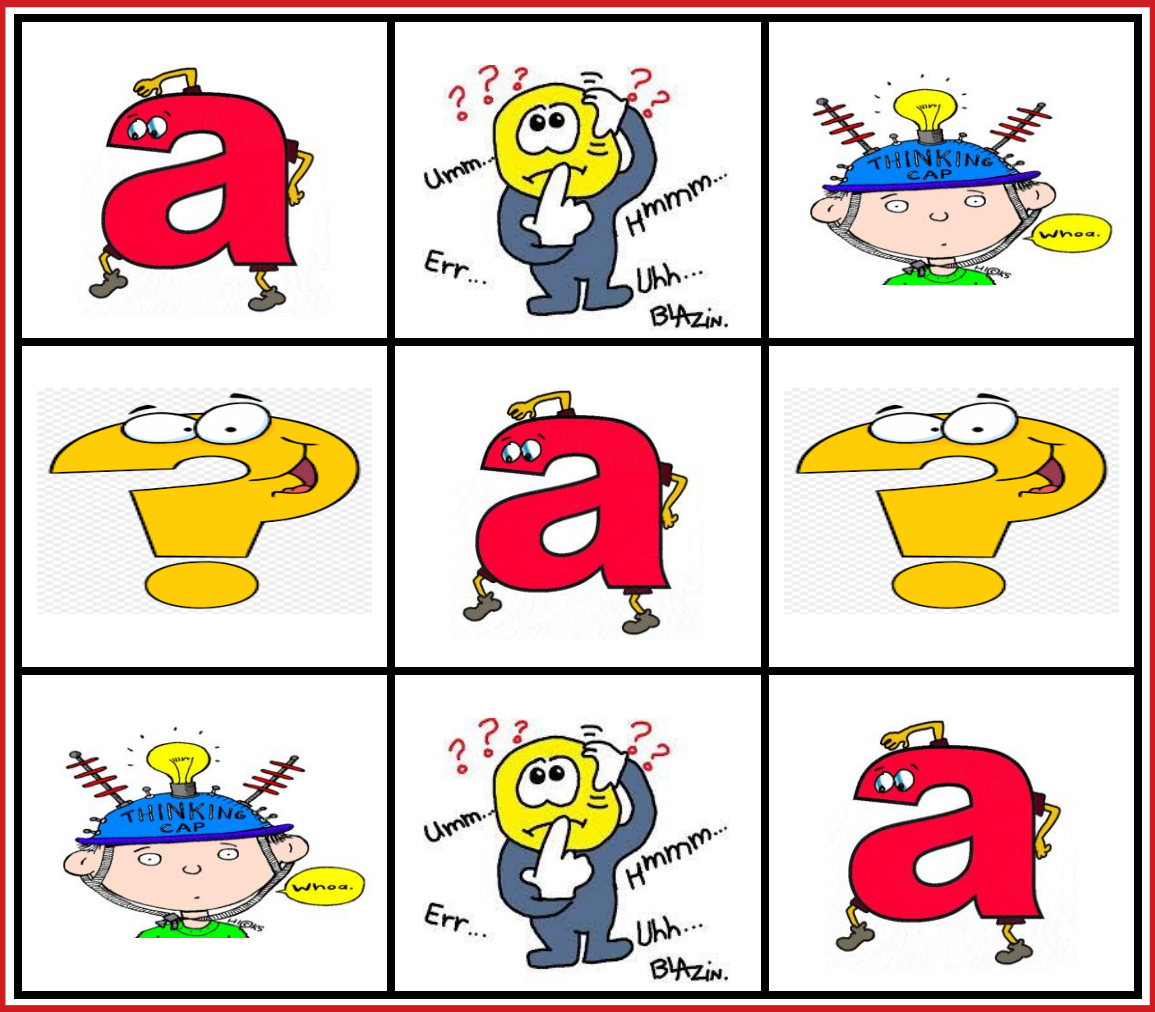
Alge-Grid: What's the *a*?

Carole Greenes and Tanner Wolfram



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Alge-Grid puzzles are designed to enhance solvers' algebraic reasoning talents. In each puzzle, a 3-by-3 grid with nine cells is presented. Each cell contains an algebraic expression containing one unknown, the *a.* In each puzzle, the value of *a* is the same. To solve each puzzle and fill in the values of the nine expressions in the grid, the value of that a must be determined first. To assist solvers, a Clue is presented for each grid. The Clue provides information about the numbers in three of the cells. Those three cell clues are connected along a side or corner, relating to their position (not always obvious!) in the grid. Clue information may be mathematical (e.g., a perfect number; number of sides on a heptagon); or relate to sports (e.g., number of members on a soccer team); the sciences (e.g., number of eyes on a cyclops); history (e.g., number of world wars); geography (e.g., number of great lakes); or the arts (e.g., number of sharps in a specific musical scale). The goal for solvers is to determine the value of the *a* and complete the grid to include the given numbers.

Set 1, problems 1 – 18, *a* can be any number 1 – 9, and all cells contain the numbers 1 – 9.
Set 2, problems 19 – 36, *a* can be any number 10 – 18, and all cells contain the numbers 10 – 18.
Set 3, problems 37 – 54, *a* can be any number 19 – 27, and all cells contain the numbers 19 – 27.

Solutions are presented after the last problem.

Note: The use of calculators for obtaining information, as well as computing, is recommended. The focus of the problems is on reasoning, not on the memorization of facts.

Have fun!!

Carole and Tanner

Carole Greenes, Ed.D. is Professor Emerita, Mathematics Education at 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 and the College of Liberal Arts and Sciences. Currently, she directs the PRIME Group that develops books of challenge problems for students, grades K – 12. Carole is author of more than 350 books for PreK-12 and college students, 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.

Tanner Wolfram is a Fall 2019 graduate, Summa cum Laude, of Barrett, The Honors College at Arizona State University. He holds a major in Physics and minors in both Spanish and Chinese. Tanner is co-author of *Alge-Grid: What's the a?* puzzle book, and senior author of the *Facasumi Puzzle Book.* From Spring 2016 to Fall 2020, Tanner served as Senior Project Assistant in the Practice, Research, and Innovation in Mathematics Education (PRIME) Center at ASU, and is now co-Director of the PRIME Group. During his time with the PRIME Center, Tanner assisted with the NSF-funded App Maker Pro (AMP) project, edited and contributed to eight *MATHadazzle Puzzle Books*, co-authored six articles and co-edited two free monthly online *MATHgazines.* He also co-edited the Fall and Spring (2019, 2020) issues of *OnCore*, the journal of the Arizona Association of Teachers of Mathematics (AATM).

Alge-Grid: What's the *a*?

Set 1

Possible *a* values: 1 – 9

Alge-Grid 1

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$(\sqrt{a})^2$	$(a + 1)^2 - 6$	$a \div a$
$a^3 - 2$	$5a \div 2$	$(a \div 2)^3 + 6$
$a^2 - a + 2$	$a + 6$	$a^3 + 1$

Clue

Number of legs on a biped

Number of vowels in the English language

Number of sides on a nonagon

Alge-Grid 2

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$(a + 1) \div 4$	$a + 1$	$a - 1$
$(a + 3) \div 2$	$(a + 1) \div 2$	$(a - 1) \div 2$
$(4a)^0$	$a + 2$	$2a - 7$

Clue

Number of planets in the solar system

Even square number

Number of wheels on a unicycle

Alge-Grid 3

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^8 + a^7$	$2a^6 + a^5 + a^4 + 2$	$a + 3$
$3\sqrt{a}$	$8a$	$a \div 4 + 6.75$
$(a + 9) \div 2$	$a \div a \times 1$	$a \div a^2 + 8$

Clue

Number of cups in a pint

Number of arms on an octopus

Number of toes on each foot

Alge-Grid 4

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$\frac{3}{4}a + 0.5$	a^2	$(a + 1)^2$
$3a$	a^0	$a^2 - 1$
$a^2 + 1$	$a^2 + 2a - 1$	a^3

Clue

Perfect number	**Factor of all numbers**	
		(Prime) ^{3}

Alge-Grid 5

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a + 3$	$[9(a - 1)]^{1/3}$	$\sqrt{a} - 1$
$a \times a^0$	$(a - 1)^2$	$a^2 - 2a - 2$
$\frac{1}{2}a$	$(a - 2)^3$	$a + 1$

Clue

	Number of primary colors
	Greatest single-digit number
Number of brain hemispheres	

Alge-Grid 6

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^2 - 8a - 2$	$\sqrt{a} + (a \div 3)$	$a \times (a \div 9)$
$a^0 + (a \div 3) - 3$	$a - 5$	$(a - 8)^2 + 4$
$8a \div 9$	$(a + 1) \div 2 - 3$	$a \div 3$

Clue

Number of red stripes on U.S. flag	
	Smallest composite number
	Even prime

Alge-Grid 7

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$6a$	$(a + 1)^3$	$(a + 2)^2$
$a \times a^2 \times a^3$	$10a \div 2$	$2a$
$(a + 1)^2$	$2a + 1$	$(a + 2)^2 - 2$

Clue

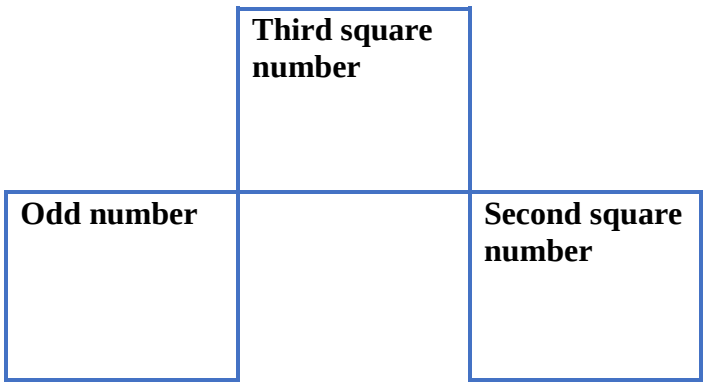
Product of two different prime numbers	**Number of faces on an octahedron**
	Third prime number

Alge-Grid 8

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^3 - a^2 - 5a + 2$	a^2	$2a$
$a - 2$	$a^0 + 1$	$(a + 3)^2 - 32$
$2a + 2$	$a^2 - 2$	$3a \div 3$

Clue



Alge-Grid 9

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a + 2$	$\sqrt{a+3} - 1$	$a \div 2$
$a - 1$	$a + 1$	$a^2 - 27$
$(a - 4)^2$	$a^2 - 30$	$a^0 \times \frac{1}{6} a$

Clue

Number of musicians in an octet		**Number of feet in a yard**
	Number of Ancient Wonders of the World	

Alge-Grid 10

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a \div a + (3a \div a)$	$2a - a \div 5$	$a + 3$
$a + 2$	$\sqrt{a+4} - 1$	$2a - 4$
$a - 4$	$(a-2)^2 - 4$	$a^2 - 4a - 2$

Clue

		Number of letters in the word "kindness"
Number of continents	**Number of wheels on a bicycle**	

Alge-Grid 11

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$\sqrt{a+8}-1$	$(a \div 4)^3$	$a \div 2$
$(a-5)^2$	a^2-7a-1	$a-2$
$\sqrt[3]{a}$	$a \div a + 4$	a^0

Clue

Sixth Fibonacci number	**Number of points on a compass**
	Half dozen

Alge-Grid 12

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$\sqrt{a} - 1$	$a \div 2 + 6$	$a + 5$
$(a^3 - a^2) \div 12 + 2$	$a^2 \div 4 - 1$	$a^2 - 3a$
$2a - 1$	$\sqrt{a}$	$a + 1$

Clue

Fourth prime number	**Factor of all even numbers**	**Roman numeral is V**

Alge-Grid 13

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$(\frac{1}{3}a)^3$	$a \div a$	$2(a + 1) - a - 1$
$\frac{1}{3}a$	$\frac{1}{2}a$	$a + \frac{1}{2}a$
$2 \times \frac{1}{3}a$	$2a - 7$	$a \times a^0$

Clue

Base of Binary System	**Number of sharps in A Major**
	Sum of two different prime numbers

Alge-Grid 14

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^{1/3}$	$2a - (a + 1)$	$3a \div 4$
$(a - 2) \div 2$	$a^3 \div a^2$	$(5a)^0$
$\frac{1}{2}a$	$2a - (a - 1)$	$40 \div a$

Clue

Number of miles in a League	**Number of musical notes in an octave**
	Sum of digits of any multiple of this number is this number

Alge-Grid 15

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^2 \div 5a$	$2a - 3$	$(a - 2)^2$
$a^4 \div a^3$	$(a + 1) \div 3$	$a + 1$
$a - 2$	$2a - 2$	$[2(a + 1)] \div 3$

Clue

Square of an odd prime number

Number faces on a cube

Number of pints in a gallon

Alge-Grid 16

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^2 \div 7$	$a - 4$	$6a^0$
$a^2 \div a + 2$	$9a - 7a - 13$	$(a - 5)^2 + a - 3$
$\sqrt[3]{a+1}$	$(a + 1) \div 2 + 1$	$a - 3$

Clue

Sum of the first two counting numbers
***a* x 0 + 1**
Number of players on the court for each team in basketball

Alge-Grid 17

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$3a - 4$	$a^2 \div 3$	$2a$
2^a	$a^2 - 2$	$a^2 - (a + 2)$
$a \div a$	a^2	$2a - 4$

Clue

		Smallest perfect number
Second cubic number	**$2^3 - 1$**	

Alge-Grid 18

Use the clue and the grid to fill in numbers, 1-9. The letter *a* represents the same number.

$a^{1/2}$	$(a + 1) \div 2$	$(\frac{1}{3}a)^2$
$a - 2$	$(a + 1) \div 5$	$2a - 10$
$\sqrt{a} - 2$	$\frac{2}{3}a$	$(a - 1) \div 2$

Clue

		Number of Beethoven symphonies
Number of sides on a heptagon	**Number of moons on Mars**	

Alge-Grid: What's the *a*?

Set 2

Possible *a* values: 10 – 18

Alge-Grid 19

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$\sqrt{a+8}+5$	$3a-2a-4$	$(a-8)^2-70$
$2(a-9)$	$a-5$	$(a-15)^3+9$
$a-2$	$(a+3)\div 2+4$	$a+1$

Clue

Even number

Number of inches in a foot

Twice the greatest single-digit square number

Alge-Grid 20

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$2a - 19$	$a - 2$	$2a - 14$
$2(a + 1) - 15$	$\frac{4}{5}a$	$\frac{2}{3}a$
$a^2 \div 5 \div 3$	$\frac{1}{3}a + 9$	$\frac{1}{5}a \times 6$

Clue

Triangular number	**Sum of first three square numbers**	**Number of holes on a golf course**

Alge-Grid 21

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$\frac{1}{3}a + 9$	$\sqrt{a+4} + a + 1$	$\frac{1}{3}a + (a-10)^3$
$\frac{1}{4}a + a$	$(a-8)^2 - 2$	$\frac{5}{6}a$
$a + 4$	$a - a^0$	$\frac{3}{2}a$

Clue

One more than a dozen

Number of lines in a sonnet

2^4

Alge-Grid 22

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$a^3 \div a^2$	$a + 1$	$(a + 7) \div 2$
$(2a - 2) \div 2$	$2(a - 4)$	$a - 2$
$\frac{3}{2}(a - 3)$	$a + 4$	$2a - 10$

Clue

Greatest number with a one-syllable name		**Reverse its digits and get the same number**
	XVII in Roman numerals	

Alge-Grid 23

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$3(a - 4)$	$a + \frac{1}{10}a$	$2a - 3$
$2a - 7$	$a^2 \div a$	$a + 0.4a$
$1.2a$	$a^2 - (10 - 1)^2 - 3$	$3a \div 2$

Clue

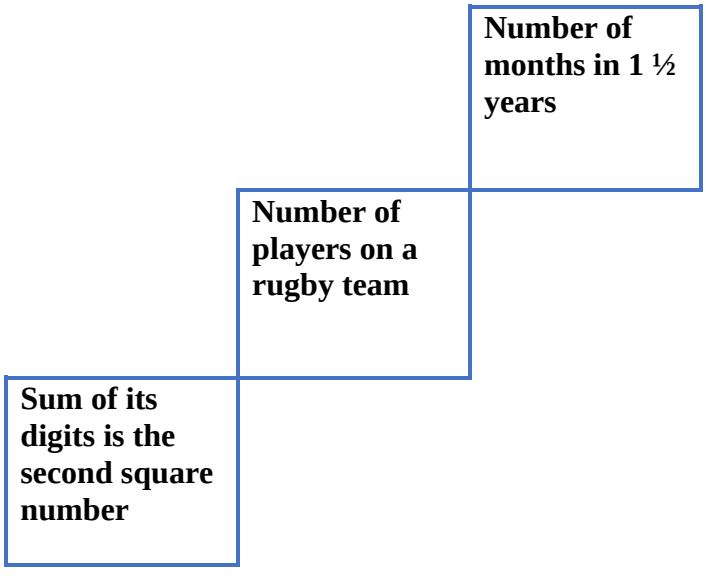
	Smallest two-digit prime number
Smallest Emirp number	**Sum of first three prime numbers**

Alge-Grid 24

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$4a - 2a - 6$	$a^4 \div a^2 - 10a$	$(a - 8)^3 - (a - 2)$
$10a^0$	$3(\sqrt{a + 5} + 1)$	$a + 3$
$\sqrt{a - 7} + a$	$a^2 - 9a - 5$	$a + 1$

Clue



Alge-Grid 25

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$(a + 6) \div 2$	$\frac{5}{6}a$	$2\sqrt{a+7}$
$18a^0$	$a - 5$	$a - 7$
$\frac{8}{9}a$	$\frac{1}{9}a + 15$	$\frac{21}{27}a$

Clue

Number of pairs of ribs in a human	**Triangular number**	
		Multiples of this number produce two like numbers

Alge-Grid 26

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$2a - 17$	$a + \frac{1}{8}a$	$a + 1$
$\frac{7}{8}a$	$3\sqrt{a} - 1$	$(a + 4) \div 2$
$\frac{1}{2}a + 5$	$16^{1/4} \times \frac{1}{2}a$	$0.75a$

Clue

	Seventh prime number
1/2 dozen + 5	**Sum of first four counting numbers**

Alge-Grid 27

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$a + 4$	$\frac{1}{2}a + \frac{1}{7}a + 2$	$2a - 12$
$a + 3$	$a^2 - 12a - 18a^0$	$6 \times \frac{1}{7}a$
$(a - 13)^2 + a - 1$	$\frac{1}{2}a + 6$	$a + 1$

Clue

Least two-digit number	
Sixth prime number	**Number of minutes in 1/4 hour**

Alge-Grid 28

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$a - 5$	$(a + 13) \div 2$	$2(a - 10)$
$a \times (2a)^0$	$a - 4$	$(a + 3) \div 2$
$a + 1$	$3a - 40$	$a - 1$

Clue

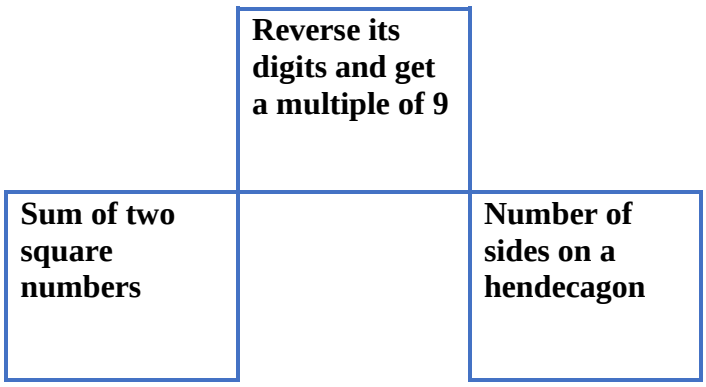
Number of weeks in each season of the year	**Deficient number**
	Square number

Alge-Grid 29

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$a + \frac{1}{7}a$	$2a - 10$	$a + a^0$
$a - a^0$	$3a - 5^2 - 3$	$a - 3$
$a \div 2 + 10$	$3a - 30$	$2a - 18$

Clue



Alge-Grid 30

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$(3a - 1) \div 2$	$3a - 20$	$a + 4$
$a \times (a^2)^0$	$(2a + 2) \div 2$	$2a - 5$
$3a - 19$	$a + [(a + 3) \div 2]$	$a - a^0$

Clue

Number of hearts in a deck of cards	**Product of two odd prime numbers**
	Sum of first four prime numbers

Alge-Grid 31

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$\frac{5}{6}a + \frac{1}{6}a$	$\frac{1}{3}a + 11$	$\sqrt{a+1} + 6$
$a - 2$	$3\sqrt{a+10} - 1$	$\frac{2}{3}a + a^0$
$\frac{3}{5}a + 8$	$2(a-12)^2$	$4a \div 3 - 8$

Clue

Smallest number with exactly five factors

Reversing its digits produces the same number

Abundant number

Alge-Grid 32

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$(a - 14)^2 + 12$	$3(a + 4) \div 4$	$a - 5$
$1.125a$	$3\sqrt{a}$	$\frac{1}{8}a + a - 4$
$a + 1$	$4\sqrt{a} - 3$	$2(a - 6) - 10$

Clue

Roman numeral is XII	
Fibonacci number	**Triangular number**

Alge-Grid 33

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$2a - 10$	$a + a^0$	$a^2 \div a^1 \div a^0$
$a + \frac{1}{4}a$	$(2a + 10) \div 2$	$a + \frac{1}{2}a$
$2a - 14$	$a - a^0$	$a + \frac{1}{3}a$

Clue

Smallest number with exactly six factors
Each of its digits is a cubic number
Double a cubic number

Alge-Grid 34

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$3a - 40$	$a - 1$	$2(a - 15)^2$
$\frac{1}{2}a + 6$	$\frac{2}{3}a$	$(a + 2) \div 2$
$a - \frac{1}{9}a$	$a^0 \times \sqrt{169}$	$a + 3 - 10$

Clue

Product of its digits is a prime number
Smallest abundant number
Fibonacci number

Alge-Grid 35

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$a + 4$	$9a - 8a + 3$	$3(a - 8)$
$3(a - 9)$	$(a - 15)^2 + a + 1$	$0.5(a + 1) + 3$
$a - 2$	$(a - 12)^{22} + 12$	$a + 1$

Clue

Haiku has this number of syllables	
Composite number	**Number of inches in 1/2 yard**

Alge-Grid 36

Use the clue and the grid to fill in numbers, 10-18. The letter *a* represents the same number.

$(a - 7)^2 + 3$	$a + a^0$	$2a - 3a^0$
$a^2/a + \frac{1}{5}a - 2$	$\frac{3}{2}a$	$2a - 2$
$\frac{1}{5}a + 14$	$a + 4$	$\frac{1}{5}a + 11$

Clue

10^1	
Double a cubic number	**Multiple of 7**

Alge-Grid: What's the *a*?

Set 3

Possible *a* values: 19 – 27

Alge-Grid 37

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{8}{9}a - 3a^0$	$(a - 22)^2 - 3$	$a - a/a$
$4\sqrt{a-2} + 4$	$\frac{1}{3}a + \frac{2}{9}a + 5$	$a - 8$
$(a - 23)^2 + 11$	$a - 4$	$25\sqrt{a-26}$

Clue

Number of inches in 1 ¾ feet.

Sum of three Fibonacci numbers

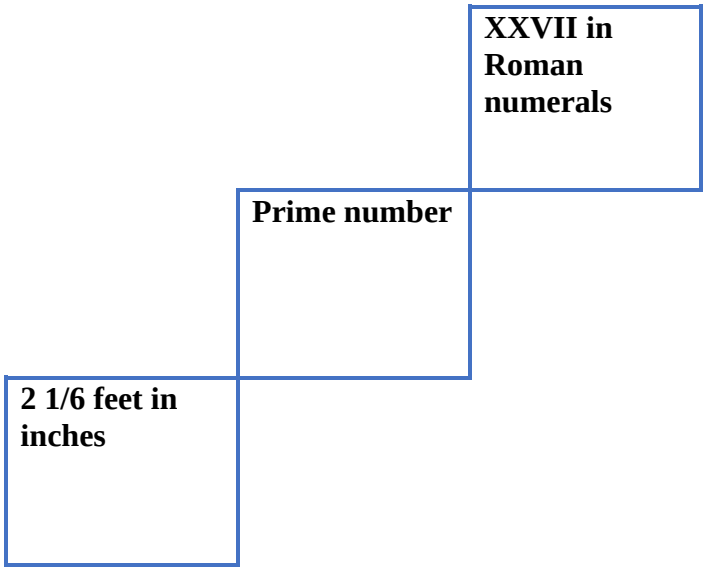
Square of a prime number

Alge-Grid 38

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{2}{3}a + 6$	$\frac{1}{2}a + 11$	$\sqrt{a + 25} + 20$
$\frac{1}{3}a + 13$	$(a - 19)^2 - 6$	$\frac{3}{4}a + \frac{3}{12}a + 1$
$a + 2$	$\frac{4}{6}a + 8$	$(a - 20)^2 + 4$

Clue



Alge-Grid 39

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{4}{5}a$	$3\sqrt{a} + 4$	$a^{1/2} \times 4 + 1$
$3(a \div 5 + 4)$	$3(\sqrt{a} + 3)$	$5(a \div 5)$
$4\sqrt{a} + 3$	$a - \frac{1}{5}a + 6$	$a \div 5 + 17$

Clue

Sum of its digits is a square number		**Sum of two consecutive square numbers**
	Only number between a square number and a cubic number	

Alge-Grid 40

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{12}{3}(a - 15)$	$\frac{3}{7}a + 4^2 + 1$	$20(a - 20)^2 + 2$
$(a - 19)^2 + 19$	$\frac{3}{7}a + 12$	$a + 6$
$a - 2$	$\frac{1}{7}a + 3^3 - 5$	$4\sqrt{a + 4}$

Clue

2/3 yard in inches
Digits differ by 1
Product of its digits is a multiple of 3

Alge-Grid 41

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$(a - 17)^4 + 9$	$(a + 1) \div 4 + 15$	$a + 7$
$12 \times (a - 3) \div 8$	$(a - 17)^5 - 9$	$\sqrt{a + 17} + 15$
$27a^0$	$19(a - 18)$	$a + 3$

Clue

	Product of two primes
XIX in Roman numerals	**3^3 minus number of fingers on one hand**

Alge-Grid 42

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{1}{13}a + \sqrt{441}$	$a - 1$	$(a - 24)^4 + 3$
$\frac{7}{13}a + \sqrt{64}$	$(a - 20)^2 - 12$	$a - 5$
$a + 1$	$(a - 24)^4 + \frac{2}{13}a$	$(a - 24)^3 + \frac{9}{13}a$

Clue

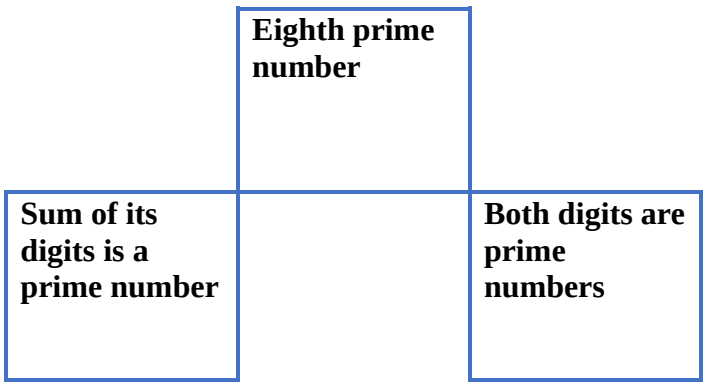
3/4 yard in inches	**Product of a square number and a prime number**	**Number of letters in the alphabet**

Alge-Grid 43

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$a \div 2 + 10$	$a \div 4 + 20$	$a - 4 + \sqrt{a+1}$
$2a \div 6 \times 3$	$(a + 14) \div 2$	$\frac{5}{6}a$
$\frac{3}{4}a + 3 \times a^0$	$a - 1$	$a \div 8 \times 9$

Clue



Alge-Grid 44

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{1}{2}a + 6$	$(a + 2) \div 2 + \frac{1}{2}a$	$a - 3$
$\frac{10}{13}a$	$2a - 26$	$a - 24 \div 2 + 10$
$\frac{1}{2}a + 12$	$\frac{14}{13}a$	$\frac{7}{9}(a + 1)$

Clue

Product of its digits is a perfect number
Number of ribs in the human body
Multiple of 3

Alge-Grid 45

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$(a - 22)^2 + 13$	$\frac{1}{5}a + \sqrt{20^2}$	$\frac{1}{5}a + 4^2$
$\sqrt{a + 75} + 9$	$a - 1$	$\frac{4}{5}a + 6$
$\frac{3}{5}a + 12$	$\frac{2}{5}a + \frac{1}{5}a + 5$	$\sqrt{a + 144} + 10$

Clue

Product of its digits is a square number	**2 dozen + 1**
$\sqrt{\mathbf{144}} + \sqrt{\mathbf{49}}$	

Alge-Grid 46

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$(a + 3) \div 10 \times 9$	$0.9a - 1.3$	$a - 1$
$a + 1 - 6$	$(a + 3) \div 2 + 5$	$a - \frac{1}{9}a$
$\frac{5}{6}(a + 3)$	$a \div 3 + 10$	$\frac{7}{9}a$

Clue

Palindromic number	**Number of faces on an icosahedron**
	Sum of its digits is a multiple of 10

Alge-Grid 47

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$a^0 \times \sqrt{484}$	$a - 2$	$\frac{1}{7}a \times 9$
$a + 2^2$	$a + 2$	$2a - (a - 3)$
$6a - 100$	$\frac{1}{7}a + 18$	$\sqrt{a+4} + 15$

Clue

Double an Emirp number	**Triangular number**	**Sum of its digits is a factor of it**

Alge-Grid 48

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$2 \times (3a \div 5)$	$a + 6$	$\frac{1}{4}a + 16$
$\frac{1}{4}a + 18$	$\sqrt{30a + 25} - 3$	$\frac{5}{4}a$
$(a - 15)^2 + 2$	$5\sqrt{a - 4}$	$(a - 16)^2 + 3$

Clue

Sum of its digits is a square number	
Sum of its digits is a prime number	**Reverse its digits and get a multiple of 7**

Alge-Grid 49

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$a^2 - (a - 1)^2 - 18$	$a + 8$	$44 \div (a - 17)$
$a + 125^{1/3}$	$2a - 18$	$(a + 6) + 9^0$
$(a + 1) \div 2 + 13$	$[(a + 6)^2]^{1/2}$	$a + 2$

Clue

Number of carats in 100% gold	**Product of a prime number and the square of a prime number**
Reverse its digits and get a power of 2	

Alge-Grid 50

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$3\sqrt{a+42} - 2$	$a + 5$	$6a \div 11 + 7$
$3 \times (a \div 11)^3$	$(a - 16)^2 - 11$	$5a \div 11 + 16$
$24 \times (a - 21)^{10} - 1$	$a - 2$	$3a \div 11 + 15$

Clue

Width of a tennis court in feet

Product of its digits equals the number of months in a year

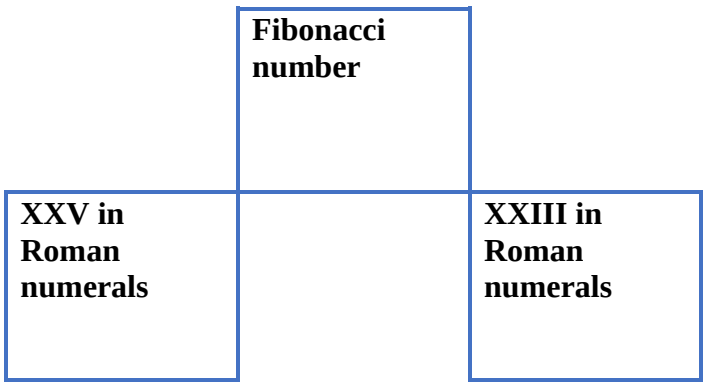
Multiple of 7

Alge-Grid 51

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$a - 3$	$(a - 20)^3 - 1$	$a + 1$
$(a - 19)^2 + 6$	$a - 2$	$a + 4$
$\sqrt{602 + a}$	$[5(a + 1)] \div 6 - 1$	$6\sqrt{a - 7} - 1$

Clue



Alge-Grid 52

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{1}{2}a + 11$	$\frac{1}{4}a + a$	$\frac{3}{4}a + 8$
$a + a^0 + a^0$	$2a - 13$	$a - \frac{2}{40}a$
$1.3a$	$\frac{4}{5}a + 4$	$\frac{1}{5}a + 20$

Clue

	Cubic number
Sum of its digits is a cubic number	**Product of a prime number and a square number**

Alge-Grid 53

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$18 + \sqrt{a+2}$	$5\sqrt{a+2}$	$a + [(a + 1) \div 6]$
$a^2 - (a - 1)^2 - 23$	$2a - 20$	$a - 2$
$4[(a + 2) \div 5]$	$a + 1$	$25 - [(a + 1) \div 4]$

Clue

	Difference between digits is a square number	
Multiple of 1, 2, 4, 5 and 10		**Reverse its digits and get a multiple of 7**

Alge-Grid 54

Use the clue and the grid to fill in numbers, 19-27. The letter *a* represents the same number.

$\frac{1}{2}a + 3 \times 5$	$a^1 + a^0$	$(a^2 + 3 \times 47)^{1/2}$
$(a^2 - 84)^{1/2}$	$2a - 20$	$\frac{1}{2}a \times a^0 \times 2$
$\frac{1}{2}a + [(a + 2) \div 3]$	$a - 1$	$\frac{1}{2}a + a - 6$

Clue

1/4 number of years in a century
When divided by 7 approximates π
Number of small cubes in a Rubik's cube

Alge-Grid Solutions

Alge-Grid 1 Solution
a **= 2**

2	3	1
6	5	7
4	8	9

Alge-Grid 2 Solution
a **= 7**

2	8	6
5	4	3
1	9	7

Alge-Grid 3 Solution
a **= 1**

2	6	4
3	8	7
5	1	9

Alge-Grid 4 Solution
a **= 2**

2	4	9
6	1	3
5	7	8

Alge-Grid 5 Solution
a **= 4**

7	3	1
4	9	6
2	8	5

Alge-Grid 6 Solution
a **= 9**

7	6	9
1	4	5
8	2	3

Alge-Grid Solutions

Alge-Grid 7 Solution
***a* = 1**

6	8	9
1	5	2
4	3	7

Alge-Grid 8 Solution
***a* = 3**

5	9	6
1	2	4
8	7	3

Alge-Grid 9 Solution
***a* = 6**

8	2	3
5	7	9
4	6	1

Alge-Grid 10 Solution
***a* = 5**

4	9	8
7	2	6
1	5	3

Alge-Grid 11 Solution
***a* = 8**

3	8	4
9	7	6
2	5	1

Alge-Grid 12 Solution
***a* = 4**

1	8	9
6	3	4
7	2	5

Alge-Grid Solutions

Alge-Grid 13 Solution
***a* = 6**

8	1	7
2	3	9
4	5	6

Alge-Grid 14 Solution
***a* = 8**

2	7	6
3	8	1
4	9	5

Alge-Grid 15 Solution
***a* = 5**

1	7	9
5	2	6
3	8	4

Alge-Grid 16 Solution
***a* = 7**

7	3	6
9	1	8
2	5	4

Alge-Grid 17 Solution
***a* = 3**

5	3	6
8	7	4
1	9	2

Alge-Grid 18 Solution
***a* = 9**

3	5	9
7	2	8
1	6	4

Alge-Grid Solutions

Alge-Grid 19 Solution
***a* = 17**

10	13	11
16	12	17
15	14	18

Alge-Grid 20 Solution
***a* = 15**

11	13	16
17	12	10
15	14	18

Alge-Grid 21 Solution
***a* = 12**

13	17	12
15	14	10
16	11	18

Alge-Grid 22 Solution
***a* = 13**

13	14	10
12	18	11
15	17	16

Alge-Grid 23 Solution
***a* = 10**

18	11	17
13	10	14
12	16	15

Alge-Grid 24 Solution
***a* = 11**

16	11	18
10	15	14
13	17	12

Alge-Grid Solutions

Alge-Grid 25 Solution
***a* = 18**

12	15	10
18	13	11
16	17	14

Alge-Grid 26 Solution
***a* = 16**

15	18	17
14	11	10
13	16	12

Alge-Grid 27 Solution
***a* = 14**

18	11	16
17	10	12
14	13	15

Alge-Grid 28 Solution
***a* = 17**

12	15	14
17	13	10
18	11	16

Alge-Grid 29 Solution
***a* = 14**

16	18	15
13	14	11
17	12	10

Alge-Grid 30 Solution
***a* = 11**

16	13	15
11	12	17
14	18	10

Alge-Grid Solutions

Alge-Grid 31 Solution
***a* = 15**

15	16	10
13	14	11
17	18	12

Alge-Grid 32 Solution
***a* = 16**

16	15	11
18	12	14
17	13	10

Alge-Grid 33 Solution
***a* = 12**

14	13	12
15	17	18
10	11	16

Alge-Grid 34 Solution
***a* = 18**

14	17	18
15	12	10
16	13	11

Alge-Grid 35 Solution
***a* = 13**

17	16	15
12	18	10
11	13	14

Alge-Grid 36 Solution
***a* = 10**

12	11	17
10	15	18
16	14	13

Alge-Grid Solutions

Alge-Grid 37 Solution
***a* = 27**

21	22	26
24	20	19
27	23	25

Alge-Grid 38 Solution
***a* = 24**

22	23	27
21	19	25
26	24	20

Alge-Grid 39 Solution
***a* = 25**

20	19	21
27	24	25
23	26	22

Alge-Grid 40 Solution
***a* = 21**

24	26	22
23	21	27
19	25	20

Alge-Grid 41 Solution
***a* = 19**

25	20	26
24	23	21
27	19	22

Alge-Grid 42 Solution
***a* = 26**

23	25	19
22	24	21
27	20	26

Alge-Grid Solutions

Alge-Grid 43 Solution
***a* = 24**

22	26	25
24	19	20
21	23	27

Alge-Grid 44 Solution
***a* = 26**

19	27	23
20	26	24
25	28	21

Alge-Grid 45 Solution
***a* = 25**

22	25	21
19	24	26
27	20	23

Alge-Grid 46 Solution
***a* = 27**

27	23	26
22	20	24
25	19	21

Alge-Grid 47 Solution
***a* = 21**

22	19	27
25	23	24
26	21	20

Alge-Grid 48 Solution
***a* = 20**

24	26	21
23	22	25
27	20	19

Alge-Grid Solutions

Alge-Grid 49 Solution
***a* = 19**

19	27	22
24	20	26
23	25	21

Alge-Grid 50 Solution
***a* = 22**

22	27	19
24	25	26
23	20	21

Alge-Grid 51 Solution
***a* = 23**

20	26	24
22	21	27
25	19	23

Alge-Grid 52 Solution
***a* = 20**

21	25	23
22	27	19
26	20	24

Alge-Grid 53 Solution
***a* = 23**

23	25	27
22	26	21
20	24	19

Alge-Grid 54 Solution
***a* = 22**

26	23	25
20	24	22
19	21	27