

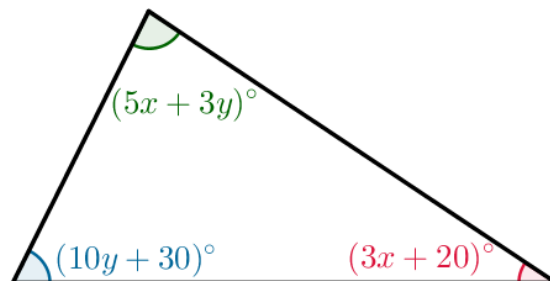


Age 14+ Level ★★
Worksheet 1

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) and WMC (competition.ac) problems.

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Worksheet 2****1. Divisible Palindrome**

Palindromic numbers read the same backwards and forwards, e.g. 7227 or 10101.

What is the sum of the digits of the largest 4-digit palindromic number which is divisible by 15?

2. Sticky Fingers

Ruth has glued 2009 unit cubes together to form a cuboid.

She opens a pack containing 2009 stickers, and she has more than enough to place one sticker on each exposed face of each unit cube.

How many stickers does she have left?

3. Eight Factors Only

A certain positive integer has exactly eight factors.

Two of these factors are 15 and 21.

What is the sum of all eight factors?

4. Times and Square

Roger picks two consecutive integers, one of which ends in a 5.

He multiplies the integers together and then squares the result.

What are the last two digits of his answer?

5. Relative Time

Albert Einstein is experimenting with two unusual clocks which both have 24-hour displays. One clock goes at twice the normal speed.

The other clock goes backwards, but at the normal speed.

Both clocks show the correct time at 13.00.

At what time do the displays on the clocks next agree?

6. Long List

I want to write a list of integers containing two square numbers, two prime numbers and two cube numbers.

What is the smallest number of integers that could be in my list?

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