Name: **SAMPLE SOLUTIONS**

Group Members: Me, myself and I

Coder or Builder

Fort Street High School Robotics Examination

Week 8, Term 4 2016

Examination Details

Exam duration:	1 hour
Total number of questions:	4
Total number of marks:	40
Topics covered:	C, RobotC OR C, RobotC, Construction

Instructions

Your marks as a group for this paper may affect your continuation of Robotics.

If you are a coder, attempt Questions 1 to 4.

If you are a builder, attempt Questions 1 to 3, and Question 5.

This paper has 11 pages, including the front page.

This paper MUST NOT be retained by the student.

Textbooks, notes, phones, laptops, tablets, smartwatches are not permitted.

All questions may be attempted. You may leave early if you complete your exam.

Examiner's Use Only					
	1	2	3	4 A / B	Total

Question 1 10 marks

a) Consider the following C program. 4

```
12
22
32
42
```

Mark	Guideline
0	No attempt, all outputs incorrect
1	One output is correct, output is not in order
2	Two outputs are correct, or several extra wrong outputs
3	Three outputs are correct, or one extra wrong outputs
4	All outputs correct

b) Consider the following C program. 6

```
A: 9
9
4
2
1
```

Mark	Guideline
0	No attempt
1-3	Several outputs wrong or out of order
4	Two outputs incorrect
5	One output inccorect
6	All outputs correct

Question 2 10 Marks

```
#include <stdio.h>

int main() {
    int mark;
    printf("Please enter your mark: “);
    scanf("%i”, &mark);
    if (mark >= 0 && mark <= 49) {
        printf("FAIL\n");
    }
    else if (mark >= 50 && mark <= 100) {
        printf("PASS\n");
    }
    else {
        printf("ERROR\n");
    }
    return 0;
}
```

Marks Available	**Guideline**
+1	#include correct
+1	main() declared and correct
+1	Integers declared
+1	printf statement for ‘enter mark’ correct
+1	scanf statement correct, with correct use of &
+2	if statements correct
+2	printf statements for marks correct
+1	return 0; used (if using int main())
-1	For any other minor mistake

Question 3 12 Marks

The line to circle:

```
if (50 < sensorLeft < 100 && 50 < sensorRight < 100) {
```

a) What are the changes you need to make to the line to fix this error?

The line needs to be changed to:

```
if (sensorLeft > 50 && sensorLeft < 100 &&
            sensorRight > 50 && sensorRight < 100) {
```

Mark	Guideline
0	No attempt, wrong line was selected
2	The correct line or section was identified to be wrong
4	New if statement correct

b) What happens to both motors if both the left and right sensors are on white (value approximately 60)?

The motors both rotate at a speed of 80.

Mark	Guideline
0	No attempt, or that motors do not move
2	State that both motors move
3	State that both motors move at a speed of 80

c) What happens to both motors if both left and right sensors are on white, and then the left sensor detects a reflected light value of exactly 50? Why?

The motors move at the last commanded speed of 80. None of the if statements are triggered when the left sensor detects exactly 50, so the motor speed values remain the same as the initial speed.

Mark	**Guideline**
0	No attempt OR wrong movement indicated
1	State that motors move at their last commanded speed (at 80 speed)
3	Explains that no if statements are met, so they continue at their initial speed

d) What is the purpose of the while loop?

The while loop allows the code to continue running and allows the robot to continue moving along the line.

Mark	**Guideline**
0	No attempt
1	Some attempt at explaining the loop
2	Explains the while loop is used to keep the code running OR Explains that if the while loop was not there, the code would stop after checking the sensor values once.

Question 4 8 Marks

a) Write a FUNCTION **`void printNiceNumber(int num)`** that accepts 4
an integer between 0 and 9999, and prints a formatted number with trailing zeroes.

```
void printNiceNumber(int num) {
    if (num < 10) {
        printf("000%i\n", num);
    }
    else if (num < 100) {
        printf("00%i\n", num);
    }
    else if (num < 1000) {
        printf("0%i\n", num);
    }
    else {
        printf("%i\n", num);
    }
}
```

An alternative solution:

```
void printNiceNumber(int num) {
    printf("%04i", num);
}
```

Marks Available	**Guideline**
+1	Function declaration is correct
+3	Digit lengths and if statements are used correctly
-1	For any other minor mistake

b) Write the MAIN FUNCTION **`int main()`** which prints all numbers from 0 to 9999 formatted with trailing zeros. Assume the function define above in part a) is already declared before the main function is run. 4

```
int main() {
    int counter = 0;
    while (counter < 10000) {
        printNiceNumber(counter);
        counter = counter + 1;
    }
    return 0;
}
```

Marks Available	**Guideline**
+1	int main and return 0; are used correctly
+1	Loop and a counter (incrementing number) is used
+1	Function printNiceNumber(int num) is used
+1	Formatting and styling
-1	For any other minor mistake

Question 5 8 Marks

a) Design and describe a possible model for a can pick-up mechanism. 4

Various solutions.

Mark	**Guideline**
0	No attempt OR mechanism does not interact with described can
2	Model is capable of grabbing or dragging a can
4	Model is capable of grabbing and lifting a can

b) Outline possible limitations that can occur with the mechanism you have designed. 4

Various solutions.

Mark	**Guideline**
0	No attempt OR does not provide any valid limitation
2	One valid limitation of the model
4	Two or more valid limitations of the model

END OF PAPER