
$$\square + \square + \triangle + \triangle = \frac{38}{}$$

Part 1

NUMBERS

and

OPERATIONS

$$\begin{array}{r} \text{TWO} \\ + \text{TWO} \\ \hline \text{FOUR} \end{array}$$



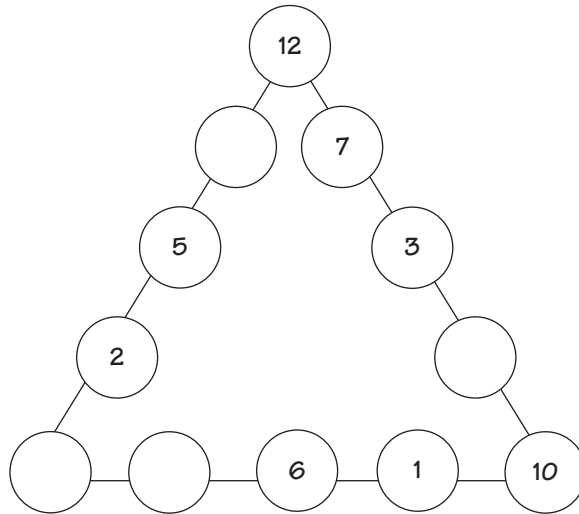
$$L \times I \times = ?$$

Whole Numbers

1. What is the next number in the sequence below?

1 4 9 16 25 36 ?

2. Place the numbers 1–12 in the twelve circles below so the sum of each side of the triangle is 36. I will give you a head start by placing some of the numbers for you. (The numbers may be used once only.)



-
-
3. My brother has a summer job and earns \$5 an hour. He is going to work 5 hours a day for 5 days a week, and will do this for 5 total weeks.
- How much money will he make in 1 week?
 - What is the total amount of money that he will earn?
4. Brenda bought a new catcher's mitt for \$75. Her mom saw another mitt that was a better quality glove and cost less, so she bought it for \$60. Brenda sold her first mitt for \$65. A week later, Brenda's mom accidentally threw her new glove in the trash. Brenda found her first mitt for sale a month later for \$50. She bought it back. How much money did Brenda and her mom end up losing on these transactions?

5. Two shapes are each given a value. Each value is a whole number. This whole number is at least 0 and at the most 10.

$$\triangle + \text{pentagon} = 19 \quad \triangle > \text{pentagon} \quad \text{pentagon} = 9$$

Write the value for the following shape.

$$\triangle = \underline{\hspace{2cm}}$$

Once you know the value, do the following exercises by replacing the shape with its value.

a. $\text{pentagon} + \triangle = \underline{\hspace{2cm}}$

b. $\triangle + \text{pentagon} \times \triangle = \underline{100}$

c. $\triangle + \text{pentagon} \times \text{pentagon} = \underline{\hspace{2cm}}$

d. $\triangle + \text{pentagon} \times \triangle - \text{pentagon} = \underline{\hspace{2cm}}$

e. $\triangle \times \triangle - \text{pentagon} = \underline{\hspace{2cm}}$

f. $\text{pentagon} + \text{pentagon} \times \triangle - \triangle = \underline{\hspace{2cm}}$

g. $\text{pentagon} + \text{pentagon} + \triangle + \triangle = \underline{38}$

h. $\triangle + \triangle + \text{pentagon} \times \text{pentagon} = \underline{\hspace{2cm}}$

i. $\triangle \times \triangle \times \text{pentagon} + \text{pentagon} = \underline{\hspace{2cm}}$

j. $\triangle + \text{pentagon} \times \text{pentagon} + \triangle = \underline{\hspace{2cm}}$

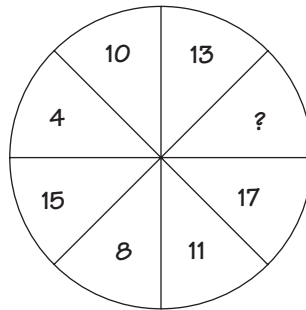
HINT
Remember the order of operations. Two of them are done for you.

6. Mrs. Johnson was going to purchase an iPod on sale for \$250. At the checkout counter she received an additional 10% discount. How much did Mrs. Johnson pay for the iPod after the discount?
7. In the addition problem below, the digits B and C represent a number different from any of the other numbers shown (that is, not 1, 4, 5, 6, or 9).

$$\begin{array}{r} B5 \\ +C9 \\ \hline 164 \end{array}$$

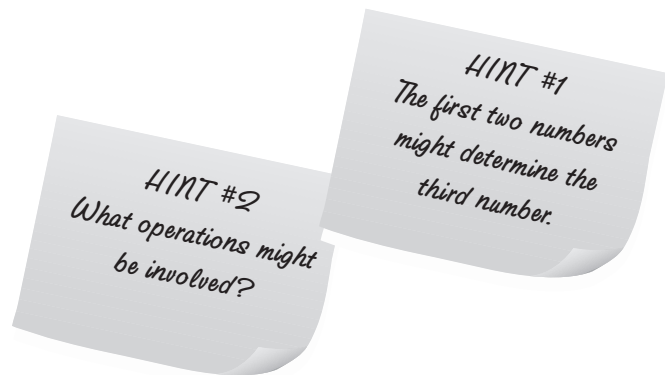
What are the only two possible values for B and C?

8. What is the missing number in the pie below?



9. The grid below has a certain pattern to it that holds true for each row. Can you determine that pattern and find the missing number?

6	3	8
4	9	6
7	5	5
9	3	7
?	8	4



-
10. Can you determine the missing number in the box? The same rule of logic applies to all three boxes.

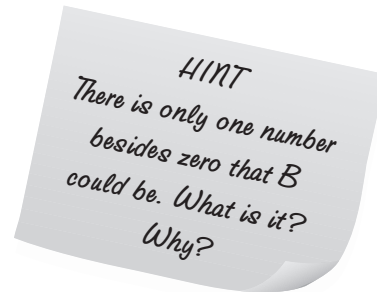
4	5	6
8	10	12
16	20	?
32	40	48

11. The three numbers in each box have a relationship that is the same in all six boxes. Knowing this, can you find the missing number where the question mark is? What is the relationship?

3	1	5
2	7	6
4	0	3
8	4	5
10	1	6
1	?	2

-
-
12. In the addition problem below, the letters AB represent a two-digit number. If you know that the letter B is not a zero (0), can you tell me which numbers represent A and B?

$$\begin{array}{r} AB \\ AB \\ +AB \\ \hline 19B \end{array}$$



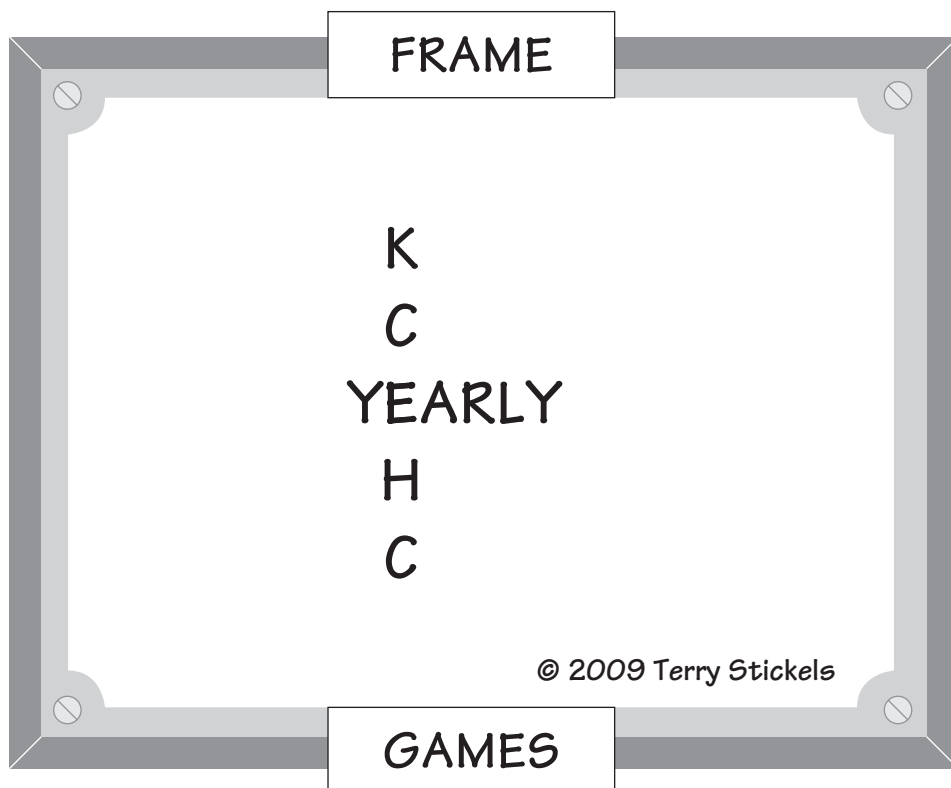
13. Below is a fun puzzle called an alphametic. Each letter stands for a different digit. Zero (0) is sometimes used for alphametics, but it can never start a word. You may use any of the digits 0–9.

$$\begin{array}{r} TWO \\ +TWO \\ \hline FOUR \end{array}$$

This puzzle has only one solution if we let the letter $W = 2$ and $R = 6$. Can you find the other numbers that fit the addition problem?

Just for Fun: Frame Game

14. Find the hidden phrase or title.



-
-
15. Analogy puzzles ask you to think about the relationships between two things. The symbol $:$ means “is the same as” or “is analogous to.”

Example: $5 : 25 :: 6 : ?$ would be read as “5 is to 25 as 6 is to what?”

The answer is 36 because 5 times itself is 25 and 6 times itself is 36.

Use the example above to answer these analogy puzzles.

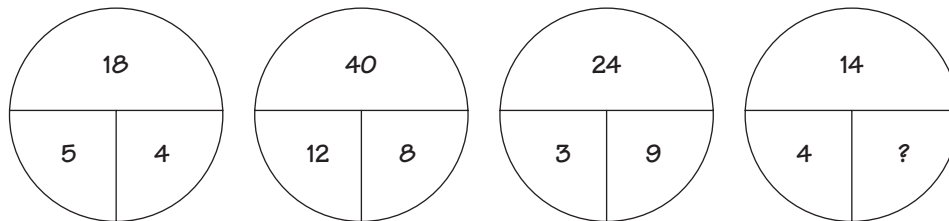
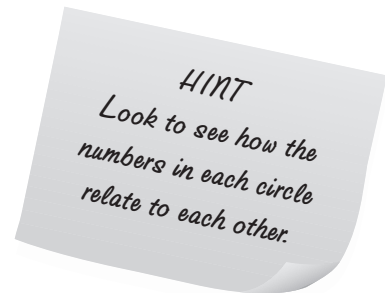
- a. $4 : 16 :: 10 : ?$

Choose from: 12 32 25 100

- b. Triangle : Hexagon :: Rectangle : ?

Choose from: Square Pentagon Line Octagon

16. By looking at the first three circles, can you see a pattern or relationship that is the same in all four circles? This pattern or relationship will help you determine the missing number in the last circle. What is that number?



-
-
17. Roman numerals are written as combinations of the seven letters below. They usually are written as capital letters because they are easier and less confusing to read.

Roman Numerals	
I = 1	C = 100
V = 5	D = 500
X = 10	M = 1,000
L = 50	

If smaller numbers follow larger numbers, the numbers are added. If a smaller number precedes a larger number, the smaller number is subtracted from the larger number. For example:

- VIII = 5 + 3 = 8
- IX = 10 - 1 = 9
- XL = 50 - 10 = 40
- XC = 100 - 10 = 90
- MCMLXXXIV = 1,000 + (1,000 - 100) + 50 + 30 + (5 - 1) = 1,984

Roman Numeral Table

1	I	14	XIV	27	XXVII	150	CL
2	II	15	XV	28	XXVIII	200	CC
3	III	16	XVI	29	XXIX	300	CCC
4	IV	17	XVII	30	XXX	400	CD
5	V	18	XVIII	31	XXXI	500	D
6	VI	19	XIX	40	XL	600	DC
7	VII	20	XX	50	L	700	DCC
8	VIII	21	XXI	60	LX	800	DCCC
9	IX	22	XXII	70	LXX	900	CM
10	X	23	XXIII	80	LXXX	1,000	M
11	XI	24	XXIV	90	XC	1,600	MDC
12	XII	25	XXV	100	C	1,700	MDCC
13	XIII	26	XXVI	101	CI	1,900	MCM

Change the following from Arabic to Roman and from Roman to Arabic numerals:

- | | |
|---------------|---------------|
| a. 59 = ? | e. LXIX = ? |
| b. 88 = ? | f. MCD = ? |
| c. 449 = ? | g. 2,919 = ? |
| d. MXLVII = ? | h. CMXCIX = ? |

-
-
18. Joan's sister scored 17 points in her school's basketball game. She had an even number of 2-point shots and an odd number of 3-point shots for her points. She attempted no freethrows. How many baskets of each type did Joan's sister make?
19. You can have lots of fun creating your own puzzles. Here's an example to get you started:

Write the numbers 1 through 9 in a straight line.

1 2 3 4 5 6 7 8 9

Now, depending upon what your goal is, you can insert the basic math operation symbols between the numbers and arrive at different totals.

$$1 + 2 + 3 + 4 - 5 + 6 + 7 - 8 + 9 = 19$$

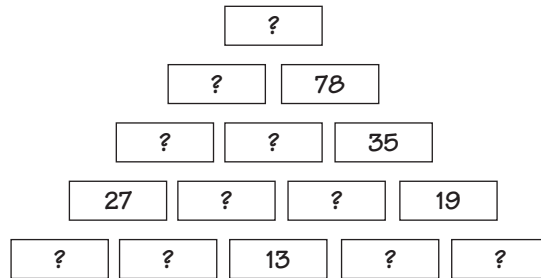
$$12 - 3 + 45 - 67 + 89 = 76$$

$$123 + 45 - 67 + 8 - 9 = 100$$

Now try to get the answer 100 in different ways. Then try to create some problems of your own. (Don't forget—you can use multiplication and division, too.)

20. Which of the values below is the same as 7?
- a. $(6 \times 5) \div 2$
 - b. $(3 + 4) \div 5$
 - c. $(10 - 4) + \frac{1}{1}$
 - d. $(12 - 5) + 2$

21. Below is a pyramid of numbers where the number on each brick is the sum of two bricks below it. The numbers given will help you fill in the entire pyramid.



22. Use the clues to find these mystery numbers that include decimals.

“My hundredths number is one half my tenths number. My ones digit number is twice my tenths number. There is no number 1 in any of the three places.”

What number am I?

_____ . _____ _____

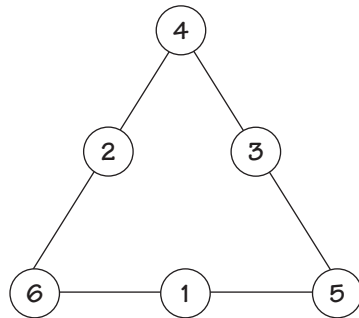
23. In the addition problem below, A, B, C, and D each stand for a different one-digit number.

None of the letters represents zero.

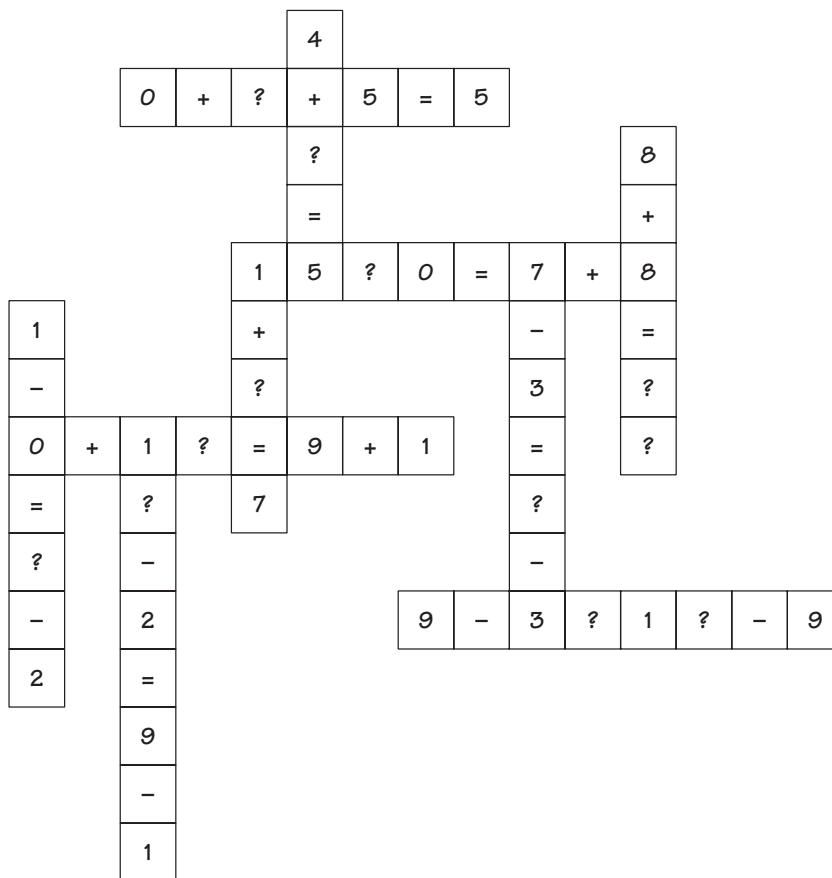
$$\begin{array}{r} A \\ +B \\ \hline DC \end{array}$$

If C is 5 and A is 7, then B is ?.




24. The numbers 1 through 6 are placed in the triangle below so that each of the three sides totals 12. Using the same numbers, can they be placed around the triangle so that each side totals 9?





25. Solve the puzzle by putting back the parts that are missing. Equations are formed horizontally from left to right and vertically from top to bottom. Use both numbers and math operations (+, −, and = signs).



26. On one of my math travel excursions, I ended up in the far-off land of Footfree. The entire country of Footfree liked shoes, and all the residents had some of the neatest and strangest shoes I've ever seen. Everything they did had to do with shoes. Even their schools were built like army boots. All the problems in their math books used shoes as examples—like this problem.

Three fourth-graders had shoes sizes of  $6\frac{1}{3}$,  $8\frac{1}{2}$, and  $5\frac{2}{3}$ (yes, they had all kinds of fractional sizes).

Three fifth-graders had shoe sizes that added up to the same total as the sum of the fourth-graders' shoes.

Two of the fifth-graders' sizes were  $7\frac{1}{4}$ and  $6\frac{1}{2}$. What size was the third fifth-grader's shoe?

27. Also, in Footfree, the residents liked to combine adding and multiplication. They had a math operation called a "shoebox" that looked like this:

$$5 \boxed{} 3 \rightarrow 23$$

The shoebox between the 5 and the 3 meant that you had to add $5 + 3$, then multiply 5×3 , and then add those two sums together:

$$\begin{array}{r} 5 + 3 = 8 \\ \underline{5 \times 3 = 15} \\ 23 \end{array}$$

What does this shoebox puzzle equal?

$$4 \boxed{} 2 \quad + \quad 3 \boxed{} 6 \quad = \quad ?$$

28. Before I left Footfree, the kids in all the math classes had “Footfree Puzzle Day” and asked me to be their guest. It was great fun with lots of food. Here is the puzzle they gave me to remember my time in their wonderful school:

Tennis shoes → \$4.00 (Footfree dollars)

Snow boots → \$3.00

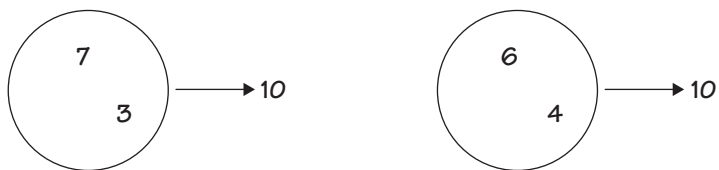
Slippers → \$2.00

Flip-flops → \$2.00

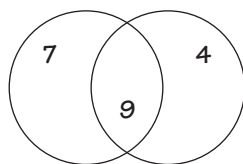
All of the above prices are based on a simple math concept. Based on these prices, what would a pair of loafers cost?

- a. \$1.00
- b. \$3.00
- c. \$4.00
- d. \$8.00

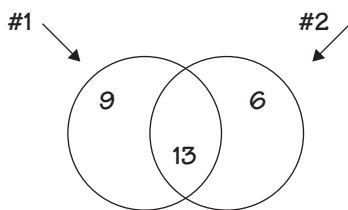
-
-
29. Here's a fun puzzle game called Circle Squeeze. Each circle has two numbers. For each pair of circles, the sum of their two numbers is the same, like this:



But the circles are like magnets. They crash into each other, and one number from each circle is added to one number from the other circle.

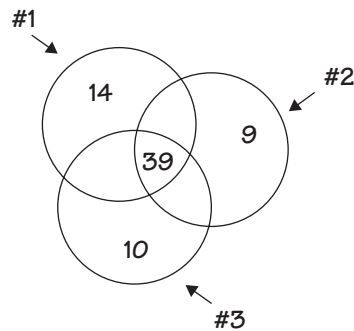


You can see here that the 3 from the circle on the left has been added to the 6 from the second circle to form the sum of 9. Now here's the puzzle:



What are the two numbers that go back into circle #1 and circle #2? In other words, what did these two circles look like before they were “squeezed” into each other? Is there an easy way to solve this?

30. What if there are three circles? What did these three circles look like before they were squeezed into each other?



31. The boxes on the left fit together in such a way that their numbers help to build the box on the right. See if you can determine how the numbers in the two rows on the left make the numbers on the right, then fill in the missing numbers.

a.

1	3	5	7	9
2	4	6	8	10

 →

3, 7, 11, 15, ?

b.

25	20	15	10	5
1	2	3	4	5

 →

24, 18, 12, 6, ?

c.

4	5	10	12	7
12	20	30	36	49

 →

3, 4, 3, 3, ?

d.

50	40	30	20	10
2	4	6	8	10

 →

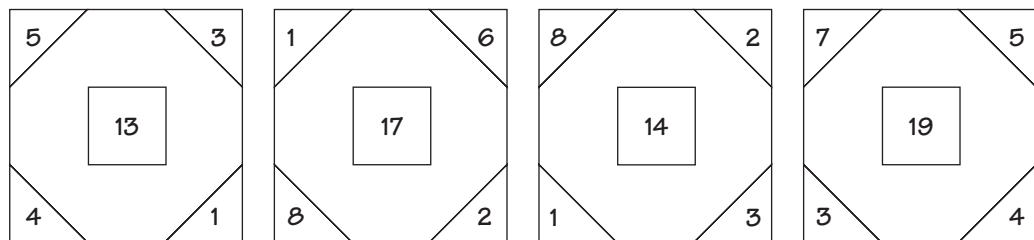
100, 160, 180, 160, ?

32. My friend Billy needs some help. His math teacher told him to take a look at the addition problem below.

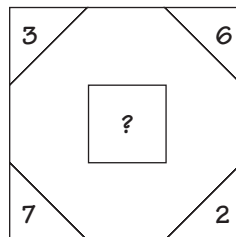
$$\begin{array}{r} 16 \\ +69 \\ \hline 85 \end{array}$$

The teacher then asked him what are the fewest number of single digits that would have to be changed for the sum to be 160 instead of 85. Can you help Billy? Here are the choices:

- 1 digit—the 1
 - 2 digits—the 1 and the 6 in “69”
 - 3 digits—the 9 and the 1 and 6 in “16”
 - 2 digits—the 1 and the 9
33. The numbers in the corners of the boxes below fit together in such a way that they determine the number in the middle of each box. The rule for finding that middle number is the same in each box.



Once you find that rule, see if you can put the correct number in this box:



34. What number or numbers comes next in this series?

1 22 333 4444 55555 666666 ?

35. Here's a fun puzzle game called FTN (Find This Number). It works like this:

I'll give you some instruction, and you put the clues together and write down the answer. Here's an example:

$7 < \text{this number} < 12$. This number is often used when speaking about cats. FTN!

Answer: The number is 9. Because 9 is more than 7 and less than 12, and cats are said to have 9 lives. Now try these:

- $3 < \text{this number} < 7$. This number is between two other numbers that total 10. FTN!
- $15 > \text{this number} > 9$ and exactly in the middle of the two numbers mentioned here. FTN!
- This number is $(5 \times 2) + 3 + 7 - 6$. Take that result and divide by 7 and multiply by 3. FTN!

36. In this puzzle, each of the letters has a whole-number value from 1 to 9. (No two letters can share the same value.) Your job is to find the value of the letters so the sum at the end of each row and column comes out correctly. To get you started: $A = 3$.

D	E	B	E	E	28
E	C	D	E	E	31
A	E	A	B	D	22
C	B	A	E	B	15
C	A	D	E	C	26
26	20	25	25	26	

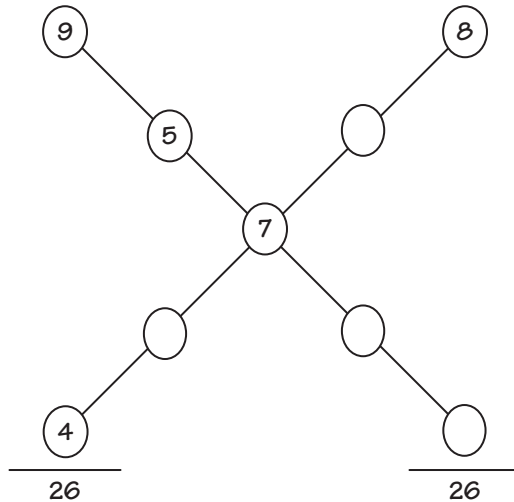
- 37.** In this arithmetic puzzle you have to fill in the question marks in the equations with numbers or one of the three operation symbols: +, −, ×. (This puzzle has no division.)

4	×	3	−	9	+	8	11
+		+		+		+	
8	×	9	+	3	−	?	71
+		×		+		−	
9	×	4	+	4	?	1	41
×		?		×		+	
3	+	8	−	?	?	9	18
		39		31		20	20

- 38.** Can you place the numbers 1, 4, 5, 6, 7, and 0 in the boxes below? Each number can be used once and only once. There is more than one correct answer.

$$\begin{array}{r}
 2 \\
 \square \\
 + \\
 \hline
 9
 \end{array}$$

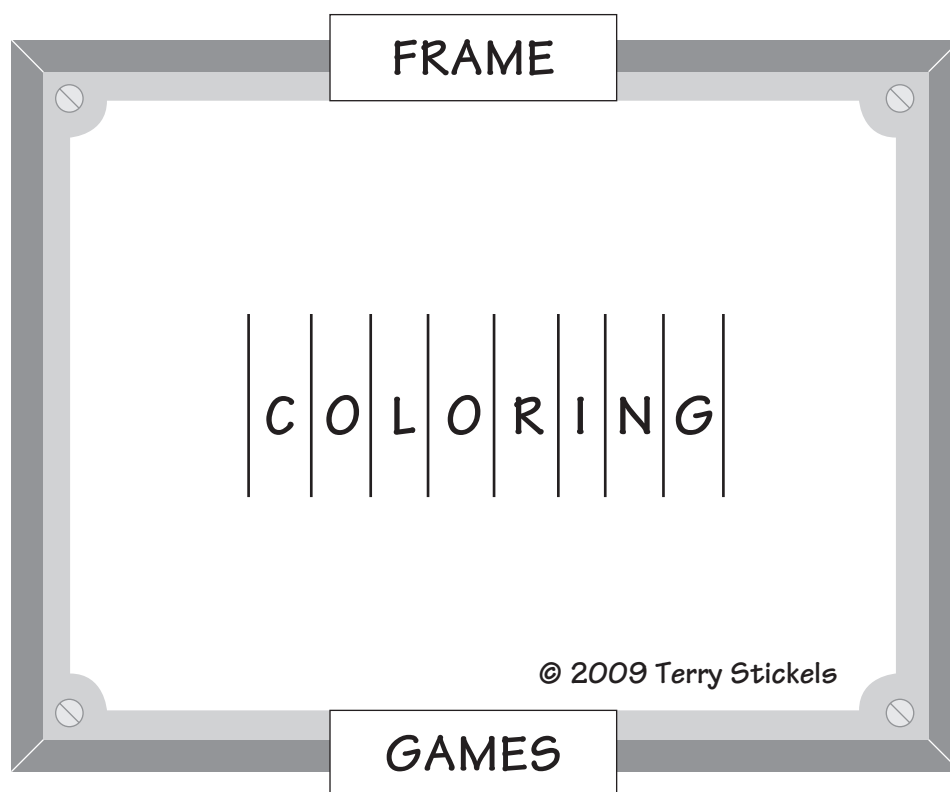
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39. The numbers 1–9 can be placed in the nine circles below in such a way that both sets of crossed circles can add up to 26. From the numbers already given, where would the number 1 go? It can be placed in either one of two circles.



40. In a group of 28 junior high school students, 7 take French, 10 take Spanish, and 4 take both languages. The students taking both French and Spanish are not counted with the 7 taking French or the 10 taking Spanish. How many students are not taking either French or Spanish?
41. A fruit dealer packages pears in two different box sizes. One size holds 5 pears and the other size holds 12 pears. The dealer sold 68 pears in one of the stores in one hour. He said to his assistant, "You don't see that very often. We sold the same number of boxes of each type of packaging." How many boxes of each size did they sell in one hour?

Just for Fun: Frame Game

42. Find the hidden phrase or title.



-
-
43. Suppose all numbers from 1 to 1,000 are arranged in columns like they are below.

A	B	C	D	E	F	G
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—

Under what letter will 50 appear? What about 100?

44. A person was born on May 14, 40 B.C. and died on May 14, 30 A.D. How many years did this person live?



HINT
Try using a number line.

45. Below is a fun type of puzzle called a Number Scramble or an Equation Scramble. The numbers and operations are scrambled, so you'll have to move things around so the equation will make sense. You must use all the parts in the boxes on the left-hand side of the equation to arrive at the solution on the right-hand side of the equation.

Here is an example:

$$\boxed{3} \quad \boxed{5} \quad \boxed{\times} \quad \boxed{7} \quad \boxed{+} \quad \boxed{()} \quad \boxed{=} \quad \boxed{56}$$

One solution is:

$$(3 + 5) \times 7 = 56$$

Now try these:

a. $\boxed{6} \quad \boxed{4} \quad \boxed{()} \quad \boxed{+} \quad \boxed{2} \quad \boxed{\times} \quad \boxed{=} \quad \boxed{32}$

b. $\boxed{\times} \quad \boxed{4} \quad \boxed{+} \quad \boxed{5} \quad \boxed{()} \quad \boxed{5} \quad \boxed{1} \quad \boxed{+} \quad \boxed{=} \quad \boxed{50} \quad \boxed{()}$

c. $\boxed{\times} \quad \boxed{\div} \quad \boxed{2} \quad \boxed{()} \quad \boxed{3} \quad \boxed{\times} \quad \boxed{4} \quad \boxed{6} \quad \boxed{=} \quad \boxed{4}$

d. $\boxed{1} \quad \boxed{+} \quad \boxed{+} \quad \boxed{2} \quad \boxed{3} \quad \boxed{\div} \quad \boxed{6} \quad \boxed{=} \quad \boxed{()} \quad \boxed{1}$

46. Complete the table using the pattern already created by the numbers you see. Fill in the last three boxes.

10	7	8
13	11	9
16	15	11
19	19	14
22	23	18
?	?	?

47. A certain whole number is evenly divisible by 3. It is also divisible by 5 and 4. What is the smallest number that fits these conditions? Can you find a number larger than 100 that is divisible by 3, 4, and 5?

48. One of the following numbers does not belong with the others in each of the three puzzles. The other numbers have a similarity the “odd one out” does not have. Which one does not belong?

a.	7		63		56
		21		28	36
b.		63		18	72
	54		45		36
				36	26
c.		16		64	45
	24		48		8

49. Using the 3×3 grid below, answer the following questions:

25	13	37
42	8	9
66	58	34

- a. The number beneath the number that is to the left of the number that is 37 is ?.
- b. The sum of three of the numbers in the squares equals 100. Two of the numbers multiplied together equals 225. What are the three numbers?
- c. The sum of the numbers in the two diagonals is 20 more than the sum of this row or column. Which row or column is it?

50. Two friends were playing a ring toss game where you throw 10 rings over the tops of cylinders 15 feet away. For each ring that goes over a cylinder, you receive 5 points. For each ring that misses, you lose 3 points. One of the friends scored 26 and the other scored 18. How many rings did each have that were successful tosses?
51. Look carefully at the numbers in each row of the pyramid below. See if you can find a relationship or pattern to determine the number that goes at the top of the pyramid.



52. In the equations below, replace each asterisk with one of the four math operations signs: +, −, ×, ÷. Each sign can be used once and only once. The parentheses have been placed for you.



- a. $(8 * 7) * 6 * (6 * 1) = 18$
- b. $5 * 4 * 3 * 2 * 1 = 7$

-
-
53. The second, third, and fourth numbers in each row below are determined by a simple method applied to the first number in each row. The procedure is the same for each row. See if you can determine how the second, third, and fourth numbers in each row were determined, and fill in the missing blank.



384	96	54	20
624	48	32	6
579	315	15	5
739	189	72	_____

54. Starting on January 1 of each year, a company has set up a delivery schedule in which the company will receive paper supplies every 2 days, bottled water every 3 days, and electrical supplies every 4 days. How often do the paper supplies, water, and electrical supplies arrive on the same day? On how many total days throughout the year will all three arrive?

55. Here are some more arithmetic square puzzles. Find the missing numbers or operation symbols that complete the equations.

a.

9	-	1	-	?	= 2
+		x		+	
?	x	7	x	4	= 56
x		x		x	
5	x	8	+	?	= 43
=		=		=	
19		56		18	

b.

7	+	9	-	?	= 12
+		+		-	
2	+	6	-	?	= 7
x		x		+	
8	+	3	+	5	= 16
=		=		=	
23		27		8	

c.

?	x	8	x	3	= 24
x		-		x	
?	-	?	+	6	= 13
x		x		x	
7	x	5	+	?	= 39
=		=		=	
63		2		72	

d.

1	x	?	x	2	= 16
x		-		x	
?	x	6	+	?	= 37
+		x		-	
3	x	9	x	4	= 108
=		=		=	
8		46		10	

-
-
- 56.** This is a fun puzzle called Addiply. It combines both addition and multiplication.

Using the numbers 1 through 9 (you can use higher numbers as you become more proficient at solving these), look for combinations of two numbers to find the ones whose sum and product match the numbers given. Here's an example:

1st Number	2nd Number	Sum	Product
3	4	7	12
4	6	10	24
?	?	6	8

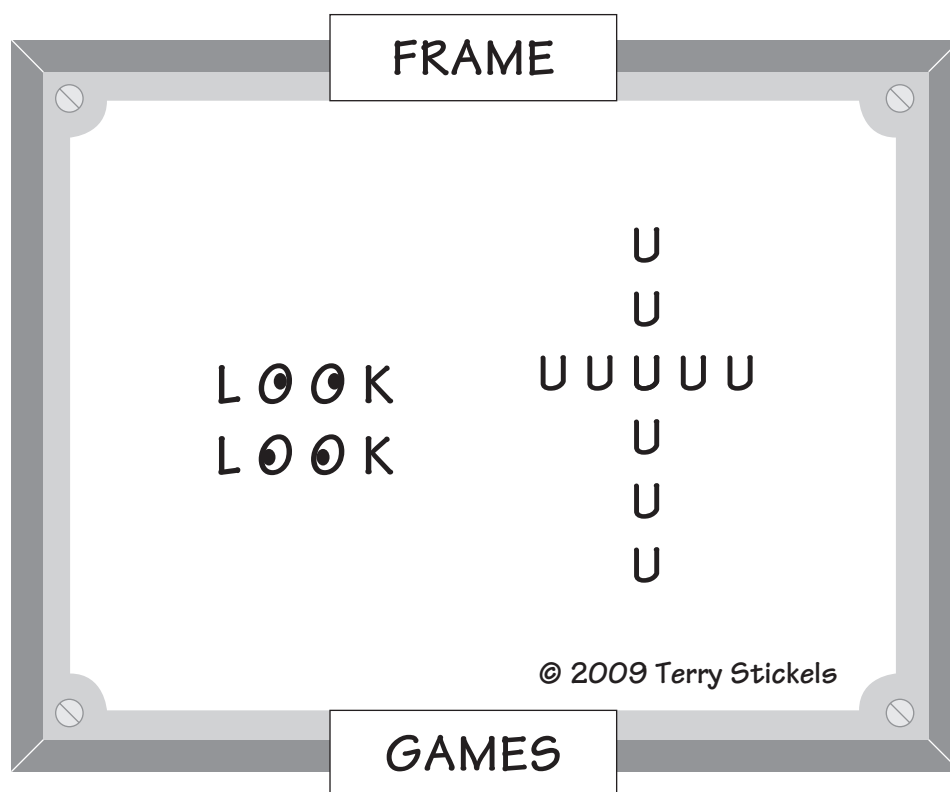
Answer: The two missing numbers are 2 and 4 (in either order).

Now try these:

	1st Number	2nd Number	Sum	Product
a.	5	?	14	45
b.	?	?	8	15
c.	?	?	13	36
d.	?	?	9	8

Just for Fun: Frame Game

57. Find the hidden phrase or title.



-
-
- 58.** Below are some football scores from a fictitious college football season. One of the things fans like to do is compare scores of different games to see what might happen if two of their favorite teams might meet in a game later in the year—maybe in a Bowl game.

For example, let's say Michigan beat Nebraska 24 to 20. Later that season Nebraska beat Texas 17 to 10. Then it is decided that Michigan will play Texas in the Rose Bowl at the end of the season. Based only on the scores of the games above, a Michigan fan might conclude that Michigan should beat Texas by 11 points, because the team beat Nebraska by 4 and Nebraska beat Texas by 7 ($7 + 4 = 11$). This type of fan game is called a Game Ladder and is used to determine national rankings.

Try your skill at these scores and predict who would win according to a Game Ladder if Oklahoma were to play UCLA. And by how much?

Oklahoma beats Northwestern 21 to 7

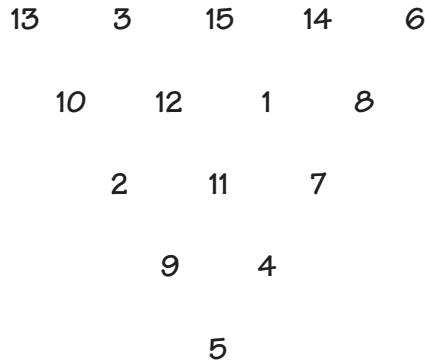
Northwestern beats Iowa 31 to 30

Iowa beats UCLA 17 to 10

- 59.** Find the relationship between the numbers in the top row and the numbers in the bottom row, and then determine the missing number.

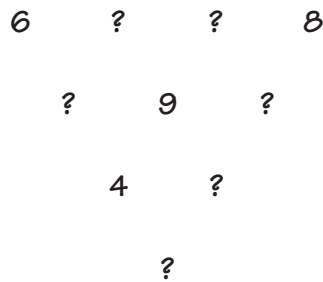
12	24	36	45	60	84
6	8	9	9	10	?

-
60. Below is a “subtraction triangle,” where the numbers directly below the two numbers above them result from subtracting the two numbers. The numbers in the following example are from 1 to 15, and each number is only used once.

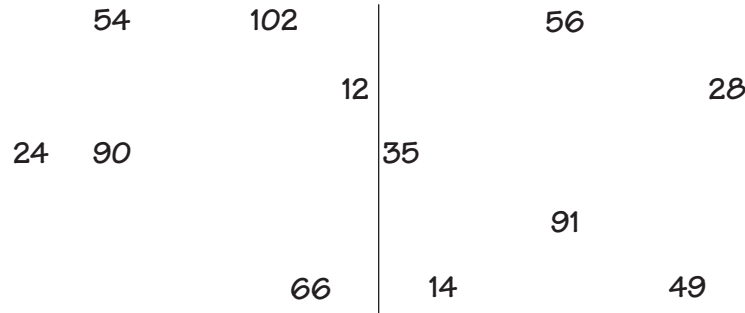


Notice that $13 - 3 = 10$, $15 - 3 = 12$, $8 - 1 = 7$, $9 - 4 = 5$, etc. As you can see from the $15 - 3$ example, the two numbers can be subtracted in any order.

Now see if you can build a subtraction triangle using the numbers 1 to 10. I'll help get you started by supplying a few numbers.



61. The numbers on each side of the line are grouped together for a specific reason because they share a basic feature in common.



- a. On what side of the line would the number 98 fit?
 - b. On what side of the line would the number 18 fit?
 - c. What is a number that might fit on either side?
62. Bess weighs 20 pounds less than her brother Brandon. Together they weigh 120 pounds. What does each weigh?
63. Here's an alphametic puzzle where each letter stands for a positive whole number between 0 and 9. Zero (0) cannot begin a word. I'll help you get started.

$$\begin{array}{r}
 \text{ICE} \\
 + \text{CREAM} \\
 \hline
 \text{CAKES}
 \end{array}$$

Let A = 3
 I = 9
 R = 2
 S = 8

-
-
64. Here's another alphametic puzzle. Each letter has a digit value. Zero (0) cannot begin a word. I'll give you some hints to get you started. When completed properly, this will be a correct addition problem.

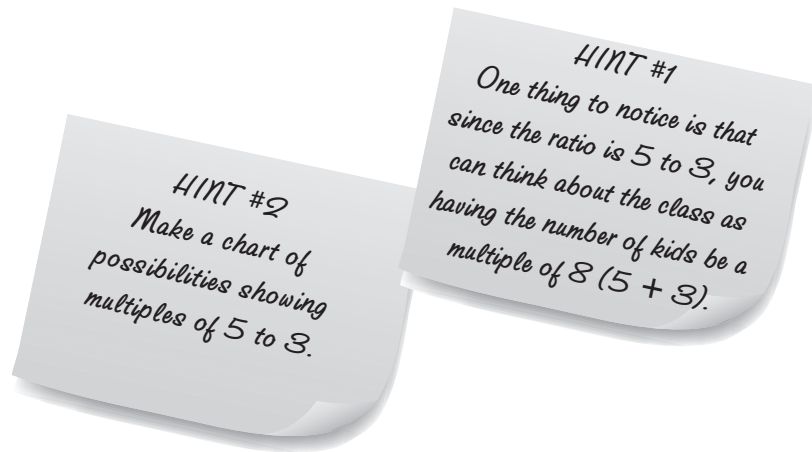
$$\begin{array}{r} \text{THIS} \\ + \text{IS} \\ \hline \text{NEAT} \end{array}$$

Let $A = 7$

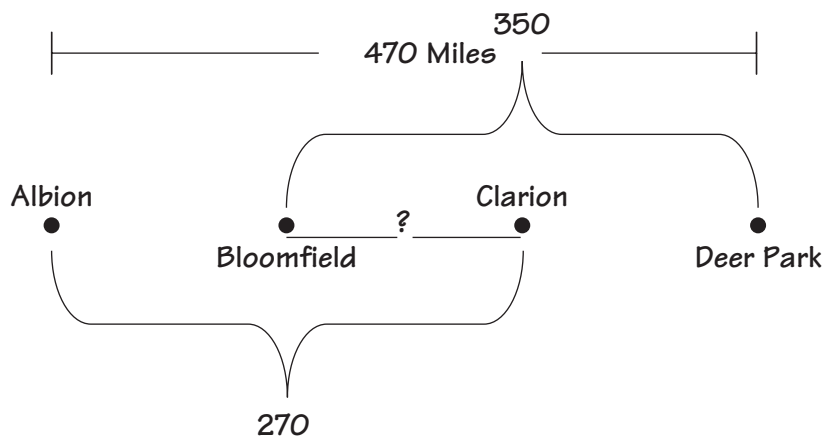
$T = 2$

The number 1 is not in this puzzle.

65. In Nina's class the ratio of boys to girls is 5 to 3. There are 10 more boys than girls. How many girls and boys are there in Nina's class?



66. Jim and his mom were taking a vacation from their home in Albion to a lake resort in Deer Park. The total distance from Albion to Deer Park is 470 miles. Jim knows that the distance from Albion to Clarion is 270 miles. Jim's mom also had told him that the distance from Bloomfield to Deer Park is 350 miles. But neither Jim nor his mom was sure of the distance from Bloomfield to Clarion. Note that Bloomfield and Clarion are between Albion and Deer Park (see the diagram below). Can you help Jim and his mom find the distance from Bloomfield to Clarion with the information given?



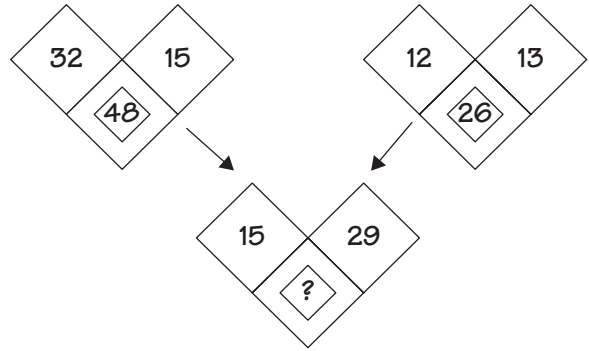
67. In the following words, the letters in the alphabet each have been given a number, following a logical sequence. If $C = 3$, $E = 5$, $S = 19$, $I = 9$, $A + T = 21$, and $C + A + T = 24$, can you figure out what number these words equal?

$$\begin{array}{ll}
 B + E + E = ? & G + A + M + E = ? \\
 Z + O + O = ? & S + C + H + O + O + L = ? \\
 D + O + G = ? & I + S + L + A + N + D = ?
 \end{array}$$

68. Carla was enjoying her new calculator and discovering all the features and functions. She accidentally multiplied a number by 5 when she should have divided by 5. The incorrect answer displayed was 75. What should have been the correct answer?

- a. 3 c. 15
b. 6 d. 25

69. Here's a puzzle called Triple Diamonduzzle. The numbers in the two sets of diamond figures on top have a relationship that determines the number inside the small diamond on the bottom. Here's an example:



Answer: 45

The numbers on top are added together. The number found in the smaller diamond on the bottom is one more than the sum of those two numbers.

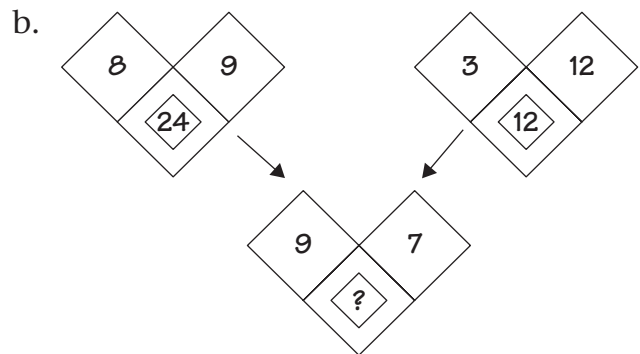
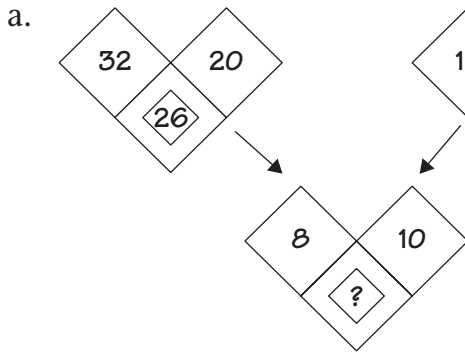
$$32 + 15 = 47$$

$$12 + 13 = 25$$

$$15 + 29 = 44$$



Try these Triple Diamonduzzles:



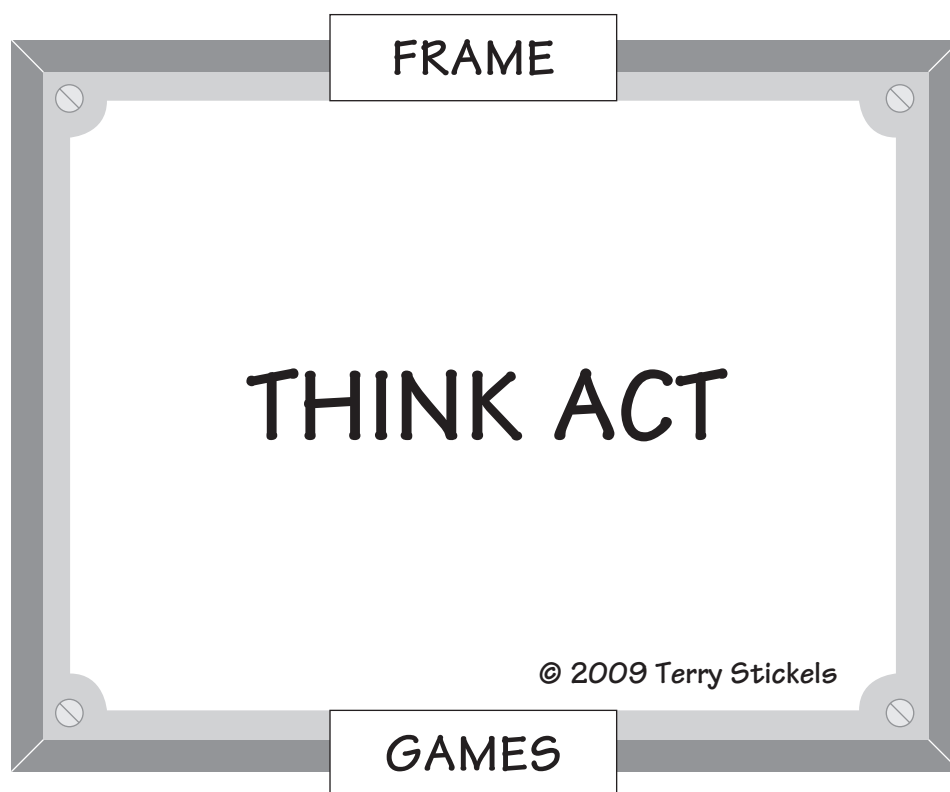
70. Five friends each bought a candy bar and a drink at the local convenience store. When they checked to see how much money each of them had left, the answer was surprising. Each had less than 50 cents, and each had just 4 coins. No one had pennies or quarters. Each of the five friends had a different amount of money. What amounts did they each have left?

71. Each series below follows its own logical rules. Can you determine the next number in each series?

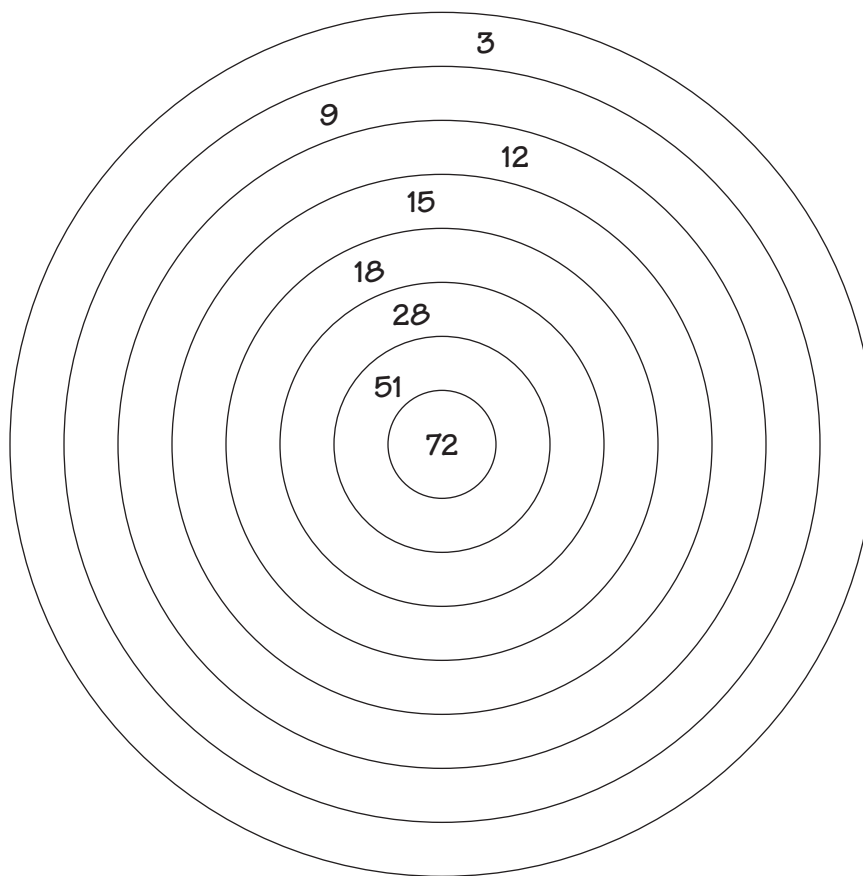


Just for Fun: Frame Game

72. Find the hidden phrase or title.



-
-
- 73.** Elise took an archery class last summer. The targets had an unusual scoring system, shown in the illustration below. One of the weekly goals was to shoot arrows into the targets where the total would be exactly 100. For example, two arrows, one of which landed inside 72, the other of which landed in 28, would total 100. Another example might be seven arrows that landed like this: 3, 9, 12, 15, 18, 28, and 15 again. Can you come up with two more sets of numbers? What number must always be in any group to reach 100? Why does that number have to be in any grouping?



74. This is a very old puzzle that goes like this:

*As I was going to Saint Ives,
I crossed the path of seven wives.
Every wife had seven sacks,
Every sack had seven cats,
Every cat had seven kittens,
Kittens, cats, sacks, wives,
How many were going to Saint Ives?*

Two answers usually are given. The first answer is one. Since the narrator was going to Saint Ives, the seven wives must have been leaving Saint Ives because the narrator crossed their paths. The other answer is the one many people come up with: 2,801 (7 wives, 49 sacks, 343 cats, and 2,401 kittens equal 2,800. Then you have to add one more for the person speaking the words of the riddle.)

Now, here's our version. How many of each are there?

<i>Five by five they walked my way</i>	<i>And the stars had five points</i>
<i>Side by side their arms did sway.</i>	<i>Just like you thought</i>
<i>Gold pips on their shoulders</i>	<i>Would cost you a fortune</i>
<i>To carry the day.</i>	<i>For you to have bought.</i>
<i>Brass-tipped swords</i>	<i>So, soldiers and pips</i>
<i>Full battle array.</i>	<i>And swords with brass tips</i>
<i>Each with white gloves</i>	<i>White gloves with a star</i>
<i>They were a sight to see</i>	<i>Five points seen afar.</i>
<i>Each glove with a star</i>	<i>Add them together</i>
<i>Silver and shiny.</i>	<i>Would you kind sir?</i>
	<i>Tell me the total</i>
	<i>My mind is a blur.</i>

75. Find the pattern starting with the first four numbers and moving to the right, and then fill in the missing number.

3	15	7	4	2	45	10	66	12	?
5	6	1	21	9	8	11	50	20	72

Now, using any whole numbers you wish, create your own grid of four numbers that will continue the sequence above.

76. The grid below has a specific pattern that determines the numbers in each box. What are the missing four numbers?

9	6	2	1
15	12	8	7
21	18	14	?
27	24	20	19
?	30	?	?

77. Here is a number cross where the sum in both directions is 23 (using the numbers 1–9 once and only once).

		4		
		5		
2	3	1	8	9
		6		
		7		

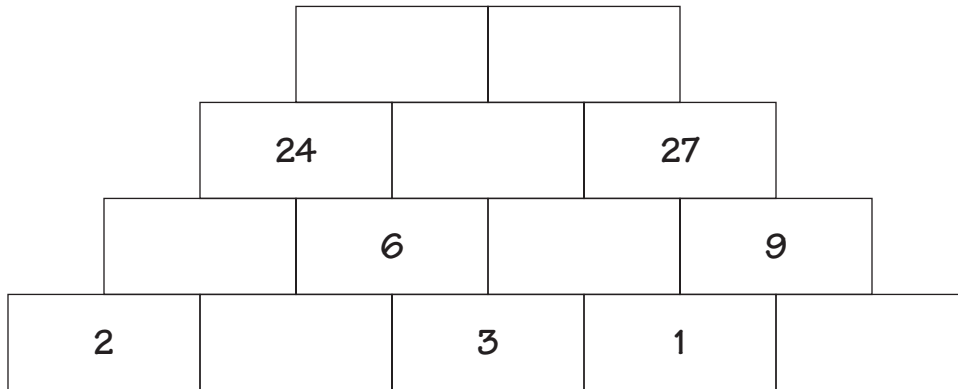
Now create a number cross that has a cross sum of 24 using the numbers 1–9 once and only once. (There are several possible variations, but the number in the middle will always be the same.)

78. All but one of these numbers share a common factor. Which number is the odd one out? What is the common factor?

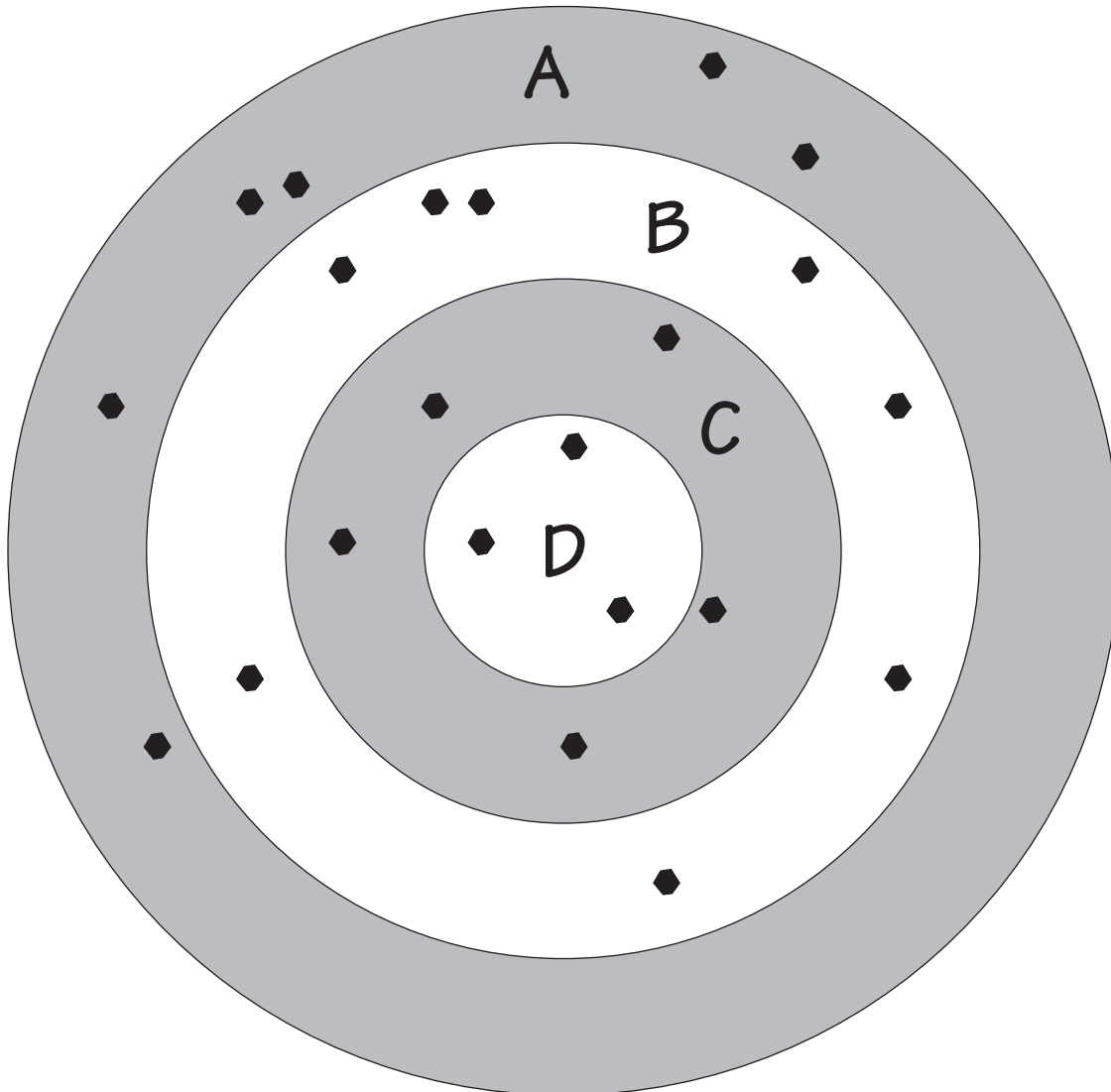


185 407 111
 740 37 1369 78

79. Can you fill in each of the boxes so the number in a rectangle is the product of the two numbers beneath it?

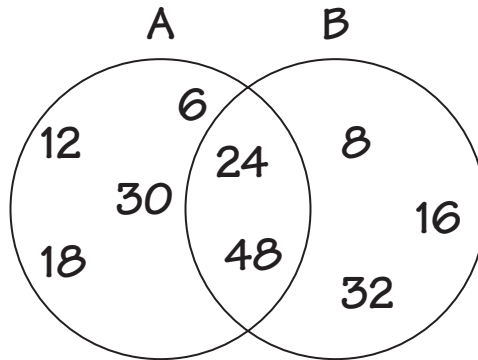


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-
80. Maria and Damian were playing a bull's-eye game where each layer in the target had a different point value. Layer A was worth 1 point for each hit. Layer B was worth 5 points for each, and Layer C was worth 10 points.



They saw that the total on the scoreboard was 156 points—but the lights that showed the value of the three target hits on D were out. Maria knew how to find out their value right away. How did she find the value of the target hits in D?

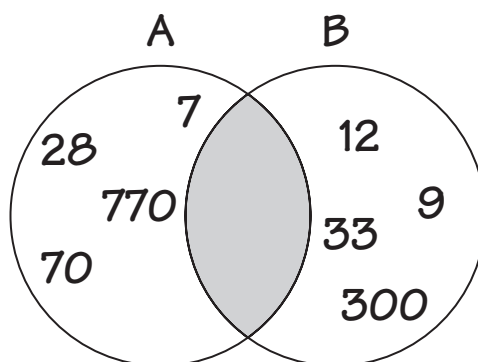
-
-
81. The numbers in Circle A below are factors of 6. The numbers in Circle B are factors of 8.



Where do the following numbers go?

- a. 72
- b. 40
- c. 36
- d. 25
- e. 480

82. The numbers in Circle A below are factors of 7. The numbers in Circle B are factors of 3. Pick three numbers that will fit in the shaded area.



Rational Numbers

- 83.** My sister gave me a bunch of pennies and nickels in change for a dollar bill and two dimes. She then said to me, "You have the same number of nickels as you do pennies in that \$1.20." How many nickels and pennies did my sister give me?
- 84.** My father bought me a pencil and a protractor. Together, the cost was \$3.00. The protractor was \$2.00 more than the pencil. How much was the pencil?
- 85.** 9 is $\frac{1}{2}$ of 18; 18 is $\frac{1}{2}$ of 36. What is 72 divided by $\frac{1}{2}$?
- 86.** Brady goes running for $\frac{3}{4}$ of an hour. When he comes home, he goes shopping with his mom for $\frac{2}{3}$ of an hour. How many minutes does Brady spend running and shopping?
- 87.** Central Park Middle School has 100 kids. Each student is required to participate in an extracurricular activity. The choices are band, tennis, basketball, and drama club. $\frac{3}{10}$ of the students are in band, $\frac{1}{10}$ are in tennis, and 17 play basketball. How many students are going to participate in drama club?

88. Try to match the left column with the appropriate number in the right column. You may not know each one, but you might be able to make some “educated guesses” that can get you the correct answer.

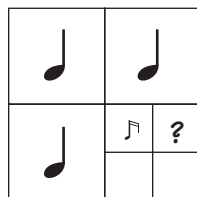
- | | | |
|----|-----------------------------|---------------|
| a. | 4^3 | 14 |
| b. | $\frac{1}{8} + \frac{1}{8}$ | $\frac{1}{4}$ |
| c. | $\frac{5}{9}$ | 64 |
| d. | XIV | .555... |

HINT
 $5 \times 5 \times 5$ is also called 5 cubed and can be written 5^3 . It is equal to 125.

89. See if you can place these fractions from lowest to highest value. I'll get you started. $\frac{1}{10}$ has the least value.

$$\frac{3}{5} \quad \frac{1}{10} \quad \frac{15}{17} \quad \frac{1}{5} \quad \frac{4}{9} \quad \frac{1}{3}$$

90. Below is a box divided into different-sized squares with musical notes in each grid. What fraction of the entire big box would be represented by the small box with the question mark?



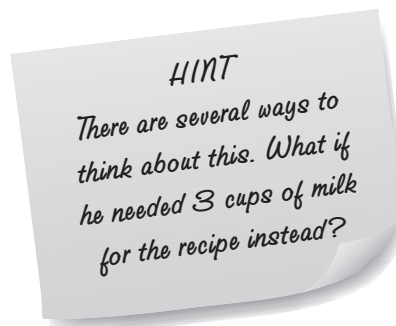
HINT
 If you know music, then you know ♪ is a quarter note.

-
-
91. Mary said to her brother, “I was given an assignment to use the numbers 8 and 9 and any math symbol or operation I want, to make a number greater than 8 but less than 9. I can use only one symbol or operation. I don’t think it can be done.”


Her brother replied, “I can do it in five seconds. Period.”

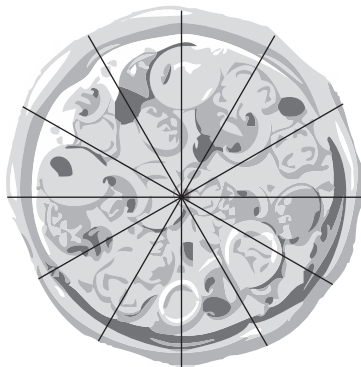
If the word “period” is a hint, how did her brother do it?

92. Rolando is making a cake and needs exactly 6 cups of milk for the recipe. He has small containers of milk that he can use, but they come in only $\frac{3}{4}$ -cup containers.



How many smaller containers would be needed to have the 6 cups he needs for the recipe?

93. Our baseball team won the league championship. For our awards dinner, the team had a pizza party. Each giant pizza was cut into 12 pieces. When they brought the giant pepperoni pizza, Jimmy grabbed $\frac{1}{3}$ of the entire pizza, Mark took $\frac{1}{6}$ of the pizza, Ernie grabbed $\frac{1}{4}$, and Roberto took $\frac{1}{6}$. How many individual pieces were left of the giant pepperoni pizza? 



-
-
94. Here's a fun puzzle. See how many different ways you can put three 3's together. You can use any math symbols you wish. For example:

$$(3 \times 3) + 3 = 12 \quad \text{or} \quad 3 \times \frac{3}{3} = 3 \quad \text{or} \quad \frac{(3 \div 3)}{3} = \frac{1}{3}$$

- a. Can you make three 3's equal 11?
- b. How about using three 3's to make 4?
- c. Try making three 3's equal $\frac{1}{2}$.

95.

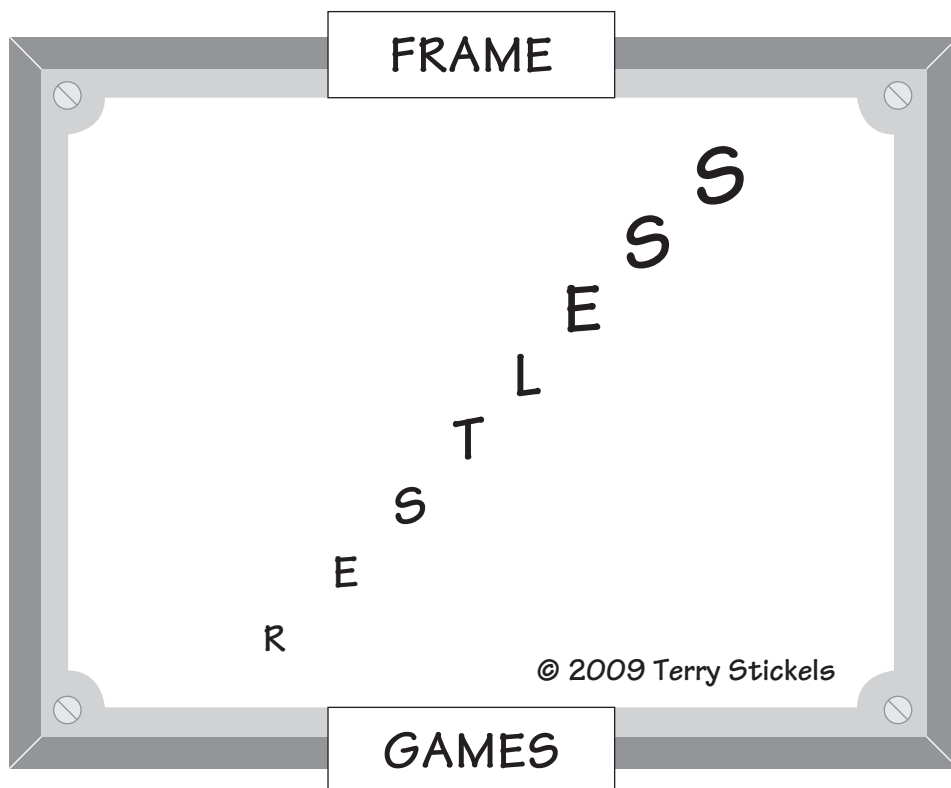
80	63	48	35	24	?
8	7	6	5	4	3

What is the relationship between the top and bottom boxes of each set, and which of the following might fit in the box with the question mark?

- a. 20
- b. 18
- c. 47
- d. 15

Just for Fun: Frame Game

96. Find the hidden phrase or title.



-
-
97. Marty's father has work crews who cut trees. He has one crew of six men who can cut 10 trees in a day. He is going to send them on a project where they need to cut 30 trees. How many days will it take this crew to accomplish this?

On the next project after this, Marty's dad has decided to increase the crew to 12 men. This new project has 20 trees. So, with 20 trees and 12 men, how long will the crew take to complete the work?

98. What is the value of the following expression?

$$\frac{3 \times 3 \times 3 \times 3}{3 + 3 + 3} =$$

- a. 5
b. 3
c. 9
99. Which of the following fractions are less than $\frac{1}{3}$?
- a. $\frac{15}{46}$ b. $\frac{33}{90}$ c. $\frac{5}{12}$ d. $\frac{101}{300}$

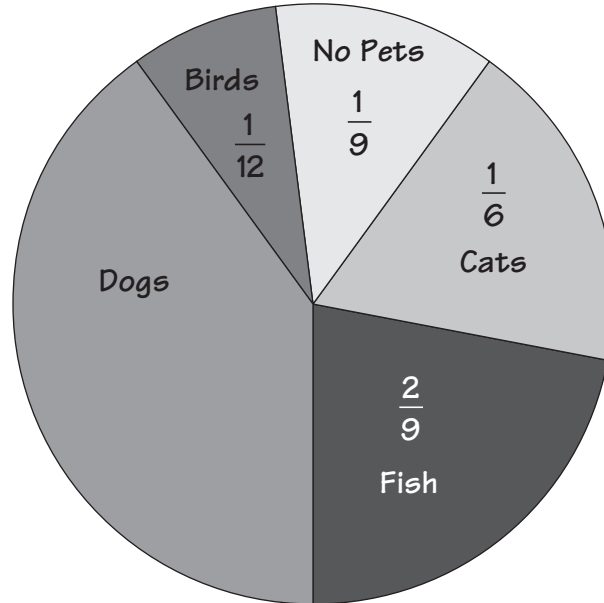
100. Amelia's father works in a chocolate factory that makes 400 pounds of chocolate into a big brick, then shaves off enough to package it into boxes that hold 2.5 pounds of chocolate each. Each box then is sold for \$10. What is the total selling price of all 400 pounds of chocolate?

101. Allison has \$.82 in coins. There are no more than two of any one coin. (There is not a \$.50 piece.) Can you tell me how many coins Allison has?



102. Matt made the circle graph below to show how many students in his school had pets. Of the total students, 180 students gave Matt the information and 20 said they had no pets.

- What fraction of the students had a dog?
- How many students is that?
- What is the fraction of bird owners compared to dog owners?
- How many students are represented by kids who own fish, cats, and no pets?



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103.

Here is a puzzle made just for you:

The clues are right there, but just a few.

Pennies and nickels in my pocket for now

Add in some quarters and I'll tell you how

To add up the total with some dimes there, too.

Five of the first—now that's just a start

Eight of the dimes—but that's only part.

Quarter and nickels—the number's the same.

Are you still with me now, your head in the game?

Twenty-one total, that is the count.

Coins in my pocket, no small amount.

So tell me, my friends, what do you see?

How much money for you and for me?

104. Olivia needed change for the bus. She exchanged a \$1 bill and two quarters for nickels and dimes. When she looked at what she had been given, she was surprised to see the same number of nickels and dimes. How many of each did she have?

105. Janie's dad asked her this question at dinner, and she wasn't sure of the answer. Could you help her?

“You have three numbers, and two of those numbers are $\frac{2}{3}$ and $\frac{3}{4}$.

What should the third number be so all three numbers average 2?”

106. Amara was reading a book about a funny monster who had a paisley toenail. When Prozillio (the name of the monster) tried to cut his toenail, 2 more grew back. When he cut these two, 4 toenails grew back. Of course, he couldn't believe his eyes, so he cut the 4 toenails and 8 grew back. So, after 3 cuttings, he had 8 toenails. What if Prozillio kept cutting? How many toenails would he have after 7 cuts?

107. What number goes where the question mark is?

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \frac{15}{16}$$

$$\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} = \frac{15}{32}$$

$$\frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} = \frac{?}{64}$$

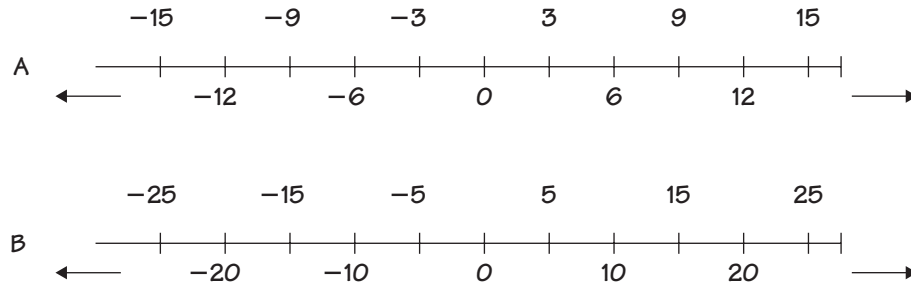
108. Here's a fun fraction sequence. Can you find the missing number?

$$\frac{1}{2} \quad \frac{1}{6} \quad \frac{1}{3} \quad \frac{1}{5} \quad \frac{1}{4} \quad \frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{3} \quad \frac{1}{6} \quad ?$$



109. If I have 1 penny, 1 nickel, 1 dime, and 1 quarter, what fraction of \$1.00 do I have?

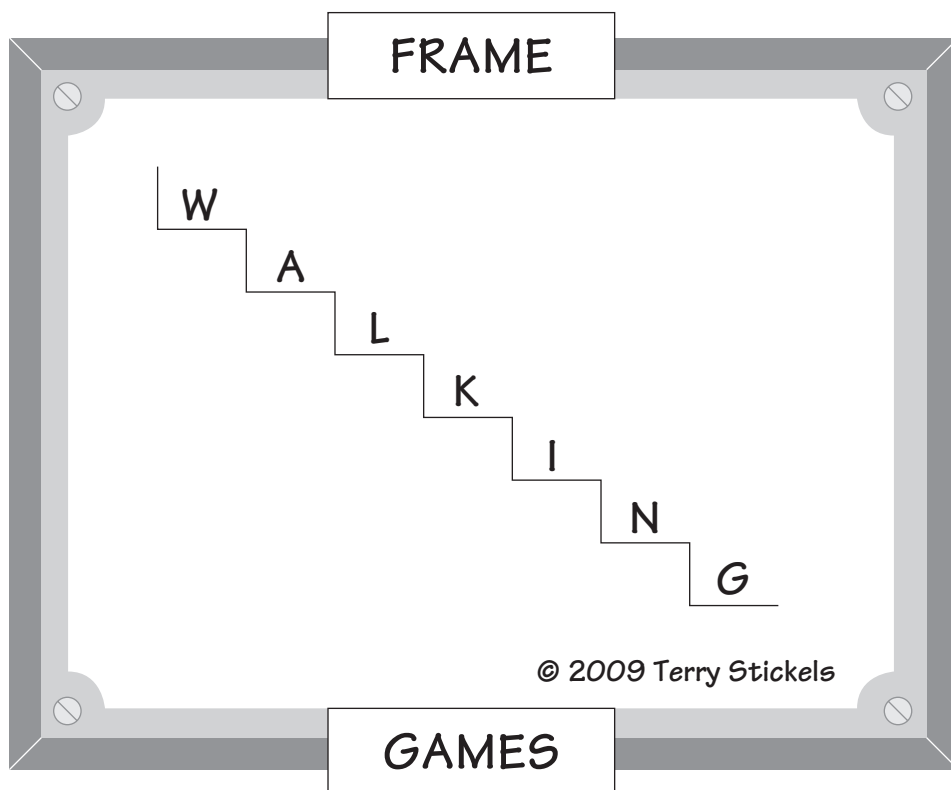
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110. Below are two number lines. One is marked for every third number. The other is marked for every fifth number. If you placed one number line on top of the other, the origins would be the same. The numbers 3 and 5 would be together, 6 and 10 would be together, etc. The same for the negative numbers: $(-3, -5)$ $(-6, -10)$.



- a. When line B reaches 100, what number will be read at the end of line A that is on top of line B?
- b. If a point on line A reads -24 , what is the same point on line B?

Just for Fun: Frame Game

111. Find the hidden phrase or title.



112. You can use four 9's to make 99: $(9 \times 9) + (9 + 9) = 81 + 18 = 99$

You can use four 9's to make 2: $\frac{9}{9} + \frac{9}{9} = 1 + 1 = 2$

You can use four 9's to make 990:
$$\begin{array}{r} 999 \\ - 9 \\ \hline 990 \end{array}$$

But can you make four 9's equal 100?

113. The fractions and percentages in the left-hand column have equivalent values in the right-hand column. Can you match them?

Examples: $\frac{5}{8} = .625$

$$37\% = \frac{37}{100}$$

$$\frac{1}{2} \div 5 = \frac{1}{10}$$

- | | | |
|----|----------------------------------|-----------------|
| a. | $\frac{2}{5} \times \frac{5}{8}$ | $\frac{11}{25}$ |
| b. | $\frac{3}{8}$ | $\frac{5}{6}$ |
| c. | 44% | $\frac{1}{4}$ |
| d. | $\frac{2}{9}$ | .2222... |
| e. | $\frac{1}{3} + \frac{1}{2}$ | .375 |
| f. | 4.4% | .044 |

-
-
114. A pan of brownies $9'' \times 9''$ serves 8 people. How many people will a pan of $18'' \times 18''$ serve?

HINT #2
Remember—you're
dealing with square
units.

HINT #1
Be careful! Take a close
look at what is needed.

HINT #3
Think of comparing
area to people.

115. Zara's dad said he had just driven the 3 miles home from work in 4 minutes, without stopping. How many miles per hour is 3 miles in 4 minutes?

116. Which of these are bigger?

a. (1) 171 hundredths \times 171 hundredths

(2) 1.71000×1.71000

(3) They are the same.

b. (1) $\frac{1}{2} + \frac{1}{7}$

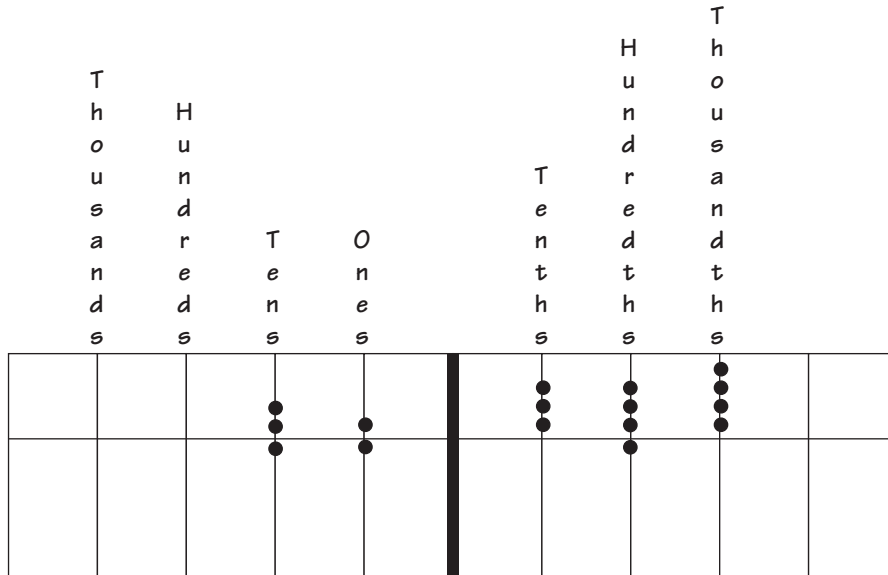
(2) $\frac{1}{3} + \frac{1}{6}$

(3) $\frac{1}{4} + \frac{1}{5}$

(4) They are the same.

-
-
- 117.** There are 60 seconds in 1 minute. There are 60 minutes in 1 hour. There are 5,280 ft. in 1 mile. So what are the following in miles per hour?
- a. 88 ft./sec. = ? miles/hr.
 - b. 440 ft./sec. = ? miles/hr.
- 118.** The school's copying machine needs repairs. It will not make copies that are the exact size of the document being copied. In other words, there is no 100% button. Copies can be made larger and smaller. For example, the 200% button works, so copies can be made twice as large. The 50% button works, so copies can be made $\frac{1}{2}$ their original size. The machine also has 40% and 20% buttons. Pam knows that she can make a 100% copy by blowing up the original to 200% and then pushing the 50% button, so she feels comfortable making copies of different sizes by pushing the buttons in different combinations.
- a. How can she make a document $\frac{1}{4}$ its original size (25%)?
 - b. 80% its original size?
 - c. What happens if she mistakenly pushes the 20% three times? What percentage or fraction will the size of the document be?
- 119.** Laura saw that there were three pieces of candy left in a bowl on the kitchen table. She knew they were either chocolates or caramels but didn't know how many of each. What is the probability that there is a piece of chocolate candy in the bowl?
- a. $\frac{1}{2}$
 - b. $\frac{7}{8}$
 - c. $\frac{1}{3}$
 - d. Can't tell
-
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120. In the diagram below, the circles above the crossbar have a value of 1. These below the bar have a value of 5. The bold black line is 0 (zero). The numbers to the left are whole numbers (ones, tens, hundreds, thousands). The numbers to the right of the bold line are fractions (tenths, hundredths, and thousandths).



What number do the circles represent?

- a. 120.371
- b. 36.281
- c. 76.344
- d. 76.384

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121. A grocery store recently did a survey of its customers to see what kinds of candy they preferred. Of the 1,000 people surveyed, 48% liked *Chocolate Crunchers*. Of that 48%, one-third thought it was the second best-tasting candy bar, and of that group, 25% thought it was the third best-tasting candy bar. All the rest who weren't in the above percentages thought it was the best-tasting candy.

How many thought it was the third best-tasting candy bar? How many thought it was the best-tasting candy?

122. What is $\frac{1}{2}$ of $\frac{1}{3}$ of $36 \times 6 \div \frac{1}{2}$?

123. What is 37% of 37% of 37% of 37% of 1?

- a. .1369 squared
- b. .37 to the 4th power
- c. 1.87%
- d. All of the above

