

Worksheet: Computation

CS 101 Algorithmic Problem Solving

Fall 2023

Name(s): _____

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1. Chef's Test

Chef appeared for a placement test.

The test is worth X points and has exactly 10 questions. Each question is worth the same number of points. Chef got N questions correct.

Given X and N , determine the score that Chef will get.

Constraints

- $X, N \in \mathbb{Z}$
- $10 \leq X \leq 200$
- $0 \leq N \leq 10$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of X and N respectively.

The output must contain a single number denoting the corresponding score earned by Chef.

Sample

Input	Output
20 3	6
15 5	7.5

In the first case, $(X, N) = (20, 3)$. There are 20 points for 10 questions. Each question is therefore worth 2 points. As Chef got 3 questions correct, the score is $3 \times 2 = 6$.

In the second case, $(X, N) = (15, 5)$. There are 15 points for 10 questions. Each question is therefore worth 1.5 points. As Chef got 5 questions correct, the score is $5 \times 1.5 = 7.5$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
10 3	3
100 10	100
130 4	52

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: A simple computation question, where we need to figure out how much is each question worth and multiply with the number of correct answers.

2. Working Hours

The working hours of Chef's kitchen are from X pm to Y pm.

Given X and Y find the number of hours that Chef works.

Constraints

- $X, Y \in \mathbb{N}$
- $1 \leq X < Y \leq 11$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of X and Y respectively.

The output must contain a single number denoting the working hours of Chef.

Sample

Input	Output
4 6	2
1 11	10

In the first case, $(X, Y) = (4, 6)$. The kitchen is open between 4pm and 6pm. Therefore, Chef works 2 hours.

In the second case, $(X, Y) = (1, 11)$. The kitchen is open between 1pm and 11pm. Therefore, Chef works 10 hours.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
1 3	2
3 7	4
9 14	5

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: A subtraction question, larger subtracted by smaller.

3. Mana Points

Chef is playing a mobile game. In the game, Chef's character *Chefario* can perform special attacks. However, one special attack costs X mana points to *Chefario*.

If Chefario currently has Y mana points.

Given X and Y determine the *maximum* number of special attacks he can perform.

Constraints

- $1 \leq X \leq 100$
- $1 \leq Y \leq 1000$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of X and Y respectively.

The output must contain a single number denoting the maximum number of special attacks Chefario can perform.

Sample

Input	Output
10 30	3
6 41	6

In the first case, $(X, Y) = (10, 30)$. Chefario can perform a maximum number of 3 attacks which will cost him 30 mana points.

In the second case, $(X, Y) = (6, 41)$. Chefario can perform a maximum number of 6 attacks which will cost him 36 mana points, with 5 mana points left to spare.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
50 2	0
8 68	8
9 23	2

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: A division problem, where we need to find max number of moves that can be performed.

4. Ticket Fine

On a certain train, The ticket collector, collects a fine of Rs. X if a passenger is travelling without a ticket. It is known that a passenger carries either a single ticket or not ticket. P passengers are travelling and they have a total of Q tickets.

Given X , P and Q calculate the total fine collected.

Constraints

- $1 \leq X \leq 10$
- $0 \leq Q \leq P \leq 10$

Interaction

The input comprises a single line containing 3 space-separated integers denoting the values of X , P and Q respectively.

The output must contain a single number denoting the total money collected by the ticket collector.

Sample

Input	Output
4 1 1	0
2 10 7	6

In the first case, $(X, P, Q) = (4, 1, 1)$. Total number of people travelling without a ticket are $1 - 1 = 0$. The total fine collected is $4 \cdot 0 = 0$.

In the first case, $(X, P, Q) = (2, 10, 7)$. Total number of passengers travelling without ticket are $10 - 7 = 3$. The total fine collected is $3 \cdot 2 = 6$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
8 5 4	8
9 7 0	63
4 5 2	12

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: First we need to figure out how many people are not carrying a ticket and then multiply it with the fine value.

5. Calculate the new cells

Anas has recently started learning SQL.

He has a table which initially has R rows and C columns. He then adds E extra rows to it.

Given R , C and E calculate the total number of cells he has in his table.

Constraints

- $1 \leq R \leq 100$
- $1 \leq C \leq 100$
- $1 \leq E \leq 100$

Interaction

The input comprises a single line containing 3 space-separated integers denoting the values of R , C and E respectively.

The output must contain a single number denoting the total number of cells in the table.

Sample

Input	Output
5 2 1	12
6 10 3	90

In the first case, $(R, C, E) = (5, 2, 1)$. Initially there were 5 rows and 2 columns, total number of cells were $5 * 2 = 10$. Adding one more row makes 6 rows therefore the new total is $6 * 2 = 12$.

In the second case, $(R, C, E) = (6, 10, 3)$. Initially there were 6 rows and 10 columns, total number of cells were $6 * 10 = 60$. Adding three more rows makes 9 rows therefore the new total is $9 * 10 = 90$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
7 3 2	27
3 19 8	209
17 5 6	115

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: A simple multiplication problem.

6. Tour of Aziz

Aziz loves to go on tours with his friends.

Aziz has N cars that can seat 5 people each and M cars that can seat 7 people each.

Given N and M determine the *maximum* number of people that can travel together in these cars.

Constraints

- $0 \leq N, M \leq 100$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of N and M - the number of 5-seaters and 7-seaters, respectively.

The output must contain a single number denoting the maximum number of people that can travel together in these cars.

Sample

Input	Output
4 8	76
2 13	101

In the first case, $(N, M) = (4, 8)$. Aziz has 4 cars that seat 5 each and 8 cars that seat 7 each. So, $(4 * 5) + (8 * 7) = 76$ people can travel together.

In the second case, $(N, M) = (2, 13)$. Aziz has 2 cars that seat 5 each and 13 cars that seat 7 each. So, $(2 * 5) + (13 * 7) = 101$ people can travel together.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
50 2	264
8 68	516
9 23	206

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Another multiplication problem.

7. Matching Problem

There are G girl and B boy students in a school such that $B > G$.

There is a team game where teams can only be of size 2, having *exactly* 1 girl student and 1 boy student.

Given G and B determine the *minimum* number of boy students who would not be able to participate

Constraints

- $1 \leq G \leq B \leq 100$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of G and B - the number of girl and boy students at the school respectively.

The output must contain a single number denoting the minimum number of boy students from the school who would not be able to participate.

Sample

Input	Output
1 3	2
3 10	7

In the first case, $(G, B) = (1, 3)$. There is only 1 girl and 3 boys. Only 1 team can be formed and, and *minimum* of 2 boys will be left behind.

In the second case, $(G, B) = (3, 10)$. There are 3 girls and 10 boys. So, maximum of 3 teams can be formed, and minimum 7 boys will be left behind.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
2 4	2
7 10	3
18 23	5

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Matching problem with girls and boys, just a pairing problem.

8. Waiting Time

Ali is eagerly waiting for a piece of information. His secret agent told him that this information would be revealed to him after K weeks.

X days have already passed and Ali is now restless.

Given K and X determine the number of *remaining* days Ali has to wait for, to get the information.

Constraints

- $1 \leq K \leq 10$
- $1 \leq X < 7.K$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of K and X .

The output must contain a single number denoting the number of days Ali has to wait for.

Sample

Input	Output
1 5	2
2 13	1

In the first case, $(K, X) = (1, 5)$. The information would be revealed after 1 week out of which 5 days have already passed, therefore he needs to wait 2 more days to get the information.

In the second case, $(K, X) = (2, 13)$. The information would be revealed after 2 weeks out of which 13 days have already passed, therefore he needs to wait 1 more day to get the information.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
3 16	5
5 7	28
6 12	30

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Need to convert week to days and then give an output.

9. Number of Words

Harsh was recently gifted a book consisting of N pages. Each page contains exactly M words printed on it. As he was bored, he decided to count the total number of words in the book.

Given N and M determine the total number of words in Harsh's book

Constraints

- $1 \leq N \leq 100$
- $1 \leq M \leq 100$

Interaction

The input comprises a single line containing 2 space-separated integers denoting the values of N and M .

The output must contain a single number denoting the total number of words in Harsh's book.

Sample

Input	Output
4 2	8
8 12	96

In the first case, $(N, M) = (4, 2)$. The book consists of 4 pages and each page has 2 words therefore $4 \cdot 2 = 8$.

In the second case, $(N, M) = (8, 12)$. The book consists of 8 pages and each page has 12 words therefore $8 \cdot 12 = 96$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
7 29	203
17 9	153
72 5	360

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: multiplication problem.

10. Hot Summer

Ali has recently purchased a water cooler. He noticed that the water cooler requires 2 liters of water to cool for 1 hour.

Given N - The number of hours, determine how much water would be required to cool for N hours.

Constraints

- $1 \leq N \leq 1000$

Interaction

The input comprises a single line containing the integer N .

The output must contain a single number denoting the total number of water required.

Sample

Input	Output
8	16
3	6

In the first case, $N = 8$. 16 liters of water is required to cool for 8 hours as $2 \cdot 8 = 16$

In the second case, $N = 3$. 6 liters of water is required to cool for 3 hours as $2 \cdot 3 = 6$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
18	36
29	58
71	142

Propose

Provide sample inputs and outputs below. Do not reuse any of the values from above.

Input	Output

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: multiplication by 2 problem.