

## BEGINNERS 1 DISCOUNTS

Brittany went into a grocery store to purchase cereal. Brand X usually sells for \$3.95, but this week, it is on sale for \$2.99. Brittany wants a program to calculate the percent of the discount. Prompt for the original price and the discount price. Print out the percent discount.

Example:

```
Enter original price: 100.00
Enter discounted price: 70.00
The discount is 30%
```

## Pythagorean Triples

A Pythagorean Triple is a sequence of 3 integers  $a$ ,  $b$ , and  $c$ , satisfying the following properties:

1.  $0 < a < b < c$ ; and
2.  $a^2 + b^2 = c^2$ .

Write a program that takes 3 integers as input and reports whether they form a Pythagorean Triple.

Example 1:

```
Enter a: 3
Enter b: 4
Enter c: 5
A Pythagorean Triple.
```

Example 2:

```
Enter a: -3
Enter b: 4
Enter c: 5
Not a Pythagorean Triple.
```

Example 3:

```
Enter a: 4
Enter b: 3
Enter c: 5
Not a Pythagorean Triple.
```

Example 4:

```
Enter a: 4
Enter b: 5
Enter c: 6
Not a Pythagorean Triple.
```

Test Cases

First Submission:

Test 1:

```
Enter a: 20
Enter b: 21
Enter c: 29
A Pythagorean Triple.
```

Test 2:

```
Enter a: 21
Enter b: 20
Enter c: 29
Not a Pythagorean Triple.
```

Test 3:

```
Enter a: -21
Enter b: -20
Enter c: 29
Not a Pythagorean Triple.
```

Second submission: Above tests plus

Test 4:

```
Enter a: 9
Enter b: 40
Enter c: 41
A Pythagorean Triple.
```

Test 5:

```
Enter a: 0
```

```
Enter b: 2
Enter c: 2
Not a Pythagorean Triple.
```

## Boxer

Write a program that reads in a string and outputs the same string in a box of asterisks. The string should be separated from the asterisks by exactly one row of spaces above and below and exactly one space to the left and right. The asterisks in the horizontal rows should not be separated by blanks, nor should the asterisks in the vertical columns be separated by blank lines. You may assume the string is no more than 30 characters.

Example:

Enter a string: This is a string.

```
*****
*           *
* This is a string. *
*           *
*****
```

Test Cases

First Submission:

Test 1:

Enter a string: First test case

```
*****
*           *
* First test case *
*           *
*****
```

Test 2:

Enter a string: 123456789012345678901234567890

```
*****
*           *
* 123456789012345678901234567890 *
*           *
*****
```

Second Submission: Above tests, plus

Test 3:

Enter a string: a

```
*****
*   *
* a *
*   *
*****
```

Tom has a problem with typing. He often types the word "hte" instead of "the". He wants a program that will search through his text input and corrects that mistake and that mistake only. You do not have to consider the case where "the" begins or ends the sentence. Assume that all the input is on one line.

Example:

```
Enter text This is the right way.  
The correct text is:  
This is the right way.
```

Write a program that generates a monthly calendar. The columns should be labeled with the day of the week. The leftmost day should be Sunday. Asterisks should separate the weeks and the days. The program should accept the starting day of the month: U for Sunday, M for Monday, T for Tuesday, W for Wednesday, R for Thursday, F for Friday, and S for Saturday. Assume the month has 30 days.

Example:

```

                Enter start day:    W

Sun  Mon Tue  Wed Thu  Fri Sat
*****
*      *      *      * 1 * 2 * 3 * 4 *
*****
* 5 * 6 * 7 * 8 * 9 *10 * 11 *
*****
* 12 * 13 * 14 * 15 * 16 *17 * 18 *
*****
* 19 * 20 * 21* 22 * 23 *24 * 25 *
*****
* 26* 27 * 28 * 29 * 30 *      *
*****
    
```

BEGINNER 6 SUM OF DIGITS

Write a program which accepts an integer between 0 and 9999 and returns the sum of all digits in the number.

Example:

```
Enter integer: 3475  
Sum: 19
```

```
Enter integer: 9999  
Sum: 36
```

ADVANCED 1 POKER

Given a poker hand of five cards, determine if the player has been dealt a straight (5 cards with consecutive values, for example, Q J 10 9 8). Enter the cards using the notations A K Q J T 9 8 7 6 5 4 3 2 (one space between each card). The cards may not necessarily be dealt in ascending or descending order. NOTE: This is also the order of the card values, for example, A (for Ace) is highest.

Examples:

Deal five cards: 8 J 9 T Q  
Yes, this is a straight.

Deal five cards: 2 5 3 4 9  
No, this is not a straight.

ADVANCED 2

Pythagorean Triples

A Pythagorean Triple is a sequence of 3 integers  $a$ ,  $b$ , and  $c$ , satisfying the following properties:

1.  $0 < a < b < c$ ;
2.  $a^2 + b^2 = c^2$ ; and
3.  $a$  and  $b$  are relatively prime (i.e., 1 is the greatest integer that divides both  $a$  and  $b$  evenly).

Write a program that takes 3 integers as input and reports whether they form a Pythagorean Triple.

Example 1:

```
Enter a: 3
Enter b: 4
Enter c: 5
A Pythagorean Triple.
```

Example 2:

```
Enter a: -3
Enter b: 4
Enter c: 5
Not a Pythagorean Triple.
```

Example 3:

```
Enter a: 4
Enter b: 3
Enter c: 5
Not a Pythagorean Triple.
```

Example 4:

```
Enter a: 6
Enter b: 8
Enter c: 10
Not a Pythagorean Triple.
A2 Test Cases
```

First Submission:

Test 1:

```
Enter a: 20
Enter b: 21
Enter c: 29
A Pythagorean Triple.
```

Test 2:

```
Enter a: 51
Enter b: 68
Enter c: 85
Not a Pythagorean Triple.
```

Test 3:

```
Enter a: -21
Enter b: -20
Enter c: 29
Not a Pythagorean Triple.
```

Second Submission: Above tests, plus

Test 4:

```
Enter a: 21
Enter b: 20
Enter c: 29
Not a Pythagorean Triple.
```

Test 5:

Enter a: 0

Enter b: 2

Enter c: 2

Not a Pythagorean Triple.

ADVANCED 3

Overlapping Rectangles

This program first prompts for two integers, m and n, 2 ≤ m ≤ 10, 2 ≤ n ≤ 10. Two rectangles composed of asterisks are then displayed on the screen. One rectangle is m asterisks by n asterisks, and the other is n asterisks by m asterisks. The center of both rectangles is at the same point. The asterisks on same vertical side of a rectangle must be separated one blank line, and the asterisks on the same horizontal side of a rectangle must be separated by three spaces. Note that if m and n are the same, the two rectangles will be identical, so only one will be seen. The program does not need to check the validity of the input.

Example 1:

Enter an integer m, 2 ≤ m ≤ 10: 4  
Enter an integer n, 2 ≤ n ≤ 10: 7

```
      *  *  *  *
      *      *
*   *  *  *  *  *  *
      *      *
*           *
      *      *
*           *
*   *  *  *  *  *  *
      *      *
      *  *  *  *
```

Example 2:

Enter an integer m, 2 ≤ m ≤ 10: 3  
Enter an integer n, 2 ≤ n ≤ 10: 5

```
      *  *  *
*   *  *  *  *
*   *      *  *
*   *  *  *  *
      *  *  *
```

A3 Test Cases

First Submission:

Test 1:

Enter an integer m, 2 ≤ m ≤ 10: 10  
Enter an integer n, 2 ≤ n ≤ 10: 2

```
          *  *
          *  *
          *  *
          *  *
*   *  *  *  *  *  *  *  *  *  *
*   *  *  *  *  *  *  *  *  *  *
          *  *
          *  *
          *  *
          *  *
```

Test 2:

Enter an integer m, 2 <= m <= 10: 2  
Enter an integer n, 2 <= n <= 10: 2

\* \*

\* \*

Second Submission: Above tests, plus

Test 3:

Enter an integer m, 2 <= m <= 10: 2  
Enter an integer n, 2 <= n <= 10: 3

\* \*  
\* \* \*  
\* \*  
\* \* \*  
\* \*

## TIC - TAC - TOE

Write a program that accepts 3 rows of 3 characters each, each character representing a cell in a tic-tac-toe board, and determines who is the winner. An "X" or an "O" (uppercase letters) in a cell denotes that the cell has been taken by player X or player O, respectively, and a "-" in a cell denotes that the cell is empty. The program must print "X wins", "O wins", or "Neither wins", depending on which player has 3 in a row, either horizontally, vertically, or diagonally; if the game is not over, print "Neither wins". You may assume that all input will represent situations that can occur in a legal game (i.e., that the players take turns selecting cells).

Example 1 :

```
Enter 1st row:  XOX
Enter 2nd row:  OOX
Enter 3rd row:  OXX
```

```
Result:  X wins
```

Example 2:

```
Enter 1st row:  -X-
Enter 2nd row:  OOX
Enter 3rd row:  XXO
```

```
Result:  Neither wins
```

ADVANCED 5

String Sorting

Write a program to read a sentence and print the words in the sentence in alphabetic order, one word per line. Assume that the character comparison or string comparison mechanism in your programming language determines correctly the relative ordering of characters or strings, even though all upper-case letters will precede all lower-case letters. Also assume that

1. the sentence contains at least one word;
2. each word is at most 10 characters;
3. adjacent words are separated by exactly one space;
4. no punctuation or numbers will appear in the sentence, except for a period at the end;
5. the sentence contains no more than 10 words; and
6. the entire sentence fits on one line.

Example:

Enter the sentence: This is an example of a sentence.

This  
a  
an  
example  
is  
of  
sentence  
A5 Test Cases

First Submission:

Test 1:

Enter the sentence: This is the first Test.

Test  
This  
first  
is  
the

Test 2:

Enter the sentence: one two three four five six seven eight nine ten.

eight  
five  
four  
nine  
one  
seven  
six  
ten  
three  
two

Test 3:

Enter the sentence: onebigword.

onebigword

Second Submission: Above tests plus

Test 4:

Enter the sentence: z y x w v u t s r q.

q  
r  
s  
t  
u  
v  
w  
x  
y



## ADVANCED 6

### Equation Solver

Given the following form for an equation:  $aw + bx + cy + dz = 0$ , prompt for values for the coefficients  $a$ ,  $b$ ,  $c$ , and  $d$ . Then prompt for values for variables,  $w$ ,  $x$ ,  $y$ , and  $z$ . One of the values will be zero, which will indicate the unknown variable. Use the other values and determine the value of the unknown variable. The output must contain both the name of the unknown variable and its value.

Example:

Value for a: 1.0  
Value for b: 2.5  
Value for c: 3.0  
Value for d: -4.0

Value for w: 0  
Value for x: 4.5  
Value for y: 3  
Value for z: 2

Answer: w = -12.25  
A6 Test Cases

First Submission:

Test 1:

Value for a: -1.1  
Value for b: 2.2  
Value for c: -3.3  
Value for d: 0

Value for w: -7  
Value for x: 0  
Value for y: 4.3  
Value for z: 2

Answer: x = 2.95

Test 2:

Value for a: 1  
Value for b: 2  
Value for c: 3  
Value for d: 4

Value for w: 5  
Value for x: 6  
Value for y: 7  
Value for z: 0

Answer: z = -9.5

Second submission: Above tests, plus

Test 3:

Value for a: 1  
Value for b: 1  
Value for c: 1  
Value for d: 1

Value for w: 1  
Value for x: 1  
Value for y: 0  
Value for z: 1

Answer: y = -3.0