Part II – For the Teacher

Curriculum Areas

Problem 1 – Number Sense and Numeration
Problem 2 – Logical Reasoning
Problem 3 – Geometry and Spatial Sense
Problem 4 – Measurement
Problem 5 – Number Sense and Numeration
Problem 6 – Number Sense and Numeration; Pattering and Algebra

Hints and Suggestions

Problem 1
Hint 1 – a) Which square do you think is used most often in the additions? Why?
(Answer: The middle square occours in four of the eight additions.)
Hint 2 – a) What numbers cannot be placed in a row or column together?
(Answer: 7,8,9 or 1,2,3)
Hint 3 – c) How can you use your answer from a) to find a solution?

Problem 2
Hint 1 – Tanya's brother and Nancy's brother are both playing. Who is Emily's brother?
Hint 2 – Who could Alan have (or not have) for a sister? Why?

Suggestion: Have the students make two tables (as shown), one for sibling pairs and one for partners. Students can then place an X or a ✓, to indicate their trial solutions.

Girls

Boys		E	N	T
	A			
	R			
	S			

Problem 3
Hint 1 – a) How many sizes of triangles are there?
Hint 2 – c) Are there any triangles in the four squares that are not in the single square? (Note that the idea here is NOT to count the number of triangles, but rather to explain why it is not just 16x4.)
Hint 3 – (*Extension*) How many sizes of squares are there? Is a diamond a square?

Problem 4
Hint 1 – How big will each card be when unfolded?

Problem 5
Hint 1 – If Andreas had 7 jellybeans left, how many did he give to Hilde?
Hint 2 – Work backwards, check forwards.

Suggestion: You may wish to have counters available (e.g., pennies, beans, macaroni, etc.).

Problem 6
Suggestion: The game of Emmy can be played with counters, if desired. Have students keep track of each game (rotate who records), so they can try to detect winning strategies by looking back on several games.

Solutions and Notes

Problem 1

a) There are many possible answers. One square is shown at right

4	9	2
3	5	7
8	1	6

b) One easy way to get other squares is by reflections or turns (or a combination thereof) of a known square. For example, using the square in a):

2	9	4
7	5	3
6	1	8

Reflection

4	3	8
9	5	1
2	7	6

Reflection (diagonal)

2	7	6
9	5	1
4	3	8

Turn

4	3	8
9	5	1
2	7	6

Turn & Reflection

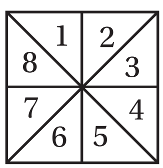
Suggest to the students that they try other operations, e.g., multiply each entry by 2 and add 1.

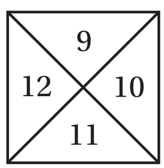
Problem 2

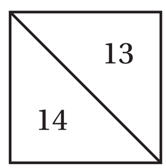
1. Since Scott is not playing, both Richard and Alan are.
2. Since Nancy's brother and Tanya's brother are not playing, Emily's brother cannot be playing. Thus Emily's brother must be Scott.
3. Tanya's brother and Alan's sister are partners, so Tanya's brother cannot be Alan, since otherwise Alan would be playing with his sister. Thus Tanya and Richard are siblings, and Nancy and Alan are siblings. (Partners and Richard and Nancy, and Alan and Emily.)

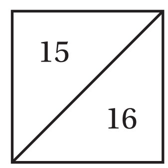
Problem 3

a) There are 16 triangles in total; they can be counted as follows:





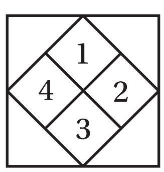


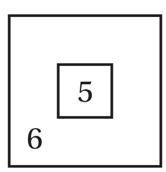


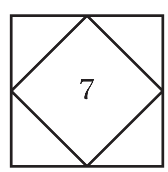
b) All the triangles are both isosceles and right angled.

c) No. There are overlapping triangles (at least 12 more than four times the number of triangles in a).)

Extension: There are 5 squares in each of the original squares (the outer square and four interior squares). This gives 20 squares. In addition, there are 7 squares created by the combination:

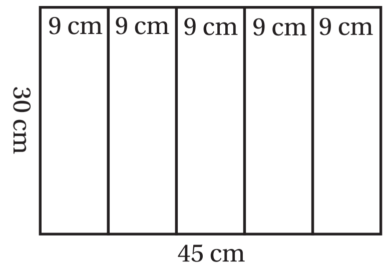




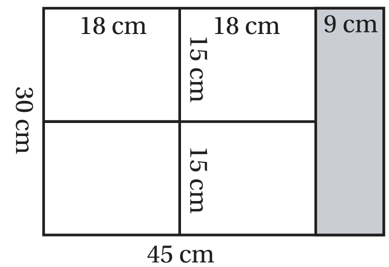


Thus the total is 27 squares.

Problem 4
a) Folding along the 9cm side requires a 9 cm by 30 cm rectangle; folding along the 15 cm side requires a 15 cm by 18 cm rectangle. We can picture the use of the 30 cm by 45 cm sheets as follows:



Type B cards



Type A cards

Thus folding along the 9cm side wastes the least amount of paper. She will need 5 sheets of construction paper.
b) It makes no difference, because the shaded 'waste' area in the right diagram can now be used for a 9 cm by 30 cm card. She can cut 12 Type A cards and 3 Type B cards from 3 sheets, and the other 10 Type B cards from 2 sheets.

Problem 5
Andreas originally had 65 jellybeans in the bag (7 + 7 + 14 + 28 + 9 = 65). Note that some students will work backwards, while others may draw a diagram; strategies are worth discussing.

Extension: The total trip was 400 km (75 + 75 + 150 + 100 = 400). Essentially the same strategies work, even though the context is quite different and the fractions vary.

Problem 6
Possible strategies that students may discover include:
1. Force your opponent to reach 13.
2. Be the first one to 12.
3. Force your opponent to move to an odd number.
4. Always make the total even.
5. Be the first player to go, and always make your total even.
6. Make the total a multiple of 3.
7. Always go second, and make your total a multiple of 3.

The ultimate winning strategy is #7.

Suggestion: Try changing the rules of the game. Possibilities include a) start at 15 and subtract 1 or 2 each turn, or b) play by the original rules, but make the first player to reach 15 the loser. Try reaching 21 instead of 15. Does this change the strategy?