Maths Challenge - Week 297 – Problems

Welcome to week 297 of our weekly maths challenge, with problems and puzzles posed by David Browning, Rod Marshall, Ian Stewart, Annie Stothers and the u3a Maths and Stats Subject Adviser - David Martin. If you would like to share your ideas on how to solve these puzzles please join our learning forum or discuss within your u3a and interest group. Check back each week for the solutions and let us know how you get on by contacting the u3a office. New maths puzzles will go up onto the website every Thursday.

Question 1.

On a certain planet, a year has 360 days, arranged into 12 months of 30 days each. A week has 6 days (Monday to Saturday). The first day of Year 1 is a Monday. What day of the week is the first day of Year 25?

Question 2.

Bill has eight two-metre sections of fencing and is trying to decide whether to arrange them into a square or an octagon to enclose the largest area. Which will give him the largest enclosed area and by what percentage does this benefit over the other arrangement?

Question 3.

(a) In any calendar year, what is the maximum number of times the 13^{th} of a month can fall on a Friday?
(b) Is it possible for a year to have no Friday the 13^{ths}?

Question 4.

A builder is preparing to construct a brick wall of height 1.93 m between two concrete posts which are separated by a distance of 5.2 m. The wall will rest on a concrete foundation and odd and even rows will be commenced using full and half bricks respectively. The selected bricks have dimensions of 215 x 102.5 x 65 mm (length x width x height) and do not have frogs (recesses). The half-bricks will be shortened to a length of 102.5 mm. If the mortar thickness is 10 ± 1 mm, and whole bricks are to be used throughout with the exception of the ends of the even rows, what will be the minimum number of 10 kg tubs of pre-prepared wet mortar which will be required assuming the mortar density is 2000 kg m^{-3}?