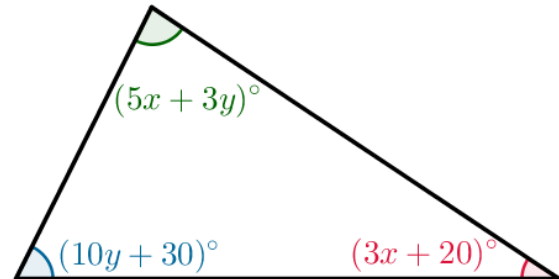


**Age 14+ Level ★★  
Worksheet 1****1. Triangular Algebra**

The interior angles of a triangle are  $(5x + 3y)^\circ$ ,  $(10y + 30)^\circ$  and  $(3x + 20)^\circ$ , where  $x$  and  $y$  are positive integers.



What is the value of  $x + y$ ?

**2. Last-but-one**

If all the integers from 1 up to  $n$  are multiplied together, this is called the **factorial** of  $n$ , and is written as  $n!$ .

For example,  $4! = 4 \times 3 \times 2 \times 1 = 24$ .

This means that the last-but-one digit of  $4!$  is 2.

What is the last-but-one digit of  $99!$ ?

**3. Powerful Zeros**

The number  $3^4 \times 4^5 \times 5^6$  is written out in full.

How many zeros are there at the end of the number?

**4. Coin Collection**

Tom has a collection of more than 24 coins.

When he puts the coins in piles of 6, there are 3 coins remaining.

When he puts the coins in piles of 8, there are 7 coins remaining.

How many coins remain when he puts the coins in piles of 24?

**5. Added Power**

For how many primes  $p$  is the number  $p^3 + 3$  also prime?

**6. Square Sum**

One of the following is the largest of nine consecutive positive integers whose sum is a perfect square. Which one is it?

- a) 118      b) 128      c) 138      d) 148      e) 158

*These problems are adapted from UKMT ([ukmt.org.uk](http://ukmt.org.uk)) and WMC ([competition.ac](http://competition.ac)) problems.*