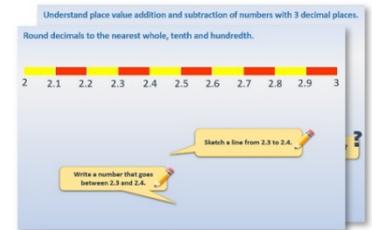


# Week 13, Day 3

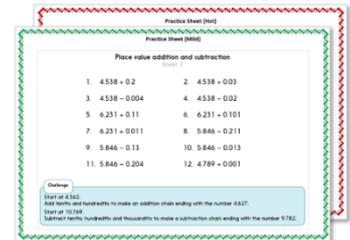
## Prime numbers

Each day covers one maths topic. It should take you about 1 hour or just a little more.

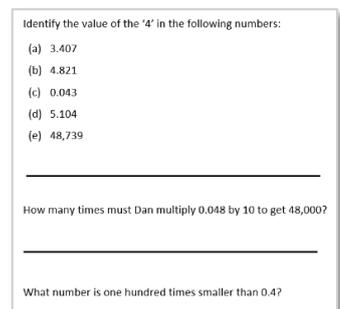
1. Start by reading through the **Learning Reminders**.



2. Think you've got it? Have a go at the **Investigation** or **Practical Activity**.



3. Have I mastered the topic? A few questions to **Check your understanding**.  
Fold the page to hide the answers!



## Learning Reminders

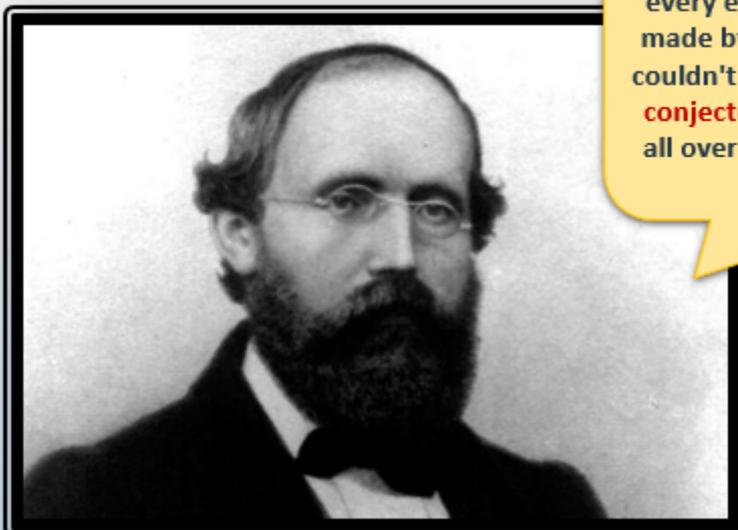
Recognise prime numbers; Investigate a general statement.

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

**Prime numbers** are full of mystery. No one has ever found a way of predicting the next one without going through every number between to see if it is divisible by a number other than one and itself.

There just doesn't seem to be a pattern!

Recognise prime numbers; Investigate a general statement.



Christian Goldbach (1690–1764) thought that every even number greater than 4 could be made by adding two prime numbers, but he couldn't prove it. This is known as **Goldbach's conjecture**. Centuries later, mathematicians all over the world are still trying to prove or disprove this conjecture.

Goldbach also thought that every odd number more than 5 could be made from adding three prime numbers.

## Investigation

### Goldbach's conjecture

Christian Goldbach (1690 – 1764) thought that every even number greater than 4 could be made by adding two prime numbers, but he couldn't prove it. This is known as Goldbach's conjecture.

Centuries later, mathematicians all over the world are still trying to prove or disprove this conjecture.

List the prime numbers up to 50: 2, 3, 5, ...

Find pairs of prime numbers which add to make even numbers in the table. Do you think Goldbach's conjecture might be true or not?

Even numbers	Pairs of prime numbers	Even numbers	Pairs of prime numbers
6	3 + 3	22	
8		24	
10		26	
12		28	
14		30	
16		32	
18		34	
20		36	

#### Further challenge

Goldbach also thought that *every odd number more than 5* could be made by adding three prime numbers.

List the odd numbers from 7 to at least 51. Find groups of three primes which sum to each number. Can you develop a system to find all possibilities for each total?

## Check your understanding

### Questions

Prime numbers are often 1 more than or 1 less than a multiple of 6.  
Write the two prime numbers of which this is **not** true.

---

Explain why 1 is not a prime number.

---

Write 30 as the sum of prime numbers in two different ways.

---

True or false:

The lowest common multiple of two prime numbers, a and b is always  $a \times b$ .

*Fold here to hide answers.*

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## Check your understanding

### Answers

Prime numbers are often 1 more than or 1 less than a multiple of 6.  
Write the two prime numbers of which this is **not** true. **2 and 3.**

---

Explain why 1 is not a prime number. **It has only 1 factor, itself. Prime numbers always have 2 factors.**

---

Write 30 as the sum of prime numbers in two different ways.

**There are 5 possible solutions involving adding 2 or 3 prime numbers:  $23 + 7$ ,  $19 + 11$ ,  $17 + 13$  and  $17 + 11 + 2$  or  $23 + 5 + 2$ .**

**Further answers are possible if other primes are used a multiple number of times.**

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True or false:

The lowest common multiple of two prime numbers, a and b is always  $a \times b$ .

**True, since they are prime numbers, they will have no other factors so cannot have any other multiples in common.**