Big Holes by Elap – Full Solution

Very little trial and error is needed to solve this puzzle. In this solution, the symbol □ denotes a digit.

27Dn. TTT: This has four digits, and so **T** is in the range 10 to 21.

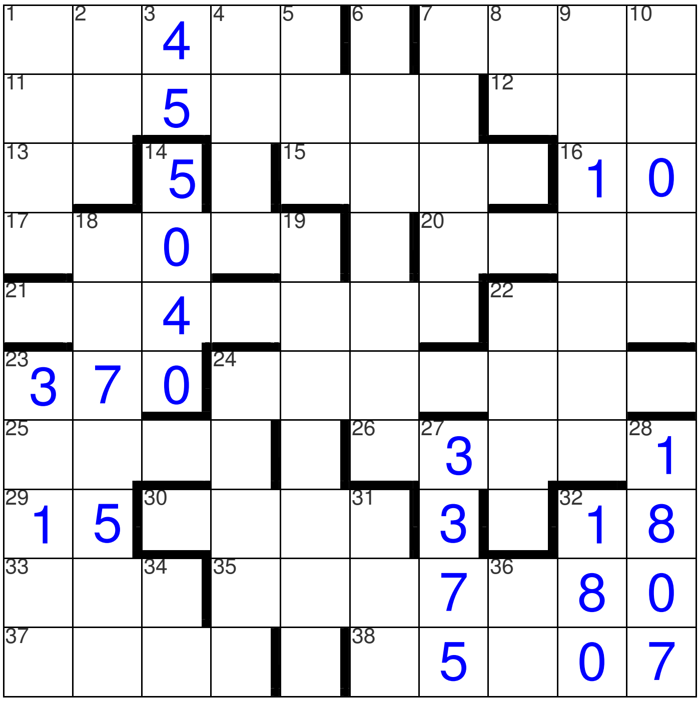
3Dn. W = 3T = 3O + T: It follows that **2T = 3O**, meaning that **T** is a multiple of 3 and **O** is even. **T** is therefore 12, 15, 18 or 21, and **O** is 8, 10, 12 or 14.

32Dn. U = TO + 2T: **U** is therefore 120, 180, 252 or 336.

14Dn. Q = (V – OU)! There is only one four-digit factorial, and so **Q = 5040**, meaning that 23Ac ends with a zero.

23Ac. P = O + 2U: For this to end with zero, **T = 15** and **O = 10**, giving **U = 180**, **W = 45** and **P = 370**. Since 14Dn is 7!, **V = 1807**.

After entering the known values, the grid now looks like this:



32Ac. H has worked itself out, giving **H = 18**.

26Ac. OY + OK + A = □3□□1: Since **O** is 10, **A** must end with 1.

23Dn. TAW + G = 3□1□□: The maximum possible value for **A** is (39199 - 11) / 15 / 45 = 58 (39199 is the highest possible value for 23Dn, and 11 is the lowest possible value for **G**).

35Ac. AUU + PQ + U = □□□7□80: Substituting the known values, we have

32400**A** + 1864980 = □□□7□80

i.e. 324**A** + 18649 = □□□7□

Since we know that **A** ends with 1, let it be 10n + 1. This gives

324(10n + 1) + 18649 = □□□7□

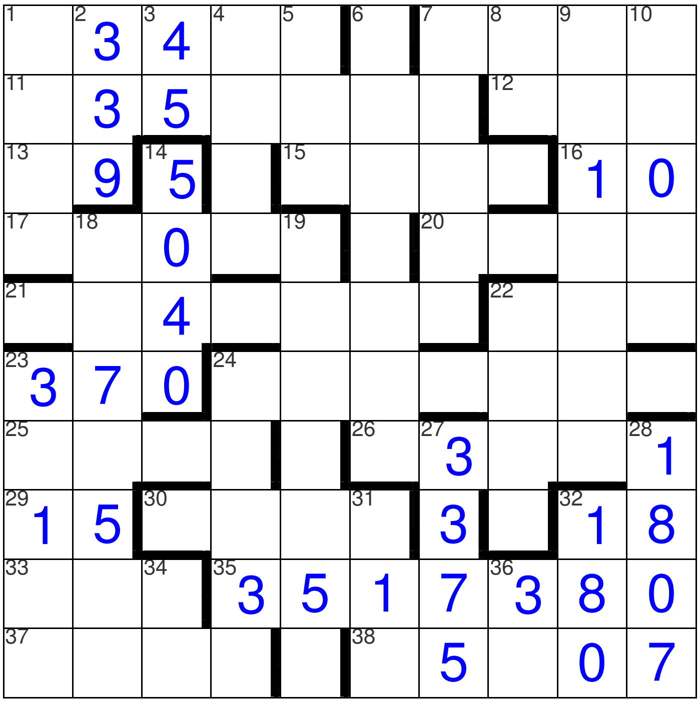
i.e. 3240n + 18973 = □□□7□

To retain the penultimate digit of 7, n must be a multiple of 5. Since **A** must have at least two digits (as stated in the preamble), and we know from 23Dn that it cannot exceed 58, we have **A = 51**.

Big Holes by Elap – Full Solution

Thus 35Ac = 51x180x180 + 370x5040 + 180 = **3517380**. We can now evaluate **2Dn. H + A + TH** = 18 + 51 + 15x18 = **339**.

This is what the grid looks like now:



1Dn. OOE + 2V: Since **O** is 10 and **V** is 1807, we have 1Dn = 100**E** + 3614, and so 1Dn is □□14. This gives 13Ac, i.e. **E = 19**. 1Dn is therefore **5514**.

1Ac. EYY + O + E + A = 534□□, i.e. 19**YY** + 80 = 534□□. $\mathbf{Y}^2$ is therefore (534□□ - 80) / 19. The minimum value of $\mathbf{Y}^2$ is (53411 - 80) / 19 = 2807, and the maximum is (53499 - 80) / 19 = 2811. The only square in range is 53^2 = 2809, and so **Y = 53** (which is 8Dn). This gives 1Ac = **53451**.

38Ac. TO + OK + U + V = □5□07, i.e. 150 + 10**K** + 180 + 1807 = □5□07, or 2137 + 10**K** = □5□07. This gives 213 + **K** = □5□0, meaning that **K** ends with 7.

11Ac. KEY + W + Z = 535□□□□, i.e. 1007**K** + 45 + □1□ + = 535□□□□ (**Z** is 31Dn). This gives

$$K = \frac{535\square\square\square\square - 45 - \square 1 \square}{1007}$$

The minimum value of **K** is therefore (5350000 - 45 - 919) / 1007 = 5312 and the maximum value is (5359999 - 45 - 111) / 1007 = 5322. We know from 38Ac that **K** ends with 7, and so **K = 5317**, which is 25Ac. We can now write in **26Ac. OY + OK + A** = 10x53 + 10x5317 + 51 = **53751**. We can also write in **38Ac. TO + OK + U + V** = 15x10 + 10x5317 + 180 + 1807 = **55307**. **36Dn. R** has now worked itself out, giving **R = 33**.

7Ac. OO + EU + R can now be evaluated as 10x10 + 19x180 + 33 = **3553**, and **5Dn. = 2E + 2R** as 2x19 + 2x33 = **104**.

Now that 38Ac has been completed, we know that **Z** is □15.

11Ac. KEY + W + Z = 535□0□□, i.e. 5317x19x53 + 45 + □15 = 535□0□□. This simplifies to 5354264 + □15 = 535□0□□, and so 4264 + □15 = □0□□. This gives 4264 + 815 = 5079, and so we have **Z = 815** (= 31Dn), 11Ac = 5317x19x53 + 45 + 815 = **5355079**. **37Ac. AY + U + V + Z** is now known to be 51x53 + 180 + 1807 + 815 = **5505**.

Big Holes by Elap – Full Solution

This is the current state of the grid:

[1] 5	[2] 3	[3] 4	[4] 5	[5] 1	[6]	[7] 3	[8] 5	[9] 5	[10] 3
[11] 5	3	5	5	0	7	9	[12] 3		
[13] 1	9	[14] 5		[15] 4				[16] 1	0
[17] 4	[18]	0		[19]		[20]			
[21]		4					[22]		
[23] 3	7	0	[24]						
[25] 5	3	1	7		[26] 5	[27] 3	7	5	[28] 1
[29] 1	5	[30]			[31] 8	3		[32] 1	8
[33]		[34]	[35] 3	5	1	7	[36] 3	8	0
[37] 5	5	0	5		[38] 5	5	3	0	7

18Dn. EYQ + UI + F = □□735□5: 19x53x5040 + 180**I** + **F** = 5075280 + 180**I** + **F**. Whatever the values of **I** and **F**, 18Dn must begin with 5.

17Ac. TAW + TG = 450□□. The minimum value of **G** is (45001 - 15x51x45) / 15 = 706, and the maximum value is (45099 - 15x51x45) / 15 = 711.

23Dn. TAW + G = 351□5: This gives 15x51x45 + **G** = 351□5, i.e. 34425 + **G** = 351□5, and so **G** is a multiple of 10. Since we know that **G** is in the range 706 to 711, we have **G =710**. Thus 17Ac is 15x51x45 + 15x710 = **45075** and 23Dn is 15x51x45 + 710 = **35135**.

21Ac. COX + O + H must end with 8, because **O** is 10 and **H** ends with 8.

15Ac. CO + E + 2C = 4□□□, i.e. 12**C** + 19 = 4□□□. The minimum value of **C** is (4000 -19) / 12 = 332, and the maximum value is (4999 - 19) / 12 = 415.

4Dn. RW + C + 2V = 55□7, i.e. 33x45 + **C** + 2x1807 = 55□7, i.e. 5099 + **C** = 55□7. **C** is therefore in the range 408 to 498.

Combining the above results, **C** must be in the range 408 to 415. Returning to **4Dn. RW + C + 2V**, the minimum value is 5099 + 408 = 5507, and the maximum is 5099 + 415 = 5514. Since 4Dn = 55□7, it must be **5507**, giving **C = 408**. This gives 15Ac = 408x10 + 19 + 2x408 = **4915**.

7Dn. AB + G + B = 391□8. Thus **B** = (391□8 - 710) / 52, putting it in the range 739 to 740. **B** = 740 gives 7Dn = 39190, but **B = 739** gives an answer which fits: **39138**. **22Ac. B + 2A + 2R** can now be evaluated as 739 + 2x51 + 2x33 = **907**.

10Dn. RS + E + 2K = 3□0□7, i.e. 33**S** + 19 +2x5317 = 3□0□7, i.e. 33**S** + 10653 = 3□0□7. **S** must therefore end with 8 and have three digits.

30Ac. M = THE + V + X = □□□8, i.e. 15x18x19 + 1807 + **X** = □□□8, or 6937 + **X** = □□□8. **X** therefore ends with 1. It follows that **20Ac. B + S + 3X** ends with 0.

Big Holes by Elap – Full Solution

The grid now looks like this:

(1) 5	(2) 3	(3) 4	(4) 5	(5) 1	(6)	(7) 3	(8) 5	(9) 5	(10) 3
(11) 5	3	5	5	0	7	9	(12) 3		
(13) 1	9	(14) 5	0	(15) 4	9	1	5	(16) 1	0
(17) 4	(18) 5	0	7	(19) 5		(20) 3			0
(21)		4				8	(22) 9	0	7
(23) 3	7	0	(24)						
(25) 5	3	1	7		(26) 5	(27) 3	7	5	(28) 1
(29) 1	5	(30)			(31) 8	3		(32) 1	8
(33) 3		(34)	(35) 3	5	1	7	(36) 3	8	0
(37) 5	5	0	5		(38) 5	5	3	0	7

Returning to **10Dn. RS + E + 2K**, we have 33**S** + 10653 = 3□007 where **S** = □□8. Let **S**'s first and second digits be a and b, i.e. **S** = 100a + 10b + 8. Then we have

$$33(100a + 10b + 8) + 10653 = 3\square007.$$

Concentrating on the last three digits only, we have

$$3300a + 330b + 264 = 3\square007 - 10653 = 1000n + 354,$$

i.e. $3300a + 330b = 1000n + 90,$

which gives $330a + 33b = 100n + 9.$

It follows that b is 3, giving **S** = □38.

Thus we have $330a + 99 = 100n + 9,$

i.e. $33a + 9 = 10n.$

The only value of a which gives a multiple of 10 for the left-hand side is 7, giving **S = 738**. **10Dn. RS + E + 2K** is now 33x738 + 19 + 2x5317 = **35007**.

12Ac. F - U: We have **F** - 180 = 3□5, giving **F** = 485, 495,… or 575.

9Dn. FIE + G + Q = 5□1□0□5, i.e. 19**FI** + 710 + 5040 = 5□1□0□5. We know that **F** is in the range 485 to 575. We can now find the range of **I**. The minimum possible value is

$$\frac{5010005 - 710 - 5040}{19 \times 575} = 459$$

and the maximum value is

$$\frac{5919095 - 710 - 5040}{19 \times 485} = 641.$$

Big Holes by Elap – Full Solution

24Dn. WB + WI + W = □7□35 = 45(739 + **I** + 1) = 33300 + 45**I**. Applying the known range of values for **I**, we have a range for 24Dn of 33300 + 45x459 = 53955 to 33300 + 45x641 = 62145. 24Dn therefore begins with 5, and since it is divisible by 9 (because **W** is), 24Dn = **57735**. This gives **I = 543**, resulting in 24Ac = 18x543x543 + 739x51 + 33 = **5345004**.

This is now the state of the grid:

5	3	4	5	1		3	5	5	3
5	3	5	5	0	7	9	3		5
1	9	5	0	4	9	1	5	1	0
4	5	0	7	5		3			0
		4				8	9	0	7
3	7	0	5	3	4	5	0	0	4
5	3	1	7		5	3	7	5	1
1	5		7		8	3		1	8
3			3	5	1	7	3	8	0
5	5	0	5		5	5	3	0	7

9Dn. FIE + G + Q = 5□1□005, i.e. 10317**F** + 5750 = 5□1□005. We know that **F** = 485, 495,… or 575. Let **F** = 485: this gives a value of 5009495. In order to get a result which ends in 005, we need to add an amount that ends in 510. Since each increase in **F** of 10 adds an amount ending in 170 to the result, we need to make **F** higher by 30, giving **F = 515**. 12Ac is therefore 515 - 180 = **335** and 9Dn is 515x543x19 + 710 + 5040 = **5319005**. 18Dn can now be evaluated as 19x53x5040 + 180x543 + 515 = **5173535**.

The known letter values so far are

A =	51	**G** =	710	**P** =	370	**U** =	180
B =	739	**H** =	18	**Q** =	5040	**V** =	1807
C =	408	**I** =	543	**R** =	33	**W** =	45
E =	19	**K** =	5317	**S** =	738	**Y** =	53
F =	515	**O** =	10	**T** =	15	**Z** =	815

and the unknown values are now just **D**, **J**, **L**, **M** and **X**.

The remaining unsolved clues are

20Ac. B + S + 3X
21Ac. COX + O + H
30Ac. M = THE + V + X
33Ac. P + B - X

6Dn. TJ + LP + O!
19Dn. JA + MS + D
22Dn. OX + HR + X
34Dn. HR - D

22Dn. OX + HR + X = 907□: This gives 11X + 594 = 907□, and so **X = 771**, giving 22Dn = **9075**. 20Ac is therefore 739 + 738 + 3x771 = **3790**, 21Ac is 408x10x771 + 10 + 18 = **3145708**, 30Ac is

Big Holes by Elap – Full Solution

15x18x19 + 1807 + 771 = 7708, i.e. **M = 7708**, and 33Ac = 370 + 739 - 771 = **338**. 34Dn has worked itself out, and so **HR** - **D** = 80, giving **D = 514**.

There are now two clues to solve, and **J** and **L** to determine:

6Dn. TJ + LP + O! = □79□045
19Dn. JA + MS + D = 573□05□

19Dn. JA + MS + D = 51**J** + 7708x738 + 514 = 573□05□, i.e. 51**J** + 5689018 = 573□05□. We therefore have **J** = (5□05□ - 9018) / 51. **J** is therefore in the range 805 to 981. Only **J = 883** produces a value which fits, giving 19Dn = **5734051**.

6Dn. TJ + LP + O! = 15x883 + 370**L** + 3628800 = □79□045, i.e. 370**L** + 3642045 = □79□045. Subtracting 5 from each side and dividing by 10, we get 37**L** + 364204 = □79□04, meaning that **L** must be a multiple of 100. Let **L** = 100n. Then we have 37n + 3642 = □79□, and n = 4 is the only value which works, giving **L = 400**. This results in 6Dn = 15x883 + 400x370 + 3628800 = **3790045**, thus completing the grid:

[1] 5	[2] 3	[3] 4	[4] 5	[5] 1	[6] 3	[7] 3	[8] 5	[9] 5	[10] 3
[11] 5	3	5	5	0	7	9	[12] 3	3	5
[13] 1	9	[14] 5	0	[15] 4	9	1	5	[16] 1	0
[17] 4	[18] 5	0	7	[19] 5	0	[20] 3	7	9	0
[21] 3	1	4	5	7	0	8	[22] 9	0	7
[23] 3	7	0	[24] 5	3	4	5	0	0	4
[25] 5	3	1	7	4	[26] 5	[27] 3	7	5	[28] 1
[29] 1	5	[30] 7	7	0	[31] 8	3	5	[32] 1	8
[33] 3	3	[34] 8	[35] 3	5	1	7	[36] 3	8	0
[37] 5	5	0	5	1	[38] 5	5	3	0	7

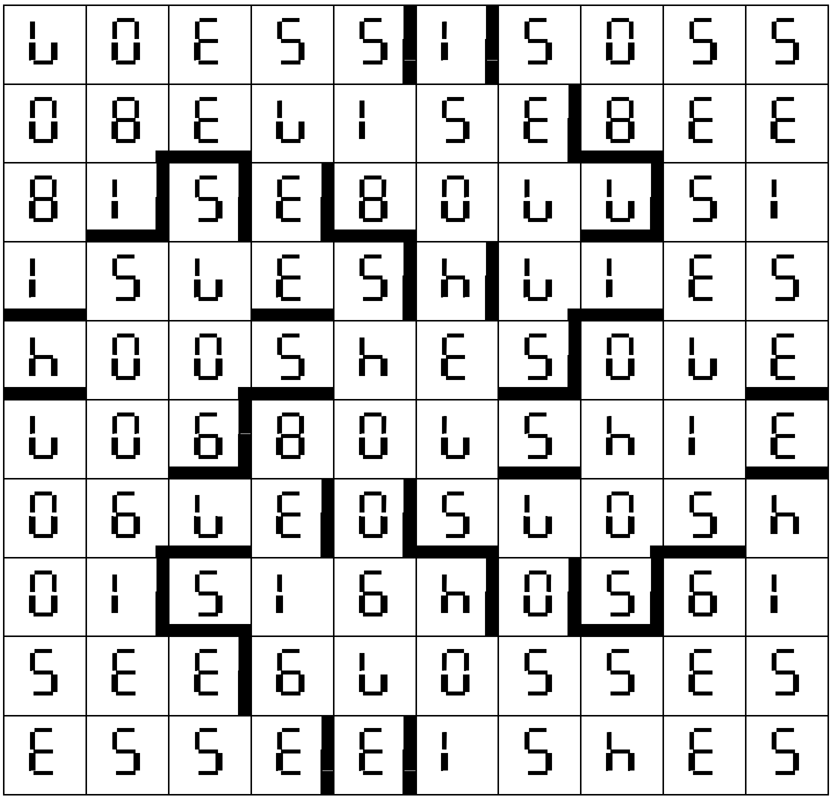
When the letters are sorted by their values in ascending order, we get

O	T	H	E	R	W	A	Y	U	P	L	C	D
10	15	18	19	33	45	51	53	180	370	400	408	514

F	I	G	S	B	X	Z	J	V	Q	K	M
515	543	710	738	739	771	815	883	1807	5040	5317	7708

and the hint which appears is "Other way up LCD figs", LCD standing for Liquid Crystal Display. If the digits are entered in the grid as LCD segments, and the grid is then turned upside-down, it turns into a crossword:

Big Holes by Elap – Full Solution



The values of the letters in the clues also form words when they are turned upside-down.

The sum of the grid entries is 37819173, and when this is written using typical 7-segment LCD digits and the number is turned upside-down, the word ELIGIBLE appears, and this word was to be written underneath the grid.

The puzzle's title comprises the eight different letters which appear in the completed grid when it is inverted.