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;
```

```
	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");
```

```
	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");
	}

}
```

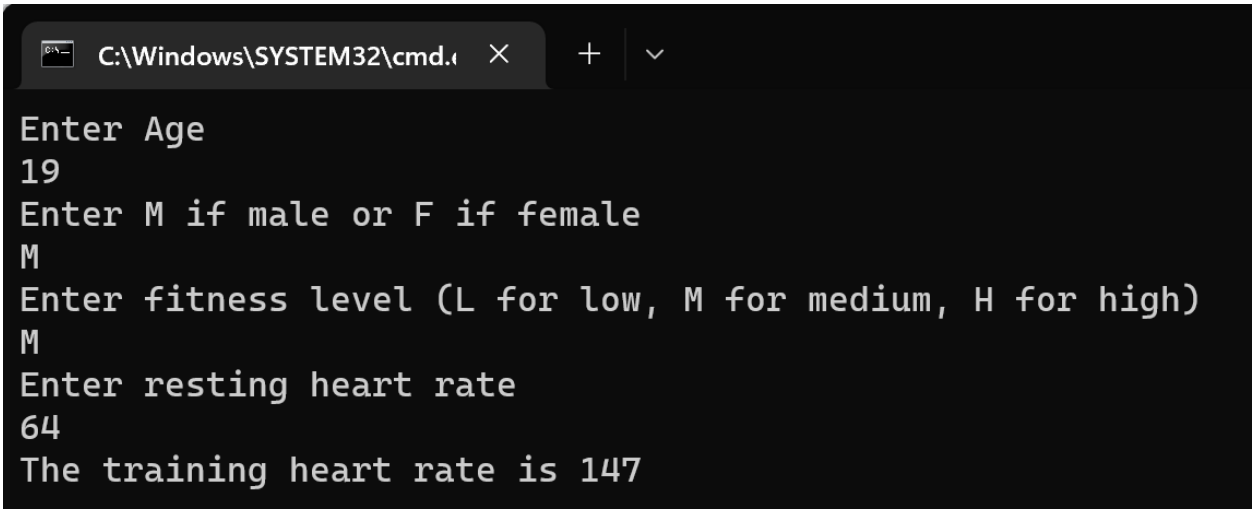
Answer to part a)

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:

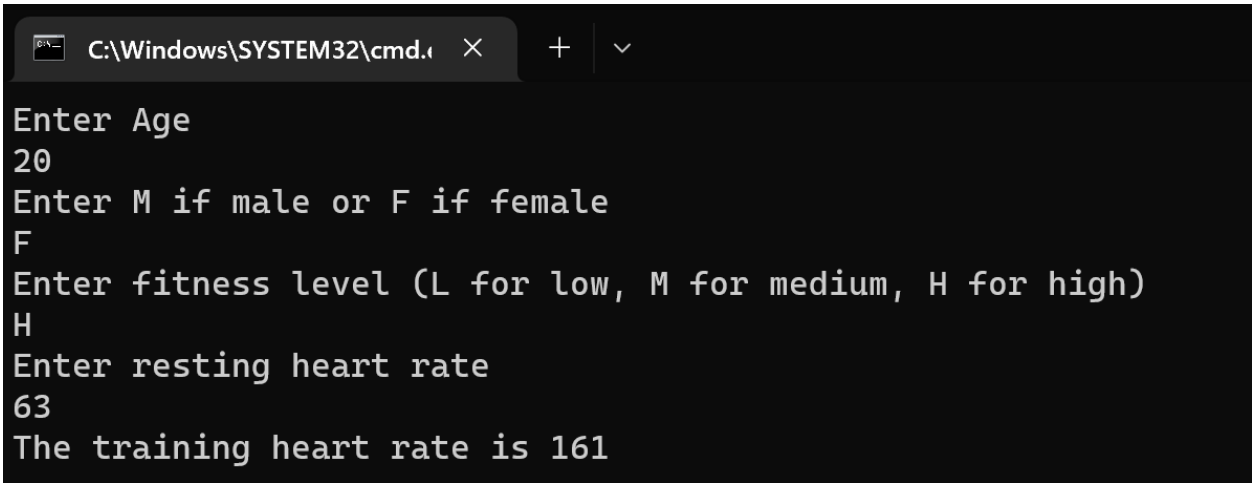


Answer to part b)

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:



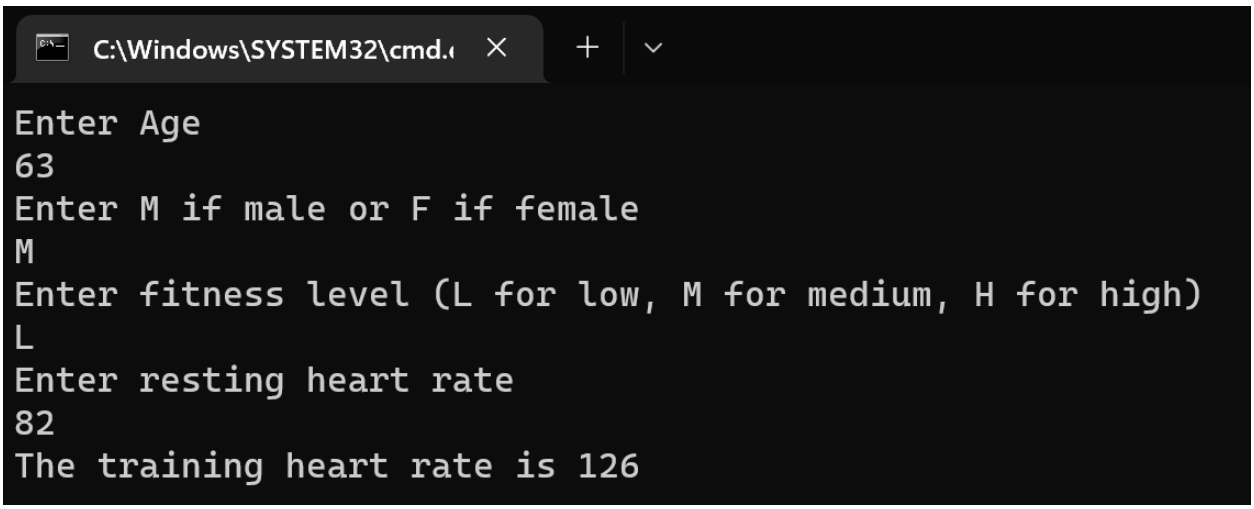
Answer to part c)

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:



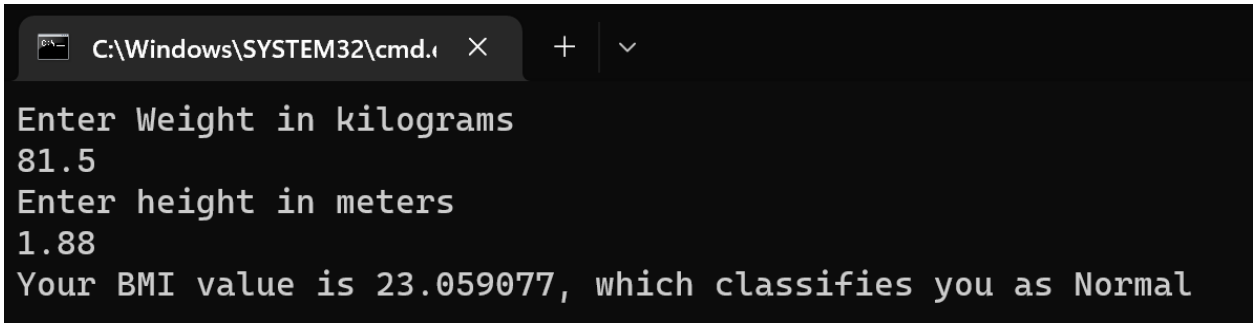
Problem 2:
Source code:

```
#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;
```

```
	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);
	}
}
```

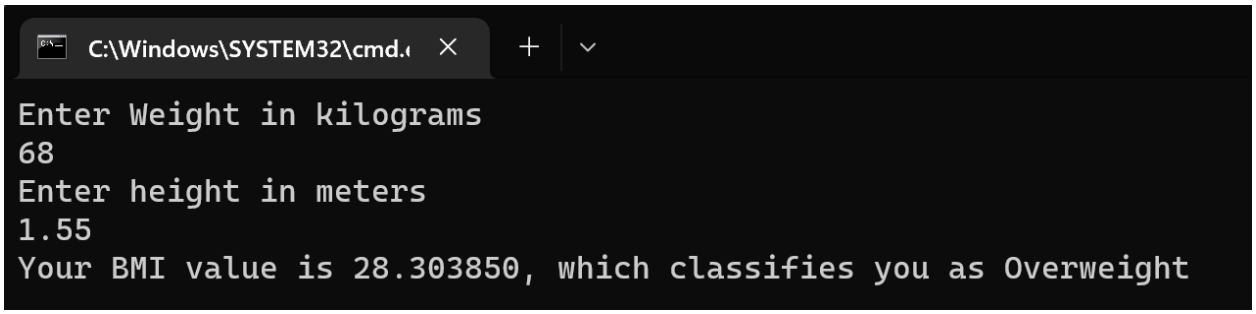
Answer to part a)

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



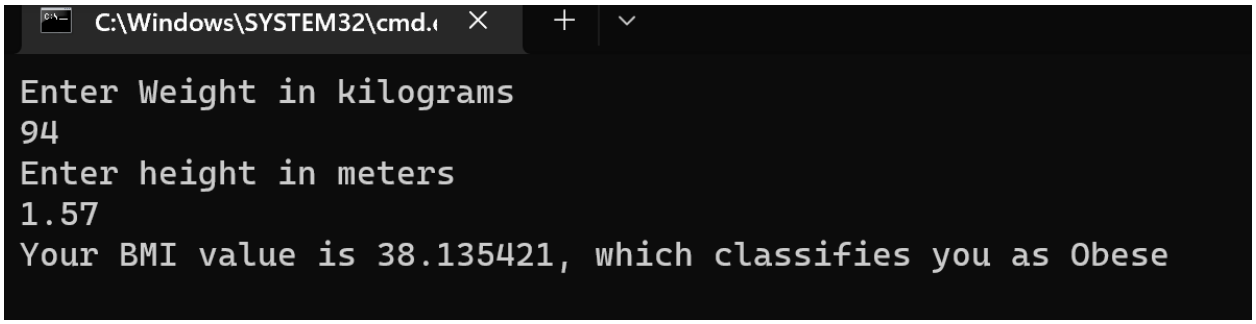
Answer to part b)

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



Answer to part c)

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



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);
```

```
        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;
```

```
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);
```

```
	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);
```

```
            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
```

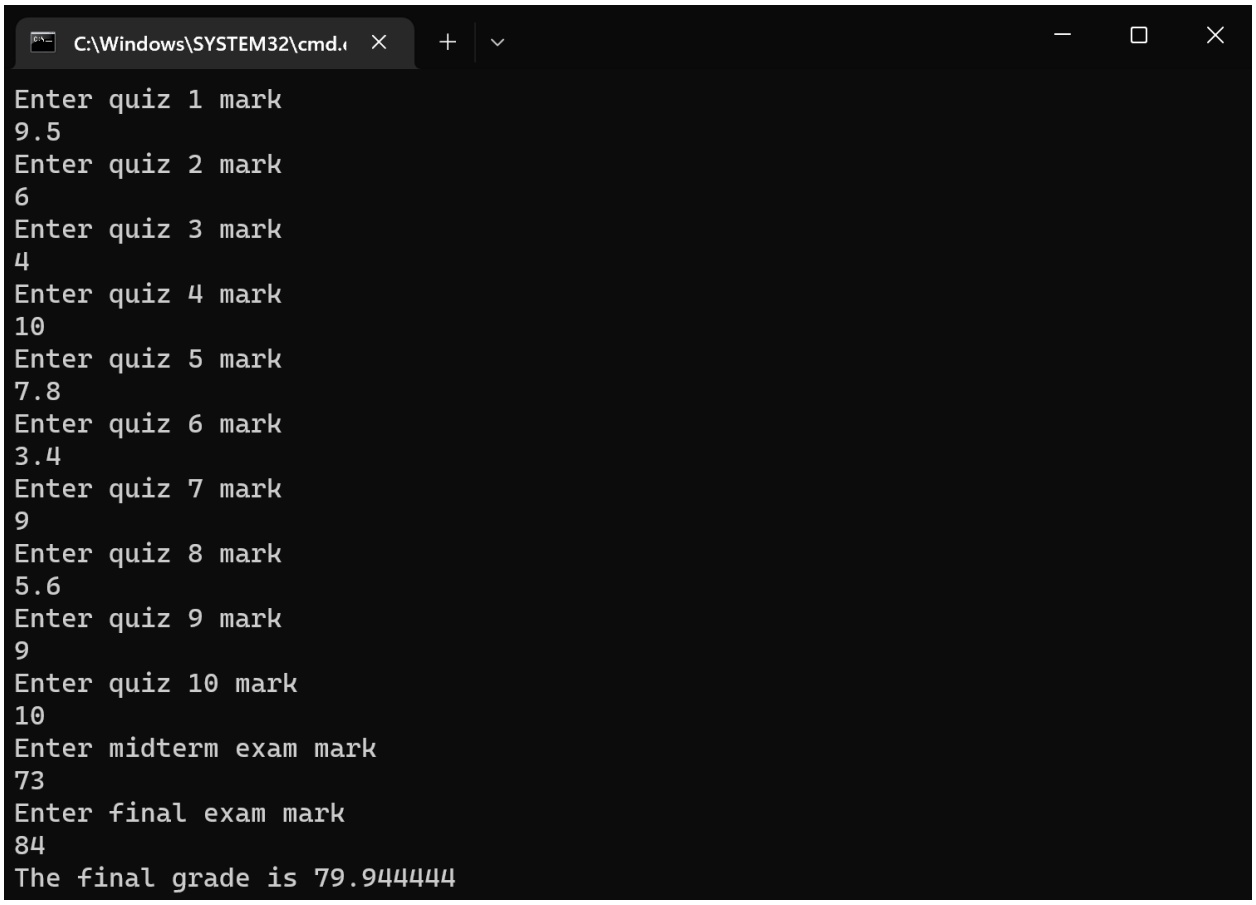
```
      {

            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
```

```
	{

		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);
```

```
	}

	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);

	}

}
```

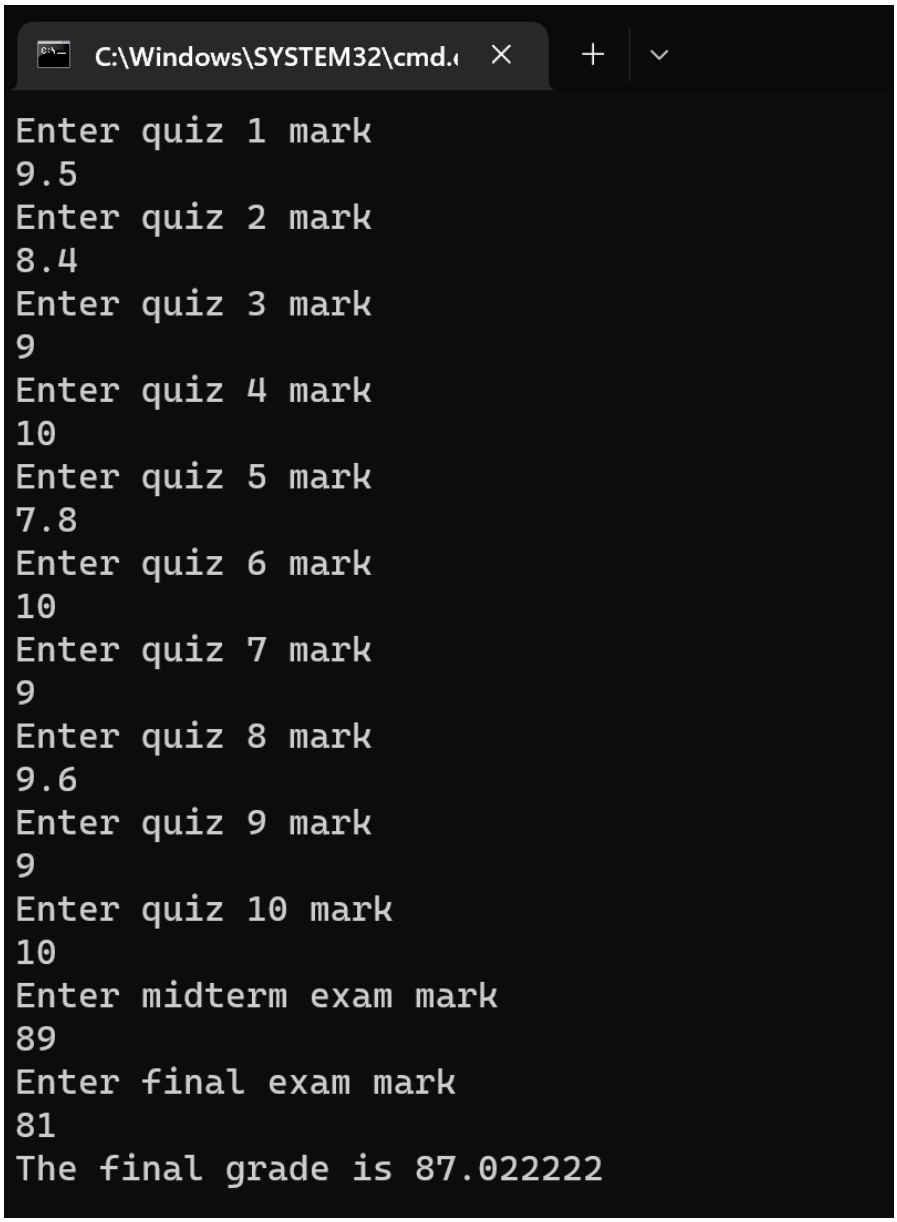
Answer to part a)

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



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



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