The Sierpenski Triangle

These figures illustrate a design known as the Sierpenski triangle

Try to find the formulae for the number of black and white triangles in the nth figure.

Who Am I?

A) I am a proper fraction. The sum of my numerator and denominator is a one-digit square. Their product is a cube. What fraction am I?

B) I am the smallest three-digit square number whose digits total a number that is not a square. What number am I?

C) I am a counting number. All three of my digits are odd but different. The sum of my digits is 13. The product of my digits is greater than 30. The sum of my tens and hundreds digits is less than my units digit. Which two numbers could I be?

Twin Primes

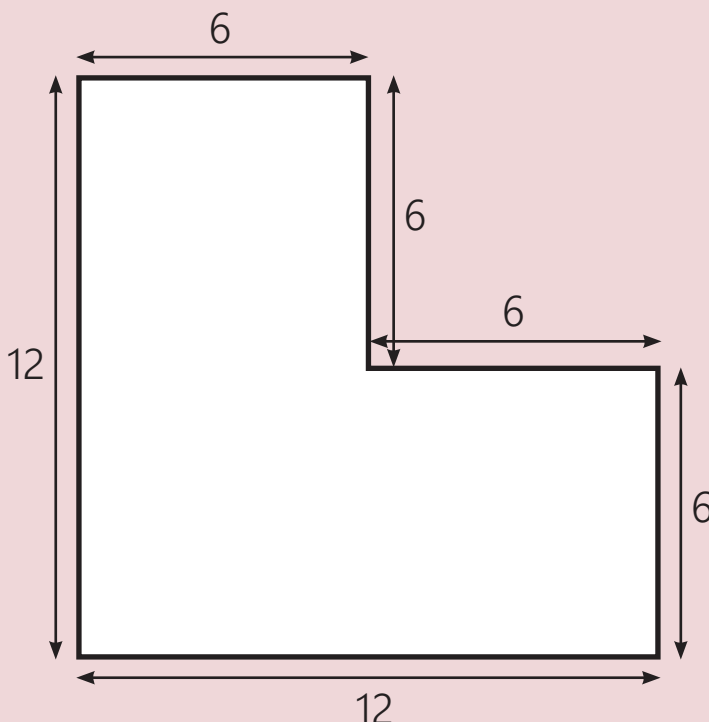Primes that differ by two are called *twin primes*.

There are 8 twin primes among the first 100 numbers. Can you list them?

Pair Problems

Which pairs of consecutive numbers:

1. Add up to 373?

2. Multiply together to give 306?

3. Give an answer of 1.1 when the larger is divided by the smaller?

Inheritance

A certain man had 4 daughters. He made a will to share his land into four equal areas, each area to have the same shape.

This is the plan of the land.

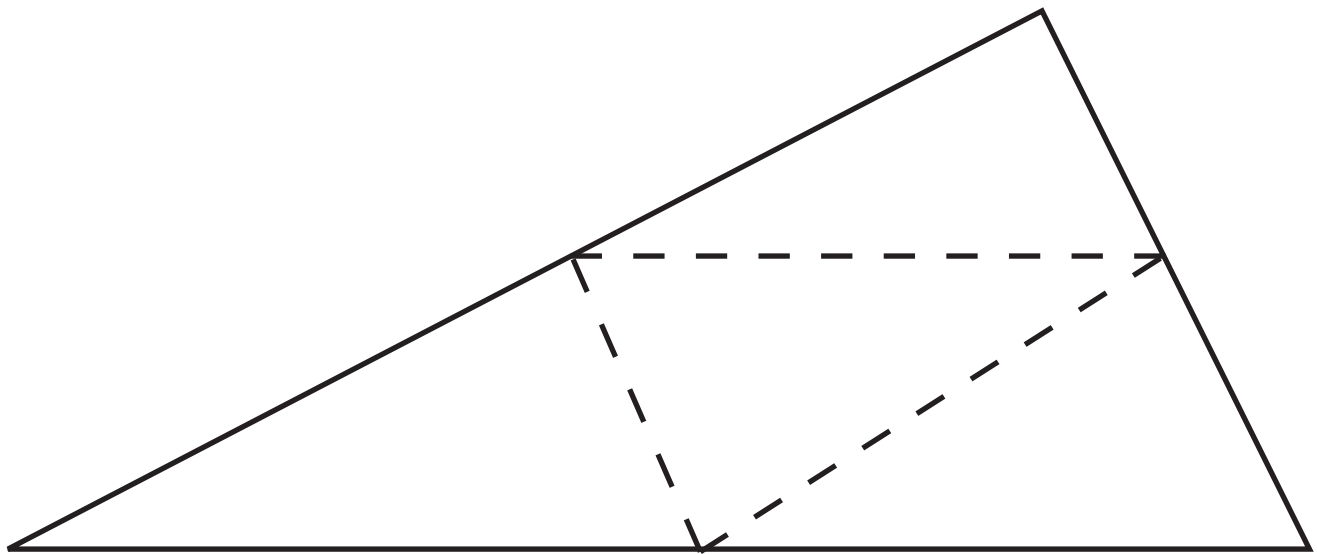Copy the plan and try to work out how he would do it.

Testing Triangles

How many different triangles can be made with a perimeter of 30 so that all sides are of integer length?
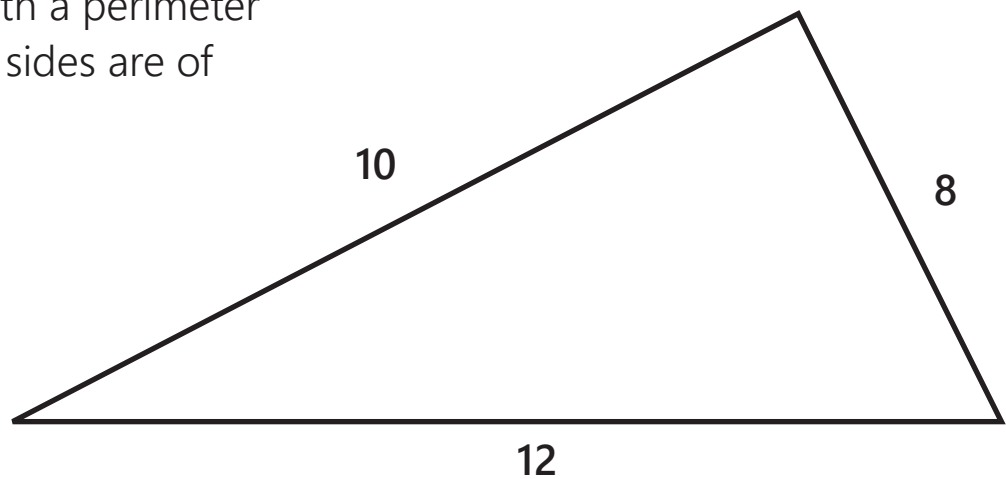
Cutting Triangles

Find the halfway point of each side by folding and mark with little creases. Join up the creases with ruler and pencil. Like this:

Cut along the pencil lines.

How many pieces have you got?

What shape are they?

What do you notice about them?

What fraction are your new pieces of the original triangle?

Calculator

Find five pairs of numbers that give the answer 0.4 when you divide one number in each pair by the other.

What happens if you use the same 5 pairs of numbers but this time divide them the other way round?

Answers

The Sierpenski Triangle

Figure	No. of Black Triangles	Figure	No. of Black Triangles
1	1	1	0
2	3	2	1
3	9	3	3
4	27	4	9
5	81	5	27
6	243	6	81
10	3^9	10	3^8
n	3^{n-1}	n	3^{n-2}

Who Am I?

a) 1/8

b) $16^2 = 256$,
    $2 + 5 + 6 = 13$

c) 157 or 517

Pair Problems

1) 186, 187

2) 17, 18

3) 10, 11

Twin Primes

5, 3;   7, 5;   13, 11;   19, 17;

31, 29;   43, 41;   61, 59;   73, 71

Calculator

2,5; 4,10; 6,15; 8,20; 10,25. 2.5

Testing Triangles

6 triangles

Cutting Triangles

Congruent triangles, quarter of the original