Problem Solutions

N(NC)-01, Page 10

Jerry: 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810,820, 830, 840, 850, 860, 870, 880, 890, 900,910, 920, 930, 940, 950, 960, 970, 980, 990. Jerry says 37 numbers.

Erica: 875, 880, 885, 890, 895, 900, 905, 910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970, 975, 980, 985, 990, 995. Erica says 25 numbers before reaching 1000.

Johnel: 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 062, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 075, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999. Johnel says 64 numbers before 1000.

N(NC)-02, Page 11, *Answers vary.*

Answer varies depending upon class size. Largest number is triple the number of students in the class. Smallest number is the same as the number of students.

N(NC)-03, Page 12

Split the set of bingo chips between Janna and Susan, giving each girl 37 chips (37 + 37 = 74). To ensure Janna has 10 more chips than Susan, give 5 of Susan's chips to Janna:

Janna: 37 + 5 = 42.
Susan: 37 – 5 = 32.
Total: 42 + 32 = 74.

N(NC)-04, Page 13

We may use 0, 1 or 2 single blocks, therefore we can make the numbers 30, 31 or 32. However, the problem does not limit blocks larger than the long blocks, so any combination of flat blocks or large cubes together with the 3 longs and singles would also be correct! Other possible solutions: 130, 530, 3432, 731, etc. In all, there are 300 solutions using only the single, long, flat and large cube blocks!

N(NC)-05, Page 14

Any value less than 100 where the digits have a sum of 8 would work:

8, 17, 26, 35, 44, 53, 62, 71, 80.

N(NC)-06, Page 15

Rounded Down: 24, 30, 31, 32, 33, 34, 40, 41, 42, 43, 44, 50, 51, 52, 53, 54. There would be 16 numbers which would be rounded down if you count 30, 40 and 50.

Rounded Up: 25, 26, 27, 28 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 55, 56, 57. There would be 18 numbers which would be rounded up.

N(NC)-07, Page 16

The largest number you can make is by putting the largest digit in the tens place, and the same digit in the ones place, therefore 66. The smallest you can make is 22 using the same process. The largest you can make without repeating a digit can be made by putting the largest digit in the tens place, and the second largest in the ones place, hence 65. Using the same process the smallest that can be made is 23.

N(NC)-08, Page 17

Letter E: used 33 times	Letter F: used 5 times
Letter G: used 2 times	Letter H: used 4 times
Letter I: used 9 times	Letter L: used 2 times
Letter N: used 17 times	Letter O: used 4 times
Letter R: used 4 times	Letter S: used 4 times
Letter T: used 15 times	Letter U: used 2 times
Letter V: used 5 times	Letter W: used 3 times
Letter X: used 2 times	*Letter Y*: used 1 time.

The letter E is used the most often. The letter Y is used only once, and the vowel A is not used at all.

N(NC)-09, Page 18

1-rain, 2-wind, 3-sun, 4-rain, 5-wind, 6-sun, 7-rain, 8-wind, 9-sun, 10-rain, 11-wind, 12-sun, 13-rain, 14-wind, 15-sun, 16-rain, *17-wind*, 18-sun, 19-rain, 20-wind, 21-sun, *22-rain*, 23-wind, 24-sun, 25-rain, 26-wind, 27-sun, 28-rain, 29-wind, 30-sun, *31-rain*. There are 10 sunny days in all.

N(NC)-10, Page 19

To enter 1–9 requires pressing 9 numbered keys. To enter 10–19 requires 20 key strokes. 20–29 takes 20 key strokes, 30–39 takes 20 key strokes, 40-49 takes 20 key strokes. To enter 50 requires 2 key strokes.

$9 + 20 + 20 + 20 + 20 + 2 = 91$ strokes.

The following numbers require pressing the 3 key: 3, 13, 23, 30, 31, 32, 33 (twice!), 34, 35, 36, 37, 38, 39, and 43. Jackie will press the 3 key 15 times.

N(NC)-11, Page 20

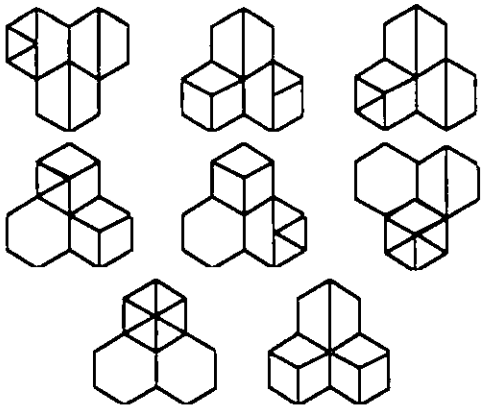
Recognize that any number 1, 3, 4 or 8 can go in the tens place, but only the 4 and 8 can go in the ones place if it is to be an even number. Therefore, we can construct this list:

4, 8, 14, 18, 34, 38, 44, 48, 84, 88.

We can make 10 different numbers.

N(NC)-12, Page 21

The solutions shown below represent the various combinations of blocks which can be made having an area 3 times that of a single yellow hexagon. The arrangement of the blocks may vary.



The last solution above is the only combination of blocks not using any green blocks.

N(NO)-13, Page 22

On Monday and Tuesday: $18 + 39 = 57$ people.

$96 - 57 = 39$ people came on Wednesday.

N(NO)-14, Page 23

Clarissa's shoe and Joel's shoe together would make a train 19 cm + 24 cm = 43 cm long.

Answers vary.

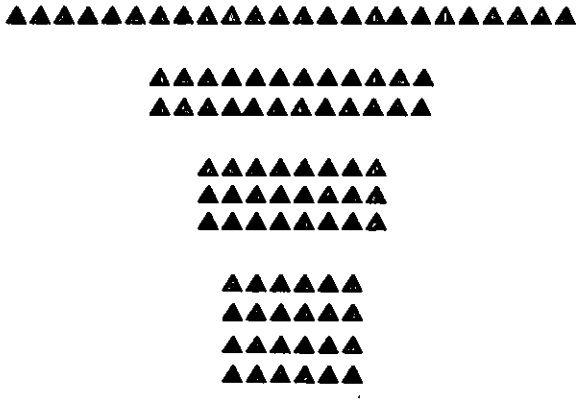
N(NO)-15, Page 24, *Answers vary.*

N(NO)-16, Page 25

Assuming that you use only whole numbers, and that 1 + 9 counts as the same equation as 9 + 1, then there are six in all.

N(NO)-17, Page 26

Assuming you create only simple arrays, and assuming that a 2 x 12 array is considered the same as a 12 x 2 array, there are 4 different ways:



PR(P)-01, Page 27, *Answers vary.*

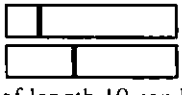
PR(P)-02, Page 28

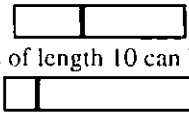
The names of each of the first set of objects contain the letter A: b*a*t, guit*a*r, gl*a*ss, p*a*per, and er*a*ser. None of the objects in the second set have names which contain the letter A: clock, spoon, desk.

PR(P)-03, Page 29

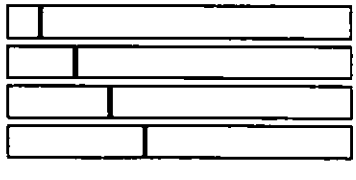
Any number which is a factor of 50 and which can be built using a set of two counting rods would work. The factors of 50 are 1, 2, 5, 10, 25 and 50. Of these only the values 2, 5 and 10 can be built from a train of two counting rods. A train of length 2 can only be built from two white rods, and they are not <u>different</u> from each other, so we are left with trains of length 5 and 10.

Trains of length 5 can be made from:

 (length 1 + length 4)

 (length 2 + length 3)

Trains of length 10 can be made from:



(1 + 9)

(2 + 8)

(3 + 7)

(4 + 6)

PR(P)-04, Page 30

Day One: 7 blocks + 1 block = 8 blocks.
Day Two: 8 blocks + 2 blocks = 10 blocks.
Day Three: 10 blocks + 3 blocks = 13 blocks.
Day Four: 13 blocks + 4 blocks = 17 blocks.
Day Five: 17 blocks + 5 blocks = 22 blocks.
Day Six: 22 blocks + 6 blocks = 28 blocks.
Day Seven: 28 blocks + 7 blocks = 35 blocks.
Day Eight: 35 blocks + 8 blocks = 43 blocks.
Day Nine: 43 blocks + 9 blocks = 52 blocks.
Day Ten: 52 blocks + 10 blocks = 62 blocks.
Day Eleven: 62 blocks + 11 blocks = 73 blocks.
Day Twelve: 73 blocks + 12 blocks = 85 blocks.
Day Thirteen: 85 blocks + 13 blocks = 98 blocks.
Day Fourteen: 98 blocks + 14 blocks = 112 blocks.
Jonas had collected 100 blocks on the fourteenth day.

PR(P)-05, Page 31

Construct a list of blocks by color until you reach the fortieth element in the list. The blocks are grouped below in sets of ten:

B R R B R R B R R B
R R B R R B R R B R
R B R R B R R B R R
B R R B R R B R R B

The fortieth block is blue.

SS(M)-01, Page 32

A black rod has a length of 7, and a purple rod has a length of 4. Create a table of the numbers of each rod used and their total length:

Black	Purple	Total Length
4	1	32
3	3	33
2	4	30
1	6	31, √

Therefore, 1 black rod and 6 purple rods together have a length of 31 cm.

SS(M)-02, Page 33, *Answers vary.*

SS(M)-03, Page 34

Eraser is 5 cm long.
Pencil is twice as long as eraser, 2 x 5 = 10 cm.
Comb is 9 cm longer than eraser, 9 + 5 = 14 cm.
Candle is 10 cm longer than pencil 10 + 10 = 20 cm.

SS(M)-04, Page 35

In a set of pattern blocks, a hexagon has an area equal to 6 green triangles, a trapezoid has an area equal to 3 green triangles, and a blue rhombus has an area of 2 green triangles. Therefore, the total area covered by the first set would be: 6 + 3 + 2 + 1 = 12 green triangles. The total area covered by the second set would be: 3 + 3 + 2 + 2 + 1 = 11 green triangles. The first set covers a greater area.

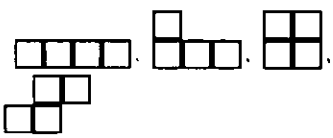
SS(M)-05, Page 36

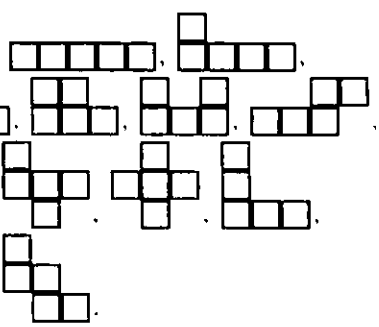
There are 21 possibilities in all, as follows:

Using one tile:

Using two tiles: 

Using three tiles: 

Using four tiles: 

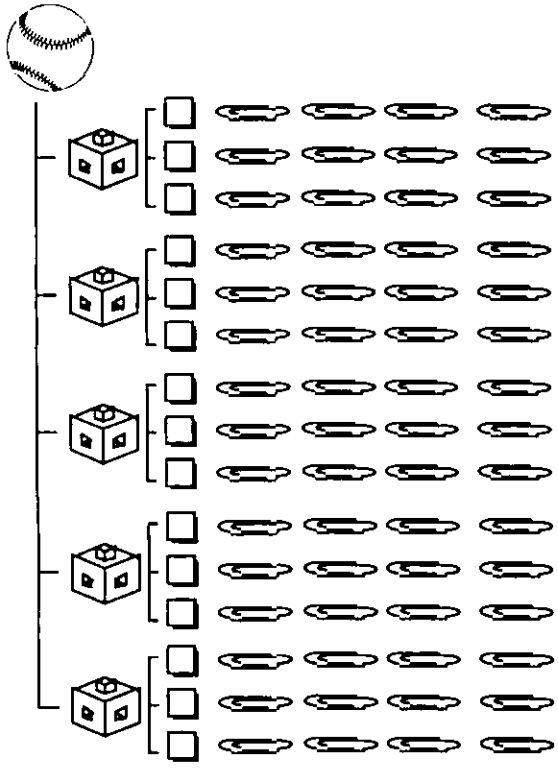
Using five tiles: 

SS(M)-06, Page 37

15 + 23 – 7 = 31 cubes. Kim's box can hold 31 cubes.

SS(M)-07, Page 38

4 x 3 x 5 = 60. It will take 60 paper clips to balance the ball.



SS(M)-08, Page 39

Each pile (styrofoam and wood chips) must weigh the same if they each weigh 1 kg. Because styrofoam is a less dense material, the pile of styrofoam would be much bigger.

SS(M)-09, Page 40, *Answers vary.*

SS(M)-10, Page 41, *Answers vary.*

SS(M)-11, Page 42

Because Mark was almost a New Year's baby, he must be the one born in December. Braden was born before Kara who was born before Melody. The order is:

April — Braden
June — Kara
July — Melody
December — Mark

SS(M)-12, Page 43

The minute hand will point to a 3 at quarter past every hour of the day. Given there are 24 hours of the day, the minute hand will point to the 3 a total of 24 times. There are five 1's on an analog clock, so the minute hand will point to a 1 five times every hour. There are 24 hours in the day, so the minute hand will point to a 1 a total of 5 x 24 = 120 times each day.

SS(M)-13, Page 44

In 1998, July 17th was a Friday and September 24th was a Thursday. Because the number of days between July 17th and September 24th can never vary from one year to the next, whenever July 17th falls on a Friday, September 24th will fall on a Thursday.

SS(M)-14, Page 45

Construct an equation by working backwards:
16°+8°–6°–5° = 13°C. It was 13°C that morning.

SS(M)-15, Page 46

Construct a table to show all the possibilities:

Quarters	Dimes	Nickels	Pennies	Total
0	0	0	36	36
0	0	1	31	36
0	0	2	26	36
0	1	0	26	36
0	0	3	21	36
0	1	1	21	36
0	0	4	16	36
0	1	2	16	36
0	2	0	16	36
0	0	5	11	36
0	1	3	11	36
0	2	1	11	36
1	0	0	11	36
0	0	6	6	36
0	1	4	6	36
➡ ***0***	***2***	***2***	***6***	***36***
0	3	0	6	36
1	0	1	6	36
0	0	7	1	36
0	1	5	1	36
0	2	3	1	36
0	3	1	1	36
1	0	2	1	36
1	1	0	1	36

There are 24 ways in all to make up 36¢. The arrow marks the combination using 10 coins.

SS(M)-16, Page 47

In the problem it says that Angela has three different kinds of coins, at least two of each kind. Therefore, Angela cannot have any quarters as 2 x 25¢ = 50¢. There are then six possibilities, and only the last combination works:

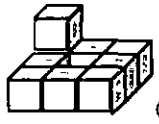
3 pennies, 2 nickels, 5 dimes ➡ 63¢, X
3 pennies, 2 dimes, 5 nickels ➡ 48¢, X
3 nickels, 2 pennies, 5 dimes ➡ 67¢, X
3 nickels, 2 dimes, 5 pennies ➡ 40¢, X
3 dimes, 2 pennies, 5 nickels ➡ 47¢, X
3 dimes, 2 nickels, 5 pennies ➡ 45¢, √

SS(M)-17, Page 48

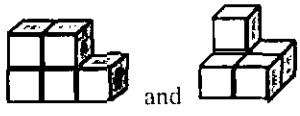
775 pennies have a value of $7.75. To have the fewest possible coins and bills, Tim would have a $5 bill, a $2 coin, and three quarters.

SS(3D&2D)-18, Page 49


On this figure you can see 4 faces on the top, and similarly 4 faces on the bottom. If you count the perimeter of the top (as one way to count the number of faces showing on all the sides) you count a total of 10. This figure therefore has a total of 18 faces showning.


On this figure you can see 8 faces when looking down from the top or up from the bottom. You can also count 16 faces along the sides, and 4 faces showing on the inside. 8 + 8 + 16 + 4 = 36 faces in all.

There are many different arrangements which can be built to show 20 faces, including


and

SS(3D&2D)-19, Page 50

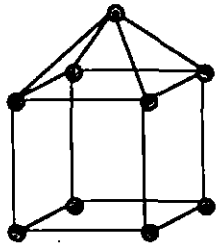
Construct a table of faces, vertices and edges, then guess and check to look for a possible combination.

Shape	Faces	Edges	Vertices
Sphere	1	0	0
Cylinder	3	2	0
Cone	2	1	1
Tri. Pyramid	4	6	4
Tri. Prism	5	9	6
Rect. Pyramid	5	8	5
Rect. Prism	6	12	8

Two cylinders and one rectangular prism have a total of 12 faces, 16 edges, and 8 vertices.

SS(3D&2D)-20, Page 51

Construct the cube first, which requires 8 vertices (marshmallows) and 12 edges (toothpicks). Now add the pyramidal shape to the four marshmallows on the top, which requires four more toothpicks and one more marshmallow. A total of 16 toothpicks and 9 marshmallows will be needed.



SS(3D&2D)-21, Page 52

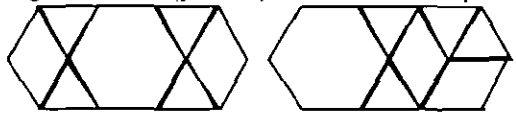
Construct a list of all of the buttons by color (grouped here in sets of 5):

Blue Red Black Blue Red
Black Blue Red Black Blue
Red Black Blue Red Black
Blue Red Black Blue Red
Black Blue Red Black Blue

In the first 25 buttons there are 9 blue, 8 red, and 8 black buttons.

SS(3D&2D)-22, Page 53

To construct the exact same shape requires the use of one yellow hexagon pattern block, 4 green triangles, and 2 blue diamond blocks. These blocks could be arranged in a variety of ways to create the shape.



SS(T)-23, Page 54

We know from clues two and three that we have one red, one blue and two green tiles in our stack. With the four tiles, there are 12 different arrangements:

GGBR GGRB *GRGB* GRBG
GBRG GBGR BRGG BGRG
BGGR RBGG *RGBG* RGGB

Of the 12 arrangements, only 2 meet all of the conditions, shown in italics above.

SS(T)-24, Page 55

The chart below shows the letters which have vertical and/or horizontal lines of symmtery:

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z

Any combinations of letters all of which either have horizontal lines of symmetry or vertical lines of symmetry would work to form words:

BOX, DICE, BED, TOYOTA, WOW, KICK, MOW, DID, HOW, WHAT, WHO, OW, TOW, MUMMY, HAM, MITT, HIT, etc.

SP(DA)-01, Page 56, *Answers vary.*

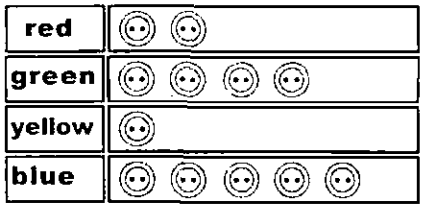
SP(DA)-02, Page 57

So far Darren has asked 6 + 10 + 4 + 2 = 22 people. If Darren has 24 people in his class he must ask 24 - 22 = 2 more people.

SP(DA)-03, Page 58, *Answers vary.*

SP(DA)-04, Page 59

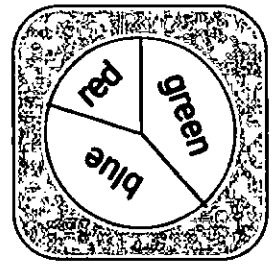
We know from the first clue that there must be a total of six blue and yellow buttons. We know from the last two clues that there must be only one yellow, therefore the other five buttons are blue.



SP(DA)-05, Page 60, *Answers vary.*

This list of results could be created by *any* spinner which had some red, some green, and some blue spaces!

The spinner could also have any other combination of colors along with red, green and blue spaces (for example, if there were a very tiny space of orange, it very likely would not have shown up in the first 15 spins). If the 15 results are a fair sampling of the spinner, then the spinner probably has 5 parts where one part is red, two are green, and two are blue, as below.



SP(DA)-06, Page 61

Assuming Justin has finished pulling the marbles from the bag, the first question can be answered: there are more red marbles. The second question can be answered: there are four different colors of marbles. The third question can be answered by finding the total for each color: 11 + 5 + 2 + 7 = 25 marbles. The last question cannot be answered because a tally chart does not specify the order in which information is collected.

SP(C&U)-07, Page 62

The likelihood of spinning a 1 is determined by the area covered by the 1 spaces. More than half the area must be covered by a 1 for it to be a probable outcome as seen in the third spinner. Likewise, you are likely to spin a 2 with the second spinner.

SP(C&U)-08, Page 63

Students should solve the problem experimentally, by rolling each die several times and counting the number of 2s rolled.

Theoretically, there is one 2 on a 6-sided die, so the chance of rolling a 2 is 1/6. There is one 2 on a 4-sided die, so the chance of rolling a 2 with this die is 1/4. Because 1/4 > 1/6, you have a better chance of rolling a 2 with the 4-sided die.