

ACTIVITY 14.3

Easter Day

The problem of finding the date of Easter Day is not an easy one to solve. It depends on both the *Gregorian* calendar (in which there is a leap year every four years, except for century years where only one in every four is a leap year) and the *Jewish* calendar (which follows a solar cycle for years, a lunar cycle for months and has a 19-year cycle in which the third, sixth, eighth, eleventh, seventeenth and nineteenth years have a thirteenth month).

In the Bible (St. Luke, Chapter 22), we have a description of how Jesus ate the Passover with his disciples, before going to Gethsemane. The Last Supper, the Agony in the Garden and the Crucifixion were at the time of the full moon following 21 March (Spring Equinox). The hurry to remove the body from the cross before the beginning of the Jewish Sabbath (Saturday) fixes the Crucifixion on a Friday.

The Church has sought to preserve this sequence. In 1961, T. O'Beirne published in the journal the *New Scientist*, an algorithm called 'Ten Divisions to Easter' to give the date of Easter Day for any year. The algorithm is shown below:

<i>Algorithm to find the date of Easter Day for any year</i>				
<i>Step</i>	<i>Number</i>	<i>Divide by</i>	<i>Answer (if needed)</i>	<i>Remainder (if needed)</i>
1.	$x = \text{year}$	100	$b =$	$c =$
2.	$5b + c$	19	-	$a =$
3.	$3(b + 25)$	4	$r =$	$s =$
4.	$8(b + 11)$	25	$t =$	-
5.	$19a + r - t$	30	-	$h =$
6.	$a + 11h$	319	$g =$	-
7.	$60(5 - s) + c$	4	$j =$	$k =$
8.	$2j - k - h + g$	7	-	$m =$
9.	$h - g + m + 110$	30	$n =$	$q =$
10.	$q + 5 - n$	32	-	$p =$

Where a dash (-) is shown, it means that the number is not needed.

Easter Day is the p th day of the n th month in the year x .

Source: *Maths Focus*

1. Calculate the date of Easter Day this year. Check that you are correct by looking in a diary or on a calendar.
2. Calculate the date of Easter Day for each of the next 10 years – what are the *earliest* and the *latest* dates found?

Extension

Write a computer program to calculate the date of Easter Day for the next 100 (or 200) years. Analyse the results.