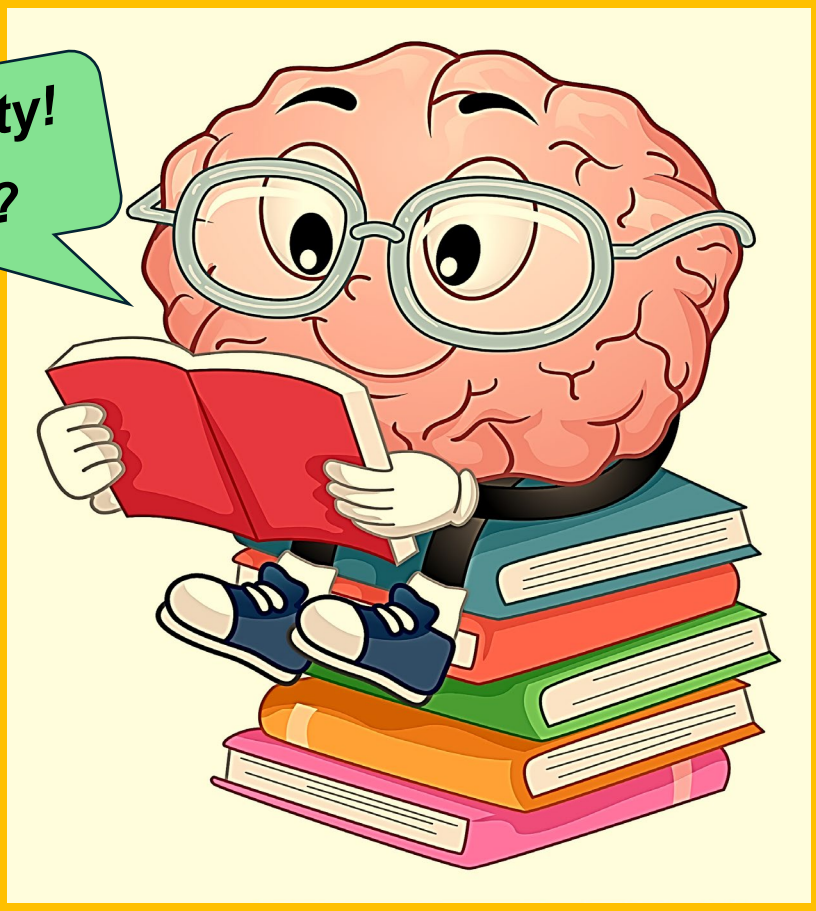
SMARTY

Algebraic Reasoning Puzzle



Carole Greenes

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Alge-Grid: What's the a?

Factor Max

Make It Proper Pattern Grid-unLocks

Play It Positively or Negatively!

Shape-Up

READY- X

Practice Research Innovation in Mathematics Education (PRIME) Group

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Author Bio

Carole Greenes, Ed.D. is Professor Emerita, Mathematics Education, Arizona State University. While at ASU, she served as Associate Vice President for STEM Education, Dean of the School of Educational Innovation and Teacher Preparation, Director of the Practice Research and Innovation in Mathematics Education (PRIME) Center, Director of the Vertically Integrated Projects program that provides research experiences for undergraduate students, and Professor of Mathematics Education in the Ira A. Fulton Schools of Engineering, the College of Liberal Arts and Sciences, and the Mary Lou Fulton Teachers College. Currently, she directs the PRIME Group that develops books of challenge problems and games for students, grades K – 12, and authors Carole's Corner for the Center for Mathematics and Teaching, Inc. in California. Carole is the author of more than 350 books for students, PreK-12 and college, and teachers; 81 articles; six mathematical musicals; and two histories of mathematics in story and song. She served as editor of the Arizona Association of Teachers of Mathematics journal, *OnCore*, and author of the online monthly free *MATHgazine Senior* (grades 8-12), *MATHgazine Junior* (grades 5-8), *MATHgazine Elementary* (grades 3-5) and *MATHgazine Primary* (grades K-2). In 2003, Greenes was inducted into the Massachusetts Mathematics Educators' Hall of Fame. In 2011, she received the NCSM Ross Taylor/Glenn Gilbert National Leadership Award in Mathematics Education. In 2016, she received the Copper Apple Award for Leadership in Mathematics in Arizona, and in 2018 she received the National Council of Teachers of Mathematics Lifetime Achievement Award. Her 2021 - 2024 books/games include: *Alge-Grid: What's the a?*, *Pattern Grid-unLocks, Play It Positively or Negatively?*! *Factor Max!*, *Make It Proper!, Shape-Up* and *READY-X,* all of which are at no cost through the Center for Mathematics and Teaching, which also features *Carole's Corner* and *Carole's Commentary*.

SMARTY

Algebraic Reasoning and Equation Solving

What is SMARTY?

SMARTY shows grids with cells that contain the letters: S, M, A, R, T, and Y , some with coefficients that are fractions and others with exponents. Exponents may be whole numbers or fractions (square or cubic roots). Within each grid, each letter represents the same number. Values of letters differ with different grids.

At the end of each row and at the bottom of each column in the grid is the sum of the numbers in that row or column. Therefore, all rows and columns are addition equations.
To complete the grid, the value of each letter: S, M, A, R, T, and Y, must be determined. Letter values may be 1, 2, 3, 4, 5, 6, 7, 8, or 9. All letter values within a grid are unique – that is no two letters have the same value.

Grid Sizes: 3-by-3, 3-by-4, and 4-by-4.

Section 1: 10 3-by-3 Grids
Section 2: 20 3-by-4 Grids
Section 3: 20 4-by-4 Grids

Section 4: Possible Solutions

Note that this section is labeled "Possible" because, for most puzzles, there is more than one solution method. You may want to compare solution methods with others.

Solution Strategies: Suggested by grade 7 students.

At the start:

1) Find a row or a column that has the same letter. Then, solve for the value of that letter. Replace all same letters in the grid with that value.
2) Look for rows/columns that have two pairs of letters. Solve for the value of one pair. Replace all pairs in the grid with that value.
3) Identify two rows or two columns that have the same numbers. Add the equations and solve.
4) With 3 by 4 grids, if a row of 4 has all letters that are in a row of 3, then subtract the row with 3 from the row with 4, and you get the value of the other letter.

Are you a SMARTY? Check it out!

Section 1: SMARTY 3 BY 3 GRIDS

SMARTY- 1

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	R	T	M	16
	2	A	T	S	14
	3	Y	T	T	21
		8	24	19	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 2

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	S	1/3 R	1/6 M	11
	2	A	A	A	24
	3	S	Y	T	12
		26	10	12	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 3

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	S	A	R	11
	2	S	A	T	11
	3	M – 1	Y	Y	5
		9	13	8	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 4

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	M	A^2	M	27
	2	$Y^{1/3}$	Y	Y	18
	3	S	R	T	14
		13	22	24	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 5

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	T	$Y^{1/2}$	A	15
	2	T	Y	M	11
	3	R	$Y^{1/2}$	$S^{1/3}$	13
		21	8	10	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 6

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	Y	M	Y	10
	2	S	M^0	1/5 A	4
	3	T	M	1/4 R	18
		12	17	3	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 7

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	
1	M^2	M^2	R	163
2	S	T	T	8
3	S	A	Y	12
	89	86	8	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 8

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	A	S 1/3	A	16
	2	M	Y	R	15
	3	M	Y	T	13
		19	10	15	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

SMARTY - 9

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	
1	1/9 A	S	T	7
2	1/5 S	1/7 R	T	3
3	M	M	Y	12
	4	8	10	

S = ___ M = ___ A = ___ R = ___ T = ___ Y = ___

SMARTY - 10

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	
	1	A	S	R	17
	2	A 1/3	T	M	14
	3	1/3 Y	2/3 Y	M	14
		13	16	16	

S = ___ M = ___ A = ___ R= ___ T= ___ Y= ___

Section 2: SMARTY 3 BY 4 GRIDS

SMARTY - 1

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**S**	**A**	**R**	**R**	**25**
	2	**M**	**A**	**R**	**T**	**24**
	3	**M**	**A**	**R**	**Y**	**20**
		11	**18**	**21**	**19**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 2

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	S	S	A	A	22
2	R	R	R	R	20
3	M	S	T	Y	18
	14	19	15	12	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 3

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
	1	1/3 Y	1/2 M	M	Y	24
Rows	2	T	R	M	S	21
	3	T	R	M	A	20
		9	12	24	20	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 4

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	S^0	A^3	M	T^5	**13**
	2	S	A	Y	T^6	**12**
	3	S	A	R	R	**25**
		11	**12**	**16**	**11**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 5

Solve for the values of S, M, A, R, T, Y.

Columns

Rows		1	2	3	4	
	1	R	1/8 S	M	S	29
	2	R	T	1/2 A	Y	15
	3	2/3 R	T	M	Y	14
		24	5	13	10	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 6

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	S	¾ M	A	½ Y	17
2	R	½ M	T	M	16
3	S	M	S	½ Y	17
	11	18	10	10	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 7

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	M	S	A	R	26
2	M	T	T	T	24
3	Y^2	Y	Y	Y	18
	27	16	15	10	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 8

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**S**	**A**	**M**	**Y**	**16**
	2	**S**	**T**	**M**	**Y**	**14**
	3	**S**	**1/3 R**	**½ R**	**½ S**	**11**
		12	**6**	**17**	**6**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 9

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	1/5 Y	M	M	M	25
2	R	A	S	T	20
3	R^2	A	S	T	26
	13	26	10	22	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 10

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	T	S	Y	R	22
2	Y	R	Y	T	24
3	Y	M	A	S	29
	23	12	26	14	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 11

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	T	Y	A	Y	14
2	R	R	A	½ R	11
3	R	M	S	Y	18
	15	16	4	8	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 12

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	A	T	S	R	18
2	S	S	M	M	20
3	Y	T	M	R	16
	19	17	11	7	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 13

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
	1	T/S	T	A	Y	22
Rows	2	S	M	M	M	24
	3	S	T	R	Y	26
		9	25	15	23	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 14

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	Y	R	S	S	21
2	A	M	A	M	24
3	Y	T	A	A	20
	20	15	19	15	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 15

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**Y**	**M**	**R**	**R**	**21**
	2	**S**	**A**	**M**	**T**	**18**
	3	**Y**	**T**	**T**	**T**	**10**
		16	**16**	**11**	**6**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 16

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	Y	T	A	Y	24
2	M	R	R	R	15
3	S	$T^{1/3}$	A	Y	16
	12	17	19	17	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 17

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	Y	S	T	T	24
2	R	R	M	M	22
3	Y	S	A	M	23
	27	5	20	17	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 18

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	S	Y	Y	M	24
2	M	A	A	A	14
3	R	R	T	M	31
	16	16	19	31	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 19

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	R	T	Y	S	19
2	R	Y	R	Y	14
3	A	M	M	A	22
	11	12	11	21	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 20

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	M	R	S	½ Y	19
2	Y	Y	A	A	24
3	Y	T	T	Y	34
	18	23	20	16	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

Section 3: SMARTY 4 BY 4 GRIDS

SMARTY - 1

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**T**	**R**	**T**	**Y**	**20**
	2	**S**	**R**	**S**	**Y**	**22**
	3	**M**	**M**	**M**	**M**	**8**
	4	**A**	**R**	**A**	**A**	**27**
		15	**29**	**15**	**18**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 2

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	T	R	Y	A	16
2	M	M	A	A	30
3	M	R	R	A	28
4	T	M	S	A	21
	18	28	20	28	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 3

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**R**	**R**	**A**	**A**	**20**
	2	**M**	**A**	**T**	**T**	**15**
	3	**R**	**A**	**S**	**M**	**18**
	4	**M**	**A**	**Y**	**Y**	**23**
		30	**12**	**15**	**19**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 4

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**S**	**R**	**R**	**T**	**13**
	2	**M**	**M**	**Y**	**Y**	**26**
	3	**R**	**A**	**A**	**M**	**25**
	4	**R**	**T**	**T**	**T**	**20**
		12	**22**	**25**	**25**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 5

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	R	A	R	Y	22
2	T	Y	T	Y	34
3	A	A	T	Y	21
4	S	A	M	A	14
	20	14	31	26	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 6

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	A	M	M	T	14
2	A	$S^{1/2}$	$M^{1/2}$	A	19
3	A	R	R	R	13
4	A	Y	Y	T	20
	28	14	13	15	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 7

Solve for the values of S, M, A, R, T, Y.

	1	2	3	4	
1	M	M	$R^{1/2}$	S	21
2	Y	Y	Y^4	Y	4
3	S	$S^{1/3}$	S	S	26
4	A	T	A	T	16
	20	10	18	19	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 8

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**A**	**S**	**T**	**Y**	**15**
	2	**A**	**M**	**Y**	**R**	**23**
	3	**A**	**Y**	**T**	**A**	**16**
	4	**Y**	**T**	**T**	**Y**	**20**
		15	**21**	**18**	**20**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 9

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**Y**	**A**	**M**	**R**	**17**
	2	**S**	**M**	**S**	**M**	**18**
	3	**M**	**T**	**S**	**S**	**22**
	4	**S**	**R**	**R**	**R**	**30**
		16	**25**	**23**	**25**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 10

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	T	T	Y	T	34
2	A	R	A	T	12
3	Y	R	Y	Y	23
4	M	A	S	Y	25
	26	17	26	32	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 11

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
	1	R	Y	Y	Y	17
	2	S	T	A	M	27
Rows	3	Y	R	Y	R	22
	4	S	T	A	T	25
		23	21	24	23	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 12

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	A^2	A^3	A^4	S	6
2	M	Y	S	M	19
3	R	$Y^{1/3}$	R	R	23
4	T	Y	T	T	14
	14	19	13	16	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 13

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**M**	**T**	**M**	**T**	**18**
	2	**M**	**T**	**R**	**R**	**15**
	3	**M**	**S**	**A**	**A**	**20**
	4	**Y**	**S**	**Y**	**S**	**10**
		25	**6**	**20**	**12**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 14

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	S	S	S	T	35
2	$S^{1/2}$	A	A	A	12
3	S	M^5	M^3	R	13
4	S	Y	R	R	20
	30	20	15	15	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 15

Solve for the values of S, M, A, R, T, Y.

Columns

	1	2	3	4	
1	T	M^0	A	M	12
2	T	M^4	R	Y	22
3	T	S	A	M	18
4	R^2	S	R	R	31
	40	16	12	15	

Rows

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 16

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	R	M	S	M	26
2	Y	A	Y	Y	34
3	R	M	T	A	24
4	T	T	T	M	23
	22	28	25	32	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 17

Solve for the values of S, M, A, R, T, Y.

Columns

		1	2	3	4	
Rows	**1**	**$M^{1/3}$**	**M**	**M**	**M**	**26**
	2	**M**	**$S^{1/2}$**	**T**	**T**	**12**
	3	**Y**	**Y**	**R**	**R**	**10**
	4	**Y**	**A**	**R**	**A**	**15**
		14	**17**	**15**	**17**	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 18

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	Y^2	T	S	S	20
2	M	A^2	R	R	18
3	M	T	T	S	25
4	M	Y	Y	S	17
	36	21	16	10	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 19

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	R	S	Y	S	29
2	M	T	Y	A	23
3	Y^2	S	Y^2	S	50
4	R	T	T	T	22
	36	28	29	31	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY - 20

Solve for the values of S, M, A, R, T, Y.

Columns

Rows	1	2	3	4	
1	T	T	R	R	22
2	Y	M	R	S	19
3	M	M	M	A	22
4	A	A	A	M	18
	19	24	16	22	

S = ____ M = ____ A= ____ R = ____ T = ____ Y = ____

SMARTY 3 BY 3
Possible Solutions

SMARTY - 1

S = 4 M = 7 A = 2 R = 1 T = 8 Y = 5

Column 2: T + T + T = 24.
Then, 3T = 24, and T = 8.

Row 3: Y + T + T + Y = 21.
Replace each T with 8. Then, 8 + 8 + Y =21.Then, 16 + Y = 21, and Y = 5.

Column 1: R + A + Y = 8.
Replace Y with 5. Then, R + A + 5 = 8. Then R + A = 3.
That means that R can be 1 and A can be 2, or R can be 2 and A can be 1.

Row 2. A + T+ S = 14.
Replace T with 8. Then, A + 8 + S = 14. Then, A + S + 8 = 14.
Then, A + S = 6.
From Column 1, if A = 1, then S = 5. From Row 3, Y = 5.
Then, A = 2 and S = 4.

Column 1: R + A + Y = 8.
Replace A with 2 and Y with 5. Then, R + 2 + 5 = 8, and R = 1.

Row 1: R + T + M = 16.
Replace R with 1 and T with 8. Then, 1 + 8 + M = 16. Then, 9 + M = 16, and M = 7.

SMARTY - 2

S = 9 M = 6 A = 8 R = 3 T = 2 Y = 1

Row 2: A + A + A = 24.
Then, 3A = 24, and A = 8.

Column 1: S + A + S = 26.
Replace A with 8. Then, 2S + 8 = 26. Then, 2S = 18, and S = 9.

Row 1: S + 1/3 R + 1/6 M = 11.
Replace S with 9. Then, 9 + 1/3 R + 1/6 M = 11. Then, 1/3 R + 1/6 M = 2.
Since values of letters can be only 1 through 9, then the only number that is a multiple of both 3 and 6, is 6. Then, M = 6.

Row 1: S + 1/3 R + 1/6 M = 11.
Replace S with 9 and M with 6.
Then, 9 + 1/3 R + 1/6 (6) = 11. Then, 9 + 1/3R + 1 = 11.
Then, 10 + 1/3 R = 11. Then, 1/3 R = 1, and R = 3.

Column 2: 1/3 R + A + Y = 10.
Replace R with 3 and A with 8, Then, 1/3 (3) + 8 + Y = 10.
Then, 1 + 8 + Y = 10. Then, Y + 9 = 10, and Y = 1.

Row 3: S + Y + T = 12.
Replace S with 9 and Y with 1. Then, 9 + 1 + T = 12.
Then, 10 + T = 12, and T = 2.

SMARTY - 3

S = 3 M = 4 A = 6 R = 2 T = 5 Y = 1

Row 3: (M – 1) + Y + Y = 5.
The only values for M and Y are M = 4 and Y = 1.
Check: (4 – 1) + 2Y = 5. Then, 3 + 2 = 5.

Column 1: S + S + (M-1) = 9.
Replace M with 4. Then, S + S + 3 = 9. Then, 2S + 3 = 9.
Then, 2S = 6, and S = 3.

Column 2: A + A + Y = 13.
Replace Y with 1. Then, 2A + 1 = 13. Then, 2A = 12, and A = 6.

Row 1: S + A + R =11.
Replace S with 3 and A with 6. Then, 3 + 6 + R = 11, and R = 2.

Column 3: R + T + Y = 8.
Replace R with 2, and Y with 1. Then, 2 + T + 1 = 8.
Then, T + 3 = 8, and T = 5.

SMARTY - 4

S = 2 M = 9 A = 3 R = 5 T = 7 Y = 8

Row 2: $Y^{1/3} + Y + Y = 18$.
The exponent 1/3 means the cube root of Y.
The only cubic numbers in 1 through 9 are 1 and 8.
Y = 1 doesn't work. The cubic root of 8 is 2. Then, $Y = 8$.
(Check: 2 + 8 + 8 = 18.)

Row 1: $M + A^2 + M = 27$.
Then, $2M + A^2 = 27$.
The only single digit numbers, that when squared are less than 10, are 1, 2 and 3.

If A = 1, then 2M + 1 = 27, and M = 13. Doesn't work.
If A = 2, then 2M + 4 = 27, and 2M = 23 and M = 11 ½ Doesn't work
If, A = 3, then 2M + 9 = 27, and 2M = 18
Then, $A = 3$ and $M = 9$.

Column 2: $A^2 + Y + R = 13$.
Replace A with 3 and Y with 8. Then, 9 + 8 + R = 22.
Then, 17 + R = 22, and $R = 5$.

Column 1: $M + Y^{1/3} + S = 13$.
Replace M with 9 and Y with 8. Then, 9 + 2 + S = 13.
Then, 11 + S = 13, and $S = 2$.

Row 3: S + R + T = 14.
Replace S with 2 and R with 5. Then, 2 + 5 + T = 14.
Then, 7 + T = 14, and $T = 7$.

SMARTY - 5

S = 8 M = 1 A = 7 R = 9 T = 6 Y = 4

Column 2: $Y^{½} + Y + Y^{½} = 8$.

The exponent ½ indicates the square root of a number.
The only square numbers from 1 through 9, are: 1, 4, and 9.
Of those, only $Y = 4$ works.
Check: 2 + 4 + 2 = 8.

Row 3: $R + Y^{½} + S^{1/3} = 13$.

Replace Y with 4. Then, $R + 2 + S^{1/3} = 13$. Then, $R + S^{1/3} = 11$.

The exponent 1/3 means the cube root of a number.
The only cubic numbers from 1 through 9 are 1 and 8.
If S = 1, then R = 10, and that doesn't work.
Then, $S = 8$, and its cube root is 2.

Replace S with 8. Then R + 2 = 11, and $R = 9$.

Column 1: T + T + R = 21.
Replace R with 9. Then, 2T + 9 = 21. Then, 2T = 12, and $T = 6$.

SMARTY - 6

S = 2 M = 8 A = 5 R = 4 T = 9 Y = 1

Row 2: S + M^0 + 1/5 A = 4.
Replace $M^0$with 1. The only number for A is 5.
Then, S + 1 + 1 = 4, and S = 2.

Column 2: M + M^0 + M = 17.
Replace M^0 with 1. Then, 2M + 1 = 17. Then, 2M = 16, and M = 8.

Row 2: S + M^0 + 1/5 A = 4.
Replace S with 2 and M^0 with 1. Then, 3 + 1/5 A = 4, and A = 5.

Row 1: Y + M + Y = 10.
Replace M with 8. Then, 2Y + 8 = 10. Then, 2Y = 2, and Y = 1.

Column 1: Y + S + T = 12.
Replace Y with 1 and S with 2. Then, T + 3 = 12, and T = 9.

Row 3 T + M + 1/4 R = 18.
Replace T with 9 and M with 8. Then, 17 + 1/4 R = 18, and R = 4.

SMARTY - 7

S = 4 M = 9 A = 3 R = 1 T = 2 Y = 5

Row 1: $M^2 + M^2 + R = 163$.
To get a row sum of 163, then $M = 9$.

Row 1: $M^2 + M^2 + R = 163$.
Replace each M with 9. Then $R + 162 = 163$, and $R = 1$.

Column 1: $M^2 + S + S = 89$.
Replace M with 9. Then, $2S + 81 = 89$. Then, $2S = 8$, and $S = 4$.

Row 2: $S + T + T = 8$.
Replace S with 4. Then $2T + 4 = 8$. Then, $2T = 4$, and $T = 2$.

Column 3: $R + T + Y = 8$.
Replace R with 1 and T with 2. Then, $Y + 3 = 8$, and $Y = 5$.

Row 3: $S + A + Y = 12$.
Replace S with 4 and Y with 5. Then, $A + 9 = 12$, and $A = 3$.

SMARTY - 8

S = 8 M = 6 A = 7 R = 5 T = 3 Y = 4

Row 1: A + $S^{1/3}$ + A = 16.

$S^{1/3}$ means the cube root of a number.
The only cubic numbers 1 through 9 are 1 and 8.
If S = 1, then 2A + 1 = 16, and A = 7 ½ which is not an option.
Then, S = 8 and its cube root is 2.

Row 1: A + $S^{1/3}$ + A = 16.
Replace $S^{1/3}$ with 2. Then, 2A + 2 = 16. Then, 2A = 14, and A = 7.

Column 1: A + M + M = 19.
Replace A with 7. Then, 2M + 7 = 19. Then, 2M = 12, and M = 6.

Column 2: $S^{1/3}$ + Y + Y = 10.
Replace $S^{1/3}$ with 2. Then, 2Y + 2 = 10. Then, 2Y = 8, and Y = 4.

Row 2: M + Y + R = 15.
Replace M with 6 and Y with 4. Then, R + 10 = 15, and R = 5.

Column 3: A + R + T = 15.
Replace A with 7 and R with 5. Then, T + 12 = 15, and T = 3.

SMARTY - 9

S = 5 M = 2 A = 9 R = 7 T = 1 Y = 8

Row 2: 1/5 S + 1/7 R + T = 3.
The only numbers in 1 through 9 for S and R, are S = 5 and R = 7.

Row 2: 1/5 S + 1/7 R + T = 3.
Replace S with 5 and R with 7. Then, 1 + 1 + T = 3.
Then, T + 2 = 3, and T = 1.

Column 3: T + T + Y = 10.
Replace each T with 1. Then Y + 2 = 10, and Y = 8.

Column 1: 1/9 A + 1/5 S + M = 4.
The only number 1 through 9 for A, is 9.
Then, A = 9.

Column 1: 1/9 A + 1/5 S + M = 4.
Replace A with 9 and S with 5. Then, M + 2 = 4, and M = 2.

SMARTY - 10

S = 3 M = 5 A = 8 R = 6 T = 7 Y = 9

Row 3: 1/3 Y + 2/3 Y + M = 14.
1/3Y + 2/3 Y = 3/3Y or Y. Then, Y + M = 14.
Y is a multiple of 3. If Y= 3, then 3 + M = 14, and M = 11,
and 11 is not in the
range.
If Y = 6, then 6 + M = 14, and M = 8.
If Y = 9, then, then 9 + M = 14, and M = 5. M can be 5 or 8.

Column 3: R + M + M = 16.
Test M = 5. Replace each M with 5. Then, R + 10 = 16, and R with 6.
Test M = 8. Replace each M with 8. Then, R + 16 = 16, and R = 0.
Zero is not in the range 1 through 9. R = 6 and M = 5.

Row 3: Row 3: 1/3 Y + 2/3 Y + M = 14.
Replace M with 5. Then, Y + 5 = 14, and Y = 9.

Column 1: $A + A^{1/3} + 1/3\ Y = 13$.
Replace Y with 9. Then, $A + A^{1/3} + 3 = 13$.
Then, $A + A^{1/3} = 10$. $A^{1/3}$ means the cube root of A. Then, A = 8.

Row 1: A + S + R = 17.
Replace A with 8 and R with 6. Then, S + 14 = 17, and S = 3.

Row 2: $A^{1/3} + T + M = 14$.
Replace A with 8 and M with 5. Then, 2 + T + 5 = 14.
Then, T + 7 = 14, and T = 7.

SMARTY 3 BY 4
Possible Solutions

SMARTY - 1

S = 5 M = 3 A = 6 R = 7 T = 8 Y = 4

Column 2: A + A + A = 18.
Then, 3A = 18, and A = 6.

Column 3: R + R + R = 21.
Then, 3R = 21, and R = 7.

Row 1: S + A + R + R = 25.
Replace A with 6 and each R with 7. Then, S + 6 + 7 + 7 = 25.
Then, S + 20 = 25, and S = 5.

Column 1: S + M + M = 11.
Replace S with 5. Then, 5 + 2M = 11. Then, 2M = 6, and M = 3.

Row 2: M + A + R + T = 24.
Replace M with 3, A with 6, and R with 7.
Then, 3 + 6 + 7 + T = 24. Then, T + 16 = 24, and T = 8.

Column 4: R + T + Y = 19.
Replace R with 7 and T with 8. Then, 7 + 8 + Y = 19.
Then, Y + 15 = 19, and Y = 4.

SMARTY - 2

S = 7 M = 2 A = 4 R = 5 T = 6 Y = 3

Row 2: R + R + R + R = 20.
Then, 4R = 20, and R = 5.

Column 2: S + R + S = 19.
Replace R with 5. Then, 2S + 5 = 19. Then, 2S = 14, and S= 7.

Column 1: S + R + M = 14.
Replace S with 7 and R with 5. Then, 7 + 5 + M= 14.
Then, M + 12 = 14, and M = 2.

Row 1: S + S + A + A = 22.
Replace each S with 7. Then, 7 + 7 + 2A = 22. Then, 2A + 14 = 22.
Then, 2A = 8, and A = 4.

Column 3: A + R + T = 12.
Replace A with 4 and R with 5. Then, 4 + 5 + T= 15.
Then, T + 9 = 15, and T = 6.

Column 4: A + R + Y = 12.
Replace A with 4, and R with 5. Then, 4 + 5 + Y = 12.
Then, Y + 9 = 12, and Y = 3.

SMARTY - 3

S = 6 M = 8 A = 5 R = 4 T = 3 Y = 9

Column 3: M + M + M = 24.
Then, 3M = 24, and M = 8.

Column 2: ½ M + R + R = 12.
Replace M with 8. Then, 4 + 2R = 12. Then, 2R = 8, and R = 4.

Row 1: 1/3 Y + ½M + M + Y = 24.
Replace M with 8. Then, 1/3 Y + 4 + 8 + Y = 24. Then, Y + 1/3 Y + 12 = 24.
Then, 4/3 Y = 12. Then, Y = 12 x ¾, and Y = 9

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Column 1: 1/3 Y + T + Y = 9.
Replace Y with 9. Then, 3 + 2T = 9. Then, 2T = 6, and T = 3.

Row 3: T + R + M + A = 20.
Replace T with 3, R with 4, and M with 8.
Then, 3 + 4 + 8 + A =20. Then, A + 15 = 20, and A = 5.

Column 4: Y + S + A = 20.
Replace Y with 9 and A with 5. Then, 9 + S + 5 = 20, and S = 6.

SMARTY - 4

S = 5 M = 3 A = 2 R = 9 T = 1 Y = 4

Column 1: $S^0 + S + S = 11$.
$S^0 = 1$. Then, $1 + 2S = 11$. Then, $2S = 10$, and $S = 5$.

Column 2: $A^3 + A + A = 12$.
The only cubic numbers in the range 1 through 9 are 1 and 8.
The number 1 does not work. Then, $2^3 + 2 + 2 = 12$. Then, $2^3 = 8$, and $A = 2$.

Row 3: S + A + R + R = 25.
Replace S with 5 and A with 2. Then, 2R + 7 = 25.
Then, 2R = 18, and $R = 9$.

Column 4: $T^5 + T^6 + R = 11$.
Replace R with 9. Then, $T^5 + T^6 + 9 = 11$. Then, $T = 1$.

Row 1: $S^0 + A^3 + M + T^5 = 13$.
Replace S with 5, A with 2, and T with 1.
(Note: A number to the zero power equals 1.)
Then, 1 + 8 +M + 1 = 13. Then, M + 10 = 13, and $M = 3$.

Column 3: M + Y + R = 16.
Replace M with 3 and R with 9. Then, 3 + Y + 9 = 16.
Then, Y + 12 = 16, and $Y = 4$.

SMARTY - 5

S = 8 M = 5 A = 6 R = 9 T = 2 Y = 1

Column 1: R + R + 2/3 R = 24.
Then, 3/3R + 3/3R + 2/3 R = 24. Then, 8/3R = 24.
Then, (3/8 x 8/3) R = 3/8(24), and R = 9.

Column 2: 1/8 S + T + T = 5.
Then, S = 8, and 1/8 S = 1. Then, 1 + 2T = 5.
Then, 2T = 4, and T = 2.

Column 4: S + Y + Y = 10.
Replace S with 8. Then, 8 + 2Y = 10. Then, 2Y = 2, and Y = 1.

Row 2: R + T + 1/2 A + Y = 15.
Replace R with 9, T with 2, and Y with 1.
Then, 9 +2 + 1/2A + 1 = 15. Then, 12 + 1/2A = 15.
Then, 1/2 A = 3, and A = 6.

Column 3: M + 1/2A + M = 13.
Replace A with 6. Then, 2M + 3 = 13. Then, 2M = 10, and M = 5.

SMARTY - 6

S = 4 M = 8 A = 5 R = 3 T = 1 Y = 2

Column 2: 3/4M + 1/2 M + M = 18.
Then, 3/4 M + 2/4 M + 4/4 M = 18. Then, (3/4 + 2/4 + 4/4) M = 18.
Then, 9/4M = 18. Then, 4/9 (9/4) M = 4/9(18). Then, M = 8.

Column 4: 1/2Y + M + 1/2Y = 10.
Replace M with 8. Then, Y + 8 = 10, and Y = 2.

Row 3: S + M + S + 1/2 Y = 17.
Replace M with 8 and Y with 2. Then, 2S + 8 + 1 = 17.
Then, 2S + 9 = 17. Then, 2S = 8 and S = 4.

Column 1: S + R + S = 11.
Replace each S with 4. Then, 8 + R = 11, and R = 3.

Row 2: R + ½ M + T + M = 16.
Replace R with 3, and each M with 8. Then, 3 + 4 + T + 8 = 16.
Then, T + 15 = 16, and T = 1.

Column 3: A + T + S = 10.
Replace T with 1 and S with 4. Then, A + 1 + 4 = 10, and A = 5.

SMARTY - 7

S = 8 M = 9 A = 7 R = 2 T = 5 Y = 3

Row 3: $Y^2 + Y + Y + Y = 18$.
Then, $Y^2 + 3Y = 18$, and $Y = 3$.

Column 1: $M + M + Y^2 = 27$.
Replace Y with 3. Then, $2M + 9 = 27$. Then, $2M = 18$, and $M = 9$.

Row 3: $M + T + T + T = 24$.
Replace M with 9. Then, $9 + 3T = 24$. Then, $3T = 15$, and $T = 5$.

Column 2: $S + T + Y = 16$.
Replace T with 5 and Y with 3.
Then, $S + 5 + 3 = 16$. Then, $S + 8 = 16$, and $S = 8$.

Column 3: $A + T + Y = 15$.
Replace T with 5 and Y with 3. Then, $A + 5 + 3 = 15$.
Then, $A + 8 = 15$, and $A = 7$.

Column 4: $R + T + Y = 10$.
Replace T with 5 and Y with 3. Then, $R + 5 + 3 = 10$, and $R = 2$.

SMARTY - 8

S = 4 M = 7 A = 3 R = 6 T = 1 Y = 2

Column 1: S + S + S = 12.
Then, 3S = 12, and S = 4.

Column 4: Y + Y + ½ S = 6.
Replace S with 4. Then, 2Y + 2 = 6. Then, 2Y = 4, and Y = 2.

Row 3: S + 1/3 R +½ R + ½ S = 11.
Replace each S with 4. Then, 4 + 1/3 R + ½ R + 2 = 11.
Then, 1/3 R + ½ R + 6 = 11. Then, 1/3 R + ½ R = 5.
Then, (2/6 + 3/6) R = 5. Then, 5/6 R = 5, and R = 6.

Column 3: M + M + R = 20.
Replace R with 6. Then, 2M + 6 = 20. Then, 2M = 14, and M = 7.

Row 1: S + A + M + Y = 16.
Replace S with 4, M with 7, and Y with 2.
Then, 4 + A + 7 + 2 = 16. Then, A + 13 = 16, and A = 3.

Column 2: A + T + R = 10.
Replace A with 3 and R with 6. Then, 3 + T + 6 = 10, and T = 1.

SMARTY - 9

S = 1 M = 8 A = 9 R = 3 T = 7 Y = 5

Row 1: 1/5 Y + M + M + M = 25.
The only number, 1 through 9, with 1/5 of that number a whole number, is 5.
Then, Y = 5.

Row 1: 1/5 Y + M + M + M = 25.
Replace Y with 5. Then, 1 + 3M = 25. Then, 3M = 24, and M = 8.

Column 3: M + S + S = 10.
Replace M with 8. Then, 8 + 2S = 10. Then, 2S =2, and S = 1.

Column 2: M + A + A = 26.
Replace M with 8. Then, 2A + 8 = 26. Then, 2A = 18, and A = 9.

Column 4: M + T + T = 22.
Replace M with 8. Then, 8 + 2T = 22. Then, 2T = 14, and T = 7.

Column 1: 1/5 Y + R + R^2 = 13.

Replace Y with 5. Then, 1 + R + R^2 = 13.

Then, R + R^2 = 12. Then, R = 3.

SMARTY - 10

S = 6 M = 5 A = 9 R = 1 T = 7 Y = 5

All of Column 4 is in Row 1.
Subtract Column 4: R + T + S = 14 from
Row 1: T + S + Y + R = 22. Then, Y= 8.

Column 1: T + Y + Y = 23.
Replace each Y with 8. Then, T + 16 = 23, and T = 7.

Column 3: Y + Y + A = 25.
Replace each Y with 8. Then, 16 + A = 25, and A = 9.

Row 2: Y + R + Y + T = 24.
Replace each Y with 8, and T with 7. Then, 8 + R + 8 + 7 = 24
Then, R + 23 = 24, and R = 1.

Column 4: R + T + S = 14.
Replace R with 1 and T with 7. Then, 1 + 7 + S = 14.
Then, S + 8 = 14, and S = 6.

Column 2: S + R + M = 12.
Replace S with 6 and R with 1.
Then, 6 + 1 + M = 12. Then, M + 7 = 12, and M = 5.

SMARTY - 11

S = 2 M = 9 A = 1 R = 4 T = 7 Y = 3

All of Column 2 is in Row 3.
Subtract Column 2: Y + R + M = 16 from Row 3: R + M + S + Y = 18.
Then, S = 2.

Column 3: A + A + S = 4.
Replace S with 2. Then, 2A + 2 = 4, and A = 1.

Row 2: R + R + A + ½R = 11.
Replace A with 1. Then, 2R + ½R = 10. Then, 5/2 R = 10.
Then, R = 2/5(10) and R = 4.

Column 1: T + R + R = 15.
Replace each R with 4. Then, T + 8 = 15, and T = 7.

Column 4: Y + ½R + Y = 8.
Replace R with 4. Then, 2Y + 2 = 8. Then, 2Y = 6, and Y = 3.

Column 2: Y + R + M = 16.
Replace Y with 3 and R with 4. Then, 7 + M = 16, and M = 9.

SMARTY - 12

S = 9 M = 1 A = 2 R = 3 T = 4 Y = 8

Row 2: S + S + M + M = 20.
Then, 2S + 2M = 20. Then, S + M = 10.

Column 3: S + M + M = 11.
Replace S + M with 10. Then, 10 + M = 11, and M = 1.
Replace each M with 1 in Column 3/. Then, S + 1 + 1 = 11, and S = 9.

Column 4: R + M + R = 7.
Replace M with 1. Then, 2R + 1 = 7. Then, 2R = 6, and R = 3.

Column 2: T + S + T = 17.
Replace S with 9. Then, 2T + 9 = 17. Then, 2T = 8, and T=4.

Row 3: Y + T + M + R = 16.
Replace T with 4, M with 1, and R with 3.
Then, Y + 8 = 16, and Y = 8.

Column 1: A + S + Y = 19.
Replace S with 9 and Y with 8. Then, A + 17 = 19, and A = 2.

SMARTY - 13

S = 3 M = 7 A = 2 R = 6 T = 9 Y = 8

Column 1: T/S + S + S = 9.
Then, T/S + 2S = 9.
The only numbers, 1 through 9, that work are: T = 9 and S = 3.
(Check: 9/3 + 2x3 = 3 + 6 = 9.)

Row 2: S + M + M + M = 24.
Replace S with 3. Then, 3 + 3M = 24. Then, 3M = 21, and M = 7.

Column 4: Y + M + Y = 23.
Replace M with 7. Then, 7 + 2Y = 23. Then, 2Y = 16, and Y = 8.

Row 3: S + T + R + Y = 26.
Replace S with 3, T with 9, and Y with 8. Then, R + 20 = 26, and R = 6.

Column 3: A + M + R =15.
Replace M with 7 and R with 6. Then, A + 13 = 15, and A = 2.

SMARTY - 14

S = 3 M = 4 A = 8 R = 9 T = 2 Y = 6

Row 2: A + M + A + M = 24.
Then, 2A + 2M = 24, and A + M = 12.

Column 4: S + M + A = 15.
Replace M + A with 12. Then, S + 12 = 15, and S = 3.

Column 3: S + A + A = 19.
Replace S with 3. Then, 3 + 2A = 19. Then, 2A = 16, and A = 8.

Row 2: A + M + A + M = 24.
Replace each A with 8. Then, 2M + 16 = 24. Then, 2M = 8, and M = 4.

Column 1: Y + A + Y = 20.
Replace A with 8. Then, 2Y + 8 = 20. Then, 2Y = 12, and Y = 6.

Row 1: Y + R + S + S = 21.
Replace Y with 6, and each S with 3. Then, R + 12 = 21, and R = 9.

Column 2: R + M + T = 15.
Replace R with 9 and M with 4. Then, T + 13 = 15, and T = 2.

SMARTY - 15

S = 2 M = 6 A = 9 R = 4 T = 1 Y = 7

All of Column 2 is in Row 2.
Subtract Column2: M + A + T = 16 from Row 2: S + A + M + T =18.
Then, S = 2.

Column 1: Y + S + Y = 16.
Replace S with 2. Then, 2Y + 2 = 16. Then, 2Y = 14, and Y = 7.

Row 3: Y + T + T + T = 10.
Replace Y with 7. Then, 7 + 3T = 10. Then, 3T = 3, and T = 1.

Column 3: R + T + T = 6.
Replace each T with 1. Then, R + 2 = 6, and R = 4.

Row 1: Y + M + R + R = 21.
Replace Y with 7, and each R with 4. Then, M + 15 = 21, and M = 6.

Column 2: M + A + T = 16.
Replace M with 6 and T with 1. Then, A + 7 = 16, and A = 9.

SMARTY - 16

S = 3 M = 4 A = 6 R = 7 T = 8 Y = 5

Column 2: $T + R + T^{1/3} = 17$.
The exponent 1/3 means cube root.
The only numbers 1 through 9 that have cube roots are: 1 and 8.
T = 1 is not possible because R would equal 15. Then, T = 8.

Column 2: $T + R + T^{1/3} = 17$.
Replace each T with 8. Then, 8 + R + 2 = 17. Then, R + 10 = 17, and R = 7.

Column 4: Y + R + Y = 17.
Replace R with 7. Then, 2Y + 7 = 17. Then, 2Y = 10, and Y = 5.

Column 3: A + R + A = 19.
Replace R with 7. Then, 2A + 7 = 19. Then, 2A = 12, and A = 6.

Row 2: M + R + R + R = 25.
Replace each R with 7. Then, M + 21 = 25, and M = 4.

Column 1: Y + M + S = 12.
Replace Y with 5 and M with 4. Then, S + 9 = 12, and S = 3.

SMARTY - 17

S = 1 M = 5 A = 8 R = 3 T = 7 Y = 9

Column 1: $Y + R^2 + Y = 27$.
R can be only: 1, 3, or 5. If R = 1, the Y will be greater than 9.
If R = 5, Y will be greater than 9. If R = 3, then 2Y + 9 = 27.
Then, $R = 3$. Then, 2Y = 18, and $Y = 9$.

Row 2: $R^2 + R + M + M = 22$.
Replace each R with 3. Then, 2M + 9 + 3 = 22.
Then, 2M + 12 = 22. Then, 2M = 10, and $M = 5$.

Column 2: S + R + S = 5.
Replace R with 3. Then, 2S + 3 = 5. Then, 2S = 2 and $S = 1$.

Row 1: Y + S + T + T = 24.
Replace Y with 9 and S with 1. Then, 2T + 10 = 24. Then, 2T = 14, and $T = 7$.

Column 3: T + M + A = 20.
Replace T with 7 and M with 5. Then, A + 12 = 20, and $A = 8$.

SMARTY - 18

S = 2 M = 6 A = 1 R = 8 T = 9 Y = 7

All of Column 4 is in Row 2.
Subtract Column 4: M + A + M = 13 from Row 2: M + A + A + A = 14.
Then, A= 1.

Column 4: M + A + M = 13.
Replace A with 1. Then, 2M + 1 = 13. Then, 2M = 12, and M = 6.

Column 3: T + A + T = 19.
Replace A with 1. Then, 2T + 1 = 19. Then, 2T = 18, and T = 9.

Row 3: R + R + T + M = 31.
Replace T with 9 and M with 6.
Then, 2R + 15 =31. Then, 2R = 16, and R = 8.

Column 2: Y + A + R = 16.
Replace A with 1 and R with 8. Then, Y + 9 = 17, and Y = 7.

Column 1: S + M + R = 16.
Replace M with 6 and R with 8. Then, S + 14 = 16, and S = 2.

SMARTY - 19

S = 9 M = 4 A = 7 R = 2 T = 3 Y = 5

Row 2: R + Y + R + Y = 14.
Then, 2R + 2Y = 14, and R + Y = 7.

Column 3: Y + R + M = 11.
Replace R + Y with 7. Then, 7 + M = 11, and M = 4.

Row 3: A + M + M + A = 22.
Replace each M with 4. Then, 2A + 8 = 22.
Then, 2A = 14, and A = 7.

Column 1: R + R + A = 11.
Replace A with 7. Then, 2R + 7 = 11. Then, 2R = 4, and R = 2.

Row 2: R + Y + R + Y = 14.
Replace each R with 2. Then, 2Y + 4 = 14. Then, 2Y = 10, and Y = 5.

Column 2: T + Y + M = 12.
Replace Y with 5 and M with 4. Then, T + 9 = 12, and T = 3.

Column 4: S + Y + A = 21.
Replace Y with 5 and A with 7. Then, S + 12 = 21, and S = 9.

SMARTY - 20

S = 7 M = 2 A = 4 R = 6 T = 9 Y = 8

Row 2: Y + Y + A + A = 24.
Then, 2Y + 2A = 24. Then, Y + A = 12.

Column 4: ½ Y + A + Y =16.

Replace A + Y with 12. Then, ½ Y + 12 = 16.

Then, ½ Y = 4, and Y = 8.

Row 2: Y + Y + A + A = 24.
Replace Y + A with 12. Replace Y with 8. Then 8 + A = 12, and A = 4.

Column 1: M + Y + Y = 18.
Replace each Y with 8. Then, M + 16 = 18, and M = 2.

Row 3: Y +T + T + Y = 34.
Replace each Y with 8. Then, 2T + 16 = 34.
Then, 2T = 18, and T = 9.

Column 2: R + Y + T = 23.
Replace Y with 8 and T with 9. Then, R + 17 = 23, and R = 6.

Column 3: S + A + T = 20.
Replace A with 4 and T with 9. Then, S + 13 = 20, and S = 7.

SMARTY 4 BY 4
Possible Solutions

SMARTY - 1

S = 4 M = 2 A = 6 R = 9 T = 3 Y = 5

Row 3: M + M + M + M = 8.
Then, 4M = 8, and M = 2.

Column 2: R + R + M + R = 29.
Replace M with 2. Then, 3R + 2 = 29. Then, 3R = 27, and R = 9.

Row 4: A + R + A + A = 27.
Replace R with 9. Then, 3 A + 9 = 27. Then, 3A = 18, and A = 6.

Column 4: Y+ Y + M + A = 18.
Replace M with 2 and A with 6.
Then, 2Y + 2 + 6 = 18. Then, 2Y = 10, and Y = 5.

Row 1: T + R + T + Y = 20.
Replace R with 9 and Y with 5.
Then, 2T + 9 + 5 = 20. Then, 2T + 14 = 20.
Then, 2T = 6, and T = 3.

Row 2: S + R + S + Y = 22.
Replace R with 9 and Y with 5.
Then, 2S + 9 + 5 =22. Then, 2S + 14 = 22.
Then, 2S = 8, and S = 4.

SMARTY - 2

S = 5 M = 8 A = 7 R = 2 T = 1 Y =

Column 4: A + A + A + A = 28
Then, 4A = 28, and A = 7.

Row 2: M + M + A + A = 30.
Replace each A with 7.
Then, 2M + 14 = 30. Then, 2M = 16, and M = 8.

Column 1: T + M + M + T = 18.
Replace each M with 8. Then, 2T + 16 = 18, and T = 1.

Row 4: T + M + S + A = 21.
Replace T with 1, M with 8, and A with 7.
Then, S + 16 = 21, and S = 5.

Row 3: M + R + R + A = 19.
Replace M with 8 and A with 7. Then, 2R + 15 = 19.
Then, 2R = 4, and R = 2.

Column 3: Y + A + R + S = 20.
Replace A with 7, R with 2, and S with 5. Then, Y + 14 = 20, and Y = 6.

SMARTY – 3

S = 2 M = 6 A = 1 R = 9 T = 4 Y = 8

Row 1: R + R + A + A = 20.
Then, 2R + 2A = 20, and R + A = 10.

Column 2: R + A + A + A = 12.
Replace R + A with 10.
Then, 10 + 2A = 12. Then, 2A = 2, and A = 1.

Column 2: R + A + A + A = 12.
Replace each A with 1.
Then, R + 3 = 12, and R = 9.

Column 1: R + M + R + M = 30. Replace each R with 9.
Then, 2M + 18 = 30. Then, 2M = 12, and M = 6.

Row 4: M +A + Y + Y = 23.
Replace M with 6 and A with 1.
Then, 6 + 1 + 2Y = 23. Then, 7 + 2Y = 23. Then, 2Y = 16, and Y = 8.

Row 3: R + A + S + M = 18.
Replace R with 9, A with 1, and M with 6.
Then, 9 + 1 + S + 6 = 18. Then, S + 16 = 18, and S = 2.

Row 2: M + A + T + T = 15.
Replace M with 6 and A with 1.
Then, 6 + 1 + 2T = 15. Then, 7 + 2T = 15. Then, 2T = 8, and T = 4.

SMARTY – 4

S = 3 M = 5 A = 9 R = 2 T = 6 Y = 8

Row 2: M + M + Y + Y = 26.
Then, 2M + 2Y = 26. Then, M + Y = 13.

Column 4: T + Y + M + T = 25.
Replace M + Y with 13.
Then, 2T + 13 = 25. Then, 2T = 12, and T = 6.

Row 4: R + T + T + T = 20.
Replace each T with 6. Then, R + 18 = 20, and R = 2.

Row 1: S + R + R + T = 13.
Replace each R with 2 and T with 6.
Then, S + 2 + 2 + 6 = 13. Then, S + 10 = 13, and S = 3.

Column 1: S + M + R + R = 12.
Replace S with 3 and each R with 2. Then, 3 + M + 2 + 2 = 12.
Then, M + 7 = 12, and M = 5.

From Row 2: M + Y = 13. Replace M with 5. Then, 5 + Y = 13, and Y = 8.

Row 3: R + A + A + M = 25.
Replace R with 2 and M with 5. Then, 2 + A + A + 5 = 25.
Then, 2A + 7 = 25. Then, 2A = 18, and A = 9

SMARTY – 5

S = 3 M = 7 A = 2 R = 6 T = 9 Y = 8

Row 2: T + Y + T + Y = 34.
Then, 2T + 2Y = 34. Then, T + Y = 17.

Row 3: A + A + T + Y = 21.
Replace T + Y with 17. Then, 2A + 17 = 21. Then, 2A = 4, and A = 2.

Column 4: Y + Y + Y + A = 26.
Replace A with 2. Then, 3Y + 2 = 26. Then, 3Y = 24, and Y = 8.

Row 2: T + Y = 17.
Replace Y with 8. Then, T + 8 = 17, and T = 9.

Row 1: R + A + R + Y = 22.
Replace A with 2 and Y with 8.
Then, 2R + 10 = 22. Then, 2R = 12, and R = 6.

Column 3: R + T + T + M = 31.
Replace R with 6, and each T with 9.
Then, 6 + 9 + 9 + M = 31. Then, 24 + M = 31, and M = 7.

Row 4: S + A + M + A = 14.
Replace each A with 2 and M with 7.
Then, S + 2 + 7 + 2 = 14. Then, S + 11 = 14, and S = 3.

SMARTY - 6

S = 9 M = 4 A = 7 R = 2 T = 3 Y = 5

Column 1: A + A + A + A = 28
Then, 4A = 28 and A = 7.

Row 3: A + R + R + R = 13.
Replace A with 7. Then, 7 + 3R = 13. Then, 3R = 6, and R = 2.

Column 4: T + A + R + T = 15.
Replace A with 7 and R with 2. Then, 2T + 7 + 2 = 15.
Then, 2T + 9 = 15. Then, 2T = 6, and T = 3.

Row 4: A + Y + Y + T = 20.
Replace A with 7 and T with 3.
Then, 2Y + 10 = 20. Then, 2Y = 10, and Y = 5.

Column 3: $M + M^{1/2} + R + Y = 13$.
Replace R with 2 and Y with 5.
Then, $M + M^{1/2} + 7 = 13$. Then, $M + M^{1/2} = 6$. Then, M = 4.

Column 2: $M + S^{1/2} + R + Y = 14$.
Replace M with 4, R with 2, and Y with 5.
Then, $4 + S^{1/2} + 2 + 5 = 14$. Then, $S^{1/2} + 11 = 14$. Then, $S^{1/2} = 3$, and S = 9.

SMARTY – 7

S = 8 M = 5 A = 6 R = 9 T = 2 Y = 1

Row 2: $Y + Y + Y^4 + Y = 4$.
The only number to the 4^{th} power in the set 1 through 9 is 1.
Then, $Y = 1$

Row 3: $S + S^{1/3} + S + S = 26$.
$S^{1/3}$ means the cubic root of a number.
The only cubic from 1 through 9, are 1 and 8. Then, S = 8.

Check: 8 + 2 + 8 + 8 = 26.

Column 4: S + Y + S + T =19.
Replace each S with 8 and Y with 1.
Then, 17 + T = 19, and $T = 2$.

Row 4: A + T + A + T = 16.
Replace each T with 2.
Then, 2A + 4 = 16, Then, 2A = 12, and $A = 6$.

Column 1: M + Y + S + A = 20.
Replace Y with 1, S with 8, and A with 6.
Then, M + 1 + 8 + 6 = 20. Then, M + 15 = 20, and $M = 5$.

Row 1: $M + M + R^{1/2} + S = 21$.
Replace each M with 5 and S with 8.
Then, $R^{1/2} + 18 = 21$. Then, $R^{1/2} = 3$, and $R = 9$.

SMARTY – 8

S = 2 M = 9 A = 3 R = 5 T = 4 Y = 6

Row 4: Y + T + T + Y = 20.
Then, 2Y + 2T = 20, and Y + T = 10.

Column 3: T + Y + T + T = 18.
Replace Y + T with 10. Then, 10 + 2T = 18.
Then, 2T = 8, and T = 4.

From Row 4: Y + T = 10.
Replace T with 4. Then, Y + 4 = 10, and Y = 6.

Column 1: A + A + A + Y = 15.
Replace Y with 6. Then, 3A + 6 = 15. Then, 3A = 9, and A = 3.

Row 1: A + S + T + Y = 15.
Replace A with 3, T with 4, and Y with 6. Then, S + 13 = 15, and S = 2.

Column 4: Y + R + A + Y = 20.
Replace each Y with 6 and A with 3. Then, R + 15 = 20, and R = 5.

Row 2: A + M + Y + R = 23.
Replace A with 3, Y with 6, and R with 5.
Then, M + 14 = 23, and M = 9.

SMARTY – 9

S = 6 M = 3 A = 5 R = 8 T = 7 Y = 1

Row 2: S + M + S + M = 18.
Then, 2S + 2M = 18. Then, S + M = 9.

Column 4: R + M + S + R = 25.
Replace S + M with 9. Then, 2R + 9 = 25. Then, 2R = 16, and R = 8.

Column 3: M + S + S + R = 23.
Replace S + M with 9 and R with 8. Then, S + 17 = 23, and S = 6.

From Row 2, S + M = 10.
Replace S with 6. Then, 6 + M = 9, and M = 3.

Column 1: Y + S + M + S = 16.
Replace each S with 6 and M with 3.
Then, Y + 6 + 3 + 6 = 16. Then, Y + 15 = 16, and Y = 1.

Row 3: M + T + S + S = 22.
Replace M with 3 and each S with 6.
Then, 3 + T + 6 + 6 = 22. Then, T +15 = 22, and T = 7.

Row 1: Y + A + M + R = 17.
Replace Y with 1, M with 3, and R with 8.
Then, A + 12 = 17, and A =
5.

SMARTY – 10

S = 8 M = 6 A = 4 R = 2 T = 9 Y = 7

Column 4: T + T + Y + Y = 32.
Then, 2T + 2Y = 32. Then, T + Y = 16.

Row 1: T + T + Y + T = 34.
Replace T + Y with 16.
Then, 2T + 16 = 34. Then, 2T + 18, and T = 9.

Column 4: T + T + Y + Y = 32.
T + Y = 16. Replace T with 9. Then, 9 + Y = 16, and Y = 7.

Row 3. Y + R + Y + Y = 23.
Replace each Y with 7. Then, 21 + R = 23, and R = 2.

Column 2: T + R + R + A = 17.
Replace T with 9 and each R with 2. Then, 13 + A = 17, and A = 4.

Column 1: T + A + Y + M = 26.
Replace T with 9, A with 4, and Y with 7. Then, 20 + M = 26, and M = 6.

Column 3: Y + A + Y + S = 26.
Replace each Y with 7 and A with 4. Then 18 + S = 26, and S = 8.

SMARTY – 11

S = 6 M = 7 A = 9 R = 8 T = 5 Y = 3

Row 3: Y + R + Y + R = 22.
Then, 2Y + 2R = 22, and Y + R = 11.

Row 1: R + Y + Y + Y = 17.
Replace Y + R with 11. Then, 11 + 2Y = 17. Then, 2Y = 6, and Y = 3.

Row 3: Y + R = 11.
Replace Y with 3. Then, 3 + R = 11, and R = 8.

Column 2: Y + T + R + T = 21.
Replace Y with 3 and R with 8. Then, 2T + 11 = 21.
Then, 2T = 10, and T = 5.

Column 1: R + S + Y + S = 23.
Replace R with 8 and Y with 3.
Then, 2S + 11 = 23. Then, 2S = 12, and S = 6.

Row 4: S + T + A + T = 25.
Replace S with 6 and each T with 5. Then, 16 + A = 25, and A = 8.

Column 4: Y + M + R + T = 23.
Replace Y with 3, R with 8, and T with 5.
Then, M +16 = 23, and M = 7.

SMARTY – 12

S = 3 M = 4 A = 1 R = 7 T = 2 Y = 8

Row 1: $A^2 + A^3 + A^4 + S = 6$.
The only number to the second, third, and fourth power in 1 through 9, is 1.
$A = 1$. Replace each A with 1. Then, 3 + S = 6, and $S = 3$.

Row 3: $R + Y^{1/3} + R + R = 23$.
Then, $3R + Y^{1/3} = 23$. Then, $Y = 8$.
The cube root of 8 is 2.
Replace $Y^{1/3}$ with 2. Then, 3R + 2 = 23. Then, 3R = 21, and $R = 7$.

Row 4: T + Y + T + T = 14.
Replace Y with 8. Then, 3T + 8 = 14. Then, 3T = 6, and $T = 2$.

Column 1: $A^2 + M + R + T = 14$.
Replace A with 1, R with 7, and T with 2. Then, M + 10 = 14, and $M = 4$.

SMARTY – 13

S = 1 M = 7 A = 6 R = 3 T = 2 Y = 4

Row 1: M + T + M + T = 18.
Then, 2M + 2T = 18, Then, M + T = 9.

Row 2: M + T + R + R = 15.
Replace M + T with 9. Then, 9 + 2R = 15. Then, 2R = 6, and R = 3.

Column 2: T + T + S + S = 6.
Then, 2T + 2S = 6. Then, T + S = 3. T and S can be 1 or 2.

Row 4: Y + S + Y + S = 10.
Then, 2 Y + 2S = 10. Then, Y + S = 5.

From Column 2, S can be 1 or 2. If S = 2, then Y + 2 = 5.
But Y cannot equal 3, because R = 3.
Then, S = 1, and Y = 4.

Column 2: T + T + S + S = 6. Then, T + S = 3.
Replace S with 1. Then, T + 1 = 3, and T = 3.

Column 1: M + M + M + Y = 25.
Replace Y with 4. Then, 3M + 4 = 25. Then, 3M = 21, and M = 7.

Row 3: M + S + A + A = 20.
Replace M with 7 and S with 1.
Then, 2A + 7 + 1 = 20. Then, 2A + 8 = 20. Then, 2A = 12, and A = 6.

SMARTY – 14

S = 9 M = 1 A = 3 R = 2 T = 8 Y = 7

Column 1: $S + S^{1/2} + S + S = 30$.
Then, $3S + S^{1/2} = 30$, and $S = 9$.

Row 1: S + S + S +T = 35.
Replace each S with 9. Then, 27 + T = 35, and $T = 8$.

Row 2: $S^{½} + A + A + A = 12$.
Replace S with 9. Then, 3A + 3 = 12. Then, 3A = 9, and $A = 3$.

Column 4: T + A + R + R = 15.
Replace T with 8 and A with 3. Then, 8 + 3 + 2R = 15. Then, 2R = 4, and $R = 2$.

Row 3: $S + M^5 + M^3 + R = 13$.
Replace S with 9 and R with 2. Then, $11 + M^5 + M^3 = 13$.
Then, $M^5 + M^3 = 2$, and $M = 1$.

Row 4: S + Y + R + R = 20.
Replace S with 9 and each R with 2. Then, Y + 13 = 20, and $Y = 7$.

SMARTY – 15

S = 7 M = 1 A = 2 R = 4 T = 8 Y = 9

Column 2: $M^0 + M^4 + S + S = 16$.
Only 1 has a 4th power within 1through 9. Then, M = 1.
Replace each M with 1. Then, 2 + 2S = 16. Then, 2S = 14, and S = 7.

Row 4: $R^2 + S + R + R = 31$.
Replace S with 7. Then, $R^2 + 2R + 7 = 31$. Then, $R^2 + 2R = 24$, and R = 4.

Column 1: $T + T + T + R^2 = 40$.
Replace R with 4. Then, 3T + 16 = 40. Then, 3T = 24, and T = 8.

Column 3: A + R + A + R = 12.
Replace each R with 4. Then, 2A + 8 = 12. Then, 2A = 4, and A = 2.

Column 4: M + Y + M + R = 15.
Replace each M with 1 and R with 4.
Then, Y + 6 = 15, and Y = 9.

SMARTY – 16

S = 6 M = 8 A = 7 R = 4 T = 5 Y = 9

Row 2: Y + A + Y + Y = 34.
Then, 3Y + A = 34.
No number other than 9 for Y will produce a single-digit value for A.
Y = 9.

Row 2: 3Y + A = 34.
Replace each Y with 9. Then, 27 + A = 34, and A = 7.

Column 4: M + Y + A + M = 32.
Replace Y with 9 and A with 7. Then, 2M + 16 = 32.
Then, 2M = 16, and M = 8.

Row 4: T + T + T + M = 23.
Replace M with 8. Then, 3T + 8 = 23. Then, 3T = 15, and T = 5.

Column 3: S + Y + T + T = 25.
Replace Y with 9, and each T with 5. Then, S + 19 = 25, and S = 6.

Column 1: R + Y + R + T = 22.
Replace Y with 9 and T with 5. Then, 2R + 14 = 22. Then, 2R = 8, and R = 4.

SMARTY – 17

S = 4 M = 8 A = 5 R = 3 T = 1 Y = 2

Row 1: $M^{1/3}$ + M + M + M = 26.
$M^{1/3}$ is the cube root of M. Then, M = 8, and its cube root is 2.

Column 1: $M^{1/3}$ + M + Y + Y = 14.
Replace M with 8. Then, 2 + 8 + 2Y = 14. Then, 10 + 2Y = 14.
Then, 2Y = 4, and Y = 2.

Row 3: Y + Y + R + R = 10.
Replace each Y with 2. Then, 4 + 2R = 10. Then, 2R = 6, and R = 3.

Row 4: Y + A + R + A = 15.
Replace Y with 2 and R with 3. Then, 2A + 5 = 15.
Then, 2A= 10, and A = 5.

Column 4: M + T + R + A = 17.
Replace M with 8, R with 3, and A with 5. Then, T + 16 = 17, and T = 1.

Row 2: M + $S^{1/2}$ + T + T = 1 2.
Replace M with 8 and each T with 1.
Then, $S^{½}$ + 10 = 12. Then, $S^{½}$ = 2, and S = 4.

SMARTY – 18

S = 2 M = 9 A = 1 R = 4 T = 7 Y = 3

Column 1: $Y^2 + M + M + M = 36$.
Then, $Y^2 + 3M = 36$.
The only number for Y in the range 1 through 9, is 3. Then, $Y = 3$.

Column 1: $Y^2 + M + M + M = 36$.
Replace Y with 3. Then, $3^2 + 3M = 36$. Then, $3M + 9 = 36$.
Then, $3M = 27$, and $M = 9$.

Row 4: M + Y + Y + S = 17.
Replace M with 9 and each Y with 3. Then, 9 + 6 + S = 17.
Then, 15 + S = 17, and $S = 2$.

Column 4: S + R + S + S = 10.
Replace each S with 2. Then, R + 6 = 10, and $R = 4$.

Row 3: M + T + T + S = 25.
Replace M with 9 and S with 2. Then, 2T + 9 + 2 = 25.
Then, 2T + 11 = 25. Then, 2T = 14, and $T=7$.

Row 2: $M + A^2 + R + R = 18$.
Replace M with 9 and each R with 4. Then, $9 + A^2 + 8 = 18$.
Then, $17 + A^2 = 18$, and $A = 1$.

SMARTY – 19

S = 9 M = 6 A = 8 R = 7 T = 5 Y = 4

Row 3: $Y^2 + S + Y^2 + S = 50$.
Then, $2Y^2 + 2S = 50$. Then, $Y^2 + S = 25$.
The only number for Y in the range, 1 through 9, is 4. Then, $Y = 4$.

Row 3: $Y^2 + S + Y^2 + S = 50$.
Replace each Y with 4. Then, 2S + 16 + 16 = 50. Then, 2S + 32 = 50.
Then, 2S = 18, and $S = 9$.

Column 2: S + T + S + T = 28.
Replace each S with 9. Then, 2T + 18 = 28. Then, 2T = 10, and $T = 5$.

Row 4: R+ T + T + T = 22.
Replace each T with 5. Then, R +15 = 22, and $R = 7$.

Column 4: S + A + S + T = 31.
Replace each S with 9 and T with 5. Then, 18 + 5 + A = 31.
Then, A + 23 = 31, and $A = 8$.

Row 2: M + T + Y + A = 23.
Replace T with 5, Y with 4, and A with 8. Then, M + 17 = 23, and $M = 6$.

SMARTY – 20

S = 9 M = 6 A = 4 R = 3 T = 8 Y = 1

Row 3: M + M + M + A = 22.
Row 4: A + A + A + M = 18.
Add the Rows: 4A + 4M = 40. Then, A + M = 10.

Row 4: A + A + A + M = 18.
Replace A + M with 10. Then, 2A + 10 = 18. Then, 2A = 8, and A = 4.

Row 3: M + M + M + A = 22.
Replace A with 4. Then, 3M + 4 = 22. Then, 3M = 18, and M = 6.

Column 3: R + R + M + A = 16.
Replace M with 6 and A with 4. Then, 2R + 10 = 16.
Then, 2R = 6, and R = 3.

Row 1: T + T + R + R = 22.
Replace each R with 3. Then 2T + 6 = 22. Then, 2T = 16, and T = 8.

Column 1: T + Y + M + A = 19.
Replace T with 8, M with 6, and A with 4.
Then, Y + 18 = 19, and Y = 1.

Column 4: R + S + A + M = 22.
Replace R with 3, A with 4, and M with 6. Then, S + 13 = 22, and S = 9.