MATH 3041 Prof. Philip Pennance Exercises on the Multiplication Table

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

1. The above 10×10 multiplication table T contains the set of all natural numbers of the form $n \times m$ where m and n are elements of $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

Prove or disprove (without looking at the table!):

- (a) $101 \in T$
- (b) $37 \in T$
- (c) $44 \in T$ (d) $42 \in T$ (e) $63 \in T$

- (a) How many times do 30 and 16 occur in T?
 - (b) In general, when does a number appear an even number of times in the 10×10 multiplication table? Explain.
 - (c) Which numbers occur exactly three times?, exactly four times? in T?
- 3. List all prime and all odd numbers numbers in T.
- 4. Explain in words where in the 10×10 multiplication table T the terms of the following sequences are located (assume $1 \le n \le 10$):

(a)
$$f(n) = n^2$$

$$(d) f(n) = (n-2)n$$

(b)
$$f(n) = n$$

(e)
$$f(n) = 6n$$

(c)
$$f(n) = (n-1)n$$

(f)
$$f(n) = 9 \times n$$

- 5. Write a formula for the sequence of numbers which forms the southeast pointing diagonal of the 10 x 10 multiplication table.
- 6. Let $A = \{n \times m \in T : n m = 4\}$
 - (a) List the elements of the set A.
 - (b) Where in the 10×10 multiplication table T, are the elements of A located?
 - (c) Write a formula for a sequence whose terms are elements of A in increasing order.

7. Complete the following multiplication tables:

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