

Programming with Constants and Variables

Name: Solutions

Part I –Statement Identification

Directions: Briefly describe what each of the following statements does.

- 1) `repeat(5) { }` Executes a task 5 times
- 2) `#define MOVE_TIME 200` Defines a constant named MOVE_TIME (value =200)
- 3) `int turn_time;` Defines a variable called turn_time
- 4) `Random (90)` Random number with a maximum value of 90
- 5) `Wait (MOVE_TIME);` Wait a time equal to the value of MOVE_TIME
- 6) `MOVE_TIME += 5;` Increase the variable MOVE_TIME by 5
- 7) `SetPower(OUT_A + OUT_C, power);` Ports A and C are set to a power level equal to the value of variable or constant power
- 8) `On(OUT_B);` Turn On Port B

Part II – Explaining Programs

Directions: For each of the given programs, answer the questions that follow.

1)

```
int a;           // Defines integer a
int b;           // Defines integer b
int c;           // Defines integer c

task main()
{
  a = 3;
  b = a * 4;
  c = b + 6;
  c /= 9;
  c += 2;
  a = 10 * (c+3)
}
```

- a) How can the integer definitions be written on one line? `int a; int b; int c;`
- b) What is the final value of variable *a*? **70**

2)

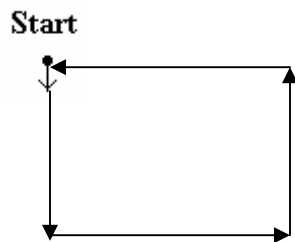
```
#define MOVE_TIME 200
#define TURN_TIME 100

task main()
{
    repeat(4)
    {
        OnFwd(OUT_A + OUT_C);
        Wait(MOVE_TIME);
        OnRev(OUT_C);
        Wait(TURN_TIME);
    }
    Off(OUT_A + OUT_C);
}
```

a) Explain *exactly* what is going on in the program above. **Be specific** about power levels and ports.

Two constants, one called MOVE_TIME (value =200) and one called TURN_TIME (value =100), are defined. The following task loops four times: Motors A and C move forward at power level 7 for 2 seconds, then Motor C moves reverse while Motor A continues to move forward (both at power level 7) for one second. After the 4th loop, ports A, B, and C stop.

b) The program above is downloaded and run on Tankbot. Sketch Tankbot's path of motion below. The start point is given. Assume that the robot makes a 90-degree turn when the motors are turning in opposite directions for 1 second.



Directions: For each of the given programs, answer the questions that follow.

3)

```
#define Forward_Time 100

task main()
{
    SetPower(OUT_A + OUT_C, 3);
    OnFwd(OUT_A + OUT_C);
    Wait(Forward_Time);

    repeat(5)
    {
        On(OUT_B);           // A lamp is connected in Port B.
        Wait(50);
        Off(OUT_A + OUT_B + OUT_C);
    }
}
```

a) Explain *exactly* what is going on in the program above. **Be specific** about power levels and ports.

Motors A and C run forward at power level 3 for 1 second (Forward_Time). A looped task begins - the lamp in port B turns on for .5 seconds at power level 7, and power is stopped to ports A, B, and C – for a total of 5 times.

b) How many seconds do motors A and C run forward before they are turned off? **1.5 sec**

4)

```
int aaa;
int bbb, int ccc;

task main()
{
    aaa = 10;
    bbb = 20 * 5;
    ccc = bbb;
    ccc /= aaa;
    ccc -= 5;
    aaa = 3 * (ccc + 4);
}
```

a) What is the final value of the variable ccc? **5**

b) What is the final value of the variable aaa? **27**

5)

```
int power_level;

task main()
{
    power_level = 0;
    repeat(5)
    {
        SetPower(OUT_A + OUT_C, power_level);
        OnFwd(OUT_A + OUT_C);
        Wait(200);
        power_level += 1;
    }
    Off(OUT_A + OUT_C);
}
```

a) Explain *exactly* what is going on in the program above. **Be specific** about power levels and ports.

Variable `power_level` is initialized to 0. Motors A and C move forward at power level 0 for 2 seconds, and the power level at which the motors run increases by 1 every 2 seconds. This happens a total of 5 times, and then Motors A and C stop.