

SOLUTIONS TO HOMEWORK #1

1a: 27: XXVII

21: XXI

93: LXXXIII

136: CXXXVI

867: DXXXLXVII

1b: VIII - 8

XX - 20

XVII - 17

XXXVIII - 38

MMXVI - 2016

2a: 12: ○ ○ ○

31: ○ ○ ○ ○

23: ○ ○ ○ ○ ○

37: ○ ○ ○ ○ ○ ○

56: ○ ○ ○ ○ ○ ○ ○

2b: ○ ○ △ ○ ○ 27

△ ○ △ ○ ○ 22

○ ○ △ △ 21

○ ○ ○ △ 17

△ ○ ○ ○ ○ 27

3: FIRST TO REQUIRE 6: 19

FIRST TO REQUIRE 7: 29

FIRST TO REQUIRE 8: 39

4: THE EXACT ANSWER DEPENDS ON HOW YOU READ THE QUESTION

IF YOUR NUMBER SYSTEM HAVING SPECIAL SYMBOLS UP TO A MILLION REQUIRES THAT IT ALSO HAVE A SYMBOL FOR 5 MILLION,

THEN YOUR SYSTEM MUST HAVE SYMBOLS FOR 10^k $k = 0, 1, 2, 3, 4, 5, 6$

AND FOR $5 \cdot 10^k$, $k = 0, 1, 2, 3, 4, 5, 6$

SO YOU WOULD NEED $2(6+1) = 2 \cdot 7 = 14$ SYMBOLS.

IF YOU DONT REQUIRE A SYMBOL FOR 5 MILLION, THEN YOUR SYSTEM MUST HAVE $2(5+1) + 1 = 13$ SYMBOLS.

BY THE SAME REASONING, ~~THE~~ REPLACING MILLION BY BILLION GIVES ~~19~~ EITHER 19 OR 20 SYMBOLS. THEN A TRILLION REQUIRES 25 OR 26 SYMBOLS.

HOWEVER, THERES NO AMBIGUITY FOR THE ~~NUMBER~~ ~~VERSION~~ $5 \cdot 10^{23}$ VERSION. YOU NEED SYMBOLS FOR 10^k $k = 0, 1, 2, \dots, 22, 23$ AND FOR $5 \cdot 10^k$, $k = 0, 1, 2, \dots, 22, 23$ GIVING $2 \cdot (23+1) = 48$ SYMBOLS

Q 5: THIS IS A HARD QUESTION WITH NO
OBVIOUSLY GREAT ANSWER. ~~HOWEVER~~ HOWEVER,
WRITING THAT YOU WOULD DO THE MULTIPLICATION
IN THE SYSTEM YOU'RE USED TO AND
THEN CONVERT BACK IGNORES THE SPIRIT
OF THE QUESTION. &

Q 6: MANY ANSWERS POSSIBLE.