 76
13) 700
14) 640

Answers

P. 18

1) 432
2) 385
3) 742
4) 762
5) 693
6) 708
7) 872
8) 909
9) 232
10) 545

P. 20

1) 632
2) 385
3) 651
4) 742
5) 762
6) 1,021
7) 909
8) 708
9) 1,274
10) 872
11) 693
12) 232
13) 545
14) 697

P. 22

1) 24
2) 7
3) 25
4) 25secs
5) 59ml
6) 15p
7) 273ml
8) 102cm
9) 325cm
10) 878
11) 29
12) 21
13) 39
14) 528

P. 24

1) 248
2) 212
3) 330
4) 335
5) 479
6) 510
7) 603
8) 639
9) 769
10) 871
11) 358
12) 461
13) 599
14) 805

P. 26

1) 125
2) 305
3) 147
4) 251
5) 152
6) 715
7) 342
8) 452
9) 455
10) 807
11) 485
12) 744
13) 856
14) 728

P. 28

1) 33
2) 27
3) 18
4) 31
5) 41p
6) 43p
7) £77
8) £18
9) 100
10) 10
11) 60
12) 70
13) 50
14) 30

P. 30

1) 20
2) 30
3) 20
4) 50
5) 150
6) 180
7) 20p
8) £0
9) 140cm
10) 130m
11) 20
12) 150
13) 230
14) 300

P. 32

1) 7, 3
2) 26, 22
3) 38, 34
4) 64, 60
5) 27, 19
6) 39, 31
7) 51, 43
8) 81, 73
9) 25, 0
10) 125, 100
11) 225, 200
12) 325, 300
13) 441, 341
14) 662, 562

P. 34

1) 11
2) 12
3) 23
4) 24
5) 27
6) 43
7) 50
8) 55
9) 50
10) 68
11) 11
12) 21
13) 27
14) 38

P. 36

1) 479
2) 209
3) 71
4) 236
5) 206
6) 307

Answers

P. 38

1) 549
2) 409
3) 449
4) 492
5) 196
6) 174
7) 271
8) 282
9) 97
10) 236
11) 119
12) 270
13) 206
14) 307
15) 117

P. 40

1) 40
2) 10
3) 120
4) 440g
5) 40secs
6) £100
7) 740
8) 728
9) 24
10) 74
11) 720
12) 678
13) 19
14) 235

P. 42

1) 20
2) 24
3) 28
4) 24
5) 21
6) 25
7) 36
8) 9
9) 32
10) 18
11) 30
12) 22
13) 20
14) 120

P. 44

1) 5
2) 9
3) 6
4) 7
5) 12
6) 7
7) 7
8) 9
9) 11
10) 2
11) 44
12) 21
13) 36
14) 28

P. 46

1) 70
2) 40
3) 170
4) 80
5) 140
6) 50
7) 150
8) 30
9) 180
10) 60
11) 220
12) 240
13) 230
14) 250

P. 48

1) 48
2) 56
3) 60
4) 48
5) 75
6) 96
7) 165
8) 74
9) 108
10) 128
11) 215
12) 324
13) 434
14) 568

P.50

1) 270
2) 555
3) 972
4) 1,265
5) 2,172
6) 2,604
7) 3,328
8) 3,834
9) 1,521
10) 2,032

P. 52

1) 810
2) 2,432
3) 837
4) 1,285
5) 552
6) 2,080
7) 1,442
8) 3,060

P. 54

1) 810
2) 1,096
3) 1,251
4) 1,285
5) 837
6) 1,872
7) 3,060
8) 2,080
9) 3,540
10) 2,432
11) 1,442
12) 7,248
13) 552
14) 1,356
15) 2,569

P. 56

1) 12
2) 3
3) 6
4) 3
5) 9
6) 80
7) 70
8) 120
9) 0
10) 35
11) 319
12) 8
13) 352
14) 16

Answers

P. 58

1) 3
2) 11
3) 7
4) 2
5) 8
6) 5
7) 5
8) 9
9) 7
10) 8
11) 10
12) 9
13) 7
14) 11

P. 60

1) 21
2) 10
3) 20
4) 45
5) 40
6) 6
7) 5
8) 9
9) 12
10) 1
11) 4
12) 4
13) 11
14) 12

P. 62

1) 36
2) 32
3) 33
4) 48
5) 12
6) 72
7) 13
8) 16
9) 24
10) 20
11) 15
12) 17
13) 23
14) 19

P. 64

1) 67 r1
2) 45 r2
3) 33
4) 85 r2
5) 64 r3
6) 53 r3
7) 85
8) 52
9) 75
10) 60 r4
11) 34 r2
12) 57 r6

P. 66

1) 67 r1
2) 45 r2
3) 33
4) 85 r2
5) 64 r3
6) 53 r3
7) 85
8) 52
9) 75
10) 60 r4
11) 34 r2
12) 57 r6

P. 68

1) 5
2) 9
3) 4
4) 100
5) 2
6) 40
7) 10
8) 2
9) 2
10) 2
11) 2
12) 2
13) 2
14) 2

P. 70

1) 14
2) 10
3) 3
4) 20
5) 24
6) 10
7) 9
8) 12
9) 26
10) 18cm

P. 72

1) $\frac{4}{5}$ 6) $\frac{4}{4}$

2) $\frac{3}{4}$ 7) $\frac{10}{11}$

3) $\frac{9}{10}$ 8) $\frac{5}{7}$

4) $\frac{5}{6}$ 9) $\frac{6}{8}$

5) $\frac{3}{3}$ 10) $\frac{2}{2}$

P. 74

1) $\frac{3}{10}$ 6) $\frac{1}{3}$

2) $\frac{2}{4}$ 7) $\frac{7}{15}$

3) $\frac{5}{10}$ 8) $\frac{2}{8}$

4) $\frac{6}{20}$ 9) $\frac{2}{11}$

5) $\frac{2}{7}$ 10) $\frac{2}{8}$

P. 76

1) 10
2) 8
3) $\frac{1}{5}$
4) 10
5) $\frac{3}{8}$
6) 14
7) 16
8) $\frac{3}{10}$
9) $\frac{3}{8}$
10) $\frac{1}{5}$

Glossary

Amount is something that has a numerical value, for e.g. 10 cubes, £6.08.

Bar Model is a pictorial representation of a number sentence in the form of bars or boxes used to solve number problems.

Column is a vertical arrangement for example, in a table the cells arranged vertically.

Column Place Value is the value of a digit that relates to its position or place in a number within a column.

Common Factor is a number which is a factor of two or more other numbers, e.g. 3 is a common factor of the numbers 9 and 30.

Common fraction is a fraction where the numerator and denominator are both integers. Also known as simple or vulgar fraction. Contrast with a compound or complex fraction where the numerator or denominator or both contain fractions.

Common Multiple is an integer which is a multiple of a given set of integers e.g. 24 is a common multiple of 2, 3, 4, 6, 8 and 12.

Concrete Objects are objects that can be handled and manipulated to support understanding of the structure of a mathematical concept. Materials such as Dienes(Base 10 materials), Cuisenaire, Numicon, are all examples of concrete objects.

Convert is changing from one quantity or measurement to another. e.g. from litres to gallons or from centimetres to millimetres etc.

Glossary

Decimal is relating to the base ten. Most commonly used synonymously with decimal fractions where the number of tenths, hundredth, thousandths, etc. are represented as digits following a decimal point. The decimal point is placed at the right of the ones column. Each column after the decimal point is a decimal place e.g. The decimal fraction 0.275 is said to have three . decimal places. The system of recording with a decimal point is decimal notation. Where a number is rounded to a required number of decimal places, to 2 decimal places for example.

Decimal Fraction is tenths, hundredths, thousandths etc. represented by digits following a decimal point. E.g. 0.125 is equivalent to 1/10 + 2/100 + 5/1000 or 1/8. The decimal fraction representing 1/8 is a terminating decimal fraction since it has a finite number of decimal places. Other fractions such as 1/3 produce recurring decimal fractions, these have a digit or group of digits that is repeated indefinitely.

Denominator is the number written below the line i.e. the divisor.
e.g. in the fraction ⅔ the denominator is 3.

Digit is one of the symbols of a number system most commonly the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Examples: the number 29 is a 2-digit number; there are three digits in 2.95. The position or place of a digit in a number conveys its value.

Digit Value is the value of a digit that relates to its position or place in a number. e.g. in 82 the digits represent 8 tens and 2 ones.

Dividend in division, is the number that is divided. e.g. in 15 ÷ 3, 15 is the dividend.

Divisor is the number by which another is divided. e.g. In the calculation 30 ÷ 6 = 5, the divisor is 6. In this example, 30 is the dividend and 5 is the quotient.

Glossary

Efficient Methods A means of calculation (which can be mental or written) that achieves a correct answer with as few steps as possible.
In written calculations this often involves setting out calculations in a columnar layout.

Equals is the symbol: =, read as 'is equal to' or 'equals'. and meaning 'having the same value as'. e.g. 7 – 2 = 4 + 1 since both expressions, 7 – 2 and 4 + 1 have the same value, 5.

Equivalent Fraction are fractions with the same value as another.
e.g. 4/8, 5/10, 8/16 are all equivalent fractions and all are equal to ½.

Exchanging is to exchange a number for another of equal value. The process of regrouping is used in some standard compact methods of calculation. e.g.: 'carrying figures/exchanging' in addition, multiplication or division; and 'decomposition' in subtraction.

Expanded Form is a way to break up a number to show the value of each digit (Partition).

Factor is when a number, can be expressed as the product of two numbers, these are factors of the first. E.g. 1, 2, 3, 4, 6 and 12 are all factors of 12 because 12 = 1 × 12 = 2 × 6 = 3 × 4.

Fluency is to be mathematically fluent one must have a mix of conceptual understanding, procedural fluency and knowledge of facts to enable you to tackle problems appropriate to your stage of development confidently, accurately and efficiently.

Glossary

Formal Written Method is the way of setting out working in columnar form. In addition and subtraction, the formal written methods can be referred to as expanded and column addition and/or subtraction. In multiplication, the formal written methods are called short or long multiplication depending on the size of the numbers involved. Similarly in division the formal written methods are called short or long division.

Fraction is the result of dividing one integer by a second integer, which be non- zero. The dividend is the numerator and the non-zero divisor is the denominator. See also decimal fraction, equivalent fraction, improper fraction, proper fraction, unit fraction and vulgar fraction.

Highest Common Factor (H.C.F.) is the common factor of two or more numbers which has the highest value.
e.g. 16 has factors 1, 2, 4, 8, 16. 24 has factors 1, 2, 3, 4, 6, 8, 12, 24. 56 has factors 1, 2, 4, 7, 8, 14, 28, 56. The common factors of 16, 24 and 56 are 1, 2, 4 and 8. Their highest common factor is 8.

Grid a lattice created with two sets of parallel lines. Lines in each set are usually equally spaced. If the sets of lines are at right angles and lines in both sets are equally spaced, a square grid is created.

Hundred Square is a 10 by 10 square grid numbered 1 to 100. A similar grid could be numbered as a 0 – 99 grid.

Improper Fraction is an improper fraction has a numerator that is greater than its denominator. Example: 9/4 is improper and could be expressed as the mixed number 2¼.

Integer is any of the positive or negative whole numbers and zero.
e.g. …2, -1, 0, +1, +2 …

Glossary

Inverse is the opposite or reverse operation.

Lowest Common Multiple (L.C.M.) is the common multiple of two or more numbers, which has the least value. Example: 3 has multiples 3, 6, 9, 12, 15, 18…. 4 has multiples 4, 8, 12, 16, 20, 24 … and 6 has multiples 6, 12, 18, 24, 30 …. The common multiples of 3, 4 and 6 include 12, 24 and 3(The lowest common multiple of 3, 4 and 6 is 12.

Mental Calculations refer to calculations that are largely carried out mentally, but may be supported with a few simple written jottings.

Mixed Fraction is a whole number and a fractional part expressed as a common fraction. e.g. 1⅓ is a mixed fraction. Also known as a mixed number.

Mixed Number is a whole number and a fractional part expressed as a common fraction. Example: 2 ¼ is a mixed number. Also known as a mixed fraction.

Multiple is the result of multiplying a number by an integer,
e.g. 12 is a multiple of 3 because$3 \times 4 = 12$.

Multiplicand is a number to be multiplied by another.
e.g. in 6×4, 4 is the multiplier as it is how many lots/groups of 6.

Multiplier is a number to be multiplied by another.
e.g. in 5×3, 5 is the multiplicand as it is the number to be multiplied by 3.

Non-Unit Fraction is a fraction that has a value of 2 or more as the numerator and whose denominator is a non-zero integer. E.g. 1/2, 1/3

Number Bond is a pair of numbers with a particular total.

Glossary

Number Line is a line where numbers are represented by points upon it.

Number Sentence is a mathematical sentence involving numbers.
e.g. 3 + 6 = 9 and 9 > 3

Numerator is the number written on the top– the dividend (the part that is divided). In the fraction ⅔, the numerator is 2.

Operations that, when they are combined, leave the entity on which they operate unchanged. Examples: addition and subtraction are inverse operations e.g. 5 + 6 – 6 = 5. Multiplication and division are inverse operations e.g. 6 × 10 ÷ 10 = 6.

Part Whole Model is a pictorial representation of the relationship between a number or number sentence and its component parts.

Partition 1) To separate a set into subsets. 2) To split a number into component parts. e.g. the two-digit number 38 can be partitioned into 30 + 8 or 19 + 19. 3) A model of division. e.g. 21 ÷ 7 is treated as 'how many sevens in 21?'

Percentage 1) A fraction expressed as the number of parts per hundred and recorded using the notation %. E.g. One half can be expressed as 50%; the whole can be expressed as 100% 2) Percentage can also be interpreted as operator 'a number of hundredths of'. E.g. 15% of Y means 15/100 × Y.

Pictorial Representations do enable learners to use pictures and images to represent the structure of a mathematical concept.
The pictorial representation may build on the familiarity with concrete objects. e.g. a square to represent a Dienes 'flat' (representing 100).
Pupils may interpret pictorial representations provided to them or create a pictorial representation themselves to help solve a mathematical problem.

Glossary

Place Holder In decimal notation, the zero numeral is used as a place holder to denote the absence of a power of 10.

Place Value is the value of a digit that relates to its position or place in a number. e.g. in 1482 the digits represent 1 thousand, 4 hundred, 8 tens and 2 ones respectively; in 12.34 the digits represent 1 ten, 2 ones, 3 tenths and 4 hundredths respectively.

Product is the result of multiplying one number by another.
e.g. the product of 2 and 3 is 6 since $2 \times 3 = 6$.

Proper Fraction has a numerator that is less than its denominator So ¾ is a proper fraction, whereas 4/3 is an improper fraction (i.e. not proper).

Quantity Something that has a numerical value. e.g. 5 bananas.

Quotient is the result of a division. e.g. $46 \div 3 = 15⅓$ and 15⅓ is the quotient of 46 by 3. Where the operation of division is applied to the set of integers, and the result expressed in integers.
e.g. $46 \div 3 = 15$ remainder 1 then 15 is the quotient of 46 by 3 and 1 is the remainder.

Regrouping is to exchange a number for another of equal value. The process of regrouping is used in some standard compact methods of calculation. e.g.: 'carrying figures/exchanging' in addition, multiplication or division; and 'decomposition' in subtraction.

Remainder in the context of division requiring a whole number answer (quotient), the amount remaining after the operation.
e.g. 29 divided by 7 = 4 remainder 1.

Glossary

Repeated Addition is the process of repeatedly adding the same number or amount. One model for multiplication. e.g. 5 + 5 + 5 + 5 = 5 x 4.

Repeated Subtraction is The process of repeatedly subtracting the same number or amount. One model for division.
e.g. 20 -5 - 5 - 5 - 5 = 0 so 20 ÷ 4 = 5 remainder 0.

Sequence is succession of terms formed according to a rule. There is a definite relation between one term and the next and between each term and its position in the sequence. e.g. 0, 4, 8, 12, 16 etc.

Short Division is a compact written method of division (four operations).

Short Multiplication is a compact written method of multiplication

Simplify a Fraction is to simplify a fraction down to its lowest terms. The numerator and denominator are divided by the same number
e.g. 4/8 = 2/4, also to 'reduce' a fraction.
When the numerator and denominator are both divided by their highest common factor the fraction is said to have been cancelled down to give the equivalent fraction in its lowest terms. e.g.18/30 = 3/5 (dividing numerator and denominator by 6).

Step Counting is the process of repeatedly adding the same number or amount. One model for multiplication. e.g. 5 + 10 + 15 + 20 = 5 x 4.

Total Value is the sum to a calculation.

Unit Fraction is a fraction that has 1 as the numerator and whose denominator is a non-zero integer. e.g.: 1/2, 1/3

Zero in a place value system, a place-holder. e.g. 105