

**Algorithms and Programming for High Schoolers**

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**Lab 2**

**Exercise 1:** In my high school, students were given letter grades based on their numerical scores. Here is the table of which numerical scores correspond to which letter grades:

Score	Grade
99-100	A+
96-98	A
93-95	A-
90-92	B+
87-89	B
84-86	B-
81-83	C+
78-80	C
75-77	C-
70-74	D
0-69	F

Write a function `convertScoreToGrade(n)` which takes an `int` numerical score  $n$  and returns a string corresponding to the letter grade in my high school.

**Exercise 2:** Write a function `listOfWords(s)` which takes as input a sentence  $s$  and outputs a list containing all the words. We'll assume that the sentence  $s$  is just a list of words each separated by a single space. So, for example, `listOfWords('How are you today')` should return the list ['How', 'are', 'you', 'today'].

**Exercise 3:** Recall, an integer is prime if it is larger than 1 and it has no divisors other than 1 and itself. Write a function `isPrime(n)` which returns `True` if  $n$  is prime, and returns `False` otherwise. Then, write a function `listOfPrimes(n)` which returns a list of all primes, in order, between 2 and  $n$  — you might want to call the function `isPrime` from within `listOfPrimes`. Notice that if you try to run `listOfPrimes` on a large number, it will take a long time. Is there a way to write `isPrime` so that `listOfPrimes(n)` takes only a few seconds to return its result when  $n$  is 1000000?

**Exercise 4:** Let's call an integer *well-spaced* if when you write down its prime factorization, you don't need to use two adjacent primes. For example, 10 is well-spaced since  $10 = 2 \cdot 5$ , and 2, 5 are not adjacent primes since the prime 3 is in between them. However, 6 is not well-spaced, since  $6 = 2 \cdot 3$ , and 2, 3 are adjacent primes, and neither is  $154 = 2 \cdot 7 \cdot 11$ , since 7, 11 are adjacent primes. Any prime number itself is of course also well-spaced. Write a function `wellSpaced(n)` which returns `True` if  $n$  is well-spaced, and returns `False` otherwise. Is 147525307 well-spaced? How about 147914243?

**Exercise 5:** An integer is said to be a *palindrome* if its digits are the same forward and backwards (not including leading zeroes). For example, 12321 is a palindrome, as is 5. 1231 on the other hand is not a palindrome, and neither is 50 (remember we are not including leading zeroes). Write a function `isPalindrome(n)` which returns `True` if  $n$  is a palindrome and `False` otherwise.

**Exercise 6:** Write a function `nextPalindrome(n)` which returns the smallest integer  $m$  larger than  $n$  such that  $m$  is a palindrome. For example, `nextPalindrome(9)` should return 11, and `nextPalindrome(12)` should return 22.