

Name and SSN:

KEY

Instructor's Name:

Andrew Charles Breiner

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	

1. (10 points) Evaluate each of the following expressions if **a** is 5, **b** is 10, **c** is 15, and **flag** is 1. Which parts of these expressions are not evaluated due to short-circuit evaluations? (Question (2) of Self-Check on page 157 in section 4.2)

Solution:

- | | | |
|---|--------------|----------------|
| a. <code>c == a + b !flag</code> | true | !flag |
| b. <code>a != 7 && flag c >= 6</code> | true | flag |
| c. <code>!(b <= 12) && a % 2 == 0</code> | false | nothing |
| d. <code>!(a > 5 c < a + b)</code> | true | nothing |

2. (10 points) What value is assigned to **x** when **y** is 15.0? (Question (2) of Self-Check on page 161 in section 4.3)

Solution:

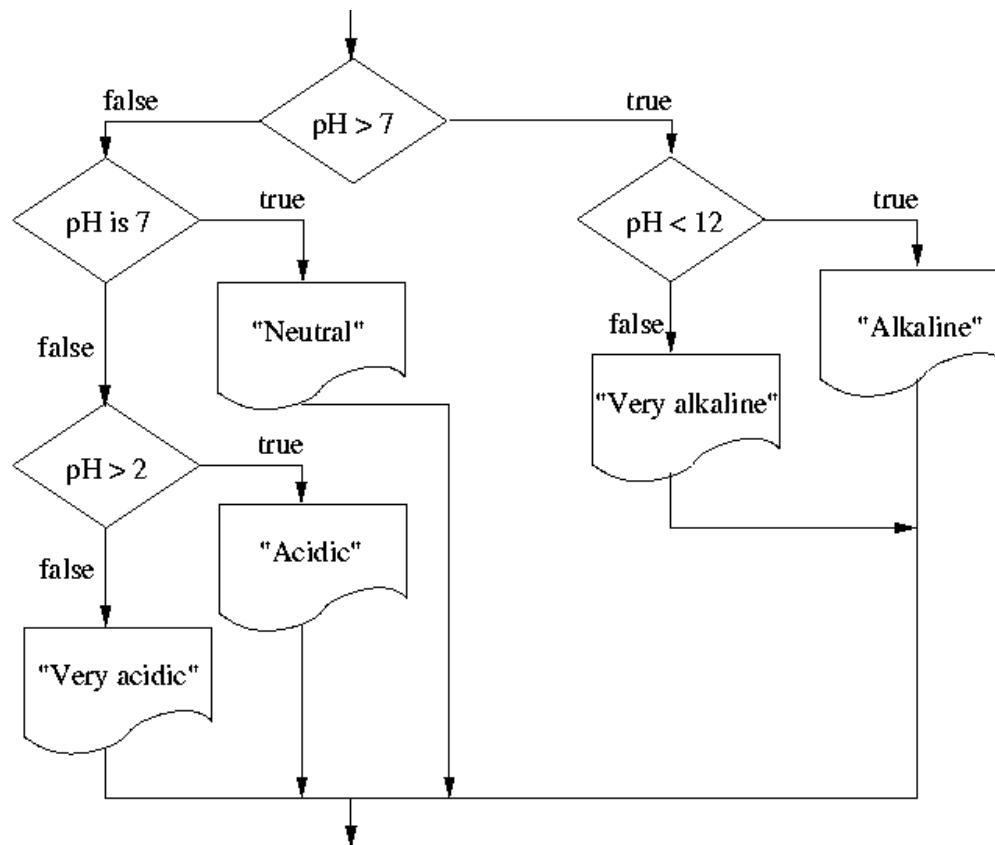
a. x = 25.0; if (y != (x - 10.0)) x = x - 10.0; else x = x / 2.0;	x = 12.5
b. if (y < 15.0) if (y >= 0.0) x = 5 * y; else x = 2 * y; else x = 3 * y;	x = 45.0
c. if (y < 15.0 && y >= 0.0) x = 5 * y; else x = 2 * y;	x = 30.0

3. (10 points) Correct the following if statement; assume the indentation is correct. (Question (2) of Self-Check on page 165 in section 4.4)

Solution:

if (num1 < 0); product = num1 * num2 * num3; printf("Product is %d\n", product); else; sum = sum + num2 + num3; printf("Sum is %d\n", sum); printf("Data: %d, %d, %d\n", num1, num2, num3);	if (num1 < 0) { product = num1 * num2 * num3; printf("Product is %d\n", product);} else { sum = sum + num2 + num3; printf("Sum is %d\n", sum); } printf("Data: %d, %d, %d\n", num1, num2, num3);
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4. (10 points) Write a nested if statement for the decision diagrammed in the accompanying flowchart. Use a multiple-alternative if for intermediate decisions where possible. (Question (3) of Self-Check on page 189 in section 4.7)



Solution:

```
if (pH < 7)
    if (pH < 12)
        printf("Alkaline");
    else
        printf("Very Alkaline");
else
    if (pH == 7)
        printf("Neutral");
    else
        if (pH > 2)
            printf("Acidic");
        else
            printf("Very Acidic");
```

5. (10 points) Why can't we rewrite our multiple-alternative if statement code from Example 4.16 and 4.17 using switch statements. (Question (2) of Self-Check on page 195 in section 4.8)

Solution:

In the first example they are using a range and we are not allowed to use ranges in the switch statement

In the second example they are using ranges and doubles and we can use neither of them in the switch statement

6. (10 points) Write C statements to carry out the following steps. (Question (1) of Programming on page 162 in section 4.3)
- If **item** is nonzero, then multiply **product** by **item** and save the result in **product**; otherwise, skip the multiplication. In either case, print the value of **product**
 - Store the absolute difference of **x** and **y**, where the absolute difference is **(x - y)** or **(y - x)**, whichever is positive. Do not use the `abs` or `fabs` function in your solution.
 - If **x** is 0, add 1 to **zero_count**. If **x** is negative, add **x** to **minus_sum**. If **x** is greater than 0, add **x** to **plus_sum**.

Solution:

```
if (item != 0)
    product = product * item;
printf("%d", product);

if ((x-y) < 0)
    abs = y - x;
else
    abs = x - y;

if (x == 0)
    zero_count++;
else
    if (x > 0)
        plus_sum += x;
    else
        minus_sum -= x;
```

7. (10 points) Write an interactive program that contains an if statement that may be used to compute the area of a square ($area = side^2$) or a triangle ($area = 1/2 * base * height$) after prompting the user to type the first character of the figure name (*S* or *T*). (Question (2) of Programming on page 166 in section 4.4)

Solution:

```
#include <stdio.h>

int main(void) {
    char shape;
    double area, base, height, side;

    printf("Do you have a square or triangle (s/t)? ");
    scanf("%c",&shape);

    if (shape == 's') {
        printf("What is the side of your square? ");
        scanf("%lf",&side);
        area = side * side;
    } //if
    else {
        printf("What is the base and height of your triangle? ");
        scanf("%lf %lf",&base, &height);
        area = base * height / 2;
    } //else
    printf("The area is %f\n",area);
    return 0;
} //main
```

8. (10 points) The Air Force has asked you to write a program to label supersonic aircraft as military or civilian. Your program is to be given the plane's observed speed in km/h and its estimated length in meters. For planes traveling in excess of 1100 km/h, you will label those longer than 52 meters "civilian" and shorter aircraft as "military". For planes traveling at slower speeds, you will issue an "aircraft type unknown" message. (Question (4) of Programming on page 190 in section 4.7)

Solution:

```
#include <stdio.h>

int main(void) {
    int speed, length;

    printf("What is the observed speed and length of the aircraft? ");
    scanf("%d %d", &speed, &length);

    if (speed > 1100 && length > 52)
        printf("Civilian\n");
    else
        if (speed > 1100)
            printf("Military\n");
        else
            printf("Aircraft type unknown\n");
    return 0;
} //main
```

9. (10 points) Write a switch statement that assigns to the variable **lumens** the expected brightness of a standard light bulb whose wattage has been stored in **watts**. Use this table: (Question 3 of Programming on page 91 in Chapter 2 review)

Watts	Brightness (in Lumens)
15	125
25	215
40	500
60	880
75	1000
100	1625

Assign -1 to **lumens** if the value of **watts** is not in the table.

Solution:

```
switch (watts) {  
    case 15 : lumens = 125;  
        break;  
    case 25 : lumens = 215;  
        break;  
    case 40 : lumens = 500;  
        break;  
    case 60 : lumens = 880;  
        break;  
    case 75 : lumens = 1000;  
        break;  
    case 100 : lumens = 1625;  
        break;  
    default : lumens = -1;  
}
```


10. (10 points) Write a program that reports the contents of a compressed-gas cylinder based on the first letter of the cylinder's color. The program input is a character representing the observed color of the cylinder: 'Y' or 'y' for yellow, 'O' or 'o' for orange, and so on. Cylinder colors and associated contents are as follows: (Question (4) of Programming on page 204 in Chapter 4 review)

orange	ammonia
brown	carbon monoxide
yellow	hydrogen
green	oxygen

Your program should respond to input of a letter other than the first letters of the given colors with the message, Contents unknown.

Solution:

```
#include <stdio.h>

int main(void) {
    char color;

    printf("What is the color of you cylinder? ");
    scanf("%c", &color);

    switch (color) {
        case 'o':
        case 'O':
            printf("ammonia\n");
            break;
        case 'b':
        case 'B':
            printf("carbon monoxide\n");
            break;
        case 'y':
        case 'Y':
            printf("hydrogen\n");
            break;
        case 'g':
        case 'G':
            printf("Oxygen\n");
            break;
        default:
            printf("Contents unknown\n");
    } //switch
    return 0;
} //main
```