PUZZLES

QUICK WITS REQUIRED

MOST of the material on The Page this week is intended for the quick-witted. Ponderous mathematics have been relegated to their proper place, and puzzlers are given an opportunity to lighten the dark days by counting the pages of books, entering into friendly competition with matches, shifting a knight around a chess board, chopping up chains, and numbering the houses in a street. These small things, it is hoped, will assist to displace the gloom-bug with the cheer-germ.

Talking of germs, your PP has lately been doing battle with a different kind of problem, and herewith apologises for letting puzzlers down last week. Instead of the usual mental fever he caught one in the throat.

ANSWERS

(Refer to issue of June 7)

In the Taxi: No punctuation was really necessary, except that a comma might have been inserted after the first use of the word "walk." The comma in the sentence as printed, after the first use of the word "taxi," was inserted by our printers, and is hereby disowned, together with the stray headlines "variations on 142857."

Palindrome: Only one response has been received to Four Feather's suggestion that readers make up palindromes after the style of Napoleon's "Able was I ere I saw Elba." E.M.S. (Wellington) gives us this one for Hitler: "EVIL I WON—NOW I LIVE."

Condensed crossword (Answer to problem in issue of June 14):

WISP
IDEA
SEAL
PALE

Cipher: The clue to the cipher was the word MAFEKING. To work out the cipher you simply wrote the letters in the word "mafeking" in alphabetical order under the letters of the cipher. Thus:

ETNEAROG
aefgikmn

Then you wrote (we hope) the letters of the cipher in the order which would bring the letters of the clue into the proper sequences for "mafeking." Thus:

OENTRAGE
mafeking

Obviously. OENTRAGE did not make very much sense, but then, having passed from "one good deed every day" to Boy Scouts, and thus to Baden-Powell, and thus to Mafeking, you remembered the words of the old motto "try, try again," and went through the same performance with OENTRAGE. Thus:

OENTRAGE
aefgikmn

Transposition to make "mafeking" out of "aefgikmn" gave the letters GONEARET, which was the beginning of the answer, which was:

GONEARETHEDAYSWHENMY
HEARTWASYOUNGANDGAY

The dash, of course, simply filled in the gap created by the fact that there was one letter short of a multiple of the eight in the clue.

PROBLEMS

House Numbers

In Victoria Street the houses were numbered 1, 2, 3 consecutively down one side and up the other. The Borough Council decided to re-number the houses, putting even numbers on one side and odd numbers on the other, in the modern style. Number one now became number 2. House number 155 was the only one which retained the same number as before. How many houses were there in the street?—*(Problem from R.G., Waihi, who asks us to tell readers that no laborious calculations are required for this).*

The Book

Mr. Jones was reading a book with between 200 and 300 pages when he was interrupted by a visitor. When he was able to settle down again with his book his mathematical mind noticed that the sum of all the numbers on the pages up to and including the page he had just read, equalled the sum of all the remaining unread pages. How many pages were there in the book and at what page did he stop?—*(Problem from R.G.).*

Cipher

Our cipher this week comes from P.J.Q. (Motueka). He tells the story of a young lady who wanted her sweetheart to write to her in code. He wrote this to her:

UAOBUTIOUNEOUOINNVIVU
IFURCRESYTHNINOULMITOOIOUSO

It should be stated that this "cipher" does not require a key but can be solved visually.

With the Chess Board

Although this problem required a chess board, F. D. Blackburn who sends it from Riccarton, points out that anyone with the necessary material can work it out, with profit and amusement. The knight, he says, has a queer move in chess. It moves one square diagonally plus one vertically or horizontally. Thus it always changes from black to white or from white to black with every move. F.D.B. places a knight in the top left-hand corner square and asks puzzlers to move it over the 64 squares, touching each square once only. Although puzzlers in general are absolved from this extra task, F.D.B. suggests that the upper hundred and ten could probably occupy themselves finding out how many different methods there are of moving the knight in this manner.

Puzzlers who do not possess a chess board can easily try their hands at the puzzle by drawing a facsimile. Chess boards have 64 squares, eight along each side. The top left-hand square is white and from it each alternate square is black.

Toss-up

What are the chances that a coin will land heads exactly five times in ten tosses?—*(Problem from H.G.L.)*

The Chain

A farmer went to a blacksmith with five pieces of chain, each of three links. He asked the smith to join them to form one chain. The smith agreed. He charged, he said, 1d for cutting and ½d for welding. There would need to be four cuts and four weldings, so the cost of the job would be 6d. The farmer demurred, and explained how the job could be done for 4½d. How was this?—*(Problem from Jack May, Taupo).*

MATCH GAME

Here is a game to be played with 12 matches. F.D.B. suggests that they be set out as follows

!!! !!!! !!!!!

Two players are required. Taking turns, they remove any number of matches from any one of the groups of three, four, and five matches. The man who picks up the last match is the loser. Any player who knows the method can invariably win against players who do not. F.D.B.'s suggestion is that puzzlers should try to discover the method.

CORRESPONDENCE

H. G. Lambert (Taupo): sends, for S.G.E., a formula for giving a series of n consecutive prime numbers. He denies that he is scornful of simpler mathematics and agrees that calculus is neither difficult nor complicated; but a simple method for doing difficult work. He says that the briefest formula for the first member of a series of n consecutive non-prime numbers is (n+1) factorial plus 2; but the following rule is quicker to use and gives an infinite number of series: Multiply together the prime numbers up to, but not including, n+2. Then multiply the product by *any* whole number and add two, which gives you the first member of a series. Alternatively, if you multiply the product of the primes by any whole number greater than one, you can subtract two, which gives the last member of a similar series. S.G.E. had asked for a series of 1,000, says H.G.L., but, as the members of such a series would be 350-figure numbers, or bigger, H.G.L. gives only 25. This we have sent on to S.G.E. Before we take S.G.E.'s observations, we must acknowledge H.G.L.'s estimate of the conditions governing the suppositious sweepstake on the Rugby match. (See issue of May 24). He says there are only 39 possible scores fulfilling the conditions set, and that the chances are 38 to 1 against guessing the correct score, no matter how many participate.

S.G.E. (Glenavy): writing about the non-prime numbers, gives his own views of a "fairly compact form of the rule": Suppose it be required (he says) to find a series of 15 consecutive numbers none of which is prime. Let n be the number whose factors have to be determined. Then a series of 15 integers is n+2, n+3 . . . . . . n+16. These will be divisible successively by 2, 3 . . . . 16 if n contains those numbers as factors. That is, if n = 1×2×3 . . . . ×16 no member of the series can be prime.

Now that H.G.L. and S.G.E. seem to be reaching agreement on how to find "any series of n consecutive integers not one of which is prime" (issue of June 7) we, like the small boy at his first geometry class, want to know what they propose to do with it.

The following correspondents are the latest to write showing by means of numerous diagrams and much argument that they know enough about geometry to see the fallacy of S.G.E.'s argument about non-euclidean geometry: T. P. (Ashburton), E. William Howard (Hastings), F. D. Blackburn (Riccarton), J. Morice (Whakatane), D.D. (Hicks Bay), etc. No doubt all these correspondents are now basking in the sunlight of self-satisfaction. They should thank S.G.E. for the opportunity.

FIGURE MYSTERIES

The Editor,
"The Listener."

Sir,—May I thank S.G.E. of Glenavy for his correction of a statement in my article, and offer this explanation by way of a slight excuse for my seeming rashness.

The "article" was written early in the year in reply to certain comments of Mr. J. A. Reid, and was intended merely as a letter to the Puzzle Page. However, it soon became too unwieldy to appear there, and the result was the article as printed. As all the statements I made referred to facts I had been interested to find out myself, I was careful to put the reservation "as far as I can tell" (or some other cautious parenthesis) to anything I had not actually verified. I assure S.G.E. that I do know that where mathematics are concerned, a little learning is a "very, very, very" dangerous thing, unless tempered with caution. I really have the greatest respect for both infinity and prime numbers.

It was unfortunate that I stopped my investigations with 29. Had I persevered, the case of 31 would have given me a clue to the puzzle of 13. But I do not see the significance of S.G.E.'s statement that "the figures in the period of 1/7 are 12, 45, 78." I notice that these are all multiples of 3, and that 3, 6, and 9 are omitted, but why arrange the group of commencing figures, 1, 2, 4, 5, 7, 8, in the apparently arbitrary form of pairs?

There is certainly a pattern in the commencing figures of seventeenths and twenty-thirds, and after a little investigation on my own account I find a similar sort of pattern in the case of nineteenths and twenty-ninths. But all I can gather from these exercises is this: The commencing figures of the decimal forms of the five fractions sevenths, seventeenths, nineteenths, twenty-thirds, and twenty-ninths are (naturally) in ascending order of the digits, and in each case there is a non-conformity with two or all of 0, 3, 6 and 9. With sevenths, none of these four appear at all; with seventeenths there are only one of each of these while there are two of all other digits; with nineteenths, there is only one 0 and one 9, but two of all others; with twenty-thirds there are three 3's and three 6's, but two of all others; and with twenty-ninths there are two 0's, two 9's, and three of all others.

Which only goes to show that there is something even more peculiar about 3 and its multiples than I had thought.

Yours, etc.,
R.W.C.

This letter was submitted to S.G.E. before publication. His further comments are summarised as lending additional interest to a fascinating subject:

"When I set down the figures in the decimal of 1/7th as 12,45,78, I meant, of course, that the commas should indicate blank spaces for 0,3,6,9. The symmetry in the commencing figures which I noticed when I read R.W.C.'s article really has a theoretical basis, as I realised soon after. The point is that if any decimal of 1/n repeats thus: 0.abc . . . fg (a and g repeating) then the multiplication of this decimal by n does not give 1, but its equivalent 0.9 repeater. For example:

$$\begin{array}{r} 1/7\text{th} = 0.142857142857 \text{ etc.} \\ \times \quad 7 \\ \hline \text{Therefore } 1 = 0.999999999999 \text{ etc.} \end{array}$$

"Suppose then that we write 1 as 0.9 repeater and subtract 1/n from it. We get n-1/n. So that if n equals 1/17th, then 0.9-1/17th equals 16/17. Or, in general,

1 = 0.9999999999 . . . . .

1/n = 0. abc . . . . . fg (a and g repeating)

"Therefore 1-1/n = 0.× . . . . where × is the commencing figure of 1-1/n. Clearly the top row is a row of 9's and the abcg's must be numbers either each equal to or each less than 9. Consequently there is *never* any *carrying figure* in the subtraction. × is therefore the difference between 9 and a, under all circumstances. Thus, since 1/17 starts off 0.0 repeater, 16/17ths will start off 0.9 repeater, and if 2/17ths starts off 0.1 repeater 15/17ths will start off 0.8 repeater. This symmetry applies to the commencing figures of all decimals that repeat. I leave you to verify for 1/13, 2/13, 3/13, . 12/13."