king.)

21 Nc3-a4 a5xb4
22 Qb2xb4 b7-b5!
(Winning a pawn, White's 'defences' in front of his king now disintegrate.)
23 Na4-c3 Nd7xc5
24 Qb4-b2 Nc5xd3
25 Rd1xd3 b5-b4
26 Be3xd4 e5xd4
(26. . . b4xc3 also wins comfortably.)

30 h2-h4 Qg3-g2
31 Rh1-h3 c6-c5
32 Qd3-c4 Qg2-f1+
33 Kb1-c2 Re8-d8
(Threatening 34 . . . d4-d3+.)
34 f3-f4 Ra8-a5
35 e4-e5 Rd8-a8
36 Kc2-b2 Qf1-g2
37 Kb2-b1 Qg2-g4
38 Qc4-d5 Bg7-h6

Just a formality

45 ... Qd2-e1+!
(Black does not need any more material. The name of the game now is mate.)
46 Kb1-b2 Qe1-a1+
47 Kb2-b3 Qa1-a2 mate
(Hooray for the good guys.)

NUMBERS COUNT

Mike Mudge presents a triad of number curiosities.

The following triad of number curiosities provides an opportunity for the computer user to explore untrodden paths. Requiring only a knowledge of simple arithmetic operations, the ability to recognise certain patterns among the digits of an integer and a certain enthusiasm; it is hoped that this choice will appeal equally to the new reader and to the regular correspondent.

1) Powers of ten may sometimes be factorised in manner that contains no zeros. For example:

$10^2 = 4 \times 25$

$10^3 = 8 \times 125$

$10^{33} = 8589934592 \times$
116415321826934814453125

Which powers of ten can be so factorised?

2) It can be proved that powers of two exist which contain arbitrarily long sequences of zeros. For example:

$2^{10} = 1\underline{0}24$

$2^{53} = 9\underline{00}7199254740992$

The first string of eight zeros is found in 2^{14007} and starts at the 729th decimal digit reading from right to left.

Which are the smallest powers of two containing a string of zeros of a given length? Where does that string occur? Do similar results occur when the zero is replaced by another integer?

3) It can be proved that when a two digit decimal integer is multiplied by its 'reverse' the result is never a perfect square, unless trivially the integer is palindromic (that is equal to its 'reverse'.) This does not extend to numbers of more than two digits for example:

$169 \times 961 = 162409 = 403^2$

$1089 \times 9801 = 10673289 = 3267^2$

These examples may lead to the conjecture that the product of a number and its 'reverse' (assumed now to be distinct) is only a square when both the number and its 'reverse' are perfect squares. Is this true? When are cubes or higher powers produced by multiplication of a number by its 'reverse'?

Readers are invited to submit their thoughts (preferably accompanied by computer related material!) relating to this triad of problems to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffordshire WV4 5NF. Tel: (0902) 892141. A suitable prize will be awarded to the 'best' entry received by 1 November 1985. Criteria will include accuracy, originality and efficiency, not necessarily in that order.

Please note that submissions can only be returned if a suitable stamped addressed envelope is included. Expanded reviews of previous problems, together with, subject to the approval of the contributor, copies of detailed programmes from the prize winning entry may also be requested.

February winner

This problem produced a record response. I have many tables of palindromic primes and n^{th} powers both base 10 and numerous other bases; enquiries for particular sets of data would be welcome and all programmers suitably acknowledged. The mystery of the palindrome attempt function applied to 196 has remained unsolved.

Additionally much empirical evidence on palindromic geometrical numbers has been produced and very

END ZONE

efficient routines in languages, and on machines far too numerous to mention.

The prize winner, after a great deal of thought is A A S Randall, Lowestoft, Suffolk for his work on a Dragon 32 using both Basic and machine code written and run using DASM/DEMON assembler and monitor from Compusense Ltd.

Steve concentrated his efforts on squares, cubes, fourth powers, pentagonal numbers and of course the palindrome attempt function all in a range of number bases; leaving primes out of his study but presenting a well-documented and efficient set of results and programs.

LEISURE LINES

77319

Brain-teasers from J J Clessa

Quickie

If I spend 25 per cent of the pounds in my wallet, and give away three-quarters of the rest, I'll have £6 left. How many pounds have I got?

Prize Puzzle

Aug 85

A bit easier than usual — but you will need your micros for it. What number when divided by 11 and multiplied by 13 gives the original number in reverse? Answers on postcards only (or backs of envelopes) to *PCW* Prize Puzzle, August 85 Leisure Lines, 32-34 Broadwick Street, London W1A 2HG. Entries to arrive not later than 30 September 1985.

May Prize Puzzle

This one must have been a bit harder than usual, since only about 110 entries were received. One reader said he gave up on his own PC and used the larger machine at work.

At the time of setting the problem I only had one solution — 5671 which splits into 2701, 1485, and 1485. As many of you pointed out, 5886 is also a solution — forming 1596, 2145 and 2145.

Both of these solutions can be deemed to be 'well over 5000 birds . . .' and therefore I accepted either for prize eligibility (the next solution was in excess of 12000 so was disqualified).

The winning entry came from Andrew Norris of Bridgwater, Somerset. Congratulations Andrew, your prize is forthcoming.