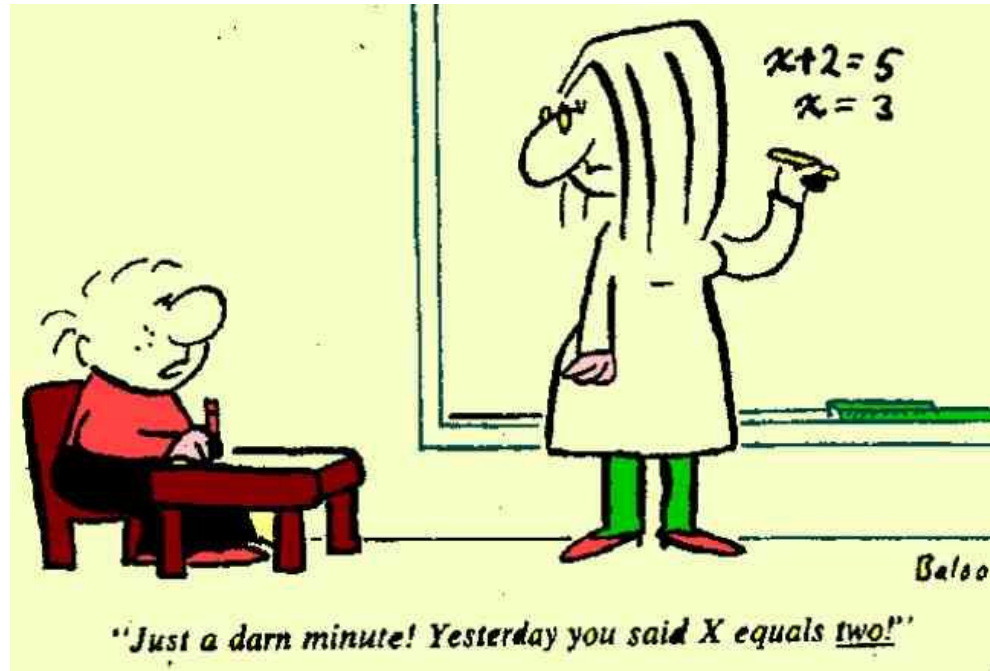


# ALGEBRA Challenge



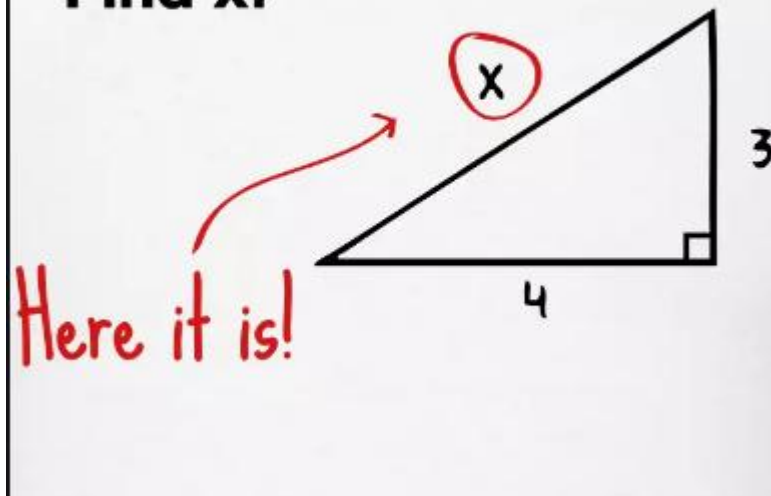
The Romans didn't  
find algebra very  
challenging, because  
 $X$  was always  
10.

WHY LEARN ALGEBRA?



FINDING  $X$  IS ONLY  
USEFUL IF YOU'RE  
A PIRATE!

Find  $x$ :



# Paul's Children

Age 11 to 14 Short ★

Paul is 32 years old.

In ten years' time, Paul's age will be the sum of the ages of his three sons.

What do his sons' ages add up to now?



This problem is taken from the [UKMT Mathematical Challenges](#).

You can find more short problems, arranged by curriculum topic, in our [short problems collection](#).

*What are the unknown? How will your equation look like?*

<https://nrich.maths.org/Paul's children>

**Want to check your answer? Click the link and go on 'solution'.**

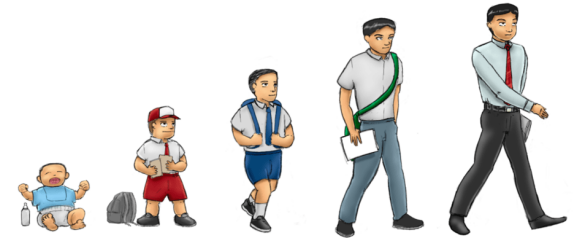
# Grow up Fast

Age 11 to 14 Short ★

Julie and her daughters Megan and Zoey have the same birthday.

Today, Julie is 32, Megan is 4 and Zoey is 1.

How old will Julie be when her age is the sum of the ages of Megan and Zoey?



This problem is taken from the [UKMT Mathematical Challenges](#).

You can find more short problems, arranged by curriculum topic, in our [short problems collection](#).

*What are the unknowns? What will your equation look like?*

[https://nrich.maths.org/grow\\_up\\_fast](https://nrich.maths.org/grow_up_fast)

**Want to check your answer? Click the link and go on 'solution'.**

# Cube Pile

Age 11 to 14 Short ★

Rick has five cubes. Each one is 2cm taller than the previous one.  
The largest cube is the same height as a tower built of the two smallest cubes.

How high would a tower of all five cubes be?



[https://nrich.maths.org/cube\\_pile](https://nrich.maths.org/cube_pile)

*How many unknown are there? What will your equation look like?*

**Want to check your answer? Click the link and go on 'solution'.**

# Starting Fibonacci

Age 11 to 14 Short ★



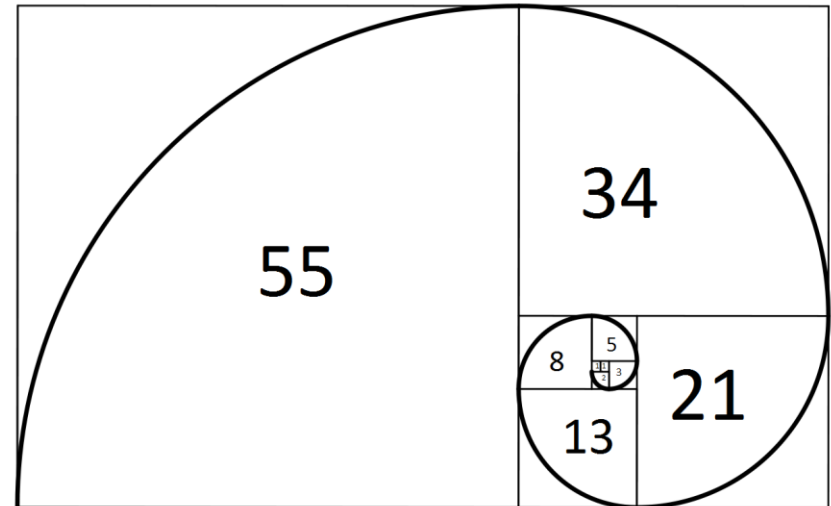
The standard Fibonacci sequence 1, 1, 2, 3, 5, 8, 13, ... begins with two 1s and each later number in the sequence is the sum of the previous two numbers.

Other Fibonacci-like sequences can be constructed by starting with any two numbers  $a$  and  $b$ , and using the same rule for creating the other numbers in the sequence.

What is the first term of the Fibonacci-like sequence whose second term is 4 and whose fifth term is 22?

[https://nrich.maths.org/starting\\_fibonacci](https://nrich.maths.org/starting_fibonacci)

*How many unknown are there?  
Can you express one in terms of another?*



**Want to check your answer? Click the link and go on 'solution'.**

# No Matter

Age 11 to 14 Short ★

Think of a whole number, double it, then add 3.  
Multiply your answer by 4 and then take away 5.  
Now take away the number you first thought of.

Your answer will always be a multiple of which number?

This problem is taken from the [UKMT Mathematical Challenges](#).

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$$S(\omega) = \frac{\alpha g^2}{\omega^5} e^{[-0.74 \left\{ \frac{\omega U_{\omega} 19.5}{g} \right\}^{-4}]} \\ = \frac{\alpha g^2}{\omega^5} \exp \left[ -0.74 \left\{ \frac{\omega U_{\omega} 19.5}{g} \right\}^{-4} \right]$$

*Not quite like this!*

*What does the equation look like? Will you need brackets? Can you simplify the equation?*

[https://nrich.maths.org/no\\_matter](https://nrich.maths.org/no_matter)

**Want to check your answer? Click the link and go on 'solution'.**

# 8 in a Row

Age 11 to 14 Short ★

The sum of five consecutive integers is equal to the sum of the next three consecutive integers.

What is the largest of these eight integers?



[https://nrich.maths.org/8 in a row](https://nrich.maths.org/8%20in%20a%20row)

*How many unknown are there? What does the equation look like?  
Can you simplify the equation?*

**Want to check your answer? Click the link and go on 'solution'.**



# Sum and Differences

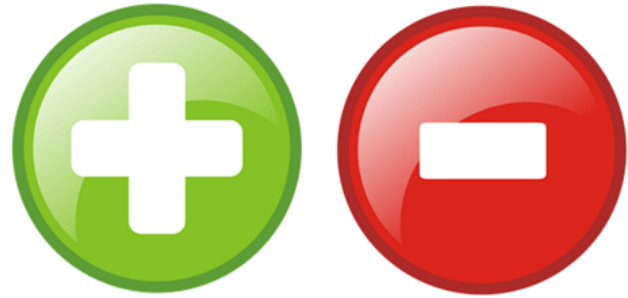
Age 11 to 14 Short ★

Three numbers add up to 100.

The difference between the two larger numbers is 12.  
The difference between the two smaller numbers is 2.

What are the numbers?

*This problem is taken from the [World Mathematics Championships](#)*



<https://nrich.maths.org/sum and differences>

**Want to check your answer? Click the link and go on 'solution'.**

# Nine in a Line

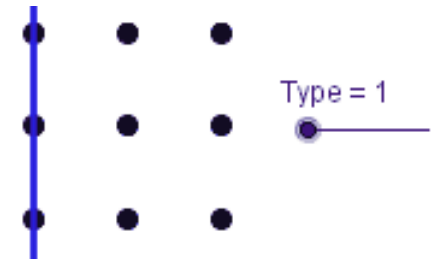
Age 11 to 14 Short ★

The sum of 9 consecutive positive whole numbers is 2007.

What is the largest of these numbers?

If you liked this problem, [here is an NRICH task](#) which challenges you to use similar mathematical ideas.

This problem is taken from the [UKMT Mathematical Challenges](#).



<https://nrich.maths.org/nineinaline>

**Want to check your answer? Click the link and go on 'solution'.**

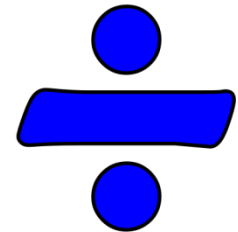
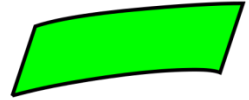
# Adding and Multiplying

Age 11 to 14 Short ★

Amy was asked to multiply a number by 8 and then add 5. Instead, she added 8 to the number, then multiplied the result by 5. This gave her 2015.

What would the answer have been if Amy had followed the instructions correctly?

*This problem is adapted from the [World Mathematics Championships](https://rich.maths.org/nineinaline)*



<https://rich.maths.org/nineinaline>

Want to check your answer? Click the link and go on 'solution'.

# Algebra extra challenge

## Adding in Pairs

Age 11 to 14 Short ★★

Three whole numbers, when added two at a time, give sums of 39, 48 and 51.

What is the largest of the three numbers?

This problem is taken from the [World Mathematics Championships](#)

You can find more short problems, arranged by curriculum topic, in our [short problems collection](#).

[https://nrich.maths.org/adding\\_in\\_pairs](https://nrich.maths.org/adding_in_pairs)

*How many unknowns are there? Can you replace one by an expression?*

Want to check your answer? Click the link and go on 'solution'.