ACSL

American Computer Science League

**All-Star #3**

**008 2015 - 2016**

**ACSL EGYTIAN MULTIPLICATION**

**PROBLEM:** Ancient Egyptian Multiplication is a systematic method for multiplying two numbers that does not require multiplication tables, only the ability to double, and to add. It decomposes larger multiplicand into a sum of powers of two and creates a table of doublings of the smaller multiplicand.

Example of the decomposition of the number 25:

|  |  |  |  |
| --- | --- | --- | --- |
| The largest power of two less than or equal to 25 | is 16: | **25 – 16** | **= 9** |
| The largest power of two less than or equal to 9 | is 8: | **9 – 8** | **= 1** |
| The largest power of two less than or equal to 1 | is 1: | **1 – 1** | **= 0** |
| 25 is thus the sum of the powers of two: 16, 8 and 1. | | |  |

After the decomposition of the larger multiplicand, it is necessary to construct a table of powers of two times the smaller multiplicand from one up to the largest power of two found during the decomposition. In the table, a line is obtained by multiplying the preceding line by two.

|  |  |
| --- | --- |
| 1 | 7 |
| 2 | 14 |
| 4 | 28 |
| 8 | 56 |
| 16 | 112 |

For example, if the largest power of two found during the decomposition is 16, and the smaller multiplicand is 7, the table is created as follows:

Only adding the column values that use the powers of 2 used in the decomposition (1, 8 and 16) above produces a sum of 175 (7 + 56 + 112) that is the product of 25 and 7.

**INPUT:** There will be 10 lines of input. Each line will contain 2 positive integers.

**OUTPUT:** For each input line print the values (in numerical order from high to low) that would be added to produce the correct product.

**SAMPLE INPUT**  **SAMPLE OUTPUT**  
1. 25, 7 1. 112, 56, 7  
2. 36, 8 2. 256, 32  
3. 80, 12 3. 768, 192  
4. 135, 10 4. 1280, 40, 20, 10  
5. 25, 600 5. 12800, 1600, 400, 200  
6. 18, 12 6. 192, 24  
7. 75, 15 7. 960, 120, 30, 15  
8. 24, 96 8. 1536, 768  
9. 8, 36 9. 256, 32  
10. 250, 60 10. 7680, 3840, 1920, 960, 480, 120

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**TEST DATA**

**TEST INPUT** **TEST OUTPUT**  
1. 44, 11 1. 352, 88, 44

2. 200, 10 2. 1280, 640, 80

3. 5, 1 3. 4, 1

4. 63, 31 4. 992, 496, 248, 124, 62, 31

5. 12, 4 5. 32, 16

6. 1, 15 6. 8, 4, 2, 1

7. 45, 76 7. 2880, 360, 180

8. 688, 812 8. 352256, 176128, 22016, 5504, 2752

9. 78, 35 9. 2240, 280, 140, 70

10. 64, 128 10. 8192