Year 6

Arithmetic

Workbook

by Richard Brown

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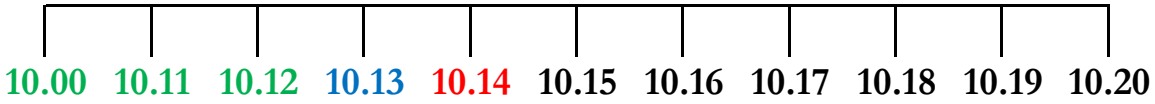
Key Language and Representations

Reasoning Scenarios are the arithmetic test questions applied to a real-life reasoning and problem solving scenario.

Concrete Objects are manipulated or handled to calculate and represent a number sentence i.e. base 10, cuisenaire, fraction tiles, metric rulers, .

Number Lines are used to count forwards and backwards in whole, decimal numbers and fractional numbers.



Formal Written Methods set out working in columnar form.

Ladder Method

$$\begin{array}{rrr} & 1 & 2 & 9 \\ \times & & & 7 \\ \hline & & 6 & 3 \\ & 1 & 4 & 0 \\ + & 7 & 0 & 0 \\ \hline & 9 & 0 & 3 \\ \hline & 1 & & \end{array}$$

Grid Method

x	200	60	7
4	800	240	28

Short Multiplication

$$\begin{array}{rrrr} & 1 & 7 & 3 \\ \times & & & 5 \\ \hline & 8 & 6 & 5 \\ \hline & 3 & 1 & \end{array}$$

$$\begin{array}{rrrr} & & 1 & 3 & 0 \\ \times & & & & 9 \\ \hline & 1 & 1 & 7 & 0 \\ \hline & & 2 & & \end{array}$$

Long Division

$$\begin{array}{r} 0\ 6\ 7\ \text{r}\ 1 \\ 2\overline{)\,1\ {}^{1}3\ {}^{1}5} \\ -\ 0 \\ \hline 1\ 3 \\ -\ 1\ 2 \\ \hline 1\ 5 \\ -\ 1\ 4 \\ \hline 1 \end{array}$$

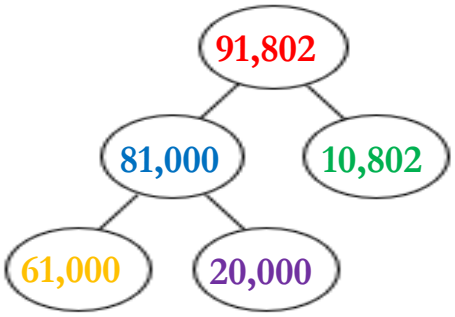
Short Division

$$\begin{array}{r} 0\ 6\ 7\ \text{r}\ 1 \\ 2\overline{)\,1\ {}^{1}3\ {}^{1}5} \end{array}$$

$$\begin{array}{r} 0\ 4\ 3\ \text{r}\ 1 \\ 4\overline{)\,1\ {}^{1}7\ {}^{1}3} \end{array}$$

Strategy Applied is when formal written method is used to calculate an arithmetic question or a reasoning and problem solving scenario. Explained using appropriate mathematical language, proven using concrete objects that can be manipulated, shown with pictorial representations to visualise the calculations, enabling deeper understanding.

Part Whole Models are pictorial mathematical images to represent an arithmetic question or reasoning and problem solving scenario.



Bar Models are an image, that pictorially represents a calculation.

5 8 x 6 = 3 4 8

58	58	58	58	58	58
348					

Fraction Tiles

1	1	1	1	1
8	8	8	8	8

+

1	1
8	8

=

1	1	1	1	1	1	1
8	8	8	8	8	8	8

1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10

-

1	1	1
10	10	10

=

1	1	1	1	1	1
10	10	10	10	10	10

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																			
$\frac{1}{2}$										$\frac{1}{2}$									
$\frac{1}{5}$				$\frac{1}{5}$				$\frac{1}{5}$				$\frac{1}{5}$				$\frac{1}{5}$			
$\frac{3}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$	
$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$

How Many

The number **98,765,432.109** is made up of how many **1,000,000s** (millions), **100,000s** (hundred thousands), **10,000s** (ten thousands) and **0.001s** (thousandths)?

1) **9 8, 7 6 5, 4 3 2 . 1 0 9**

In Maths a **number** or **figure** e.g. **98,765,432.109**, is made up of the **digits** **9**, **8**, **7**, **6**, **5**, **4**, **3**, **2**, **1**, **0** and **9**.
Each digit has a worth, otherwise known as its **place value**.
Ninety eight million, seven hundred and sixty five thousand, four hundred and thirty two point one zero nine is a **11-digit number**.
The **digits** represent the following **column place values** the **10,000,000s**, **1,000,000**, **100,000s**, **10,000s**, **1,000s**, **10s**, **1s**, **0.1s**, **0.01s** and **0.001s**.

Place Value Grid

10,000,000	1,000,000	100,000	10,000	1,000	100	10	1	0.1	0.01	0.001
9	8	7	6	5	4	3	2	1	0	9

Strategy Applied

The number **ninety eight million, seven hundred and sixty five thousand, four hundred and thirty two point one zero nine** is represented on a **Place Value Grid** as above.
First, write **9** in the **1000ths** column place value, which is also how many **thousandths** there are in the **1000ths** column, **9 thousandths**.
Then, write **0** in the **100ths** column place value, which is also how many **hundredths** there are in the **100ths** column, **0 hundredths**.

Next, write **1** in the **10ths** column place value, which is also how many **tenths** there are in the **10ths** column, **1 tenths**.
Then, write **2** in the **1s** column place value, which is also how many **ones** there are in the **1s** column, **2 ones**.
Next, write **3** in the **10s** column place value, which is also how many **tens** there are in the **10s** column, **3 tens**.
Then, write **4** in the **100s** column place value, which is also how many **hundreds** there are in the **100s** column, **4 hundreds**.
Next, write **5** in the **1,000s** column place value, which is also how many **thousands** there are in the **1,000s** column, **5 thousands**.
Then, write **6** in the **10,000s** column place value, which is also how many **ten thousands** there are in the **10,000s** column, **6 ten thousands**.
Next, write **7** in the **100,000s** column place value, which is also how many **hundred thousands** there are in the **100,000s** column, **7 hundred thousands**.
Then, write **8** in the **1,000,000s** column place value, which is also how many **millions** there are in the **1,000,000s** column, **8 millions**.
Next, write **9** in the **10,000,000s** column place value, which is also how many **ten millions** there are in the **10,000,000s** column, **9 ten millions**.
Finally, there are **8 millions**, **7 hundred thousands**, **6 ten thousands**. and **9 thousandths**.

Test Questions

How many **1,000,000s** (millions), **100,000s** (hundred thousands), **10,000s** (ten thousands) and **0.001s** (thousandths) in each number

1) 98,765,432.109 = ___
2) 25,124,619.102 = ___
3) 36,217,983.213 = ___
4) 49,353,774.908 = ___
5) 58,406,861.987 = ___
6) 63,537,902.765 = ___
7) 71,601,393.432 = ___
8) 82,721,548.098 = ___
9) 95,834,657.876 = ___
10) 96,095,372.065 = ___

Digit Value

What is the digit value of the **1,000,000s** (millions), **100,000s** (hundred-thousands), **10,000s** (ten thousands) and **0.001s** (thousandths) in the number **98,765,432.109**?

1) **9 8, 7 6 5, 4 3 2 . 1 0 9**

In Maths a **number** or **figure** e.g. **98,765,432.109**, is made up of the **digits** **9**, **8**, **7**, **6**, **5**, **4**, **3**, **2**, **1**, **0** and **9**.
Each digit has a worth, otherwise known as its **place value**.
Ninety eight million, seven hundred and sixty five thousand, four hundred and thirty two point one zero nine is a **11-digit number**.
The **digits** represent the following **column place values** the **10,000,000s**, **1,000,000**, **100,000s**, **10,000s**, **1,000s**, **10s**, **1s**, **0.1s**, **0.01s** and **0.001s**.

Place Value Grid

10,000,000	1,000,000	100,000	10,000	1,000	100	10	1	0.1	0.01	0.001
9	8	7	6	5	4	3	2	1	0	9

Strategy Applied

The number **ninety eight million, seven hundred and sixty five thousand, four hundred and thirty two point one zero nine** is represented on a **Place Value Grid** as above.
First, in the **1000ths** column the value of the digit is calculated by dividing how many **thousandths** there are, **9** by 1000 (**1000ths** column), which is **0.009**.
Then, in the **100ths** column the value of the digit is calculated by dividing how many **hundredths** there are, **0** by 100 (**100ths** column), which is **0.00**.
Next, in the **10ths** column the value of the digit is calculated by dividing how many **tenths** there are, **1** by 10 (**10ths** column), which is **0.1**.
Then, in the **1s** column the value of the digit is calculated by multiplying how many **ones** there are, **2** by 1 (**1s** column), which is **2**.

Next, in the **10s** column the value of the digit is calculated by multiplying how many **tens** there are, **3** by 10 (**10s** column), which is **30**.
Then, in the **100s** column the value of the digit is calculatedby multiplying how many **hundreds** there are, **4** by 100 (**100s** column), which is **400**.
Next, in the **1,000s** column the value of the digit is calculated by multiplying how many **thousands** there are, **5** by 1000 (**1000s** column), which is **5,000**.
Then, in the **10,000s** column the digit value is calculated by multiplying how many **ten thousands** there are, **6** by 10,000 (**10,000s** column), which is **60,000.00**
Next, in the **100,000s** column the digit value is calculated by multiplying how many **hundred thousands** there are, **7** by 100,000 (**100,000s** column), which is **700,000**.
Then, in the **1,000,000s** column the digit value is calculated by multiplying how many **millions** there are, **8** by 1,000,000 (**1,000,000s** column), which is **8,000,000**.
Then, in the **10,000,000s** column the digit value is calculated by multiplying how many **ten millions** there are, **9** by 10,000,000 (**10,000,000s** column), which is **90,000,000**.
Finally, the digit value of the **millions**, **hundred thousands**, **ten thousands** and **thousandths** is **8,000,000**, **700,000**, **60,000** and **0.009**.

Test Questions

What is the digit value of the **1,000,000s** (millions), **100,000s** (hundred thousands), **10,000s** (ten thousands) and **0.001s** (thousandths) in each number?

1)	98,765,432.109	= ___	6)	63,537,902.765	= ___
2)	25,124,619.102	= ___	7)	71,601,393.432	= ___
3)	36,217,983.213	= ___	8)	82,721,548.098	= ___
4)	49,353,774.908	= ___	9)	95,834,657.876	= ___
5)	58,406,861.987	= ___	10)	96,095,372.065	= ___

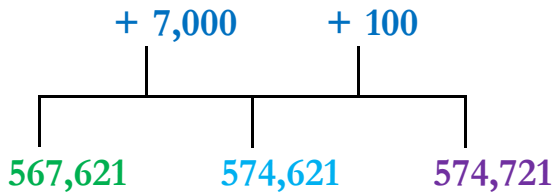
Compensate

1) **567,621** + **7,099** = **?**

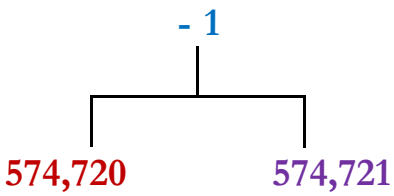
Word Problem

Donations for a charity are to **increase by** £**7,099**. The opening balance is £**567,621**. What mental strategy can the accountant use to calculate the closing balance**?**

Step 1



Step 2



Strategy Applied

When the **value** of a number is near in value to a **multiple of 10s**, **100s**, **1,000s**, it can be more efficient to **round up/down** to an appropriate **multiple**, before calculating the number sentence.

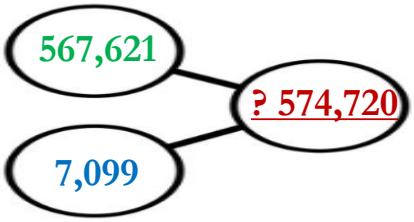
Step 1

First, **compensate** by rounding **7,099** up to **7,100**, by adding **+1**.
Then from **five hundred and sixty seven thousand, six hundred and twenty one**, count on **seven thousand** more, equal to **five hundred and seventy four thousand, six hundred and twenty one**.
Next count on **one hundred** more, equal to **five hundred and seventy four thousand, seven hundred and twenty one**.

Step 2

Finally, **decompensate** by subtracting **-1** from **five hundred and seventy four thousand, seven hundred and twenty one**, equals the total value of **five hundred and seventy four thousand, seven hundred and twenty**.

Part Whole Model



Bar Model

567,621	7,099
? 574,720	

Test Questions

1) 567,621 + 7,099 = ___

2) 355,102 + 54,097 = ___

3) 400,102 + 87,005 = ___

4) 675,555 + 987 = ___

5) 888,777 + 55,005 = ___

6) 801,821 + 1,002 = ___

7) 812,392 + 98,505 = ___

8) 333,333 + 2,222 = ___

9) 40,915 + 8,998 = ___

10) 8,391 + 999 = ___

11) ___ = 99,999 + 200

12) ___ = 99,999 + 50

13) ___ = 9,999 + 20

14) ___ = 8,999 + 60

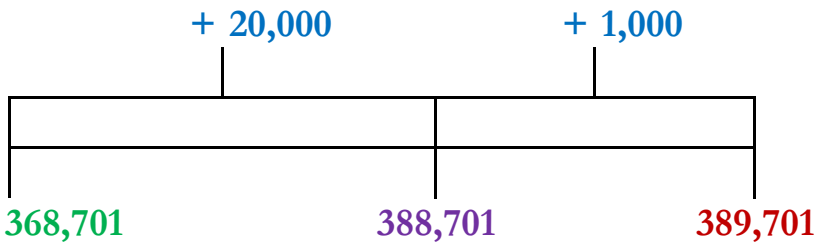
More Than 10,000

1) **368,701** + **21,000** = **?**

Word Problem

The population of a town is **three hundred and sixty eight thousand, seven hundred and one**. Next year it is expected to **increase** by a further **twenty one thousand**.
What will the population of the town be**?**

Number Line



Strategy Applied

Partition 21,000 into its **digit values** of **10,000s** + **1,000s**, 20,000 + 1,000.

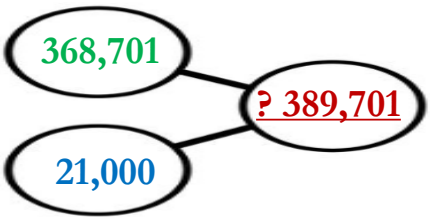
First, draw a number line and write **three hundred and sixty eight thousand, seven hundred and one** at the start.

Then, from **three hundred and sixty eight thousand, seven hundred and one** count on **twenty thousand** more in **multiples of 10,000s**, equal to **three hundred and eighty eight thousand, seven hundred and one**.

Next, count on **one thousand** more in **multiples of 1,000s**, equal to **three hundred and eighty nine thousand, seven hundred and one**.

Finally, the missing number is **389,701**.

Part Whole Model



Bar Model

368,701	21,000
? 389,701	

Test Questions

1) 368,701 + 21,000 = ___

2) 494,009 + 32,000 = ___

3) 80,400 + 73,000 = ___

4) 840,000 + 48,000 = ___

5) 383,000 + 92,000 = ___

6) 372,000 + 43,000 = ___

7) 468,888 + 110,000 = ___

8) 301,900 + 85,000 = ___

9) 560,000 + 450,000 = ___

10) 900,900 + 290,000 = ___

11) ___ = 210,100 + 72,000

12) ___ = 444,444 + 55,000

13) ___ = 230,000 + 90,000

14) ___ = 260,000 + 75,000

Decimals

1) 56.97 + 8.102 = ?

Word Problem

Fifty six point nine seven litres mixes with **eight point one zero two** litres. Can a **seventy** litre container hold both of the liquids**?**

Partitioning

5	0	.	0	0	0	+	0	.	0	0	0	=	5	0	.	0	0	0	
	6	.	0	0	0	+	8	.	0	0	0	=	1	4	.	0	0	0	
	0	.	9	0	0	+	0	.	1	0	0	=		1	.	0	0	0	
	0	.	0	7	0	+	0	.	0	0	0	=		0	.	0	7	0	
	0	.	0	0	0	+	0	.	0	0	2	=		0	.	0	0	2	+
													6	5	.	0	7	2	

Strategy Applied

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

56.97 = 50 + 6 + 0.9 + 0.07 8.102 = 8 + 0.1 + 0.00 + 0.002

First, add the **10s** digit values of **50** and **0**, equal to **fifty**.

Then, add the **1s** digit values of **6** and **8**, equal to **fourteen**.

Next, add the **10ths** digit values of **0.9** and **0.1**, equal to **one**.

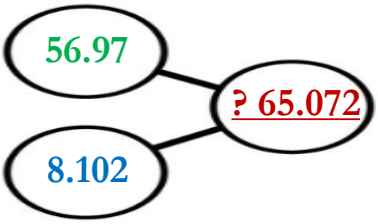
Then, add the **100ths** digit values of **0.07** and **0.00**, equal to **zero point zero seven**.

Next, add the **1000ths** digit values of **0.000** and **0.002**, equal to **zero point zero zero two**.

Next, use column addition to add the values of **50** + **14** + **1** + **0.07** + **0.002**.

Finally, **56.97** plus **8.102** is equal to **65.072**.

Part Whole Model



Bar Model

56.97	8.102
? 65.072	

Test Questions

1) 56.97 + 8.102 = ___

2) 94.37 + 8.122 = ___

3) 32.97 + 1.001 = ___

4) 21.06 + 1.934 = ___

5) 22.87 + 5.100 = ___

6) 340.0 + 3.905 = ___

7) 23.56 + 5.036 = ___

8) 25.04 + 9.138 = ___

9) 57.40 + 1.308 = ___

10) 12.60 + 4.194 = ___

11) ___ = 33.75 + 5.130

12) ___ = 48.18 + 8.713

13) ___ = 65.41 + 8.160

14) ___ = 38.10 + 8.112

Column Addition

1) **682,088 + 375,253 = ?**

Step 1

	6	8	2	0	8	8
+	3	7	5	2	5	3
				3	4	1
				1	1	

Step 2

	6	8	2	0	8	8
+	3	7	5	2	5	3
	1	0	5	7	3	4	1
	1	1			1	1	

Strategy Applied

Step 1

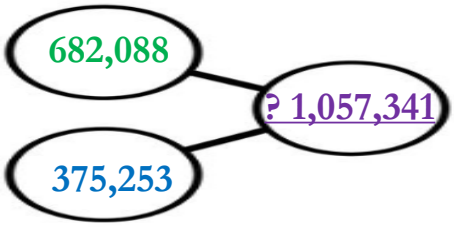
First, in the **1s** column add **altogether**, 8 + 3, equals 11 **ones** (**10** + **1**).
Write **1** in the **total value** of the **1s** column, then **exchange/regroup** the **10 ones** into **1 ten** to the **10s** column and write **1** below the **total value line** of the **10s** column.
Then, in the **10s** column add **altogether**, 8 + 5 + **1**, equals 14 **tens** (**100** + **40**).
Write **4** in the **total value** of the **10s** column, then **exchange/regroup** the **10 tens** into **1 hundred** to the **100s** column and write **1** below the **total value line** of the **100s** column.
Next, in the **100s** column add **altogether**, 0 + 2 + **1**, equals **3 hundreds** (**300**).
Write **3** in the **total value** of the **100s** column.

Step 2

Then, in the **1,000s** column add **altogether**, 2 + 5, equals **7 thousands** (**7,000**).
Write **7** in the **total value** of the **1,000s** column.
Next, in the **10,000s** column add **altogether**, 8 + 7, equals 15 **ten thousands** (**100,000** + **50,000**).
Write **5** in the **total value** of the **10,000s** column, then **exchange/regroup** the **10 ten thousands** into **1 hundred thousand** to the **100,000s** column and write **1** below the **total value line** of the **100,000s** column.
Then, in the **100,000s** column add **altogether**, 6 + 3 + **1**, equals 10 **hundred thousands** (**1,000,000** + **0**).

Write **0** in the **total value** of the **100,000s** column, then **exchange the 10 hundred thousands** into **1 million** to the **1,000,000s** column. and write **1** below the **total value line** of the **1,000,000s** column. Finally, in the **1,000,000s** column add **altogether**, 0 + 0 + **1**, equals 1 **million**. Write **1** in the **total value** of the **1,000,000s** column. **Total value** is **1,057,341**.

Part Whole Model



Bar Model

682,088	375,253
1,057,341	

Test Questions

1) 6 8 2 0 8 8
+ 3 7 5 2 5 3

2) 6 3 6 2 4 2
+ 2 1 7 8 3 8

3) 8 9 9 7 3
3 8 2 0 8
+ 2 1 7 8 3

4) 8 0 0 6 7 9
+ 5 9 9 7 3 5

5) 7 5 2 4 7 6
+ 5 2 8 0 1 5

6) 6 7 5 2 5
6 3 6 2 4
+ 5 2 8 0 1

7) 7 8 0 4 0 0
+ 3 3 0 5 0 0

8) 8 7 0 9 9 9
+ 4 8 0 9 9 9

9) 8 7 0 9 9
7 8 0 4 0
+ 2 7 8 5 3

10) 7 5 5 1 0 2
+ 3 8 9 0 7 0

11) 5 5 5 8 0 5
+ 2 7 8 5 3 7

12) 4 8 0 9 9
3 8 9 0 7
+ 2 5 6 9 2

Column Addition with Decimals

1) 8 6 . 9 7 5 + 5 1 . 5 9 1 = ?

Step 1

	8	6	.	9	7	5
+	5	1	.	5	9	1
			.	5	6	6
		1		1		

Step 2

	8	6	.	9	7	5
+	5	1	.	5	9	1
	1	3	8	.	5	6	6
	1		1		1		

Strategy Applied

Step 1

First, in the **1,000ths** column add **altogether**, 5 + 1, equals 6 **thousandths** (**0.006**).

Write **6** in the **total value** of the **1,000ths** column.

Then, in the **100ths** column add **altogether**, 7 + 9, equals 16 **hundredths** (**0.1** + **0.06**).

Write **6** in the **total value** of the **10ths** column, then **exchange/regroup** the **10** **hundredths** into **1** **tenth** to the **10ths** column and write **1** below the **total value line** of the **10ths** column.

Next, in the **10ths** column add **altogether**, 9 + 5 + **1**, equals 15 **tenths** (**1.0** + **0.5**).

Write **5** in the **total value** of the **10ths** column.

Step 2

Then, in the **1s** column add **altogether**, 6 + 1 + **1**, equals 8 **ones** (**8**).

Write **8** in the **total value** of the **1s** column.

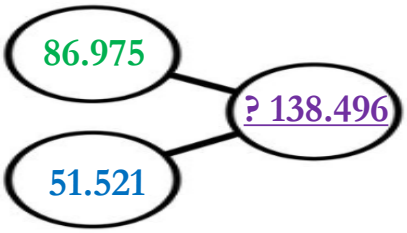
Next, in the **10s** column add **altogether**, 8 + 5, equals 13 **tens** (**100** + **30**).

Write **3** in the **total value** of the **10s** column, then **exchange/regroup** the **10** **tens** into **1** **hundred** to the **100s** column and write **1** below the **total value line** of the **100s** column.

Finally, in the **100s** column add **altogether**, 0 + 0 + **1**, equals 1 **hundred** (**100**).

Write **1** in the **total value** of the **100s** column. **Total value** is **138.566**.

Part Whole Model



Bar Model

86.975	51.521
? 138.496	

Test Questions

1) 86.975 + 51.521 = .

2) 34.027 + 39.050 = .

3) 8.521 + 5.356 + 3.973 = .

4) 94.372 + 81.845 = .

5) 52.356 + 45.056 = .

6) 9.372 + 5.975 + 4.099 = .

7) 42.973 + 30.099 = .

8) 95.704 + 21.383 = .

9) 9.940 + 3.973 + 2.067 + 1.129 = .

10) 21.067 + 19.445 = .

11) 35.692 + 29.043 = .

14) 4.186 + 2.704 + 1.445 + 1.861 = .

12) 98.186 + 43.940 = .

13) 17.861 + 15.129 = .

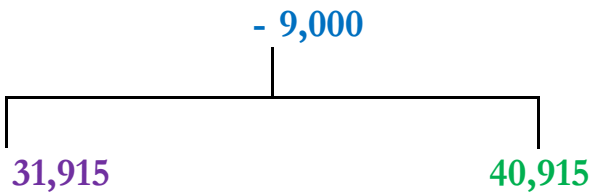
Compensate

1) **40,915** - **8,998** = **?**

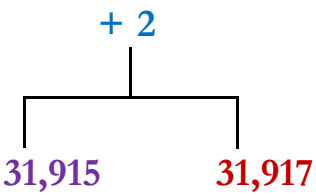
Word Problem

A bank balance of **forty thousand, nine hundred and fifteen** pounds is **reduced** by **eight thousand nine hundred and ninety eight** pounds. What is the closing bank balance**?**

Step 1



Step 2



Strategy Applied

When the **value** of a number is near in value to a **multiple of 10s**, **100s**, **1,000s**, it can be more efficient to **round up/down** to an appropriate **multiple**, before calculating the number sentence.

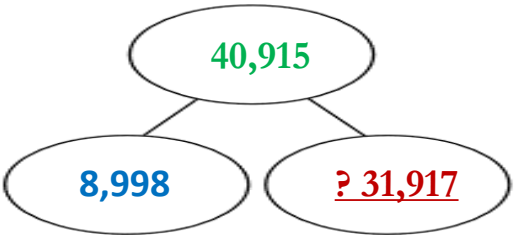
Step 1

First, **compensate** by rounding **8,998** up to **9,000**, by adding **+2**.
Then from **forty thousand, nine hundred and fifteen** count back **nine thousand** less, equal to **thirty one thousand, nine hundred and fifteen.**

Step 2

Finally, **decompensate** by subtracting **+2** from **thirty one thousand, nine hundred and fifteen**, to equal the total value of **thirty one thousand**, **nine hundred and thirteen**.

Part Whole Model



Bar Model

40,915	
8,998	31,917

Test Questions

1) 40,915 - 8,998 = ___

2) 9,900 - 2 = ___

3) 100,101 - 9 = ___

4) 777,999 - 12 = ___

5) 333,333 - 8,998 = ___

6) 8,999 - 60 = ___

7) 100,000 - 9 = ___

8) 9,999 - 2 = ___

9) 812,392 - 91,997 = ___

10) 99,999 - 50 = ___

11) 20,001 - 4 = ___

12) 99,999 - 200 = ___

13) 801,821 - 21,003 = ___

14) 675,555 - 987 = ___

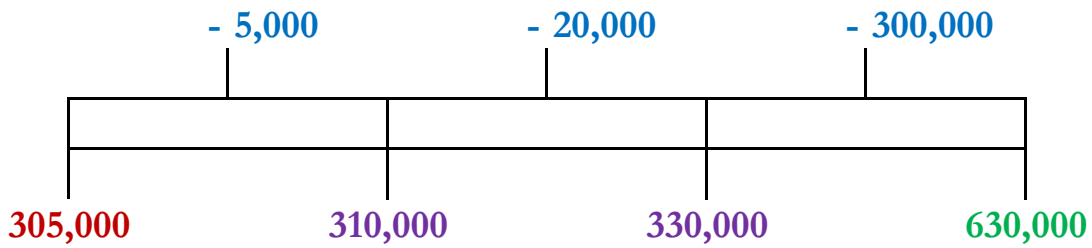
More Than 10,000

1) 630,000 - 325,000 = ?

Word Problem

The British Army has **630,000** soldiers in 2001, but today, the number of soldiers has **decreased by 325,000**. How many soldiers currently serving?

Number Line



Strategy Applied

Partition 325,000 into its **digit values** of **100,000s**, **10,000s**, **1,000s**, **300,000** + **20,000** + **5,000**.

First, draw a number line and write **six hundred and thirty thousand** at the end.

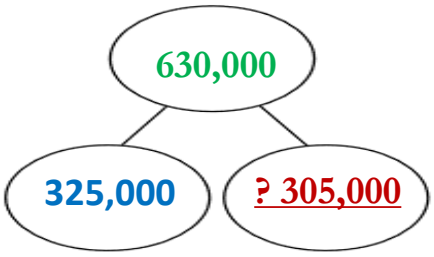
Then, from **six hundred and thirty thousand** count back **300,000** less in **multiples of 100,000s**, equal to **three hundred and thirty thousand**.

Next, from **three hundred and thirty thousand** count back **20,000 less** in **multiples of 10,000s**, equal to **three hundred and ten thousand**.

Then, from **three hundred and ten thousand** count back **5,000** less in **multiples of 1,000s**, equal to **three hundred and five thousand**.

Finally, the missing number is **three hundred and five thousand**.

Part Whole Model



Bar Model

630,000	
325,000	? 305,000

Test Questions

1) 630,000 - 325,000 = ___

2) 840,000 - 48,000 = ___

3) 900,000 - 546,000 = ___

4) 750,000 - 80,000 = ___

5) 820,000 - 405,000 = ___

6) 301,900 - 20,000 = ___

7) 601,600 - 20,000 = ___

8) 900,900 - 150,000 = ___

9) 210,100 - 25,000 = ___

10) 444,444 - 33,000 = ___

11) 330,000 - 230,000 = ___

12) 888,800 - 303,000 = ___

13) 812,000 - 98,000 = ___

14) 801,000 - 16,000 = ___

Decimals

1) 154.6 - 8.5 = ?

Word Problem

The **perimeter** of Garden A is **eight point five metres** **less than** the **perimeter** of Garden B, **one hundred and fifty four point six metres**. What is the **perimeter** of Garden A**?**

Partitioning

$$\begin{array}{rrrrrrrrrrrrrrr} 1 & 0 & 0 & . & 0 & - & 0 & . & 0 & = & 1 & 0 & 0 & . & 0 \\ & 5 & 4 & . & 0 & - & 8 & . & 0 & = & & 4 & 6 & . & 0 \\ & & 0 & . & 6 & - & 0 & . & 5 & = & & & 0 & . & 1 \\ \hline & & & & & & & & & & 1 & 4 & 6 & . & 1 \end{array} +$$

Strategy Applied

Non- standard partition both numbers into **10s**, **1s**, **10ths**, **100ths** and subtract their relative **digit values**.

154.6 = 100 + 54 + 0.6 8.5 = 8 + 0.5.

First, subtract the **100s** digit values of 100 and 0, equal to **one hundred**.

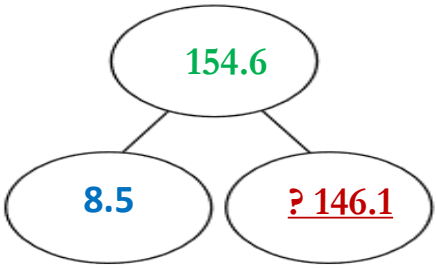
Then, subtract the **10s** and **1s** digit values of 54 and 8, equal to **forty six**.

Next, subtract the **10ths** digit values of 0.6 and 0.5, equal to **zero point one**.

Next, use column addition to add the values of **100** + **46** + **0.01**.

Finally, 154.6 subtract 8.5 is equal to **146.1**.

Part Whole Model



Bar Model

154.6	
8.5	? 146.1

Test Questions

1) 154.600 - 8.500 = ___

2) 817.020 - 59.010 = ___

3) 65.710 - 1.510 = ___

4) 524.100 - 8.100 = ___

5) 36.880 - 4.680 = ___

6) 782.400 - 3.400 = ___

7) 291.600 - 81.600 = ___

8) 460.405 - 9.205 = ___

9) 178.60 - 1.500 = ___

10) 385.100 - 8.100 = ___

11) ___ = 6.000 - 5.738

12) ___ = 9.000 - 3.45

13) ___ = 4.000 - 1.15

14) ___ = 7.000 - 2.25

Column Subtraction

1) **500,102 - 337,678 = ?**

Step 1

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

Step 2

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

Step 3

4	9	9	10	9	
5	10	10	1	10	12
- 3	3	7	6	7	8
1	6	2,	4	2	4

Strategy Applied

Step 1

In the **1s** column, 2 subtract 8, you cannot do as 2 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** from the 1 **hundreds** in the **100s** column to the **10s** column.
Cross out the 1 **hundreds** and write **0 hundreds** above, then write the **exchanged/regrouped 1 hundred** next to the 0 **tens** to make 10 tens.
Still in the **10s** column**, 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 2 **ones** to make 12 ones.
In the **1s** column, 12 subtract 8, equals 4 **ones** (4).
Write 4 in the **total value** of the **1s** column.
In the **10s** column, 9 subtract 7, equals 2 **tens** (20).
Write 2 in the **total value** of the **10s** column.

Step 2

In the **100s** column, 0 subtract 6, you can't do as 0 is a **lower value** than 6.
From the **1,000s** column, **regroup** 1 **thousand** from the 0 **thousands,** you cannot do this as the value of the **thousands** is zero.
From the **10,000s** column, **regroup** 1 **ten thousand** from the 0 **ten thousands**, you cannot do this as the value of the **ten thousands** is zero.
Instead **exchange/regroup** 1 **hundred thousand** from the 5 **hundred thousands** in the **100,000s** column to the **10,000s** column.

Exchange/Regroup 1 hundred thousand into **10 ten thousands** from the **100,000s** column to the **10,000s** column.
Cross out the 5 **hundred thousands** and write **4 hundred thousands** above, then write the **exchanged/regrouped 1 hundred thousand** next to the 0 **ten thousands** to make **10 ten thousands**.
Still in the **10,000s** column**, regroup 1 ten thousand** into **10 thousands** from the **10,000s** column to the **1,000s** column.
Cross out the **10 ten thousands** and write **9 ten thousands** above, then write the **exchanged/regrouped 1 ten thousand** next to the 0 **thousands** to make **10** thousands.
Still in the **1,000s** column**, regroup 1 thousand** into **10 hundreds** from the **1,000s** column to the **100s** column.
Cross out the **10 thousands** and write **9 thousands** above, then write the **exchanged/regrouped 1 thousand** next to the **0 hundreds** to make **10** hundreds.

Step 3

In the **100s column**, **10** subtract 6, equals 4 **hundreds** (**400**).
Write **4** in the **total value** of the **100s** column.
In the **1,000s** column, **9** subtract 7, equals 2 **thousands** (**2,000**).
Write **2** in the **total value** of the **1,000s** column.
In the **10,000s** column, **9** subtract 3, equals 6 **ten thousand** (**60,000**).
Write **6** in the **total value** of the **10,000s** column.
In the **100,000s** column, **4** subtract 3, equals 1 **hundred thousand**(**100,000**)
Write **1** in the **total value** of the **100,000s** column.
Total value is **162,424**.

Test Questions

1)	5	0	0	1	0	2	2)	4	0	0	6	7	9	3)	7	2	5	3	0
-	3	3	7	6	7	8	-	2	9	9	7	3	5	-	3	5	9	6	1
4)	7	8	0	0	0	3	5)	3	5	5	1	0	2	6)	6	3	6	3	4
-	2	7	9	1	5	4	-		7	8	9	0	7	-		8	7	8	8

Column Subtraction with Decimals

1) **3 5 0 . 2 7 0 - 5 3 . 9 0 5 = ?**

Word Problem

Two fish tanks have **different capacities**. The second tank's capacity is **53.905** litres less than **three hundred and fifty point two seven** litres. What is the capacity of the second fish tank?

Step 1

```
    4  9      6
 3  5 10 . 12 7 10
-   5  3 . 9 0 5
-------------------
            3 6 5
-------------------
```

Step 2

```
   2 14  9      6
 3  5 10 . 12 7 10
-   5  3 . 9 0 5
-------------------
 2  9  6 . 3 6 5
-------------------
```

Strategy Applied

Step 1

In the **1,000ths** column, 0 subtract 5, you cannot do as 0 is a **lower value** than 5.

Exchange/Regroup 1 **hundredth** into 10 **thousandths** from the **10ths** column to the **1,000ths** column.

Cross out the 7 **hundredths** and write **6 hundredths** above, then write the **exchanged/regrouped 1 hundredth** next to the 0 **thousandths** to make 10 **thousandths**.

In the **100ths** column, **6** subtract 0, equals 6 **hundredths** (**0.06**).

Write **6** in the **total value** of the **100ths** column.

In the **10ths** column, 2 subtract 9, you can't do as 2 is a **lower value** than 9.

Exchange/Regroup 1 **one** into 10 **tenths** from the **1s** column to the **10ths** column, you cannot do this as the value of the **ones** is zero.

Instead **exchange/regroup 1 ten** from the 5 **tens** in the **10s** column to the **1s** column.

Cross out the 5 **tens** and write **4 tens** above, then write the **exchanged/regrouped 1 ten** next to the 0 **ones** to make 10 ones.

Still in the **1s** column**, regroup 1 one** into **10 hundredths** from the **1s** column to the **10ths** column.
Cross out the 10 **ones** and write **9 ones** above, then write the **exchanged/ regrouped 1 one** next to the 2 **tenths** to make 12 tenths.
In the **10ths** column, 12 subtract 9, equals 3 **tenths** (**0.3**).
Write **3** in the **total value** of the **10ths** column.

Step 2

In the **1s** column, **9** subtract 3, equals **6 ones** (**6**).
Write **6** in the **total value** of the **1s** column.
In the **10s** column, **4** subtract 5, you cannot do as **4** is a **lower value** than 5.
Exchange/Regroup 1 **hundred** into 10 **tens** from the **100s** column to the **1s** column.
Cross out the 3 **hundreds** and write **2 hundreds** above, then write the **exchanged/regrouped 1 hundred** next to the **4 tens** to make **14** tens.
In the **10s** column, **14** subtract 5, equals 9 **tens** (**90**).
Write **9** 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 **296,365**.

Test Questions

1) 350.270 − 53.905

2) 523.560 − 45.056

3) 257.040 − 9.138

4) 385.100 − 8.112

5) 256.920 − 39.043

6) 460.400 − 29.500

Multiples of 10

1) 600 x 40 = ?

Strategy Applied

The **six hundred** **represents** the **value** of each group, the **multiplicand**.
The **forty** **represents** how many **groups of** **six hundred's** there are, the **multiplier**.
The **?** **represents** the **total value** of **forty** **groups of** **six hundred**, the **product**.

Step 1

6 0 0 is 6 x 1 0 0

4 0 is 4 x 1 0

Step 2

6 x 4 = 2 4

1 0 0 x 1 0 = 1, 0 0 0

Step 3

2 4 x 1, 0 0 0 = 2 4, 0 0 0

Step 1

Six hundred partitioned represents the value of **six** **lots of** **hundreds** or **6** x **100**.
Forty partitioned represents the value of **four** **lots of** **tens** or **4** x **10**.

Step 2

First, multiply the values of **six** and **four**, equals **twenty four**.
Then, multiply the values of **one hundred** and **ten**, equals **one thousand**.

Step 3

Finally, multiply the values of **twenty four** and **one thousand**, equal to **twenty four thousand**, the **product**.

Test Questions

1) 600 x 40 = ___

2) 80 x 120 = ___

3) 30 x 110 = ___

4) 500 x 80 = ___

5) 3 x 1,200 = ___

6) 4 x 1,100 = ___

7) 50 x 700 = ___

8) 40 x 120 = ___

9) 500 x 60 = ___

10) 40 x 800 = ___

11) ___ = 20 x 50 x 30

12) ___ = 40 x 60 x 10

13) ___ = 80 x 70 x 20

14) ___ = 15 x 50 x 20

Decimals

1) **0.08 x 9 = ?**

Strategy Applied

Zero point zero eight represents the **value** of each group, the **multiplicand**.

The **nine represents** how many **groups of zero point zero eight's** there are, the **multiplier**.

The **?** **represents** the **total value** of **nine groups of zero point zero eight**, the **product**.

Step 1

0 . 0 8 or $\frac{8}{100}$ **or 8 ÷ 1 0 0**

Step 2

8 x 9 = 7 2

Step 3

10s	1s		10ths	100ths
7	2	•		
	0	•	7	2

72 ÷ 100 = 0.72

Step 1

Zero point zero eight partitioned represents the value of **eight hundredths** or **8 ÷ 1 0 0**

Step 2

First, multiply the values of **eight** and **nine**, equal to **seventy two**.

Step 3

Finally, divide **seventy two** by **one hundred**, equal to **zero point seven two**.

Test Questions

1) 0.08 x 9 = ___

2) 0.07 x 8 = ___

3) 0.06 x 7 = ___

4) 0.04 x 12 = ___

5) 0.03 x 7 = ___

6) 0.8 x 8 = ___

7) 0.7 x 9 = ___

8) 0.6 x 11 = ___

9) 0.3 x 5 = ___

10) 0.4 x 11 = ___

11) ___ = 0.12 x 2

12) ___ = 0.11 x 3

13) ___ = 0.18 x 4

14) ___ = 0.09 x 5

x10, x100 and x1,000

Multiply the value below first by **x10**, then by **x100**, next by **x1,000** and write down the **answers consecutively**.

1) **2.381 =** ___ ___ ___

Place Value Grid

1,000s	100s	10s	1s	•	10ths	100ths	1,000ths	
			2	•	3	8	1	**Value**
		2	3	•	8	1		**x10**
	2	3	8	•	1			**x100**
2	3	8	1	•				**x1,000**

Strategy Applied

Method 1

Multiply any **value** by **ten**, means that value will become **ten times as big**.
Each **digit** in the value will move **one column place value** to the **left**, starting with the **greatest place value**, the **1s**.

Method 2

Multiply any **value** by **one hundred**, means that value will become **one hundred times as big**.
Each **digit** in the **value** will move **two column place values** to the **left**.
starting with the **greatest place value**, the **1s**.

Method 3

Multiply any **value** by **one thousand**, means that value will become **one thousand times as big**.
Each **digit** in the value will move **three column place values** to the **left**.
starting with the **greatest place value**, the **1s**.

Finally **2.381** multiplied by **x10**, **x100**, **x1,000** = **23.81**, **238.1**, **2381**

Test Questions

Multiply each value below first by **x10**, then by **x100**, next by **x1,000** and write down the **answers consecutively**.

1) 2.381

2) 4.11

3) 300.01

4) 999.9

5) 567

6) 5869

7) 4560.05

8) 28.6

9) 8851.0

10) 101.0

11) 238.100

12) 58.69

13) 99.99

14) 5.67

Short Multiplication

1) 28,395 x 9 = ?

Step 1

	2	8,	3	9	5
					9
				5	5
			8	4	

Step 2

		2	8,	3	9	5
x						9
			5,	5	5	5
		7	3	8	4	

Step 3

		2	8,	3	9	5
x						9
	2	5	5,	5	5	5
		7	3	8	4	

Strategy Applied

Step 1

In the **1s** column, multiply **5** by **9** , 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** below the **total value line** of the **10s** column.
In the **10s** column, multiply (90) **9** by **9**, equals 81 **tens** (**810**).
Add the **exchanged/regrouped** **4** **tens** (40) below, equals 85 **tens** (**800** + **50**).
Write **5** in the **total value** of the **10s** column**.**
Exchange/Regroup the **80** **tens** into **8** **hundreds** from the **10s** column to the **100s** column and write **8** below the **total value line** of the **100s** column

Step 2

In the **100s** column, multiply (300) **3** by **9**, equals **27** **hundreds** (**2,000** + **700**).
Add the **exchanged/regrouped** **8** **hundreds** (800) below, equal to 35 **hundreds** (**3,000** + **500**). Write **5** in the **total value** of the **100s** column.
In the **1,000s** column, multiply (8,000) **8** by **9**, equals **72** **thousands** (**70,000** + **2,000**).
Add the **exchanged/regrouped** **3** **thousands** (3,000) below, equals 75 **thousands** (**70,000** + **5,000**).
Write **5** in the **total value** of the **1,000s** column**.**

Exchange/Regroup the **70 thousands** into **7 hundred thousand** from the **1,000s** column to the **10,000s** column and write **7** below the **total value line** of the **10,000s** column.

Step 3

In the **10,000s** column, multiply (2,000) **2** by **9**, equals **18 ten thousands** (**100,000** + **80,000**).
Add the **exchanged/regrouped 7 thousands** (7,000) below, equals 25 **ten thousands** (**200,000** + **50,000**).
Write **5** in the **total value** of the **10,000s** column.
Write **2** in the **total value** of the **100,000s** column.
Total value is **255,555**.

Test Questions

1) 3 2 9 5 4
x 7

2) 7 0 8 2 5
x 8

3) 2 8 3 9 5
x 9

4) 6 5 7 4
x 7

5) 4 7 8 1
x 9

6) 5 4 1 8
x 6

7) 8 7 9
x 3

8) 1 6 7
x 4

9) 5 7 4
x 5

10) 4 7 6
x 2

11) 7 1
x 8

12) 3 3
x 8

13) 6 1
x 4

14) 6 5
x 3

Short Multiplication with Decimals

1) 7 5 . 8 3 6 x 5 = ?

Word Problem

What is the **total perimeter** of **five** new luxury holiday resorts in Asia, if **each** one has a **perimeter** of **seventy five point eight three six kms**.

Step 1

```
    7 5 . 8 3 6
x               5
-----------------
      . 1 8 0
-----------------
  4   1 3
```

Step 2

```
    7 5 . 8 3 6
x               5
-----------------
3 7 9 . 1 8 0
-----------------
  2 4   1 3
```

Strategy Applied

Step 1

In the **1,000ths** column, multiply **6** by **5** , **equals** 30 **thousandths** (**0.03** + **0.000**).

Write **0** in the **total value** of the **1,000ths** column.

Exchange/Regroup the **30 thousandths** into **3 hundredths** from the **1000ths** column to the **100ths** column and write **3** below the **total value line** of the **100ths** column.

In the **100ths** column, multiply **3** by **5**, equals 15 **hundredths** (**0.1** + **0.05**).

Add the **exchanged/regrouped 3 hundredths** below, equal to 18 **hundredths** (**0.1** + **0.08**).

Write **8** in the **total value** of the **100ths** column.

Exchange/Regroup the **10 hundredths** into **1 tenth** from the **100ths** column to the **10ths** column and write **1** below the **total value line** of the **10ths** column.

In the **10ths** column, multiply **8** by **5**, equals 40 **tenths** (**4** + **0.0**).

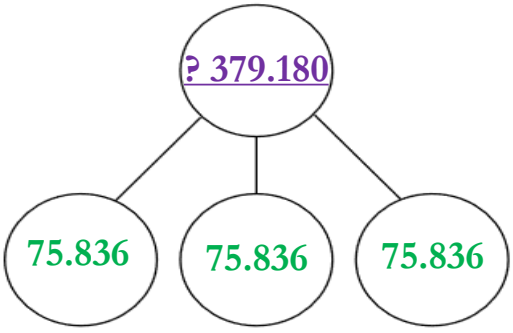
Add the **exchanged/regrouped 1 tenths** below, equals 41 **tenths** (**4** + **0.1**).

Write **1** in the **total value** of the **10ths** column.

Step 2

In the **1s** column, multiply **5** by **5**, equals 25 **ones** (**20** + **5**).
Write **5** in the **total value** of the **1s** column.
Exchange/Regroup the **20** **ones** into **2** **tens** from the **1s** column to the **10s** column and write **2** below the **total value line** of the **10s** column.
In the **10s** column, multiply **7** by **5**, equals 35 **tens** (**300** + **50**).
Add the **exchanged/regrouped** **2** **tens** below, equals 37 **tens** (**300** + **70**).
Write **7** in the **total value** of the **10s** column.
Write **3** in the **total value** of the **100s** column.
Total value is **379.180**.

Part Whole Model



Bar Model

75.836	75.836	75.836
? 379.180		

Test Questions

1) 75.836 x 5 =

2) 91.372 x 9 =

3) 35.49 x 7 =

4) 25.099 x 6 =

5) 82.998 x 5 =

6) 93.78 x 7 =

7) 98.079 x 6 =

8) 29.784 x 3 =

9) 82.30 x 8 =

Long Multiplication

1) 4 5 9 8 x 6 2 = ?

Steps 1-4

	4	5	9	8
x			6	2
	9_1	1_1	9_1	6
+				

Step 5-9

		4	5	9	8	
x				6	2	
		9_1	1_1	9_1	6	
+	2	7_3	5_5	8_4	8	0

Step 10

		4	5	9	8	
x				6	2	
		9_1	1_1	9_1	6	
+	2	7_3	5_5	8_4	8	0
	2	8	5,	0	7	6
		1	1	1		

Strategy Applied

Step 1 (First line of working out)

In the **1s** column, 8 x 2, equals 16 **ones** (10 + 6).
Write 6 underneath the 2 in the **1s** column.
Regroup the 10 **ones** into 1 **ten** and write it as a **small** 1 below the 6 in the **10s** column.

Step 2

In the **10s** column, (90) 9 x 2, equals 18 **tens** (100 + 80).
Add the **regrouped** 1 **ten** to the 18 **tens**, equals 19 **tens** (100 + 90).
Write 9 next to the **small** 1 in the **10s** column.
Regroup the 10 **tens** into 1 **hundred** and write a **small** 1 below the 5 in the **100s** column.

Step 3

In the **100s** column, (500) 5 x 2, equals 10 **hundreds** (1,000).
Add the **regrouped** 1 **hundred** to the 10 **hundreds**, equals 11 **hundreds** (1,000 + 100). Write 1 next to the **small** 1 in the **100s** column.
Regroup the 10 **hundreds** into 1 **thousand** and write a **small** 1 below the 5 in the **1,000s** column.

Step 4

In the **1,000s** column, (4,000) 4 x 2, equals 8 **thousands** (8,000).
Add the **regrouped** 1 **thousand** to the 8 **thousands**, equals 9 **thousands** (9,000). Write 9 next to the **small** 1 in the **1,000s** column.

Step 5 (Second line of working out)

In the **1s** column, write **0** below the **6**, a **place holder**, to **represent** the **tens place value** of the **6 tens** in the number **62**, the **multiplier**. (Discuss)

Step 6

In the **1s** column, **8** x **6** (60), equals 48 **tens** (**400** + **80**).
Write **8** below the **9** in the **10s** column.
Regroup the **40 tens** into **4 hundreds**.
Write a **small 4** below the **small 1** in the **100s** column.

Step 7

In the **10s** column, (90) **9** x **6** (60), equals 54 **hundreds** (**5,000** + **400**).
Add the **regrouped 4 hundreds** to the 54 **hundreds**, equals 58 **hundreds** (**5,000** + **800**). Write **8** below the **1** in the **100s** column.
Regroup the **50 hundreds** into **5 thousand** and write a **small 5** below the **small 1** in the **1,000s** column.

Step 8

In the **100s** column, (500) **5** x **6** (60), equals 30 **thousands** (**30,000**).
Add the **regrouped 5 thousand** to the 30 **thousands**, equals 35 **thousands** (**30,000** + **5,000**). Write **5** below the **9** in the **1,000s** column.
Regroup the **30 thousands** into **3 ten thousands** and write a **small 3** in the **10,000s** column.

Step 9

In the **1,000s** column, (4,000) **4** x **6** (60), equals 24 **ten thousands** (**24,000**).
Add the **regrouped 3 ten thousand** to the 24 **ten thousands**, equals 27 **ten thousands** (**200,000** + **70,000**).
Write **5** below the **9** in the **1,000s** column.

Step 10 (Third line of working out)

Add the first and second lines of working out, excluding the **small regrouped** values. **Total value** is **385,076**.

Test Questions

1) 4 5 9 8 x 6 2 = ___
2) 3 4 8 7 x 5 3 = ___
3) 7 8 6 x 9 4 = ___
4) 6 7 5 x 8 3 = ___
5) 8 3 x 9 4 = ___
6) 2 4 5 8 x 3 6 = ___
7) 1 3 9 7 x 2 5 = ___
8) 9 7 8 x 6 8 = ___
9) 8 6 7 x 5 7 = ___
10) 7 4 x 6 9 = ___

Multiples of 10

1) 3 3 0 0 ÷ 3 0 = ?

Word Problem

A **box** of maths resources costs £30. The school spends a **total** of £3,300. How many **boxes** were **purchased?**

Strategy Applied

Three thousand, three hundred represents the **total value**, the **dividend**.
Thirty represents how many **groups** the **three thousand, three hundred** is equally divided into, the **divisor**.
? represents the **value** in each group, the **quotient.**

Step 1

3 3 0 0 **is** 3 3 **x** 1 0 0
3 0 **is** 3 **x** 1 0

Step 2

3 3 ÷ 3 = 1 1
1 0 0 ÷ 1 0 = 1 0

Step 3

1 1 **x** 1 0 = 1 1 0

Step 1

Three thousand, three hundred partitioned represents the value of **thirty three lots of hundreds** or 33 x 100.
Thirty partitioned represents the value of **three lots of tens** or 3 x 10.

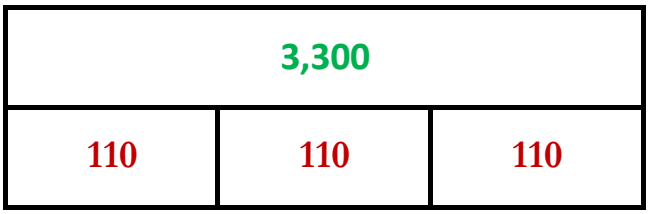
Step 2

First, divide the value of **thirty three** by **three**, equal to **eleven**.
Then, divide the values of **one hundred** by **ten**, equal to **ten**.

Step 3

Finally, multiply the values of **eleven** and **ten**, equal to **one hundred and ten**, the quotient.

Bar Model



Test Questions

1) 3,300 ÷ 30 = ___

2) 42,000 ÷ 70 = ___

3) 48,000 ÷ 80 = ___

4) 3,600 ÷ 50 = ___

5) 3,500 ÷ 70 = ___

6) 5,500 ÷ 500 = ___

7) 4,500 ÷ 300 = ___

8) 32,000 ÷ 80 = ___

9) 48,000 ÷ 40 = ___

10) 15,000 ÷ 500 = ___

11) 36,000 ÷ 90 = ___

12) 36,000 ÷ 60 = ___

13) 48,000 ÷ 40 = ___

14) 60,000 ÷ 50 = ___

Decimals

1) 5 . 4 ÷ 9 = ?

Word Problem

An engineer, Mr Young cuts a metal pole **five point four** metres long into **nine** equal pieces. How long is one piece**?**

Strategy Applied

Five point four represents the **total value**, the **dividend**.
Nine represents how many **groups** the **five point four** is equally divided into, the **divisor**.
? represents the **value** of each group, the **quotient.**

Use a **mental strategy** and the **written method** of short division to decide which is the most **efficient**.

Step 1

5 4 ÷ 9 = 6

5 . 4 ÷ 9 = 0 . 6

Step 2

$$\begin{array}{r} 0.6 \\ 9\overline{)5.54} \end{array}$$

Step 1

The mental strategy is to convert the **decimal value** to a **whole number**
5 . 4 = 5 4
First, divide the value of **fifty four** by **nine**, equal to **six**.
Then, divide the value of **five point four** by **nine**, equal to **zero point six**, as **five point four** has one **digit** in the value of the **10ths** and **represent** the **six** in the **10ths** and a **place holder 0** in the **1s** = 0 . 6

Step 2

The written method is to divide **five point four** by **nine** using short division ,equal to **zero point six**.

Bar Model

5.4								
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

Test Questions

1) 5.4 ÷ 9 = ___

2) 2.7 ÷ 3 = ___

3) 6.0 ÷ 15 = ___

4) 5.05 ÷ 1 = ___

5) 7.2 ÷ 8 = ___

6) 32.6 ÷ 1 = ___

7) 9.5 ÷ 5 = ___

8) 9.6 ÷ 4 = ___

9) 4.86 ÷ 3 = ___

10) 1.32 ÷ 12 = ___

11) 1.8 ÷ 3 = ___

12) 1.2 ÷ 12 = ___

13) 9.1 ÷ 7 = ___

14) 1.21 ÷ 11 = ___

÷10, ÷100 and ÷1,000

Divide the **value** below first by **÷10**, then by **÷100**, next by **÷1,000** and write down all **three answers consecutively**.

1) **156** = ___ ___ ___

Place Value Grid

	1,000s	100s	10s	1s	•	10ths	100ths	1,000ths
Value		1	5	6	•			
÷10			1	5	•	6		
÷100				1	•	5	6	
÷1,000				0	•	1	5	6

Strategy Applied

Method 1

Divide any **value** by **ten**, means that value will become **ten times as small**.

Each **digit** in the value will move **one column place value** to the **right**, starting with the **greatest place value**, the **100s**.

Method 2

Divide any **value** by **one hundred**, means that number will become **one hundred times as small**.

Each **digit** in the number will move **two column place values** to the **right**, starting with the **greatest place value**, the **100s**.

Method 3

Divide any number by **one thousand**, means that number will become **one thousand times as small as**.

Each **digit** in the number will move **three column place values** to the **right**, starting with the **greatest place value**, the **100s**.

When the place value is **blank**, write **zero**, a **place holder**.

Finally **156** multiplied by **÷10**, **÷100** and **÷1,000** = **15.6**, **1.56**, **1.56**.

Test Questions

Divide the values below first by **÷10**, then by **÷100**, next by **÷1,000** and write down all **three answers consecutively**.

1) 156

2) 831

3) 958

4) 7467

5) 1624

6) 456

7) 193

8) 331

9) 222

10) 255

11) 304

12) 2534

13) 326

14) 3915

Short Division

1) 8,253 ÷ 4 = ?

Step 1

$$\begin{array}{r} 2 \\ 4\overline{)\,8\;2\;5\;3} \end{array}$$

Step 2

$$\begin{array}{r} 2\;0 \\ 4\overline{)\,8\;\not{2}\;{}^{2}5\;3} \end{array}$$

Step 3

$$\begin{array}{r} 2\;0\;6 \\ 4\overline{)\,8\;\not{2}\;{}^{2}5\;{}^{1}3} \end{array}$$

Step 4

$$\begin{array}{r} 2\;0\;6\;3 \\ 4\overline{)\,8\;\not{2}\;{}^{2}5\;{}^{1}3} \end{array}$$

Step 5

$$\begin{array}{r} 2\;0\;6\;3\;\text{r}\;1 \\ 4\overline{)\,8\;\not{2}\;{}^{2}5\;{}^{1}3} \end{array}\quad 4$$

Strategy Applied

Step 1

How many **lots of** 4 divide **exactly** in to 8?
The answer is 2 (4 x 2 = 8), with no **remainder**.
Write 2 on the line above the 8.

Step 2

How many **lots of** 4 divide **exactly** in to 2?
The answer is 0 (4 x 0 = 0), with a **remainder** of 2.
Write 0 on the line above the 2.
Regroup the **remainder** 2 to the next **digit place value,** 5, to become 25.

Step 3

How many **lots of** 4 divide **exactly** in to 25?
The answer is 6 (4 x 6 = 24), with a **remainder** of 1.
Write 6 on the line above the 25.
Regroup the **remainder** 1 to the next **digit place value,** 3, to become 13.

Step 4

How many **lots of** 4 divide **exactly** in to 13?
The answer is 6 (4 x 3 = 12), with a **remainder** of 1.
Write 3 on the line above the 13.

Step 5

The **remainder** of 1, is written as **r1** on the line above or as a fraction r $\frac{1}{4}$

Remainder of 1 is the **numerator** and the divisor 4 is the **denominator**.

Total value is **2,063 r1** or **2,063 r** $\frac{1}{4}$

Test Questions

1) 8,253 ÷ 4 = ___

2) 7,643 ÷ 9 = ___

3) 5,844 ÷ 8 = ___

4) 3,686 ÷ 8 = ___

5) 1,571 ÷ 7 = ___

6) 6,789 ÷ 7 = ___

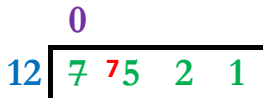
7) 8,954 ÷ 6 = ___

8) 4,555 ÷ 6 = ___

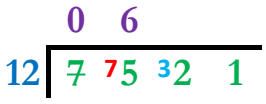
Short Division

1) 7,521 ÷ 12 = ?

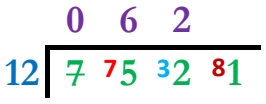
Step 1



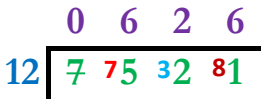
Step 2



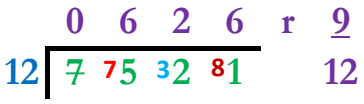
Step 3



Step 4



Step 5



Strategy Applied

Step 1

How many **lots of** 12 divide **exactly** in to 7?
The answer is 0 (12 x 0 = 0), with a **remainder** of 7 .
Write 0 on the line above the 7.
Cross out the 7 and **regroup** the **remainder** 7 to the next **digit place value**,5.

Step 2

How many **lots of** 12 divide **exactly** in to 75?
The answer is 6 (12 x 6 = 72), with a **remainder** of 3.
Write 6 on the line above the 75.
Regroup the **remainder** 3 to the next **digit place value**, 2, to become 32.

Step 3

How many **lots of** 12 divide **exactly** in to 32?
The answer is 2 (12 x 2 = 24), with a **remainder** of 8.
Write 2 on the line above the 32.
Regroup the **remainder** 8 to the next **digit place value**, 1,
to become 81.

Step 4

How many **lots of** 12 divide **exactly** in to 81?
The answer is 6 (12 x 6 = 72), with a **remainder** of 9.
Write 6 on the line above the 81.

Step 5

The **remainder** of 9, is written as **r 9** on the line above or as a fraction **r** $\frac{9}{12}$
Remainder of 9 is the **numerator** and the divisor 12 is the **denominator**.
Total value is **626 r 9** or **626 r** $\frac{9}{12}$

Test Questions

1) $12\overline{)7\ 5\ 2\ 1}$

2) $13\overline{)9\ 8\ 7\ 5}$

3) $17\overline{)5\ 7\ 1\ 5}$

4) $25\overline{)8\ 6\ 1\ 5}$

5) $29\overline{)7\ 2\ 5\ 2}$

6) $43\overline{)1\ 1\ 1\ 9}$

7) $59\overline{)2\ 2\ 4\ 5}$

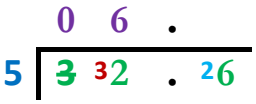
8) $97\overline{)8\ 8\ 2\ 9}$

Short Division with Decimals

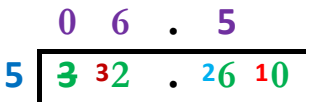
1) 32.6 ÷ 5 = ?

Step 1

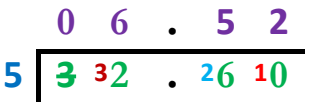
Step 2



Step 3



Step 4



Strategy Applied

Step 1

How many **lots of** 5 divide **exactly** in to 3?
The answer is 0 (5 x 0 = 0), with a **remainder** of 3.
Write 0 on the line above the 3.
Cross out the 3 and **regroup** the **remainder** 3 to the next **digit place value** 2, to become 32.

Step 2

How many **lots of** 5 divide **exactly** in to 32?
The answer is 6 (5 x 6 = 30),with a **remainder** of 2 .
Write 6 on the line above the 32 and write a decimal point next to it.
Regroup the **remainder** 2 to the next **digit place value,** 6, to become 26.

Step 3

How many **lots of** 5 divide **exactly** in to 26?
The answer is 5 (5 x 5 = 25),with a **remainder** of 1.
Write 5 on the line above the 26.
Regroup the **remainder** 1 to the next **digit place value,**
by writing a **place holder,** **zero**, to become 10.

Step 4

How many **lots of** 5 divide **exactly** in to 10?
The answer is 2 (5 x 2 = 10),with no **remainder**.
Write 2 on the line above the 10.
Total value is 6.52.

Test Questions

1) 32.6 ÷ 5 = ___

2) 76.2 ÷ 5 = ___

3) 51.4 ÷ 4 = ___

4) 37.8 ÷ 4 = ___

5) 60.4 ÷ 8 = ___

6) 96.8 ÷ 8 = ___

7) 37.2 ÷ 6 = ___

8) 87.6 ÷ 6 = ___

9) 78.6 ÷ 4 = ___

10) 98.52 ÷ 4 = ___

Long Division

1) 888 ÷ 37 = ?

Step 1

```
   0
37 | 8  8  8
   - 0
     8  8
```

Step 2

```
   0  2
37 | 8  8  8
   - 0
     8  8
   - 7  4
     1  4
```

Step 3

```
   0  2
37 | 8  8  8
   - 0
     8  8
   - 7  4
     1  4  8
```

Step 4

```
   0  2  4
37 | 8  8  8
   - 0
     8  8
   - 7  4
     1  4  8
   - 1  4  8
     0  0  0
```

Strategy Applied

Step 1

How many **lots of** 37 divide **exactly** into 8?
The answer is 0 (37 x 0 = 0), with a **remainder** of 8.
Write 0 on the line above the 8.
Write **0** below the 8 and draw a **line** underneath it.
Then 8 subtract **0**, equals 8, write the 8 below the **0** underneath the **line**.
Regroup the **remainder** 8 to the next **digit place value**, 8, to become 88, by writing 8next to the 8.

Step 2

How many **lots of** 37 divide **exactly** into 88?
The answer is 2 (37 x 2 = **74**), with a **remainder** of 14.
Write 2 on the line above the 8, next to the 0.
Write **74** below the 88 and draw a **line** underneath the **74**.
Then 83 subtract **74**, equals 14. Write 14 below the **74**.

Step 3

Regroup the **remainder** 14 to the next **digit place value**, 8, to become 148, by writing 8 next to the 14.

Step 4

How many **lots of** 37 divide **exactly** into 148?
The answer is 4 (37 x 4 = 148), with a **remainder** of **0**.
Write 4 on the line above the 8, next to the 2.
Write 148 below the 148.
Total value is 42.

Test Questions

1) 37 | 8 8 8

2) 83 | 8 0 5 1

3) 17 | 7 1 4

4) 59 | 2 2 4 2

5) 43 | 6 4 5

6) 97 | 8 8 2 7

7) 29 | 7 2 5

8) 43 | 1 1 1 8

9) 29 | 6 8 4 4

10) 25 | 8 6 2 5

11) 19 | 2 2 6 1

12) 44 | 5 7 2 0

Find The Missing Number

1) ? + 20,002 = 33,333 and 33,333 - ? = 20,002

Word Problem

Mrs Watts thinks that the missing **values** in both number sentences are of **equal** value or the **same** value. **Mr Thorne** thinks that both missing values are **different**. Who is correct, explain why**?**

Step 1

```
  3 3 3 3 3
- 2 0 0 0 2
-----------
  1 3, 3 3 1
-----------
```

Step 2

```
  3 3 3 3 3
- 2 0 0 0 2
-----------
  1 3, 3 3 1
-----------
```

Strategy Applied

There are two **operations** in both number sentences, **add** and **subtract**.

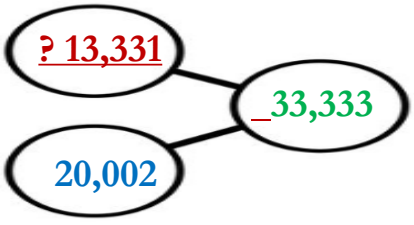
Step 1

First, calculate the first number sentence ? + 20,002 = 33,333 by applying the **inverse operation** of column subtraction.
Total value is **thirteen thousand, three hundred and thirty one**.

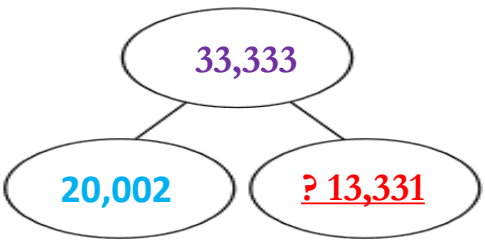
Step 2

Then, calculate the second number sentence 33,333 - ? = 20,00 by applying the **derived** calculation of column subtraction.
Total value is **thirteen thousand, three hundred and thirty one**.

Part Whole Model



Part Whole Model



Test Questions

1) ___ + 20,002 = 33,333

2) ___ + 25,100 = 40,050

3) ___ + 58,100 = 63,000

4) ___ + 3,006 = 19,005

5) ___ + 30,500 = 80,400

6) 33,333 - ___ = 20,002

7) 300,001 - ___ = 200,002

8) 121,010 - ___ = 111,005

9) 870,999 - ___ = 480,999

10) 444,005 - ___ = 22,006

Balance Equations

1) 1 8 x 3 = 2 x ?

Word Problem

In a warehouse there are **three** broken pallets of tin foods that need to be repackaged. Each pallet contains **eighteen** tins. All of the tins are repackaged onto **two** pallets. How many tins are on each pallet**?**

Strategy Applied

There are two **operations** in the number sentences, both **multiplication**. The **total value** of each number sentence are of **equal** value or the **same**.

Step 1

1 0 x 3 = 3 0
8 x 3 = 2 4 +
5 4

OR

1 8
x 3
5 4
2

Step 2

2 7
2) 5 14

Step 1

First, calculate the known number sentence 1 8 x 3 , either by using t mental strategy of **partitioning** or written method of **short multiplication**. **Total value** is **fifty four**.

Step 2

Then, we now know 2 x ? = 5 4 .
Next use the **inverse operation** of **short division** to calculate **?**
Finally, the missing **value** is **twenty seven**.

Test Questions

1) 18 x 3 = 2 x ___

2) 72,000 = 24 x ___ x 1,000

3) 423 x 7 = 9 x ___

4) 48,000 = 16 x ___ x 1,000

5) 400 = 20 x ___ x 10

6) 3,050,020 = 3,000,000 + ___ + 20

7) 826 = 800 + ___ 6

8) ___ + 58,100 = 63,000 - 2,468

9) ___ + 25,100 = 40,050 - 1,357

10) ___ + 20,002 = 33,333 - 9,083

11) 16 - 20 = - 8 + ___

12) - 16 + 20 = - 9 + ___

13) - 12 - 5 = - 17 + ___

14) 13 - 17 = - 15 + ___

Indices

1) $11^2 + 6^3 - 4^3 = ?$

Strategy Applied

11^2 represents **eleven squared,** its **expanded form** is eleven times eleven,
11 x 11

6^3 represents **six cubed**, its **expanded form** is six times six times six,
6 x 6 x 6

4^3 represents **four cubed**, its **expanded form** is four times four times four
4 x 4 x 4

Step 1 11 x 11 = 110 + 11 = 121

Step 2 6 x 6 x 6 = 36 x 6 = 180 + 36
= 216

Step 3 4 x 4 x 4 = 16 x 4 = 40 + 24 = 64

Step 4

$$\begin{array}{r} 216 \\ +\ 121 \\ \hline 337 \end{array} \qquad \begin{array}{r} 2 \\ 3\,13\,7 \\ -\ \ 64 \\ \hline 273 \end{array}$$

Step 1

Use **known facts** of times tables or step counting to calculate **eleven squared**. Calculate 11^2 or 11 x 11 or 11 **lots of** 11, equals the **product** of **one hundred and twenty one**.

Step 2

Use **known facts** of times tables or step counting to calculate **six cubed**. Calculate 6^3 or 6 x 6 x 6 or 6 **lots of** 6 **squared,** equals the **product** of **two hundred and sixteen**.

Step 3

Use **known facts** of times tables or step counting to calculate **four cubed**.
Calculate 4^3 or 4 x 4 x 4 or **4 lots of 4 squared,** equals the **product** of **sixty four**.

Step 4

Calculate the new number sentence **1 2 1 + 2 1 6 - 6 4**
, equals to **two hundred and seventy three**.

Test Questions

1) $11^2 + 6^2 - 4^3 =$ ___

2) $12^2 + 7^2 - 5^3 =$ ___

3) $3^2 + 7^3 + 4^2 =$ ___

4) $9^2 + 8^3 - 3 =$ ___

5) $1^2 + 9^3 - 3^2 =$ ___

6) $2^3 + 3 + 11^2 =$ ___

7) $4^2 + 7^3 - 5 =$ ___

8) $5^2 + 3^3 - 4^2 =$ ___

9) $3^2 + 2 + 5^2 =$ ___

10) $1^3 + 2^3 + 4^2 =$ ___

11) $2^2 + 7^3 - 1^2 =$ ___

12) $4^2 + 8^3 - 2^2 =$ ___

13) $5^2 + 5^3 - 5^2 =$ ___

14) $6^2 + 6^3 - 6^2 =$ ___

BIDMAS

1) 10^2 - (60 ÷ 4) + (9 x 2) = ?

Strategy Applied

BIDMAS is an acronym for **B**rackets, **I**ndices, **D**ivision, **M**ultiplication, **A**ddition and **S**ubtraction. All **six operations** must be calculated in that **order**.

Step 1

First, calculate the division number sentence in the **B**rackets.

(60 ÷ 4) , equal to 15.

Step 2

Then, calculate the multiplication number sentence in the **B**rackets.

(9 x 2) , equal to 18.

Step 3

Next, calculate the **I**ndices 10^2 or 10 x 10 , equal to 100.

Step 4

Then, 10^2 - (60 ÷ 4) + (9 x 2)

now becomes 100 - 15 + 18 = ?

Step 5

Next, calculate the **A**ddition operation of

15 + 18 , equal to 33.

Step 6

Finally, calculate the **S**ubtraction operation of

100 - 33 , equal to 67.

The missing value is **sixty seven**.

Test Questions

1) 10^2 - 60 ÷ 4 + 9 x 2 = ___

2) (3 + 7) x (9 + 17) = ___

3) 60 - 48 ÷ 4 + 6 = ___

4) 2 + 7 x 7 - 10 = ___

5) 236 - (30 x 6) = ___

6) 50 x 80 - 40 = ___

7) 8 + 7 x 3 = ___

8) 36 + 22 x 4 = ___

9) 60 x 90 - 80 = ___

10) 100 - 26 ÷ 2 = ___

11) 220 - 3 x 60 = ___

12) 60 ÷ (30 - 24) = ___

13) 50 + (36 ÷ 6) = ___

14) 9^2 - 36 ÷ 9 = ___

Percentage of a Quantity

1) **36%** **of** **450** **=** **?**

Strategy Applied

100% = Quantity of **450**

10% = Quantity ÷ 10 (**450** ÷ 10)

1% = Quantity ÷ 100 (**450** ÷ 100)

Partition **36%** into **30%** + **6%**

Step 1

1 0 % = **4 5 0** ÷ 1 0 = **4 5**

3 0 % = **1 0 %** x 3 = **4 5** x 3 = **3 6 3**

	10s	10s	1s
value	4	5	0
÷ 10		4	5

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

Calculate **30%** of the **quantity** of **450**.

First, work out **10%** of the **quantity** of **450**, equal to **45**.

Then, **30%** is equal to **10%** multiplied by 3, equal to the **quantity** of **135**.

Step 2

1 % = **4 5 0** ÷ 1 0 0 = **4 . 5**

6 % = **1 %** x 6 = **4 . 5** x 6 = **2 7**

	10s	1s	1s	•	10ths
value	4	5	0	•	
÷ 100			4	•	5

```
    4 . 5
x       6
---------
  2 7 . 0
---------
    3
```

Calculate **6%** of the **quantity** of **450**.
Next, work out **1%** of the **quantity** of **450**, equal to **4.5**.
Then, **6%** is equal to **1%** multiplied by 6, equal to the **quantity** of **27**.

Step 3

3 0 % + 6 % = 1 3 5 + 2 7 = 1 6 2

$$\begin{array}{r} 1\ 3\ 5 \\ +\quad 2\ 7 \\ \hline 1\ 6\ 2 \\ \hline 1 \end{array}$$

Calculate **36%** of the **quantity** of **450**.
Next, add together the quantities of **30%** and **6%**, which is **135** add **27**.
Finally, **36%** of the **quantity** of **450** is equal to **162**.

Test Questions

1) 36% of 450 = ___
2) 36% of 4,500 = ___
3) 20% of 300 = ___
4) 20% of 3,000 = ___
5) 35% of 320 = ___
6) 35% of 3,200 = ___
7) 51% of 900 = ___
8) 51% of 9,000 = ___
9) 20% of 180 = ___
10) 20% of 1,800 = ___
11) 15% of 440 = ___
12) 15% of 4,440 = ___
13) 45% of 460 = ___
14) 45% of 4,600 = ___

Fraction of a Quantity

1) $\frac{7}{8}$ **of** 64 **ml** = **?**

Word Problem

Emily has **sixty four ml** of a liquid to be evaporated in an experiment.
Only **seven-eighths** evaporate into the atmosphere.
What volume of liquid had been evaporated**?**

Strategy Applied

A fraction is part of a **whole** or part of **1** and an **eighth** is 1 of 8 **equal groups**.
64 **ml** is the **quantity** divided **equally** between the **total number** of **groups**.
8 is the **denominator**, represents the **total** number of **groups**.
7 is the **numerator**, represents **seven** of the **total** number of **groups**.

Step 1

$$\begin{array}{r} 0\ 8\ \text{ml} \\ 8\overline{)\,6\ 6\,4} \end{array}$$

Step 2

$$\begin{array}{r} 8 \\ \times\ 7 \\ \hline 5\ 6\ \text{ml} \\ \hline 5 \end{array}$$

Step 1

First, use **short division** to calculate the value of **one equal group**, **sixty four ml** divided by **eight** (denominator), equal to **eight ml**.

Step 2

Then, use **short multiplication** to calculate the value of **seven equal groups**, **eight ml** times **seven** (multiplier), equal to **fifty six**.
Finally, the **value** of the missing number is **fifty six ml**.

Bar Model

Test Questions

1) $\frac{7}{8}$ of 64ml = ___

2) $\frac{1}{7}$ of 602 = ___

3) $\frac{5}{6}$ x 24 = ___

4) $\frac{2}{5}$ x 140 = ___

5) $\frac{5}{6}$ of £72 = ___

6) $\frac{1}{8}$ of 996 = ___

7) $\frac{4}{5}$ of 450 = ___

8) $\frac{5}{8}$ x 40 = ___

9) $\frac{1}{8}$ of £3.20 = ___

10) $\frac{3}{4}$ of 1,000 = ___

Add Proper Fractions

1) $\frac{2}{3} + \frac{3}{4} = \frac{?}{?}$

Strategy Applied

Add fractions with **different denominators**, **two-thirds** and **three-quarters**.

2 is the **numerator**. 3 is the **denominator**. $\frac{2}{3}$

3 is the **numerator**. 4 is the **denominator**. $\frac{3}{4}$

Step 1

LCM = 12 = LCD

x 3	x 4
3	4
6	8
9	12
12	

Step 2

$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

Step 3

$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$

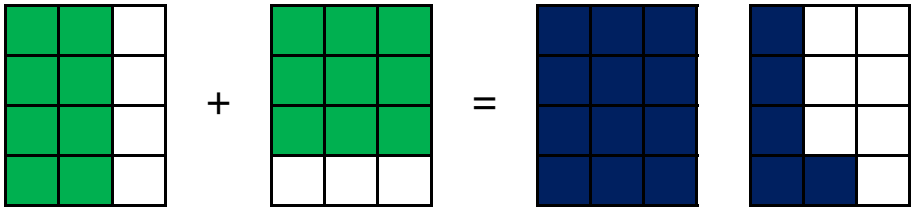
Step 4

$\frac{8}{12} + \frac{9}{12} = \frac{17}{12}$

Step 5

$$12 \overline{)17} \quad 0\ 1\ \tfrac{5}{12} = 1\ \tfrac{5}{12}$$

Bar Model



$\frac{2}{3}$ or $\frac{8}{12}$ + $\frac{3}{4}$ or $\frac{9}{12}$ = $\frac{17}{12}$ or $1\frac{5}{12}$

Step 1

First, both fractions need to be made **equivalent**.

Calculate the **Lowest Common Multiple/Denominator** (**LCM/LCD**) of the denominators 3 and 4, which is 12.

Step 2

Then, for **two-thirds**, the **denominator 3** is multiplied by 4 to make it **equivalent** to **12** (**LCD**).

The **numerator 2** must also be multiplied by 4, equal to **8**.

Step 3

Next, for **three-quarters**, the **denominator 4** is multiplied by 3 to make it **equivalent** to **12** (**LCD**).

The **numerator 3** must also be multiplied by 3, equal to **9**.

Step 4

Then, add the **numerators 8** + **9**, equalling **17** and the **denominator** remains the **same** as **12**, making the fraction **seventeen-twelfths**.

Step 5

Next, **seventeen-twelfths** is an **improper fraction** and needs to be converted into a **mixed fraction**, using **short division**.

17 (numerator) is divided by **12** (denominator), which is **1** remainder **5**.

The **remainder 5** is written as a fraction, becoming the **numerator** and the **denominator** remains the **same**, **12**.

Finally, **total value** is **one** and **five-twelfths**. (Simplify if possible)

Test Questions

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

2) $\frac{2}{3} + \frac{4}{5} = \_\_\_$

3) $\frac{2}{5} + \frac{11}{12} = \_\_\_$

4) $\frac{2}{5} + \frac{5}{9} = \_\_\_$

5) $\frac{3}{4} + \frac{7}{12} = \_\_\_$

6) $\frac{3}{5} + \frac{7}{12} = \_\_\_$

7) $\frac{5}{6} + \frac{11}{15} = \_\_\_$

8) $\frac{2}{3} + \frac{11}{12} = \_\_\_$

9) $\frac{5}{6} + \frac{5}{15} = \_\_\_$

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

Subtract Proper Fractions

1) $\frac{3}{4} - \frac{5}{10} = \frac{?}{?}$

Strategy Applied

Subtract fractions with **different denominators**, three-quarters and five-tenths.

3 is the **numerator**. 4 is the **denominator**. $\frac{3}{4}$

5 is the **numerator**. 10 is the **denominator**. $\frac{5}{10}$

Step 1

LCM = 20 = LCD

x 4	x 10
4	10
8	20
12	
16	
20	

Step 2

$\frac{3}{4} \times 5 = \frac{15}{20}$

$4 \times 5 = 20$

Step 3

$\frac{5}{10} \times 2 = \frac{10}{20}$

$10 \times 2 = 20$

Step 4

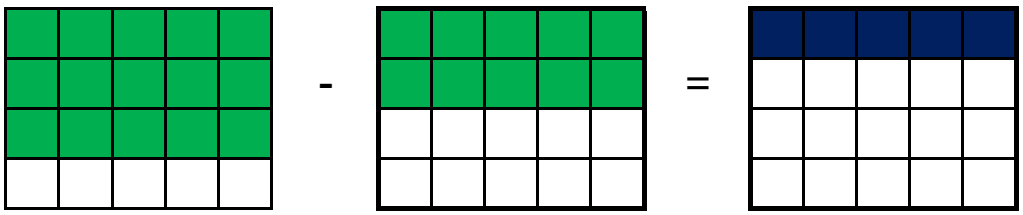
$\frac{15}{20} - \frac{10}{20} = \frac{5}{20}$

Step 5

$\frac{5}{20} \div 5 = \frac{1}{4}$

$20 \div 5 = 4$

Bar Model



$\frac{3}{4}$ or $\frac{15}{20}$ - $\frac{5}{10}$ or $\frac{10}{20}$ = $\frac{5}{20}$ or $\frac{1}{4}$

Step 1

First, both fractions need to be made **equivalent**.

Calculate the **Lowest Common Multiple/Denominator** (**LCM/LCD**) of the denominators 4 and 10, which is 20.

Step 2

Then, for **three-quarters**, the **denominator 4** is multiplied by 5 to make it **equivalent** to **20** (**LCD**).

The **numerator 3** must also be multiplied by 5, equal to **15**.

Step 3

Next, for **five-tenths**, the **denominator 10** is multiplied by 2 to make it **equivalent** to **20** (**LCD**).

The **numerator 5** must also multiplied by 2, equal to **10**.

Step 4

Then, subtract the **numerators 15** - **10**, equalling **5** and the **denominator** remains the **same** as **20**, making the fraction **five-twentieths**.

Step 5

Next, **five-twentieths** is a **proper fraction** that can be **simplified**.

Simplify the fraction, by dividing both the numerator and denominator by the same **Highest Common Factor** (**HCF**) of 5.

Then the **numerator 5** is divided by **5**, equal to **1** and the **denominator 20** is divided by 5, equal to **4**.

Finally the **total value** is **five-twentieths** or **one-quarter**.

Test Questions

1) $\frac{3}{4} - \frac{5}{10} = \_\_\_$

2) $\frac{3}{4} - \frac{3}{10} = \_\_\_$

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

4) $\frac{7}{6} - \frac{7}{10} = \_\_\_$

5) $\frac{7}{3} - \frac{4}{5} = \_\_\_$

6) $\frac{3}{4} - \frac{3}{8} = \_\_\_$

7) $\frac{2}{3} - \frac{5}{21} = \_\_\_$

8) $\frac{19}{20} - \frac{4}{5} = \_\_\_$

9) $\frac{8}{9} - \frac{1}{4} = \_\_\_$

10) $\frac{5}{4} - \frac{5}{6} = \_\_\_$

Add Mixed Fractions

1) $3\frac{2}{7} + 2\frac{4}{5} = ?\frac{?}{?}$

Strategy Applied

Add fractions with **different values**, three and **two-sevenths** and two and **four-fifths**.

The 3 represents **three ones**.
The 2 represents the **numerator**.
The 7 represents the **denominator**.

The 2 represents **two ones**.
The 4 represents the **numerator**.
The 5 represents the **denominato**

Step 1

$\frac{3 \times 7 + 2}{7} = \frac{23}{7}$ $\quad \frac{2 \times 5 + 4}{5} = \frac{14}{5}$

Step 2

L.C.M. = 35 = L.C.D

x 7	x 5
7	5
14	10
21	15
28	20
35	25
	30
	35

Step 3

$\frac{23}{7} \times 5 = \frac{115}{35}$ $\quad \frac{14}{5} \times 7 = \frac{98}{35}$

Step 4

$\frac{115}{35} + \frac{98}{35} = \frac{213}{35}$

Step 5

$35\overline{)213}\ 35 = 6\frac{3}{35}$

Step 1

First, convert both **mixed fractions** into **improper fractions.**
Multiply the 3 (ones) by 7 (denominator) and add 2 (numerator), numerator equals 23, the denominator 7 remains the **same**, **twenty three-sevenths**.
Multiply the 2 (ones) by 5 (denominator) and add 4 (numerator) numerator equals 14, the denominator 5 remains the **same**, **fourteen-fifths**.

Step 2

Then, both fractions need to be made **equivalent**.
Calculate the **Lowest Common Multiple/Denominator** (**LCM/LCD**) of the denominators **7** and **5**, which is **12**.

Step 3

Next, for **twenty three-sevenths**, the **denominator 7** is multiplied by 5 to make it **equivalent** to **35** (**LCD**).
The **numerator 23** must also multiplied by 5, equals **115**.
Then, for **fourteen-fifths**, the **denominator 5** is multiplied by 7 to make it **equivalent** to **35** (**LCD**).
The **numerator 14** must also multiplied by 7, equals **98**.

Step 4

Next, add the **numerators 115** + **98**, equalling **213**.
The **denominator** remains the **same** as **35**, equalling the fraction $\frac{213}{35}$

Step 5

Then, **two hundred and thirteen-thirty fifths** is an **improper fraction** and must to be converted into a **mixed fraction**, using **short division**.
213 (numerator) is divided by **35** (denominator), which is **6** remainder **3**.
The **remainder 3** is written as a fraction, becoming the **numerator** and the **denominator** remains the **same**, **35**.
Finally, **total value** is **six** and **three-thirty fifths**. (Simplify if possible)

Test Questions

1) $2\frac{2}{3} + 1\frac{4}{5} = \_\_\_$

2) $3\frac{2}{7} + 2\frac{4}{5} = \_\_\_$

3) $1\frac{2}{5} + 2\frac{11}{12} = \_\_\_$

4) $3\frac{3}{4} + 1\frac{7}{12} = \_\_\_$

5) $4\frac{5}{6} + 2\frac{11}{15} = \_\_\_$

6) $3\frac{2}{3} + 1\frac{11}{12} = \_\_\_$

Subtract Mixed Fractions

1) $4\frac{2}{5} - 1\frac{7}{8} = ?\frac{?}{?}$

Strategy Applied

Subtract fractions with **different values**, four and **two-fifths** and one and **seven-eighths**.

The 4 represents **four ones**.
The 2 represents the **numerator**.
The 5 represents the **denominator**.

The 1 represents **three ones**.
The 7 represents the **numerator**.
The 8 represents the **denominator**.

Step 1

$\frac{4 \times 5 + 2}{5} = \frac{22}{5}$ $\quad \frac{1 \times 8 + 7}{8} = \frac{15}{8}$

Step 2

L.C.M. = 40 = L.C.D

x 5	x 8
5	8
10	16
15	24
20	32
25	40
30	
35	
40	

Step 3

$\frac{22}{5} \times 8 = \frac{176}{40}$ $\quad \frac{15}{8} \times 5 = \frac{75}{40}$

Step 4

$\frac{176}{40} - \frac{75}{40} = \frac{101}{40}$

Step 5

$40\overline{)1\,10\,101}$ $\quad 002\frac{21}{40} = 2\frac{21}{40}$

Step 1

First, convert both **mixed fractions** into **improper fractions.**
Multiply the 4 (ones) by 5 (denominator) and add 2 (numerator), numerator equals 22, the denominator 5 remains the **same**, **twenty two-fifths**.
Multiply the 1 (ones) by 8 (denominator) and add 7 (numerator) numerator equals 15, the denominator 8 remains the **same**, **fifteen-eighths**.

Step 2

Then, both fractions need to be made **equivalent**.
Calculate the **Lowest Common Multiple/Denominator** (**LCM/LCD**)

of the denominators **5** and **8**, which is **40**.

Step 3

Next, for **twenty two-fifths**, the **denominator 5** is multiplied by 8 to make it **equivalent** to **40** (**LCD**).
The **numerator 22** is multiplied by 8, equals **176**.
Then, for **fifteen-eighths**, the **denominator 8** is multiplied by 5 to make it **equivalent** to **40** (**LCD**).
The **numerator 15** is multiplied by 5, equals **75**.

Step 4

Next, subtract the **numerators 176** - **75**, equalling **101** and the **denominator** remains the **same** as **40**, makes the fraction **one hundred and one-fortieths**.

Step 5

Then, **one hundred and one-fortieths** is an **improper fraction** and must to be converted into a **mixed fraction**, using **short division**.
101 (numerator) is divided by **40** (denominator), which is **2** remainder **21**.
The **remainder 21** is written as a fraction, becoming the **numerator** and the **denominator** remains the **same**, **40**.
Finally, **total value** is **two** and **twenty one-fortieths**. (Simplify if possible)

Test Questions

1) $3\frac{1}{4} - 1\frac{7}{8} = \_\_\_$

2) $4\frac{2}{5} - 1\frac{7}{8} = \_\_\_$

3) $6\frac{1}{6} - 2\frac{1}{7} = \_\_\_$

4) $2\frac{2}{3} - \frac{2}{9} = \_\_\_$

5) $3\frac{3}{4} - 2\frac{7}{10} = \_\_\_$

6) $4\frac{2}{5} - 3\frac{2}{6} = \_\_\_$

Multiply Proper Fractions

1) $\frac{7}{8} \times 3 = \frac{?}{?}$

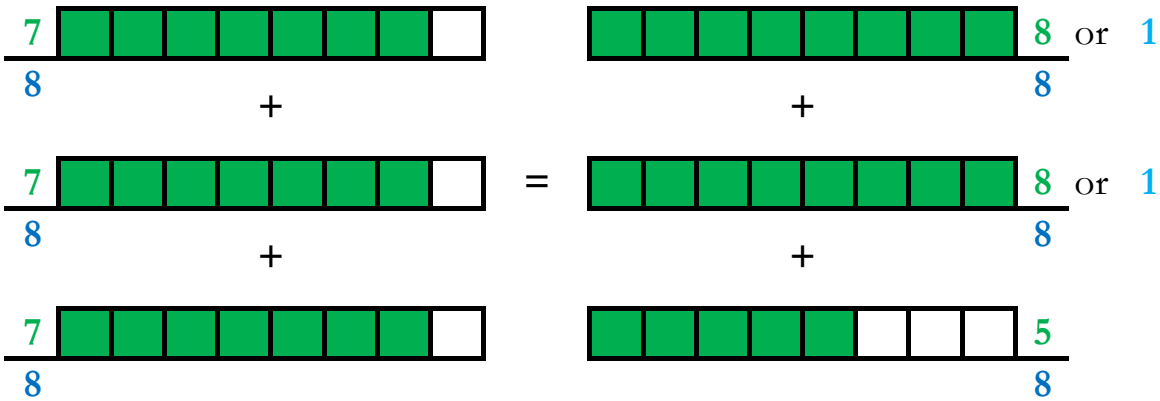
Strategy Applied

7 represents the **numerator**. 3 represents the **integer**.

8 represents the **denominator**.

$\frac{7}{8} \times 3$ means **three lots of seven-eighths**. **or** $\frac{7}{8} + \frac{7}{8} + \frac{7}{8}$

Bar Model



$\frac{7}{8} + \frac{7}{8} + \frac{7}{8} = \frac{21}{8}$ **or** $2\frac{5}{8}$

Step 1

$\frac{7 \times 3}{8} = \frac{21}{8}$

Step 2

$8\overline{)21}\ \frac{5}{8} = 2\frac{5}{8}$

Step 1

First, multiply the **numerator** 7 by the **integer** 3, to equal the **new numerator** of 21.

The **denominator** remains the **same as** 8, making **twenty one-eighths**.

Step 2

Then, **twenty one-eighths** is an **improper fraction** that must be converted into a **mixed number**.

Next, use **short division**, divide the **numerator** by the **denominator**.

21 (numerator) is divided by 8 (denominator), which is 2 remainder 5.

The **remainder** 5 is written as a fraction, becoming the **numerator** and the **denominator** remains the **same as** 8.

Finally, the **total value** is two and **five-eighths**. (Simplify if possible)

Test Questions

1) $\frac{7}{8} \times 3 = \_\_\_$

2) $\frac{5}{8} \times 12 = \_\_\_$

3) $\frac{5}{7} \times 8 = \_\_\_$

4) $\frac{3}{7} \times 6 = \_\_\_$

5) $\frac{5}{6} \times 7 = \_\_\_$

6) $\frac{3}{8} \times 7 = \_\_\_$

7) $\frac{4}{5} \times 8 = \_\_\_$

8) $\frac{3}{8} \times 12 = \_\_\_$

Multiply Proper Fractions

1) $\frac{1}{7} \times \frac{1}{3} = \frac{?}{?}$

Strategy Applied

1 is the **numerator**. $\frac{1}{7}$ 7 is the **denominator**.

1 is the **numerator**. $\frac{1}{3}$ 3 is the **denominator**.

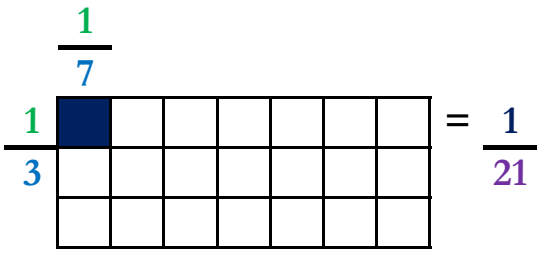
Step 1

$$\frac{n \times n}{d \times d}$$

Step 2

$$\frac{1 \times 1}{7 \times 3} = \frac{1}{21}$$

Bar Model



Step 1

Multiply both of the **numerators** and multiply both of the **denominators**.

Step 2

First, multiply the **numerators** 1 by 1, to equal the **new numerator** of **1**.
Next, multiply the **denominators** 7 by 3, to equal the **new denominator** of **21**, making **one-twenty ones**.
Finally, **total value** is **one-twenty ones**. (simplify if possible)

Test Questions

1) $\frac{1}{7} \times \frac{1}{3} = \_\_\_$

2) $\frac{3}{5} \times \frac{4}{5} = \_\_\_$

3) $\frac{3}{4} \times \frac{3}{7} = \_\_\_$

4) $\frac{1}{2} \times \frac{1}{4} = \_\_\_$

5) $\frac{1}{3} \times \frac{1}{8} = \_\_\_$

6) $\frac{1}{8} \times \frac{1}{6} = \_\_\_$

7) $\frac{3}{4} \times \frac{6}{7} = \_\_\_$

8) $\frac{3}{7} \times \frac{4}{5} = \_\_\_$

Multiply Mixed Fractions

1) $2\frac{3}{5} \times 4 = ?\frac{?}{?}$

Strategy Applied

2 represents the **whole number**.
3 represents the **numerator**.
4 represents the **integer**.
5 represents the **denominator**.

$2\frac{3}{5} \times 4$ means **four lots of** two and **three-fifths**.

or $2\frac{3}{5} + 2\frac{3}{5} + 2\frac{3}{5} + 2\frac{3}{5}$

Step 1 **Step 2** **Step 3**

$2 \times 5 + 3 = \frac{13}{5}$ $\frac{13 \times 4}{5} = \frac{52}{5}$ $5\overline{)52}\ 10\ 2 = 10\frac{2}{5}$

Step 1

Convert the **mixed fraction** two and **three-fifths** into an **improper fraction**.
First, multiply the **whole number** 2 by the **denominator** 5 and then add the **numerator** 3, to equal the **new numerator** of 13.
The **denominator** remains the **same as** 5, making the **improper fraction** of **thirteen-fifths**.

Step 2

Multiply the **improper fraction** by the **integer**.
Then, multiply the **numerator** 13 by the **integer** 4, to equal the **new numerator** of 52.
The **denominator** remains the same as 5, making an **improper fraction** of **fifty two-fifths**.

Step 3

Convert the **improper fraction** into a **mixed fraction**.
Next, use **short division** and divide the **numerator** by the **denominator**.
52 (numerator) is divided by **5** (denominator), which is **10** remainder **2**.
The **remainder 2** is written as a fraction, becoming the **numerator** and the **denominator** remains the **same as 5**.
Finally, the **total value** is **ten** and **two-fifths**. (Simplify if possible)

Test Questions

1) $2\frac{3}{5} \times 4 = \_\_\_$

2) $2\frac{1}{3} \times 3 = \_\_\_$

3) $1\frac{5}{6} \times 3 = \_\_\_$

4) $2\frac{3}{5} \times 4 = \_\_\_$

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

6) $3\frac{5}{6} \times 4 = \_\_\_$

7) $1\frac{6}{7} \times 5 = \_\_\_$

8) $2\frac{4}{7} \times 3 = \_\_\_$

Divide Proper Fractions

1) $\frac{6}{7} \div 2 = \frac{?}{?}$

Strategy Applied

6 represents the **numerator**. 2 represents the **integer**.
7 represents the **denominator**.

$\frac{6}{7} \div 2$ means **share six-sevenths equally** into **two groups**.

Step 1 **Step 2** **Step 3**

$\frac{n}{d \times i}$ $\frac{6}{7 \times 2} = \frac{6}{14}$ $\frac{6}{14} \div 2 = \frac{3}{7}$

Step 1

When dividing a **proper fraction**, the **numerator** remains the same and the **denominator** will change as it is multiplied by the **integer**.

Step 2

First, the numerator remains the same, 6.
Then, multiply the **denominator** 7 by 2 **integer**, equal to 14 the **new denominator**, to make **six-fourteenths**. (simplify if possible)

Step 3

Next, **six-fourteenths** is a **proper fraction** that can be **simplified**.
Simplify the fraction, by dividing the numerator and denominator by the by the same **Highest Common Factor** (**HCF**) of 2.
The **numerator 6** is divided by 2, equal to **3** and the **denominator** 14 is divided by 2, equal to 7.
Finally, **total value** is **three-sevenths**.

Test Questions

1) $\frac{6}{7} \div 2 = \_\_\_$

2) $\frac{6}{4} \div 2 = \_\_\_$

3) $\frac{1}{3} \div 5 = \_\_\_$

4) $\frac{2}{3} \div 4 = \_\_\_$

5) $\frac{1}{3} \div 3 = \_\_\_$

6) $\frac{1}{5} \div 2 = \_\_\_$

7) $\frac{2}{5} \div 6 = \_\_\_$

8) $\frac{1}{3} \div 4 = \_\_\_$

Converted to Percentages and Decimals

1) $\frac{5}{20}$ = _____ % = _____

Strategy Applied

5 represents the **numerator**.

20 represents the **denominator**.

A **percentage value** will be out of **100%** and a **decimal value** represents the place values of the **tenths** and **hundredths**.

Step 1

$\frac{5}{20} \times 5 = \frac{25}{100}$

Step 2

$\frac{25}{100} = \frac{25}{}$ %

Step 3

$\frac{25}{100} = 0.25$

Step 1

Convert the **proper fraction** into an **equivalent fraction** with the value of the **denominator** as **100** representing the **hundredths**.

First calculate the value of the **factor** multiplied by **twenty** to equal **one hundred**, 2 0 x **?** = 1 0 0 , which is **5**.

Multiply the **numerator** 5 and the **denominator** 20 by the same **factor** 5, equal to $\frac{25}{100}$ the equivalent fraction **twenty five-hundredths**.

Step 2

Then, the value of the **equivalent** new numerator **twenty five** converts into a **percentage** as the same value, **25%**.

Step 3

Next, the value of the **equivalent** new numerator **twenty five** converts into a **decimal** as the same value representing the digit values of the **tenths** and **hundredths**, to make **0.25**.

Finally , $\frac{5}{20} = \frac{25}{\quad} \% = \underline{0.25}$

Test Questions

1) $\frac{5}{20} = \frac{\quad}{\quad} \% = \underline{\quad}$

2) $\frac{4}{5} = \frac{\quad}{\quad} \% = \underline{\quad}$

3) $\frac{3}{10} = \frac{\quad}{\quad} \% = \underline{\quad}$

4) $\frac{1}{4} = \frac{\quad}{\quad} \% = \underline{\quad}$

5) $\frac{7}{10} = \frac{\quad}{\quad} \% = \underline{\quad}$

6) $\frac{3}{4} = \frac{\quad}{\quad} \% = \underline{\quad}$

7) $\frac{2}{5} = \frac{\quad}{\quad} \% = \underline{\quad}$

8) $\frac{15}{20} = \frac{\quad}{\quad} \% = \underline{\quad}$

Answers

P. 2

1) 9 ten million, 8 million, 7 hundred thousands, 6 ten thousands, 5 thousands, 4 hundreds, 3 tens, 2 ones, 1 tenths, 0 hundredths, 9 thousandths
2) 2 ten million, 5 million, 1 hundred thousands, 2 ten thousands, 4 thousands, 6 hundreds, 1 tens, 9 ones, 1 tenths, 0 hundredths, 2 thousandths
3) 3 ten million, 6 million, 2 hundred thousands, 1 ten thousands, 7 thousands, 9 hundreds, 8 tens, 3 ones, 2 tenths, 1 hundredths, 3 thousandths
4) 4 ten million, 9 million, 3 hundred thousands, 5 ten thousands, 3 thousands, 7 hundreds, 7 tens, 4 ones, 9 tenths, 0 hundredths, 8 thousandths
5) 5 ten million, 8 million, 4 hundred thousands, 0 ten thousands, 6 thousands, 8 hundreds, 6 tens, 1 ones, 9 tenths, 8 hundredths, 7 thousandths
6) 6 ten million, 3 million, 5 hundred thousands, 3 ten thousands, 7 thousands, 9 hundreds, 0 tens, 2 ones, 7 tenths, 6 hundredths, 5 thousandths
7) 7 ten million, 1 million, 6 hundred thousands, 0 ten thousands, 1 thousands, 3 hundreds, 9 tens, 3 ones, 4 tenths, 3 hundredths, 2 thousandths
8) 8 ten million, 2 million, 7 hundred thousands, 2 ten thousands, 1 thousands, 5 hundreds, 4 tens, 8 ones, 0 tenths, 9 hundredths, 8 thousandths
9) 9 ten million, 5 million, 8 hundred thousands, 3 ten thousands, 4 thousands, 6 hundreds, 5 tens, 7 ones, 8 tenths, 7 hundredths, 6 thousandths
10) 9 ten million, 6 million, 0 hundred thousands, 9 ten thousands, 5 thousands, 3 hundreds, 7 tens, 2 ones, 0 tenths, 6 hundredths, 5 thousandths

P. 4

1) 8,000,000, 700,000, 60,000, 0.009
2) 5,000,000, 100,000, 20,000, 0.002
3) 6,000,000, 200,000, 10,000, 0.003
4) 9,000,000, 300,000, 50,000, 0.008
5) 8,000,000, 400,000, 00,000, 0.007
6) 3,000,000, 500,000, 30,000, 0.005
7) 1,000,000, 600,000, 00,000, 0.002
8) 2,000,000, 700,000, 20,000, 0.008
9) 5,000,000, 800,000, 30,000, 0.006
10) 6,000,000, 000,000, 90,000, 0.005

Answers

P. 6

1) 575,620
2) 410,099
3) 487,107
4) 676,542
5) 943,782
6) 802,823
7) 910,897
8) 335,555
9) 49,913
10) 9,390
11) 100,199
12) 100,049
13) 10,019
14) 9,059

P. 8

1) 389,701
2) 526,009
3) 153,400
4) 888,000
5) 475,000
6) 415,000
7) 578,000
8) 386,000
9) 1,010,000
10) 1,190,000
11) 282,000
12) 499,444
13) 320,000
14) 335,000

P. 10

1) 65.072
2) 102.492
3) 33.971
4) 22.994
5) 27.97
6) 343.905
7) 28.92
8) 34.178
9) 58.708
10) 16.794
11) 38.88
12) 56.893
13) 73.57
14) 46.212

P. 12

1) 1,057,341
2) 854,080
3) 149,964
4) 1,400,414
5) 1,280,491
6) 183,950
7) 1,110,900
8) 1,351,998
9) 192,992
10) 1,144,172
11) 834,342
12) 114,698

P. 14

1) 138.496
2) 73.077
3) 17.850
4) 176.217
5) 97.412
6) 19.446
7) 73.072
8) 116.087
9) 17.109
10) 30.512
11) 64.735
12) 142.126
13) 32.990
14) 10.196

P. 16

1) 31,917
2) 8,898
3) 100,998
4) 777,987
5) 324,335
6) 8,939
7) 99,991
8) 9,997
9) 720,395
10) 99,949
11) 19,997
12) 99,799
13) 780,818
14) 674,568

P. 18

1) 305,000
2) 792,000
3) 354,000
4) 670,000
5) 415,000
6) 281,000
7) 581,000
8) 750,900
9) 185,100
10) 411,444
11) 100,000
12) 585,800
13) 714,000
14) 785,000

P. 20

1) 146.1
2) 758.01
3) 64.2
4) 516
5) 32.2
6) 779
7) 210
8) 451.2
9) 177.1
10) 377
11) 0.262
12) 5.55
13) 2.85
14) 4.75

Answers

P. 22

1) 162,424
2) 100,944
3) 36,569
4) 500,849
5) 276,195
6) 54,846

P. 24

1) 296.365
2) 478.504
3) 247.902
4) 376.988
5) 217.877
6) 430.9

P. 26

1) 24,000
2) 9,600
3) 3,300
4) 40,000
5) 3,600
6) 4,400
7) 35,000
8) 480
9) 30,000
10) 32,000
11) 30,000
12) 24,000
13) 112,000
14) 150,000

P. 28

1) 0.72
2) 0.56
3) 0.42
4) 0.48
5) 0.21
6) 6.40
7) 0.63
8) 0.66
9) 1.50
10) 4.40
11) 0.24
12) 0.33
13) 0.72
14) 0.45

P. 30

1) 23.81
2) 41.1
3) 3,000.1
4) 9,999
5) 5,670
6) 58,690
7) 45,600.5
8) 286
9) 88,510
10) 1,010
11) 2,381
12) 586.9
13) 999.9
14) 56.7

238.1	2,381
411	4,110
30,001	300,010
99,990	999,900
56,700	567,000
586,900	5,869,000
456,005	4,560,050
2,860	28,600
885,100	8,851,000
10,100	101,000
23,810	238,100
5,869	58,690
9,999	99,990
567	5,670

P. 32

1) 230,678
2) 566,600
3) 255,555
4) 46,018
5) 43,029
6) 32,508
7) 2,637
8) 668
9) 2,870
10) 752
11) 568
12) 264
13) 244
14) 195

P. 34

1) 379.180
2) 822.348
3) 248.486
4) 150.594
5) 414.990
6) 656.543
7) 588.474
8) 89.352
9) 660.472

P. 36

1) 285,076
2) 184,811
3) 73,884
4) 56,025
5) 7,802
6) 88,488
7) 34,925
8) 66,504
9) 40,419
10) 5,106

Answers

P. 38

1) 110
2) 600
3) 600
4) 72
5) 50
6) 11
7) 15
8) 400
9) 1,200
10) 30
11) 400
12) 600
13) 1,200
14) 1,200

P. 40

1) 0.6
2) 0.9
3) 0.4
4) 5.05
5) 0.9
6) 32.6
7) 1.9
8) 2.4
9) 1.62
10) 0.11
11) 0.6
12) 0.1
13) 1.3
14) 0.11

P. 42

1) 15.6	1.56	0.156
2) 83.18	8.31	0.831
3) 95.8	9.58	0.958
4) 746.7	74.67	7.467
5) 162.4	16.24	1.624
6) 45.6	4.56	0.456
7) 19.3	1.93	0.193
8) 33.1	3.31	0.331
9) 22.2	2.22	0.222
10) 25.5	2.55	0.255
11) 30.4	3.04	0.304
12) 253.4	25.34	2.534
13) 32.6	3.26	0.326
14) 391.5	39.15	3.915

P. 44

1) 2063 r1 or $\frac{1}{4}$
2) 849 r2 or $\frac{2}{9}$
3) 730 r4 or $\frac{1}{2}$
4) 460 r6 or $\frac{3}{4}$
5) 224 r3 or $\frac{3}{7}$
6) 969 r6 or $\frac{6}{7}$
7) 1,492 r2 or $\frac{1}{3}$
8) 759 r1 or $\frac{5}{6}$

P. 46

1) 626 r9 or $\frac{3}{4}$
2) 759 r8 or $\frac{8}{13}$
3) 336 r3 or $\frac{3}{17}$
4) 344 r15 or $\frac{3}{5}$
5) 250 r2 or $\frac{2}{29}$
6) 26 r1 or $\frac{1}{43}$
7) 38 r3 or $\frac{3}{59}$
8) 91 r2 or $\frac{2}{97}$

P. 48

1) 6.52
2) 15.24
3) 1.285
4) 9.45
5) 7.55
6) 12.1
7) 6.2
8) 14.6
9) 19.65
10) 24.63

P. 50

1) 51
2) 97
3) 42
4) 38
5) 15
6) 91
7) 25
8) 26
9) 236
10) 345
11) 6,119
12) 130

Answers

P. 52

1) 13,331
2) 14,950
3) 4,900
4) 15,999
5) 49,900
6) 13,331
7) 100,001
8) 100,005
9) 390,000
10) 421,999

P. 54

1) 27
2) 3
3) 329
4) 3
5) 2
6) 50,000
7) 20
8) 2,432
9) 13,593
10) 4,248
11) 4
12) 13
13) 0
14) 11

P. 56

1) 93
2) 68
3) 368
4) 590
5) 721
6) 135
7) 354
8) 36
9) 36
10) 25
11) 346
12) 524
13) 125

P. 58

1) 67
2) 1,530
3) 40
4) 41
5) 56
6) 3,960
7) 29
8) 124
9) 5,320
10) 87
11) 40
12) 10
13) 56
14) 77

P. 60

1) 162
2) 1,620
3) 60
4) 600
5) 112
6) 1,120
7) 459
8) 4,590
9) 36
10) 360
11) 66
12) 660
13) 207
14) 2,070

P. 62

1) 56ml
2) 86
3) 20
4) 56
5) £60
6) 124.5
7) 360
8) 25
9) £0.40
10) 750

P. 64

1) $\frac{17}{12}$ or $1\frac{5}{12}$
2) $\frac{22}{15}$ or $1\frac{7}{15}$
3) $\frac{79}{60}$ or $1\frac{19}{60}$
4) $\frac{43}{45}$
5) $\frac{16}{12}$ or $1\frac{1}{3}$
6) $\frac{71}{60}$ or $1\frac{11}{60}$
7) $\frac{47}{30}$ or $1\frac{17}{30}$
8) $\frac{19}{12}$ or $1\frac{7}{12}$
9) $\frac{35}{30}$ or $1\frac{1}{6}$
10) $\frac{19}{20}$

Answers

P. 66

1) $\frac{5}{20}$ or $\frac{1}{4}$

2) $\frac{9}{20}$

3) $\frac{34}{35}$

4) $\frac{28}{60}$ or $\frac{7}{15}$

5) $\frac{23}{35}$

6) $\frac{3}{8}$

7) $\frac{9}{21}$

8) $\frac{3}{20}$

9) $\frac{23}{36}$

10) $\frac{5}{12}$

P. 68

1) $4\frac{7}{15}$

2) $6\frac{3}{35}$

3) $4\frac{19}{60}$

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

5) $7\frac{17}{30}$

6) $5\frac{7}{12}$

P. 70

1) $\frac{11}{8}$

2) $2\frac{21}{40}$

3) $4\frac{1}{42}$

4) $2\frac{4}{9}$

5) $1\frac{1}{20}$

6) $1\frac{1}{15}$

P. 72

1) $\frac{21}{8}$ or $2\frac{5}{8}$

2) $\frac{60}{8}$ or $7\frac{1}{2}$

3) $\frac{40}{7}$ or $5\frac{5}{7}$

4) $\frac{18}{7}$ or $2\frac{4}{7}$

5) $\frac{35}{6}$ or $5\frac{5}{6}$

6) $\frac{21}{8}$ or $2\frac{5}{8}$

7) $\frac{32}{5}$ or $6\frac{2}{5}$

8) $\frac{36}{8}$ or $4\frac{1}{2}$

P. 74

1) $\frac{2}{21}$

2) $\frac{12}{25}$

3) $\frac{9}{28}$

4) $\frac{1}{8}$

5) $\frac{1}{24}$

6) $\frac{1}{48}$

7) $\frac{9}{14}$

8) $\frac{12}{35}$

Answers

P. 76

1) $\frac{52}{5}$ or $10\frac{2}{5}$

2) $\frac{21}{3}$ or 7

3) $\frac{33}{6}$ or $5\frac{1}{2}$

4) $\frac{52}{5}$ or $10\frac{2}{5}$

5) $\frac{52}{3}$ or $17\frac{1}{3}$

6) $\frac{92}{6}$ or $15\frac{1}{6}$

7) $\frac{65}{7}$ or $9\frac{2}{7}$

8) $\frac{54}{7}$ or $7\frac{5}{7}$

P. 78

1) $\frac{3}{7}$

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

3) $\frac{7}{15}$

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

5) $\frac{1}{9}$

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

7) $\frac{1}{15}$

8) $\frac{1}{12}$

P. 80

1)	25%	0.25
2)	80%	0.80
3)	30%	0.30
4)	25%	0.25
5)	70%	0.70
6)	75%	0.75
7)	40%	0.40
8)	75%	0.75

Glossary

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 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.

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 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.

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 1/2.

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.

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 $12 = 1 \times 12 = 2 \times 6 = 3 \times 4$.

Glossary

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.

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 2 1/4.

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

Lowest Common Multiple (L.C.M.) is the common multiple of two or more numbers, which has the least value. E.g. 3 has multiples 3, 6, 9, 12, 15
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 36.
The lowest common multiple of 3, 4 and 6 is 12.

Mixed Fraction is a whole number and a fractional part expressed as a common fraction. e.g. 1 1/3 is a mixed fraction or 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$3 \times 4 = 12$.

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.

Glossary

Numerator is the number written on the top– the dividend (the part that is divided). In the fraction 2/3, 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. $6 \times 10 \div 10 = 6$.

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. $21 \div 7$ 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 the operator 'a number of hundredths of'. E.g. 15% of Y means $15/100 \times Y$.

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.

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

Glossary

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.

Simplify 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).

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.