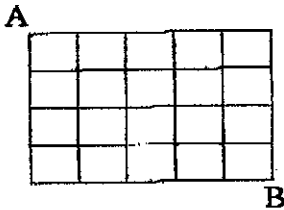


**PIMS Elementary Grades Math Contest,**

Problem solving

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1. Counting only paths that follows the lines and go downward or to the right, how many paths from A to B are possible?



2. How many squares are contained in the above diagram? How many rectangles? (squares are considered a type of rectangle).

3. When a natural number is multiplied by itself, the result is a perfect square. For example 1, 4, and 9 are perfect squares because  $1 \times 1 = 1$ ,  $2 \times 2 = 4$ ,  $3 \times 3 = 9$ . How many perfect squares are less than 10,000?

4. Suppose all counting numbers are arranged in columns as shown at the right. Under what letter will the number 3000 appear?

A	B	C	D	E	F	G
1	2	3	4			
	7	6	5			
	8	9	10	11		
		14	13	12		
		15	16	...		

5. 37546 is one of five-digit numbers each of which is different and has the digits 3, 4, 5, 6, 7. What is the sum of all this kind of 5-digit numbers?

6. Two water faucets of a bath tub one can fill the tub in 15 minutes and the other can fill the tub in 20 minutes. The drain, when opened, can empty the full tub in 12 minutes. Suppose the tub is empty and both faucets and drain are all opened at the same time. How long will it take to fill the tub?

7. A stamp collector bought a rare stamp for \$30, sold it for \$42, bought it back for \$50, and finally sold it for \$48. Did the stamp collector make or lose money and how many dollars were made or lost?

8. The product of two whole numbers is 10,000. *If neither number contains a zero digit, what are the numbers?*

9. A baseball league has nine teams. During the season, each of the nine teams plays exactly three games with each of the other teams. *What is the total number of games played?*

10. Suppose there are 1000 lockers, and 1000 people. The first person opens all the lockers; the second person closes every second locker; the third person changes the state of every third locker (if the locker is open, he will close it, and if it is closed, he will open it); the fourth person changes the state of every fourth locker. This process continues, where the  $n$ th person changes the state of every  $n$ th locker. After all 1000 people have gone through, how many lockers are open?

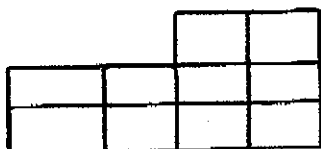
11. In a certain sequence,  $a_1 < 0$ ,  $a_2 > 0$ , and  $a_3 > 0$ .

For  $n > 2$ ,  $a_n = a_{n-1} + a_{n-2}$ .

Two consecutive terms of the sequence have values of 29 and 47.

Find the value of  $a_1 + a_2 + a_3$ .

26. How many different rectangles are there altogether in the diagram?



8. How many ordered triples  $(x, y, z)$  of positive whole numbers are there such that  $xyz = 10$ ? Note that for example the triple  $(1, 1, 10)$  is to be considered different from the triple  $(10, 1, 1)$ .

8. How many ordered triples  $(x, y, z)$  of positive whole numbers are there such that  $xyz = 16$ ? Note that for example the triple  $(1, 4, 4)$  is to be considered different from the triple  $(4, 4, 1)$ .

8. How many ordered triples  $(x, y, z)$  of positive whole numbers are there such that  $xyz = 20$ ? Note that for example the triple  $(1, 1, 20)$  is to be considered different from the triple  $(20, 1, 1)$ .

12. What is the sum of all positive integers that divide 120? Note that 1 and 120 divide 120.

12. Dina chooses at random one of the four-digit numbers that can be formed by using four *different* digits chosen from 2, 3, 4, 5, and 6. What is the probability that her chosen number is divisible by 4? Express your answer as a common fraction.

12. Dina and Ditzia each toss two fair dice. What is the probability that the sum of the numbers on Dina's dice is one more than the sum of the numbers on Ditzia's dice? Express your answer as a common fraction.

**TABLE EXERCISE (TABLE UP TO 63)**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
1	2	4	8	16	32
3	3	5	9	17	33
5	6	6	10	18	34
7	7	7	11	19	35
9	10	12	12	20	36
11	11	13	13	21	37
13	14	14	14	22	38
15	15	15	15	23	39
17	18	20	24	24	40
19	19	21	25	25	41
21	22	22	26	26	42
23	23	23	27	27	43
25	26	28	28	28	44
27	27	29	29	29	45
29	30	30	30	30	46
31	31	31	31	31	47
33	34	36	40	48	48
35	35	37	41	49	49
37	38	38	42	50	50
39	39	39	43	51	51
41	42	44	44	52	52
43	43	45	45	53	53
45	46	46	46	54	54
47	47	47	47	55	55
49	50	52	56	56	56
51	51	53	57	57	57
53	54	54	58	58	58
55	55	55	59	59	59
57	58	60	60	60	60
59	59	61	61	61	61
61	62	62	62	62	62
63	63	63	63	63	63