

## Harsh Solanki CPS188 Lab 3

### Problem 1:

#### Source code:

```
#include<stdio.h>
#include<math.h>
#define e 2.718281828

double males_Low (double age, double rhr)
{
    double exp = 0.033*(age-104.3);
    double MHR;
    double THR;

    MHR = 203.7/(1+pow(e, exp));

    THR = ((MHR-rhr)*0.55)+rhr;
    return (THR);
}

double males_Medium (double age, double rhr)
{
    double exp = 0.033*(age-104.3);
    double MHR;
    double THR;

    MHR = 203.7/(1+pow(e, exp));

    THR = ((MHR-rhr)*0.65)+rhr;
    return (THR);
}

double males_High (double age, double rhr)
{
    double exp = 0.033*(age-104.3);
    double MHR;
    double THR;

    MHR = 203.7/(1+pow(e, exp));

    THR = ((MHR-rhr)*0.8)+rhr;
    return (THR);
}

double females_Low (double age, double rhr)
{
    double exp = 0.0453*(age-107.5);
    double MHR;
    double THR;
```

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```
MHR = 190.2/(1+pow(e, exp));

THR = ((MHR-rhr)*0.55)+rhr;
return (THR);
}

double females_Medium (double age, double rhr)
{
    double exp = 0.0453*(age-107.5);
    double MHR;
    double THR;

    MHR = 190.2/(1+pow(e, exp));

    THR = ((MHR-rhr)*0.65)+rhr;
    return (THR);
}

double females_High (double age, double rhr)
{
    double exp = 0.0453*(age-107.5);
    double MHR;
    double THR;

    MHR = 190.2/(1+pow(e, exp));

    THR = ((MHR-rhr)*0.8)+rhr;
    return (THR);
}

int main (void)
{
    int AGE;
    char INTEN;
    char GENDER;
    double RHR;
    int training_rate;

    printf("Enter Age\n");
    scanf("%d", &AGE);

    printf("Enter M if male or F if female\n");
    scanf(" %c", &GENDER);

    printf("Enter fitness level (L for low, M for medium, H for high)\n");
    scanf(" %c", &INTEN);

    printf("Enter resting heart rate\n");
```

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```
scanf("%lf", &RHR);

if (GENDER == 'M' && INTEN == 'L')
{
    training_rate = males_Low(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else if (GENDER == 'M' && INTEN == 'M')
{
    training_rate = males_Medium(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else if (GENDER == 'M' && INTEN == 'H')
{
    training_rate = males_High(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else if (GENDER == 'F' && INTEN == 'L')
{
    training_rate = females_Low(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else if (GENDER == 'F' && INTEN == 'M')
{
    training_rate = females_Medium(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else if (GENDER == 'F' && INTEN == 'H')
{
    training_rate = females_High(AGE, RHR);
    printf("The training heart rate is %d", training_rate);
}
else
{
    printf("Invalid entry, please restart application and enter letters in capitals");
}

}
```

Answer to part a)

A 19-year-old male, resting heart rate of 64, and medium fitness level.

Calculator answer:

$$\left( \frac{203.7}{1 + e^{0.033(19-104.3)}} - 64 \right) \times 0.65 + 64 = 147.3209002$$

Program answer:

```
C:\Windows\SYSTEM32\cmd.exe
Enter Age
19
Enter M if male or F if female
M
Enter fitness level (L for low, M for medium, H for high)
M
Enter resting heart rate
64
The training heart rate is 147
```

Answer to part b)

A 20-year-old female, resting heart rate of 63, and high fitness level.

Calculator answer:

$$\left( \frac{190.2}{1 + e^{0.0453(20 - 107.5)}} - 63 \right) \times 0.8 + 63 = 161.9240728$$

Program answer:

```
C:\Windows\SYSTEM32\cmd.exe
Enter Age
20
Enter M if male or F if female
F
Enter fitness level (L for low, M for medium, H for high)
H
Enter resting heart rate
63
The training heart rate is 161
```

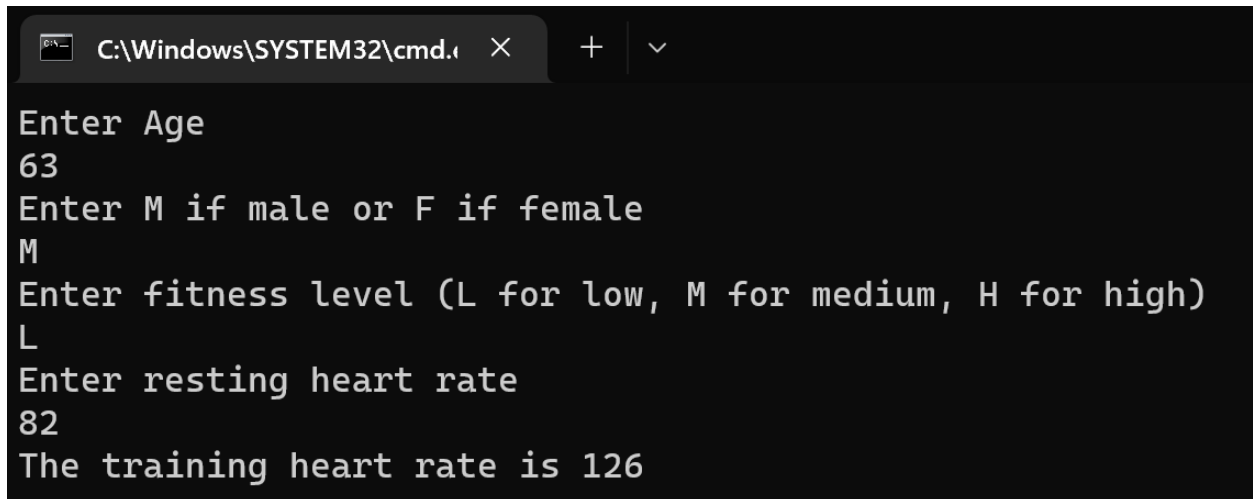
Answer to part c)

A 63-year old male, resting heart rate of 82, and low fitness level.

Calculator answer:

$$\left( \frac{203.7}{1 + e^{0.033(63-104.3)}} - 82 \right) \times 0.55 + 82 = 126.1056975$$

Program Answer:

A screenshot of a Windows command prompt window. The title bar shows the path 'C:\Windows\SYSTEM32\cmd.exe'. The window contains the following text: 'Enter Age', '63', 'Enter M if male or F if female', 'M', 'Enter fitness level (L for low, M for medium, H for high)', 'L', 'Enter resting heart rate', '82', and 'The training heart rate is 126'.

```
C:\Windows\SYSTEM32\cmd.exe
Enter Age
63
Enter M if male or F if female
M
Enter fitness level (L for low, M for medium, H for high)
L
Enter resting heart rate
82
The training heart rate is 126
```

Problem 2:

Source code:

```
#include<stdio.h>

double body_mass_index (double W, double H)
{
    double BMI;

    BMI = W / (H*H);

    return (BMI);
}

int main (void)
{
    double weight;
    double height;
    double bmi;
```

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```
printf("Enter Weight in kilograms\n");
scanf("%lf", &weight);

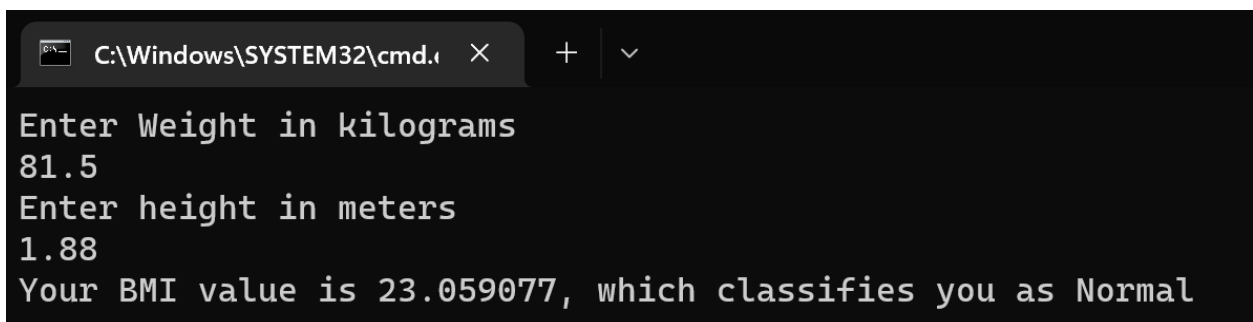
printf("Enter height in meters\n");
scanf("%lf", &height);

bmi = body_mass_index (weight, height);

if (bmi < 18.5)
{
    printf("Your BMI value is %lf, which classifies you as
Underweight", bmi);
}
else if (bmi >= 18.5 && bmi < 25)
{
    printf("Your BMI value is %lf, which classifies you as Normal",
bmi);
}
else if (bmi >= 25 && bmi < 30)
{
    printf("Your BMI value is %lf, which classifies you as Overweight",
bmi);
}
else if (bmi >= 30)
{
    printf("Your BMI value is %lf, which classifies you as Obese",
bmi);
}
}
```

Answer to part a)

A person 1.88 m tall with a weight of 81.5 kg.



```
C:\Windows\SYSTEM32\cmd.exe
Enter Weight in kilograms
81.5
Enter height in meters
1.88
Your BMI value is 23.059077, which classifies you as Normal
```

Answer to part b)

A person 1.55 m tall with a weight of 68 kg.

```
C:\Windows\SYSTEM32\cmd.exe X + v
Enter Weight in kilograms
68
Enter height in meters
1.55
Your BMI value is 28.303850, which classifies you as Overweight
```

Answer to part c)

A person 1.57 m tall with a weight of 94 kg.

```
C:\Windows\SYSTEM32\cmd.exe X + v
Enter Weight in kilograms
94
Enter height in meters
1.57
Your BMI value is 38.135421, which classifies you as Obese
```

Problem 3:

Source code:

```
#include <stdio.h>

double final_mark_35_40 (double n1, double n2, double n3, double n4,
double n5, double n6, double n7, double n8, double n9, double midterm,
double final)
{
    double final_grade;
    double sum;

    sum = n1+n2+n3+n4+n5+n6+n7+n8+n9;

    final_grade = 0.25*((sum/9)*10)+0.35*(midterm)+0.4*(final);
```

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```
        return (final_grade);
    }

double final_mark_25_50 (double n1, double n2, double n3, double n4,
double n5, double n6, double n7, double n8, double n9, double midterm,
double final)
{
    double final_grade;

    double sum;

    sum = n1+n2+n3+n4+n5+n6+n7+n8+n9;

    final_grade = 0.25*((sum/9)*10)+0.25*(midterm)+0.5*(final);

    return (final_grade);
}

int main (void)
{
    double q1;
    double q2;
    double q3;
    double q4;
    double q5;
    double q6;
    double q7;
    double q8;
    double q9;
    double q10;
    double midterm;
    double final;
    double result;
```



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```
printf("Enter quiz 1 mark\n");
scanf("%lf", &q1);

printf("Enter quiz 2 mark\n");
scanf("%lf", &q2);

printf("Enter quiz 3 mark\n");
scanf("%lf", &q3);

printf("Enter quiz 4 mark\n");
scanf("%lf", &q4);

printf("Enter quiz 5 mark\n");
scanf("%lf", &q5);

printf("Enter quiz 6 mark\n");
scanf("%lf", &q6);

printf("Enter quiz 7 mark\n");
scanf("%lf", &q7);

printf("Enter quiz 8 mark\n");
scanf("%lf", &q8);

printf("Enter quiz 9 mark\n");
scanf("%lf", &q9);

printf("Enter quiz 10 mark\n");
scanf("%lf", &q10);
```

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```
printf("Enter midterm exam mark\n");

scanf("%lf", &midterm);

printf("Enter final exam mark\n");

scanf("%lf", &final);


if (q1 < q2 && q1 < q3 && q1 < q4 && q1 < q5 && q1 < q6 && q1 < q7
&& q1 < q8 && q1 < q9 && q1 < q10 && midterm >= final) //exclude quiz 1
{

    result = final_mark_35_40 (q2, q3, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q2 < q1 && q2 < q3 && q2 < q4 && q2 < q5 && q2 < q6 && q2
< q7 && q2 < q8 && q2 < q9 && q2 < q10 && midterm >= final) //exclude
quiz 2
{

    result = final_mark_35_40 (q1, q3, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q3 < q1 && q3 < q2 && q3 < q4 && q3 < q5 && q3 < q6 && q3
< q7 && q3 < q8 && q3 < q9 && q3 < q10 && midterm >= final) //exclude
quiz 3
{

    result = final_mark_35_40 (q1, q2, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q4 < q1 && q4 < q2 && q4 < q3 && q4 < q5 && q4 < q6 && q4
< q7 && q4 < q8 && q4 < q9 && q4 < q10 && midterm >= final) //exclude
quiz 4
{

    result = final_mark_35_40 (q1, q2, q3, q5, q6, q7, q8, q9,
q10, midterm, final);
```

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```
        printf("The final grade is %lf", result);

    }

    else if (q5 < q1 && q5 < q2 && q5 < q3 && q5 < q4 && q5 < q6 && q5
< q7 && q5 < q8 && q5 < q9 && q5 < q10 && midterm >= final)//exclude quiz
5

    {

        result = final_mark_35_40 (q1, q2, q3, q4, q6, q7, q8, q9,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q6 < q1 && q6 < q2 && q6 < q3 && q6 < q4 && q6 < q5 && q6
< q7 && q6 < q8 && q6 < q9 && q6 < q10 && midterm >= final)// exclude
quiz 6

    {

        result = final_mark_35_40 (q1, q2, q3, q4, q5, q7, q8, q9,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q7 < q1 && q7 < q2 && q7 < q3 && q7 < q4 && q7 < q5 && q7
< q6 && q7 < q8 && q7 < q9 && q7 < q10 && midterm >= final)// exclude
quiz 7

    {

        result = final_mark_35_40 (q1, q2, q3, q4, q5, q6, q8, q9,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q8 < q1 && q8 < q2 && q8 < q3 && q8 < q4 && q8 < q5 && q8
< q6 && q8 < q7 && q8 < q9 && q8 < q10 && midterm >= final)// exclude
quiz 8

    {

        result = final_mark_35_40 (q1, q2, q3, q4, q5, q6, q7, q9,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q9 < q1 && q9 < q2 && q9 < q3 && q9 < q4 && q9 < q5 && q9
< q6 && q9 < q7 && q9 < q8 && q9 < q10 && midterm >= final)// exclude
quiz 9
```

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```
{

    result = final_mark_35_40 (q1, q2, q3, q4, q5, q6, q7, q8,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q10 < q1 && q10 < q2 && q10 < q3 && q10 < q4 && q10 < q5
&& q10 < q6 && q10 < q7 && q10 < q8 && q10 < q9 && midterm >= final)//
exclude quiz 10

{

    result = final_mark_35_40 (q1, q2, q3, q4, q5, q6, q7, q8,
q9, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q1 < q2 && q1 < q3 && q1 < q4 && q1 < q5 && q1 < q6 && q1
< q7 && q1 < q8 && q1 < q9 && q1 < q10 && midterm < final) //exclude quiz
1

{

    result = final_mark_25_50 (q2, q3, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q2 < q1 && q2 < q3 && q2 < q4 && q2 < q5 && q2 < q6 && q2
< q7 && q2 < q8 && q2 < q9 && q2 < q10 && midterm < final) //exclude quiz
2

{

    result = final_mark_25_50 (q1, q3, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q3 < q1 && q3 < q2 && q3 < q4 && q3 < q5 && q3 < q6 && q3
< q7 && q3 < q8 && q3 < q9 && q3 < q10 && midterm < final) //exclude quiz
3
```

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```
{

    result = final_mark_25_50 (q1, q2, q4, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q4 < q1 && q4 < q2 && q4 < q3 && q4 < q5 && q4 < q6 && q4
< q7 && q4 < q8 && q4 < q9 && q4 < q10 && midterm < final) //exclude quiz
4

{

    result = final_mark_25_50 (q1, q2, q3, q5, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q5 < q1 && q5 < q2 && q5 < q3 && q5 < q4 && q5 < q6 && q5
< q7 && q5 < q8 && q5 < q9 && q5 < q10 && midterm < final)//exclude quiz
5

{

    result = final_mark_25_50 (q1, q2, q3, q4, q6, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q6 < q1 && q6 < q2 && q6 < q3 && q6 < q4 && q6 < q5 && q6
< q7 && q6 < q8 && q6 < q9 && q6 < q10 && midterm < final)// exclude quiz
6

{

    result = final_mark_25_50 (q1, q2, q3, q4, q5, q7, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);

}

else if (q7 < q1 && q7 < q2 && q7 < q3 && q7 < q4 && q7 < q5 && q7
< q6 && q7 < q8 && q7 < q9 && q7 < q10 && midterm < final)// exclude quiz
7

{

    result = final_mark_25_50 (q1, q2, q3, q4, q5, q6, q8, q9,
q10, midterm, final);

    printf("The final grade is %lf", result);
```

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```
    }

    else if (q8 < q1 && q8 < q2 && q8 < q3 && q8 < q4 && q8 < q5 && q8
< q6 && q8 < q7 && q8 < q9 && q8 < q10 && midterm < final)// exclude quiz
8

    {

        result = final_mark_25_50 (q1, q2, q3, q4, q5, q6, q7, q9,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q9 < q1 && q9 < q2 && q9 < q3 && q9 < q4 && q9 < q5 && q9
< q6 && q9 < q7 && q9 < q8 && q9 < q10 && midterm < final)// exclude quiz
9

    {

        result = final_mark_25_50 (q1, q2, q3, q4, q5, q6, q7, q8,
q10, midterm, final);

        printf("The final grade is %lf", result);

    }

    else if (q10 < q1 && q10 < q2 && q10 < q3 && q10 < q4 && q10 < q5
&& q10 < q6 && q10 < q7 && q10 < q8 && q10 < q9 && midterm < final)//
exclude quiz 10

    {

        result = final_mark_25_50 (q1, q2, q3, q4, q5, q6, q7, q8,
q9, midterm, final);

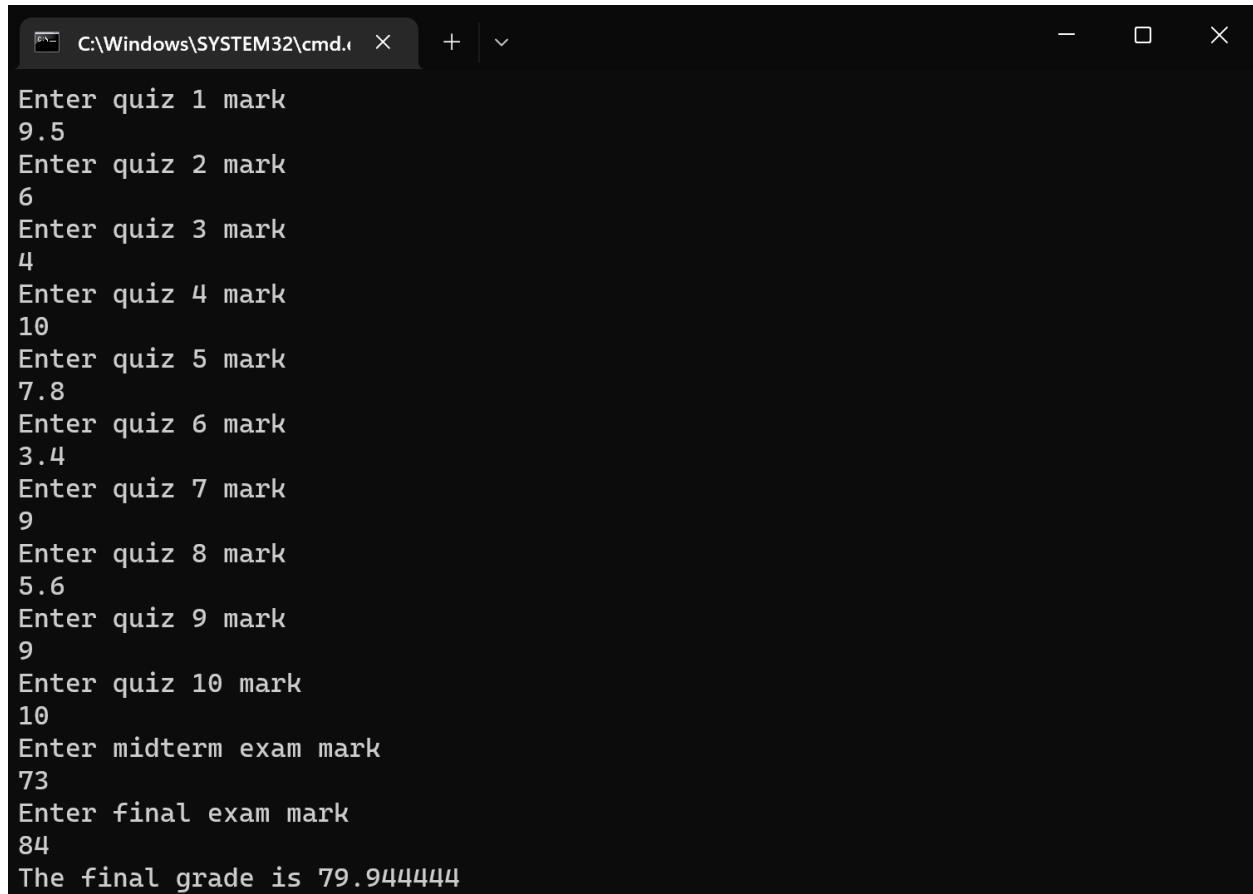
        printf("The final grade is %lf", result);

    }

}
```

Answer to part a)

Quiz grades: 9.5, 6, 4, 10, 7.8, 3.4, 9, 5.6, 9, 10, Midterm grade: 73, and Final exam: 84.



```
C:\Windows\SYSTEM32\cmd.exe
Enter quiz 1 mark
9.5
Enter quiz 2 mark
6
Enter quiz 3 mark
4
Enter quiz 4 mark
10
Enter quiz 5 mark
7.8
Enter quiz 6 mark
3.4
Enter quiz 7 mark
9
Enter quiz 8 mark
5.6
Enter quiz 9 mark
9
Enter quiz 10 mark
10
Enter midterm exam mark
73
Enter final exam mark
84
The final grade is 79.944444
```

Answer to part b)

Quiz grades: 9.5, 8.4, 9, 10, 7.8, 10, 9, 9.6, 9, 10, Midterm grade: 89, and Final exam: 81

```
C:\Windows\SYSTEM32\cmd.exe X + v
Enter quiz 1 mark
9.5
Enter quiz 2 mark
8.4
Enter quiz 3 mark
9
Enter quiz 4 mark
10
Enter quiz 5 mark
7.8
Enter quiz 6 mark
10
Enter quiz 7 mark
9
Enter quiz 8 mark
9.6
Enter quiz 9 mark
9
Enter quiz 10 mark
10
Enter midterm exam mark
89
Enter final exam mark
81
The final grade is 87.022222
```



Answer to part c)

Quiz grades: 8.5, 8.5, 9, 8.5, 7.5, 7, 9, 9.5, 10, 10, Midterm grade: 80, and Final exam: 70

```
C:\Windows\SYSTEM32\cmd.exe
Enter quiz 1 mark
8.5
Enter quiz 2 mark
8.5
Enter quiz 3 mark
9
Enter quiz 4 mark
8.5
Enter quiz 5 mark
7.5
Enter quiz 6 mark
7
Enter quiz 7 mark
9
Enter quiz 8 mark
9.5
Enter quiz 9 mark
10
Enter quiz 10 mark
10
Enter midterm exam mark
80
Enter final exam mark
70
The final grade is 78.361111
```