

“Count Positive Integers with a Given Number of Divisors” (divisors)

You are expected to demonstrate a working C program according to the description below. Your solution should be uploaded (via Blackboard) before the deadline. You must use the file name(s) as specified in the problem description below. Late submissions will not be corrected and will receive zero credit, so even if your program is not running correctly, you should submit your “best attempt”.

Program description

Write a program (`divisors.c`) which reads in an integer k , and prints out the number of positive integers between 1 and 100000 (inclusive) which have exactly k divisors. As an example, the number 24 has 8 divisors: 1, 2, 3, 4, 6, 8, 12, and 24.

Note that for any positive integer n , the number 1 will always be a divisor of n , and so will n itself.

The program execution should look like the following (user input in **bold** text):

```
Enter the target number of divisors: 16
```

```
There are 10728 numbers between 1 and 100000 inclusive which have exactly  
16 divisors.
```

You might find the following ideas helpful:

- 1) Think about how we can determine if an integer b divides another integer a . As a hint, what would $a \% b$ evaluate to, where $\%$ is the modulo operator?
- 2) To get started, try taking a *small* number of divisors, and checking up to a much smaller limit than 100000.
- 3) Try *printing out* the numbers with k divisors, instead of just counting them. Does the output look correct?
- 4) What kind of number has 2 divisors? What about 3 divisors? Does your program give the correct output for these cases?
- 5) When you have the program working, ask yourself: is there any way I can make this search run faster?

Deliverables:

File name	Description
<code>divisors.c</code>	C source code as described above

YOUR PROGRAMS WILL NOT BE MARKED UNLESS THEY HAVE THE CORRECT NAMES

**STUDENTS MUST WORK INDEPENDENTLY. PROGRAMS WILL BE EXAMINED FOR
EVIDENCE OF COPYING. COPYING OR ALLOWING YOUR WORK TO BE COPIED WILL
RESULT IN ZERO MARKS BEING ALLOCATED FOR THE ASSIGNMENT.**