Number 1a

Calculation

By the end of this chapter you should be able to:

- round any whole number
- use negative numbers in practical contexts such as temperature and calculate intervals across zero;
- count forwards or backwards in steps of any whole number with one significant figure, e.g. 9, 20, 3000;
- add and subtract whole numbers with more than four digits, using formal written methods where appropriate;
- use their understanding of place value to multiply and divide whole numbers and decimals with up to two decimal places by 10 or 100 (e.g. 1532 ÷ 100 = , ? ÷ 100 = 6.3).
- multiply and divide whole numbers mentally drawing upon multiplication facts up to 12 × 12 and place value (e.g. 60 × 70) and begin to use these facts to work with larger numbers
- multiply numbers with up to two digits by a two digit number using the formal long multiplication method and becoming more confident with multiplication with larger numbers; multiply and divide numbers with up to four digits by a single digit number using the formal short division method and become more confident with division using larger numbers including the long division method.
- round decimals with two decimal places to the nearest whole number and to one decimal place
- solve problems involving number up to three decimal places
- add and subtract decimal numbers that have the same number of decimal places (e.g. 157.31 – 29.16)
- multiply a one digit decimal number by a single digit number (e.g. 0.6 × 8)
- express one quantity as a fraction of another in simple cases.



2010

"Drop in Blackpool FC attendance figures is ruining trade", say local traders.

17 September 2016 Crowd 5,471

22 October 2016 Crowd 3,623



2016

Traders on Lytham Road are worried at the drop in match day takings due to the drop in attendance at Blackpool FC.

Roughly speaking, how many people attended the two games?



Jon

Definitely more than 8000.

Definitely less than 10000



Sarah

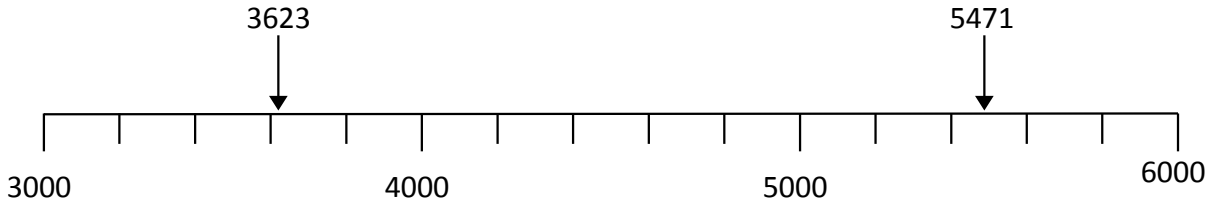


Alice

Actually, it's roughly 9000

1

Can you explain why each of them is correct?
The number line below might help.





Jon

Jon's explanation (Rounding down)

3623 is definitely more than 3000, and 5471 is definitely more than 5000.
So 3623 + 5471 must be more than 3000 + 5000 = 8000



Sarah

Sarah's explanation (Rounding up)

3623 is definitely less than 4000, and 5471 is definitely less than 6000.
So 3623 + 5471 must be less than 4000 + 6000 = 10000



Alice

Alice's explanation (Rounding to the nearest 1000)

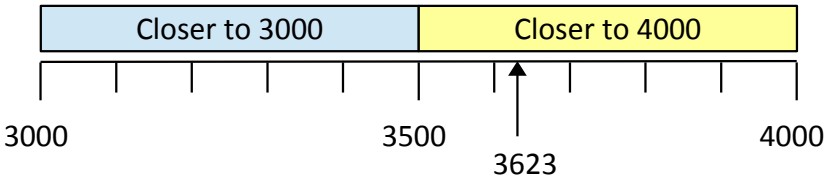
3623 is nearer to 4000 than 3000. 5471 is nearer to 5000 than 4000.
So 3623 + 5471 is roughly 4000 + 5000 = 9000

Rounding to the nearest 1000

Alice rounded 3623 to the nearest 1000. She did this by looking at the digit in the hundreds column.

For which digits in the hundreds column, should we say the number is approximately 3000?

For which digits in the hundreds column, should we say the number is approximately 4000?



When approximating a number between 3000 and 4000 to the nearest 1000,

- We round down to 3000 if the digit in the hundreds place is 0, 1, 2, 3 or 4.
- We round up to 4000 if the digit in the hundreds place is 5, 6, 7, 8 or 9.

This method is generally referred to as rounding.

Fitness check



Round these numbers as appropriate

1. 5423 (nearest 1000)
2. 651 (nearest 100)
3. 2389 (nearest 1000)
4. 50061 (nearest 10000)
5. 101 (nearest 10)
6. 15045 (nearest 10000)
7. 5452 (nearest 100)
8. 12609 (nearest 1000)
9. 3061 (nearest 100)
10. 2142 (nearest 100)

Estimate the the answer to these calculations by rounding as appropriate.

11. 37 + 58 (nearest 10)
12. 82 – 29 (nearest 10)
13. 742 + 587 (nearest 100)
14. 742 + 587 (nearest 100)
15. 812 – 489 (nearest 100)
16. 812 – 489 (nearest 10)
17. 8925 + 3217 (nearest 1000)
18. 8925 + 3217 (nearest 100)
19. 8925 + 3217 (nearest 10)
20. 6406 - 4983 (nearest 1000)
21. 6406 - 4983 (nearest 100)
22. 6406 - 4983 (nearest 10)

Estimating

It is often a good idea to estimate the results of a calculation to get a feel for what the answer should be. For example, look at this supermarket till receipt.

SuperMarket Bognor Regis	
1 Ribena Blkcrrnt	£2.97
1 Andrex T/R Wht	£3.59
1 Fries	£1.44
1 JS6 Teacakes	£0.98
1 Cereal bowl	£3.42

Estimate the total amount by

a) Rounding **down** to the nearest pound below (Jon's method)

b) Rounding **up** to the nearest pound above (Sarah's method)

c) Rounding to the **nearest** pound (Alice's method)



Amber

I think you should round to the nearest 50p.
You will get a better estimate.

2 Do you think Amber is correct? Check it out.

Fitness check



Estimate the totals of these bills by rounding a) down to nearest pound below b) up to the nearest pound above c) to the nearest pound d) to the nearest 50p e) to the nearest 10p.

1. £2.34
   £6.79
   £4.49
   £5.64
   £9.82

2. £1.24
   £5.19
   £3.89
   £2.72
   £7.32

3. £0.49
   £1.99
   £3.37
   £4.25
   £6.09

4. Check your estimates against the actual total in each case.
5. Does rounding to the nearest 10p always give the best estimate?



Alice

When I am shopping, I like to estimate to the nearest pound above – just to make sure I have enough money when I get to the till.

My shopping list
Trainers £28.96
Shorts £7.35
Socks £1.85

3 Look at Alice's shopping list. How much money would she take with her?

Over or Under?

£2.50
Over or Under



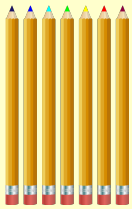
5 packets of crisps at 47p each

£8.00
Over or Under



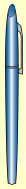
9 packets of crisps at 89p each

£6.00
Over or Under



4 packets of pencils at £1.49 each

£10.00
Over or Under



3 pens at £3.29 each

£2.50
Over or Under



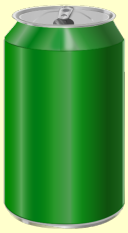
5 croissants at 47p each

£2.80
Over or Under



8 bread rolls at 36p each

£3.50
Over or Under



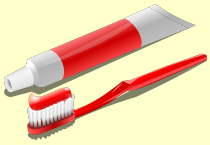
6 cans of soda at 59p each

£4.90
Over or Under



5 cup cakes at 97p each

£11.00
Over or Under



4 tooth brush sets at £2.24 each

£4.50
Over or Under



5 bars of soap at 87p each

Compatible pairs

In each of these questions, search for compatible pairs that make the target number when added together.

Make 50

28 31 37 12 19 22 9 13 41 38

Make 100

45 75 55 85 5 65 15 35 25 95

Make 500

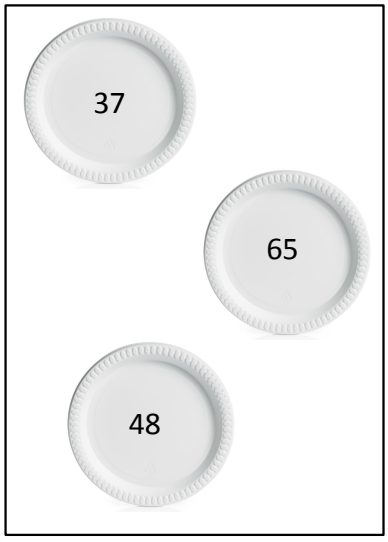
240 375 260 125 350 415 165 85 150

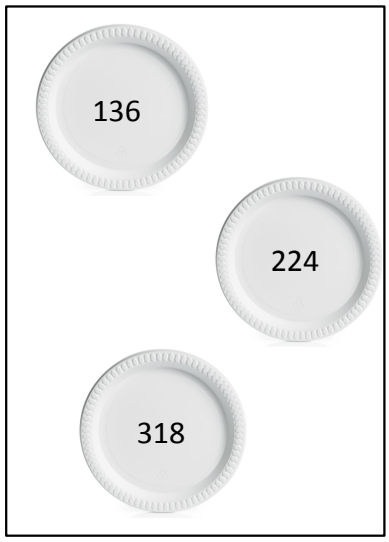
Make 1000

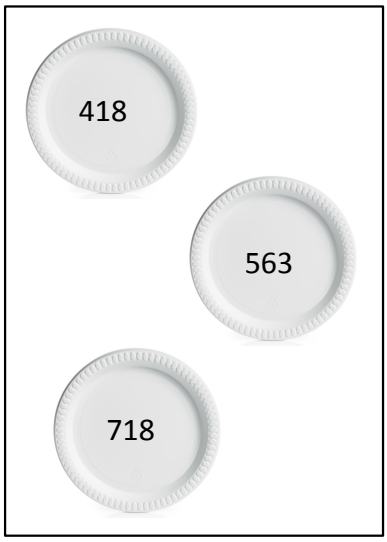
720 760 565 240 365 280 450 435 550 635

Middle and closer

In each of these questions, decide which is the middle number. Then decide which of the other two numbers is closer to the middle number.







4 In each explain how you decided which was closer to the middle number.

Sensible answers

In answering these questions, make sure that you have given a sensible answer.



1. There are 107 pupils in year 7. Each classroom can hold 24 pupils.
   How many classrooms are needed?



2. 177 students from London are going to visit the Hampshire Educational Farm, travelling by coach. Each coach can carry 46 students.
   How many coaches will be needed?



3. Eggs are sold in boxes of a dozen (12). On Friday, the farmer's hens laid 496 eggs.
   How many whole boxes of eggs can he package?



4. Christmas crackers are sold in boxes of 10. There are 53 teachers in the school.
   How many packs of crackers need to be ordered for the teachers Christmas party if each teacher will have one each?



5. The school games field is being re-seeded. Each box of grass seed covers $12m^2$.
   How many boxes will be needed to cover a $150m^2$ field?



6. Evie wants to load some music onto her mp3 player for the coach journey. Her device can hold 40GB of music (40GB = 40,000MB).
   How many 3.6MB songs can she load?

What do you know about formal methods of calculating?

Add up 236 and 585

using formal methods

Calculate 734 minus 367

using formal methods

Add up 145, 354 and 612

using formal methods

Subtract 386 from 1247

using formal methods

Multiply 63 by 10

Multiply 63 by 30

Multiply 63 by 34

using formal methods

Divide 43 by 7

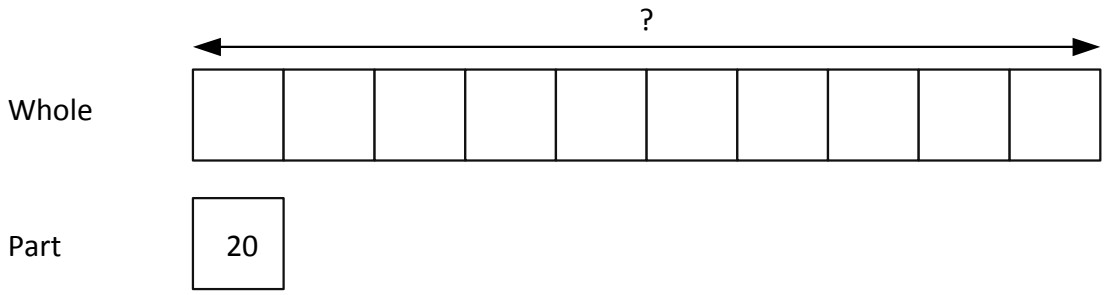
using short division

Divide 254 by 12

using short division

5 Cakes cost 20p each from the class cake sale. How much would 10 cakes cost?

The Singapore Model Method



Maths sentence 10 x 20 = ?

Let's think about how to work it out...



Sarah

We could write out 20 ten times

Or we could write out 10 twenty times. The result will be the same.



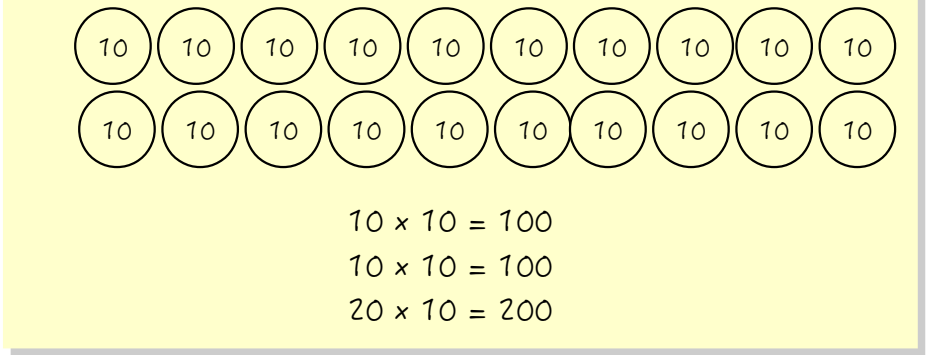
Matthew

6 Can you explain why 10 x 20 is the same as 20 x 10?



Matthew

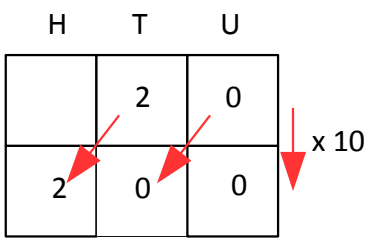
Matthew's working



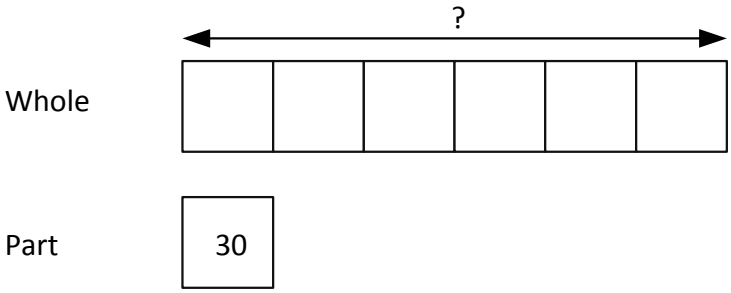


Evie

That's really easy! All of the digits move one to the left!



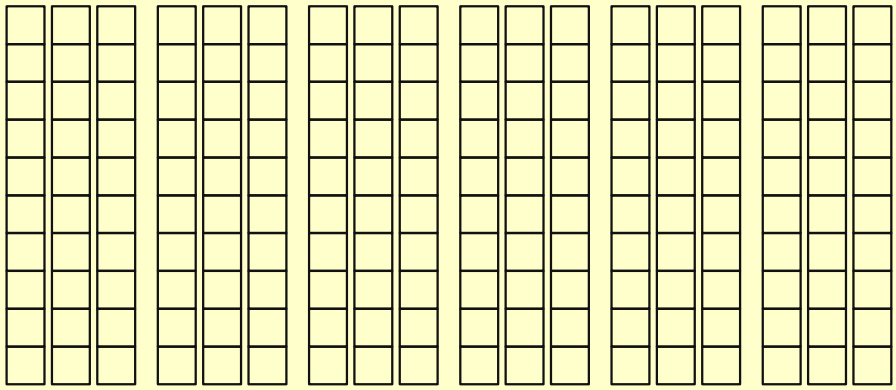
7 A coach holds 30 people. If there are 6 coaches, how many people will they hold together?



Maths sentence 6 x 30 = ?
Let's think about how to work that out.


Amber

Amber's Idea



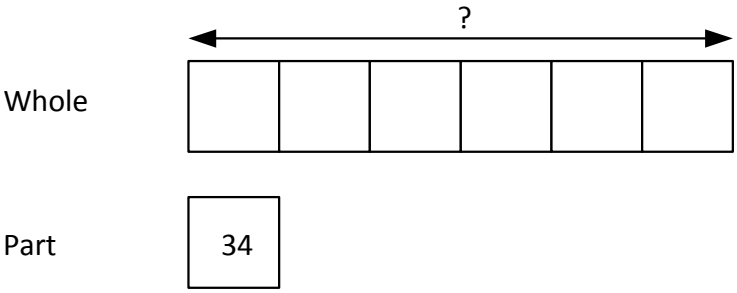
6 x 30 = (6 x 3) x 10
= 18 x 10 = 180
The coaches hold 180 people altogether


Evie

Evie's Idea

6 x 30 = 6 x (3 x 10)
6 x (3 x 10) = (6 x 3) x 10
= 18 x 10 = 180
The coaches hold 180 people altogether

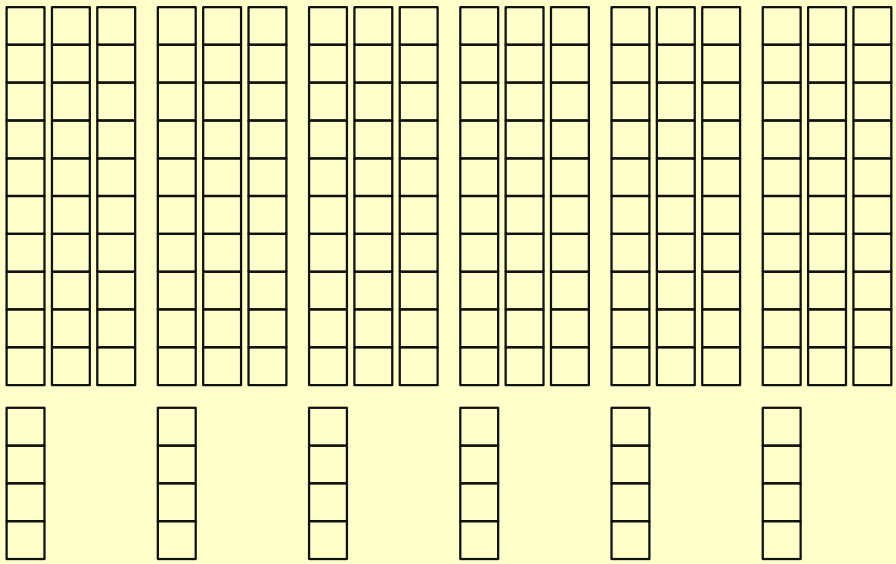
8 A larger coach holds 34 people. If there are 6 coaches, how many people will they hold altogether?



Maths sentence 6 x 34 = ?
Let's think about how to work it out...


Amber

Amber's Idea



6 x 30 = 180
6 x 4 = 24
6 x 34 = 204
The coaches hold 204 people altogether


Jon

Jon's Idea

6 x 34 = 6 x (30 + 4)
6 x (30 + 4) = (6 x 30) + (6 x 4)
= 180 + 24 = 204
The coaches hold 204 people altogether



Jon

Jon's Idea

6 times 4 is 24.
That's 2 tens and 4 units
So write the 2 under the tens column.

6 times 3 is 18.
Add the 18 and the 2 that was carried over to get 20.
Write down the answer.

hundreds	tens	units
	3	4
x		6
2	0	4

2



Matthew

Matthew's Idea

Using the multiplication algorithm

hundreds	tens	units
	3	4
x		6
1	8	0
	2	4
2	0	4

9 A train carriage holds 124 people. If there are 8 carriages, how many people will they hold altogether?

You can use either Jon's method or Matthew's method.

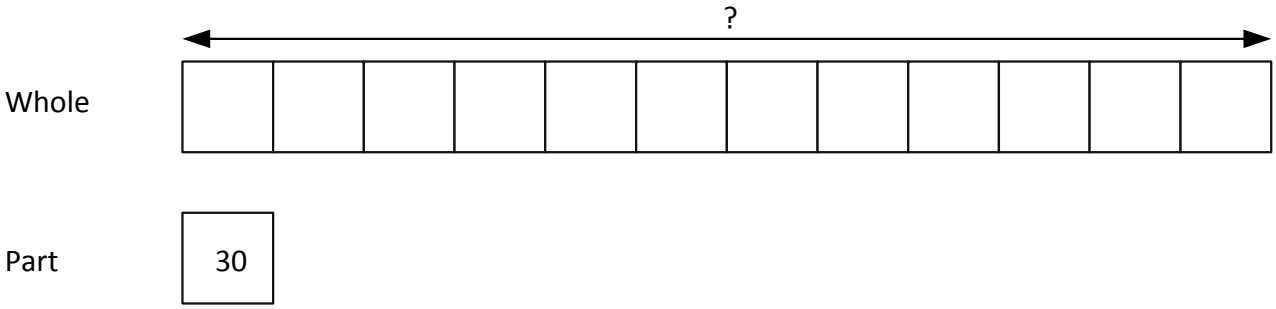
10 Are these methods really the same? What do you think?

Fitness check

Calculate the following as quickly as possible...

1. 30 x 5
2. 60 x 7
3. 400 x 8
4. 14 x 6
5. 13 x 9
6. 3 x 40
7. 34 x 6
8. 25 x 8
9. 79 x 7
10. 342 x 9
11. 613 x 4
12. 204 x 6
13. 345 x 6
14. 380 x 7
15. 975 x 8
16. 558 x 9

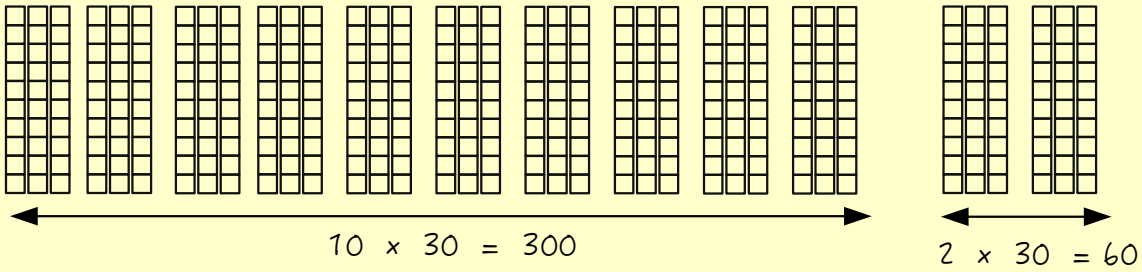
11 A coach holds 30 people. If there are 12 coaches, how many people will they hold altogether?



Maths sentence 12 x 30 = ?
Let's think about how to calculate this.


Sarah

Amber's Idea



The coaches hold 300 + 60 = 360 people altogether


Matthew

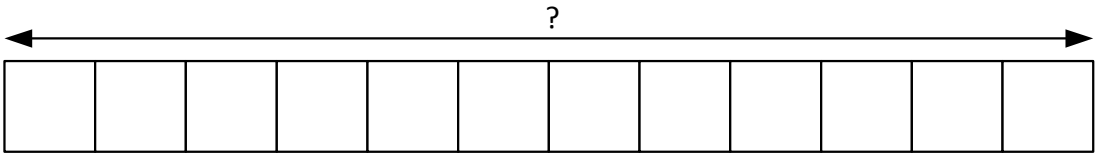
Matthew's Idea

hundreds	ten	unit	
	3	0	
x	1	2	
3	0	0	10 x 30
+	6	0	2 x 30
3	6	0	12 x 30

The coaches hold 360 people altogether

12

A larger coach holds 34 people. If there are 12 coaches, how many people will they hold altogether?



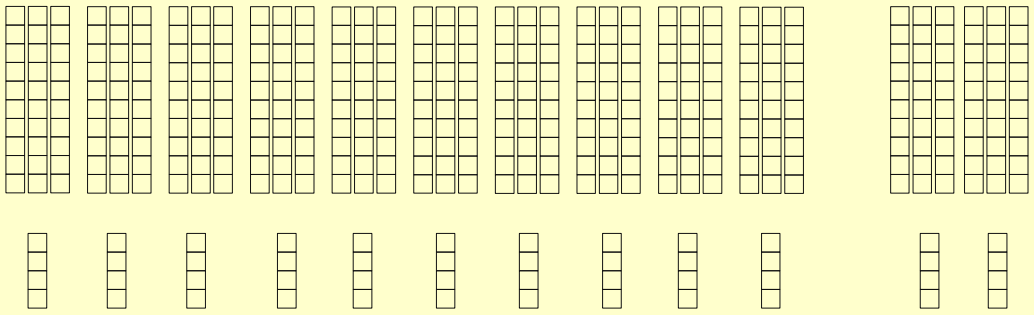
Maths sentence 12 x 34 = ?

Let's think about how to work it out...



Jon

Jon's Idea



10 x 34 = 340

2 x 34 = 68

340 + 68 = 408

The coaches hold 408 people altogether



Sarah

Sarah's Idea

hundreds	tens	units
	3	4
x	1	2
3	4	0
+	6	8
4	0	8

10 x 34

2 x 34

12 x 34

The coaches hold 408 people altogether



Evie

Evie's Idea

	30	4	
10	300	40	340
2	60	8	68 +

12 x 34 = 408

The coaches hold 408 people altogether

13 Golf balls are sold in boxes of 12. A shop orders 144 boxes of balls. How many do they have altogether?



Jon

Jon's Idea

thousands	hundreds	ten	unit	
	1	4	4	
x		1	2	
1	4	4	0	10 x 144
+	2	8	8	2 x 144
1	7	2	8	12 x 144
	1			

There are 1728 golf balls in total



Amber

Amber's Idea

	100	40	4	
10	1000	400	40	1440
2	200	80	8	288
	1200	480	48	1728

There are 1728 golf balls in total

Fitness check

1. 6 x 70
2. 8 x 50
3. 3 x 36
4. 32 x 40
5. 50 x 90
6. 14 x 23
7. 21 x 19
8. 30 x 28
9. 62 x 95
10. 76 x 49
11. 86 x 57
12. 98 x 68
13. 532 x 24
14. 978 x 48
15. 609 x 34
16. 214 x 80

17. There are 8 forms in a year group. There are 28 pupils in each form group in years 7 to 11. How many pupils are there altogether in those years?

18. The cost of the school ski trip is £675 each. If 23 people go on the trip, how much money is collected altogether?

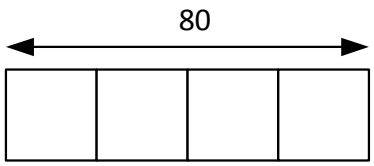
19. The average length of a stage in the Tour de France cycle race is 167 km. There are 21 stages. How far does each cyclist cover if he finishes every stage?

20. The distance run in a marathon race is 42 km. Recently a runner ran 401 marathons in 401 days to raise money for charity. How far did he run altogether?

14

80 year 7 pupils joined the school athletics team. They were split into 4 groups. How many were in each group?

The Singapore Model Method



Maths sentence 80 ÷ 4 = ?
Let's think about how to work it out...

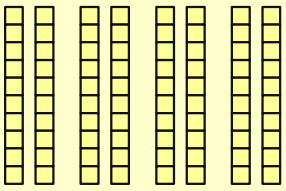

Evie

Easy, halve 1 tand halve it again!
So 80, 40, 20
80 ÷ 4 = 20

8 ÷ 4 = 2
x 10 x 10
80 ÷ 4 = 20


Sarah

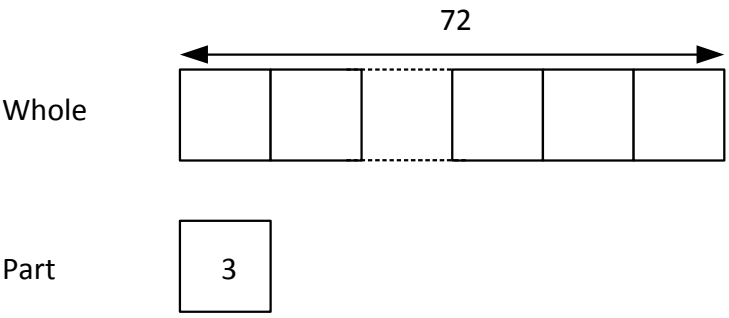

Matthew


80 ÷ 4 = 20

15

72 Year 7 pupils entered the school cookery competition. They had to work in threes. How many groups were there?

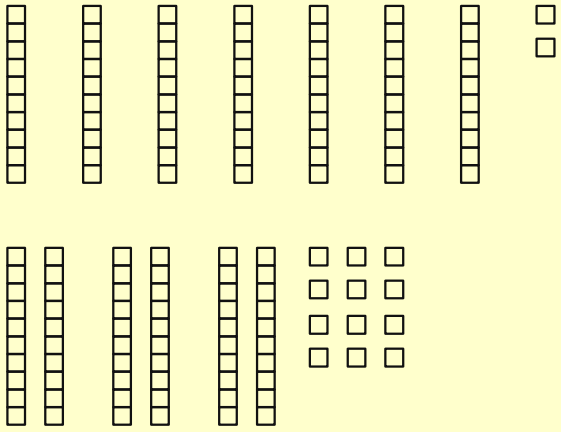
The Singapore Model Method



Maths sentence 72 ÷ 3 = ?
Let's think about how to work it out...


Matthew

Matthew's Idea



72 ÷ 3 = 24
So there are 24 groups


Jon

Jon's Idea

20 x 3 = 60
72 - 60 = 12
4 x 3 = 12
20 + 4 = 24
So there are 24 groups



Sarah

Sarah's Idea

Use short division

	tens	units
	2	4
3	~~7~~	$^{1}2$

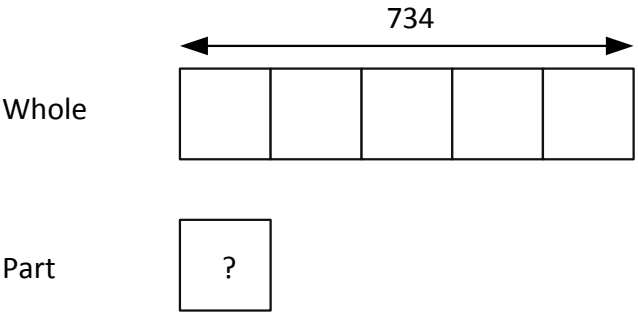
72 ÷ 3 = 24

So there are 24 groups

16

734 stickers were shared equally amongst 5 pupils from one form. How many did they each receive?

The Singapore Model Method



Maths sentence 734 ÷ 5 = ?

Use short division to answer this question.



Evie

Evie's Idea

Using short division

	hundreds	tens	units	
	1	4	6	r 4
5	~~7~~	^{2}~~3~~	^{3}~~4~~	

734 ÷ 5 = 146 r 4

1. A 747 can carry 366 passengers in rows of 9, with one smaller row at the rear. How many rows of seats are there?
2. 124 Year 7 pupils turned up for the rugby sevens competition. They were divided into teams of 7. How many teams were there. and how many didn't get into a team?
3. The textiles department have bought 300 yellow beads. They have been divided equally amongst the 8 school houses. How many did each house get, and how many were left over?



Question creation - Have fun creating problems for your friends to solve. Make up your own decreasing number sequences and challenge your friends to find your rule.

Fitness check

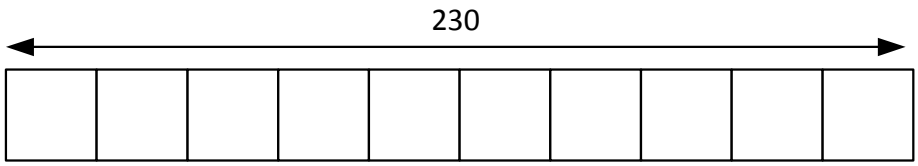


Calculate the following as quickly as possible...

1. 60 ÷ 3
2. 800 ÷ 2
3. 84 ÷ 7
4. 92 ÷ 3
5. 590 ÷ 7
6. 100 ÷ 4
7. 628 ÷ 6
8. 849 ÷ 4
9. 542 ÷ 3
10. 808 ÷ 4
11. 458 ÷ 5
12. 109 ÷ 9
13. 803 ÷ 8
14. 314 ÷ 7
15. 420 ÷ 6
16. 870 ÷ 3

17 230 year 7 pupils are split into 10 groups for team games. How many are in each group?

The Singapore Model Method



Part 10

Maths sentence: 230 ÷ 10 = 23

So there are 23 pupils in each group

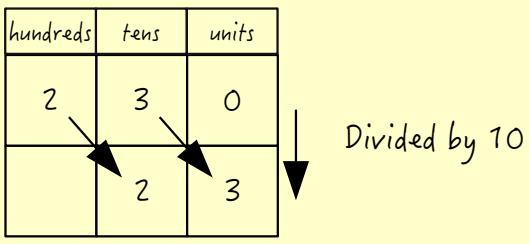
Let's think about division...

230 ÷ 10 = 23


Amber

Amber's Idea

It's easy – look at my diagram!

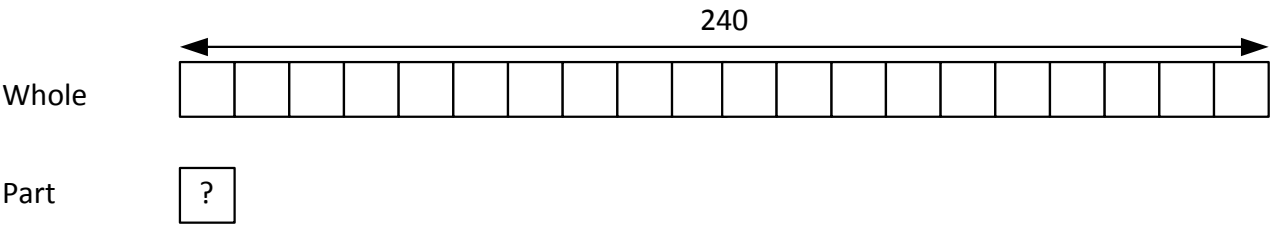


18 Can you explain Amber's idea about how to divide by 10?

19

A pack of coloured paper contains 240 sheets of paper. These are then shared equally amongst 20 pupils in a DT lesson. How many sheets do they get each?

The Singapore Model Method



Maths sentence 240 ÷ 20 = ?
Let's think about how to work it out...


Matthew

Matthew's Idea

10 x 20 = 200

240 - 200 = 40

2 x 20 = 40

10 + 2 = 12

240 ÷ 20 = 12

So they get 12 sheets each.


Evie

Evie's Idea

240 ÷ 20

÷ 10 ÷ 10

24 ÷ 2

So they get 12 sheets each


Sarah

Sarah's Idea

240 ÷ 20

20 = 2 x 10

So I have to divide by 2 and 10

240 ÷ 2 = 120

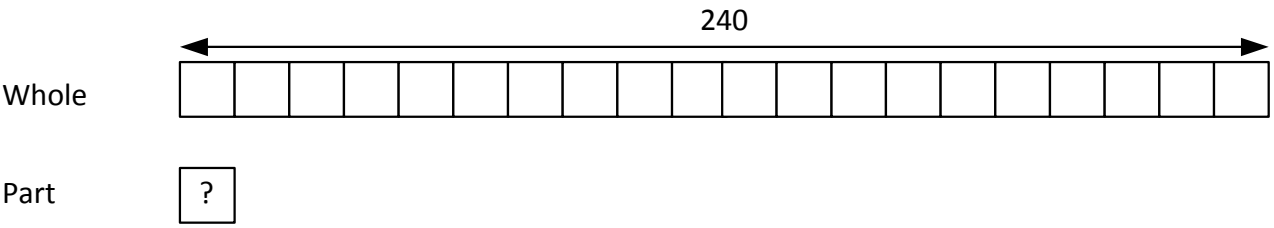
120 ÷ 10 = 12

So they get 12 sheets each.

20

A pack of coloured paper contains 240 sheets of paper. These are then shared equally amongst 21 pupils in a DT lesson. How many sheets do they get each?

The Singapore Model Method



Maths sentence 240 ÷ 21 = ?
Let's think about how to work it out...


Sarah

Sarah's Idea

You can use the long division algorithm 240 ÷ 21 = 11 r 9.

So they get 11 sheets each and there are 9 sheets left over.

			1	1	
2	1	2	4	0	r9
		2	1		
			3	0	
			2	1	
				9	


Matthew

Matthew's Idea

You can build up your 21 times table

10 x 21 = 210

11 x 21 = 231

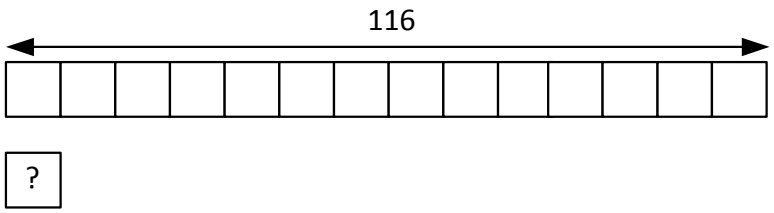
12 x 21 = 252

So they each get 240 - 231 = 9 and there are 9 sheets left over.

21

The PE department gave the girls in one form a box of sweets to share equally for their excellent gymnastics display. There were 116 sweets in the box, and 14 girls took part in the display. How many sweets did they get each?

The Singapore Model Method



Maths sentence 116 ÷ 14 = ?
Let's think about how to work it out...


Jon

Jon's Idea

You can build up your 14 times table
1 x 14 = 14
2 x 14 = 28
4 x 14 = 56
8 x 14 = 112
9 x 14 = 126
So they each get 8 sweets each.

116 - 112 = 4
There are 4 sweets left over.

- Year 7 decided to raise money by selling toffee apples. Their aimed to sell 500 units. The toffee apples come in boxes of 24. How many boxes will they need to order?
- The PE department divided the 230 pupils in year 7 into teams of 14, for a cricket competition. How many teams were there?
- The school needed to transport 460 year 7 and 8 pupils to the theatre using buses. Each bus holds 79 passengers. How many did they need?



Question creation - Have fun creating problems for your friends to solve. Make up your own decreasing number sequences and challenge your friends to find your rule.

Fitness check

Calculate the following as quickly as possible...

1. 420 ÷ 70
2. 70 ÷ 34
3. 94 ÷ 12
4. 84 ÷ 28
5. 128 ÷ 29
6. 426 ÷ 68
7. 506 ÷ 53
8. 826 ÷ 42
9. 515 ÷ 14
10. 714 ÷ 13
11. 602 ÷ 35
12. 814 ÷ 16
13. 850 ÷ 17
14. 852 ÷ 200
15. 2600 ÷ 500
16. 852 ÷ 243

Find the missing numbers...

1.

		2	☐	6	
1	9	4	4	8	☐

2.

		4	8	☐	
1	7	8	2	☐	9

3

		2	☐	3	r 17
2	1	5	1	2	☐

Number 1a: Mastery questions

1. Round 375 to the nearest 10

A	B	C	D
374	300	370	380

2. Which of these numbers has been incorrectly rounded?

A	4279 = 4280 (nearest 10)
B	2149 = 2100 (nearest 100)
C	6498 = 6400 (nearest 1000)
D	9876 = 10000 (nearest 10000)

3. A newspaper estimates the crowd at a soccer match as 27000 to the nearest thousand. Which of these could have been the actual size of the crowd?

A	B	C	D
27545	27448	26449	27996

4. Which calculation will give you the closest estimate for 673 + 248 ?

A	B	C	D
700 + 300	700 + 200	600 + 200	1000 + 200

5. When estimating the total cost of her shopping, Alice rounds up each price to the nearest pound above. Which of these represents Alice's estimate?

A	B	C	D
£61	£62	£63	£65

Alice's shopping list

£12.49

£17.85

£8.35

£24.15

6. Estimate 297 x 632

A	B	C	D
12000	18000	120000	180000

Number 1a: Mastery questions

7. Which digit is missing in this calculation?

$$\begin{array}{r} 376 \\ +2?7 \\ \hline 633 \end{array}$$

A	B	C	D
4	5	6	7

8. Calculate 4742 - 2286

A	B	C	D
2544	2556	2566	2444

9. One hundred times two hundred and twenty two thousand is ...

A	B	C	D
222000	2220	2220000	22200000

10. Divide five thousand,six hundred and twenty by ten.

A	B	C	D
5620	562	56200	526

11. What number should go in the box?

$$\begin{array}{r} 73 \\ \times\ 28 \\ \hline 1460 \\ \square \\ \hline \\ \hline \end{array}$$

A	B	C	D
584	24	4	564

12. Work out 4284 ÷ 9

A	B	C	D
476	486	467	484

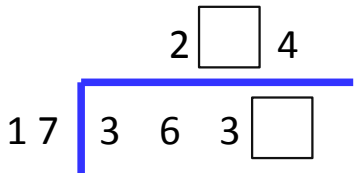
13. 2638 students travel to a concert by coach. Each coach holds 54 students. How many coaches are needed?

A	B	C	D
48	49	50	51

14. Sarah collected some apples from the orchard. She put 12 apples in each bag and found that she had 3 apples left over. How many apples could she have collected?

A	B	C	D
50	84	87	95

15. Find the missing digits in this division sum.



16. Altogether Jon, Taro and Amber have 53 soccer magazines. Jon has twice as many as Taro. Amber has 5 more than Taro. How many magazines do they each have?

17. When a 2 digit number is divided by 8, the remainder is 7. When the same number is divided by 7, the remainder is 3. What might the number be?