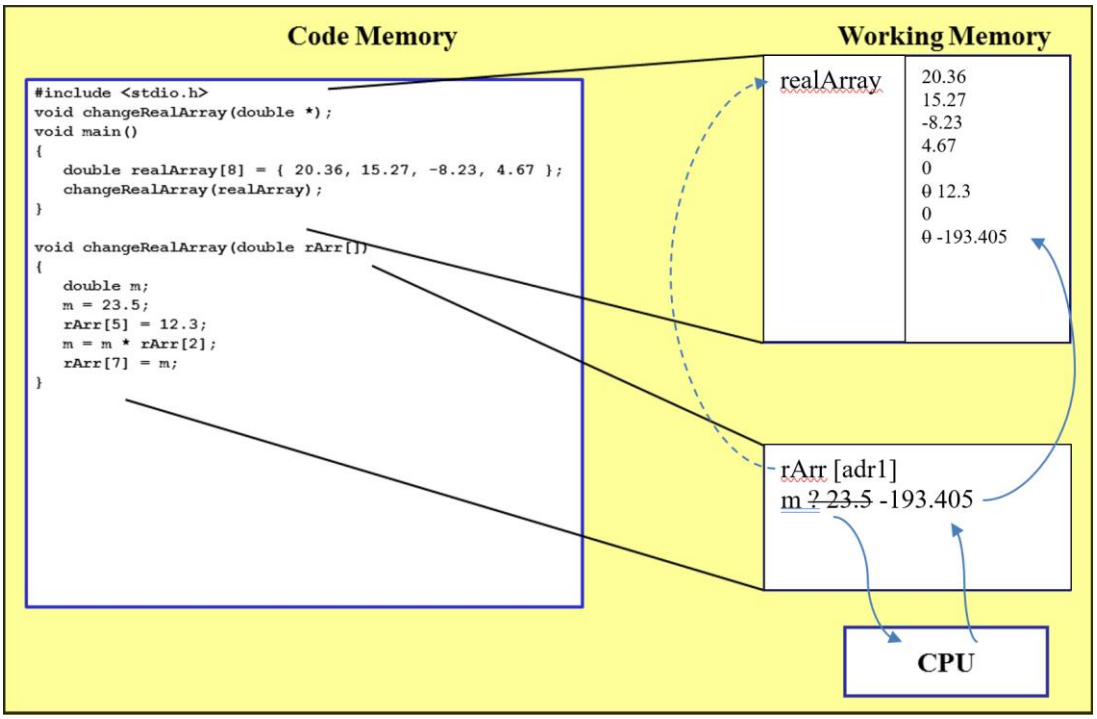
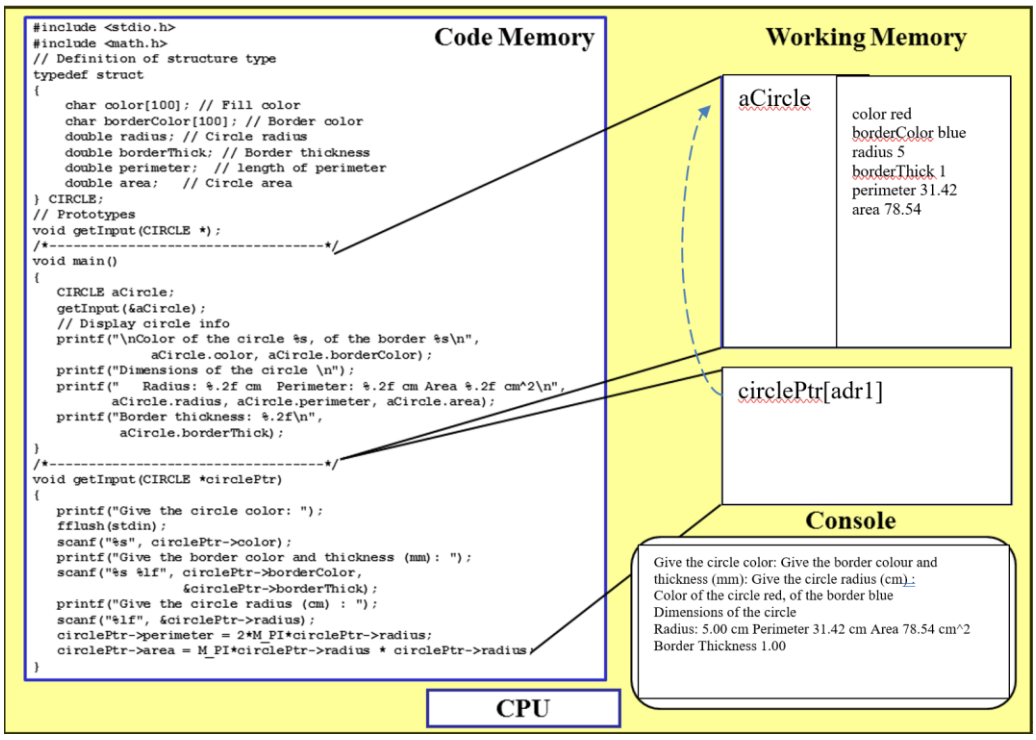
GNG 1105-Assignment #4

1.

A)



b)



2.

```
/*-------------------------------------------------------------------------------------------
File: rocketV
Author: James Matthew Forgie
Description: Calculates the velocity of a rocket at a chosen time with one of the 4 rocket values
within the structure.
-------------------------------------------------------------------------------------------*/
#include <stdio.h>
#include <math.h>
#define G 9.81 //symbolic constant of gravity
typedef struct //Structure definition
{
   char name;
   double u;
   double m;
   double q;
} ROCKET;
int selectRocket(int); //function prototype
double calcSpeed(ROCKET, double); //function prototype
/*-------------------------------------------------------------------
Function: main
Description: Variables are defined initally, the rocket number function
is called to calculate the proper location of the rocket number in the
array. The time is collected from the user, and used along with the rocket's
values to calculate the velocity of the rocket at that point. Output and input
are both then printed out on the console.
-------------------------------------------------------------------*/
void main(void)
{
   int which, rocketNumber;
```

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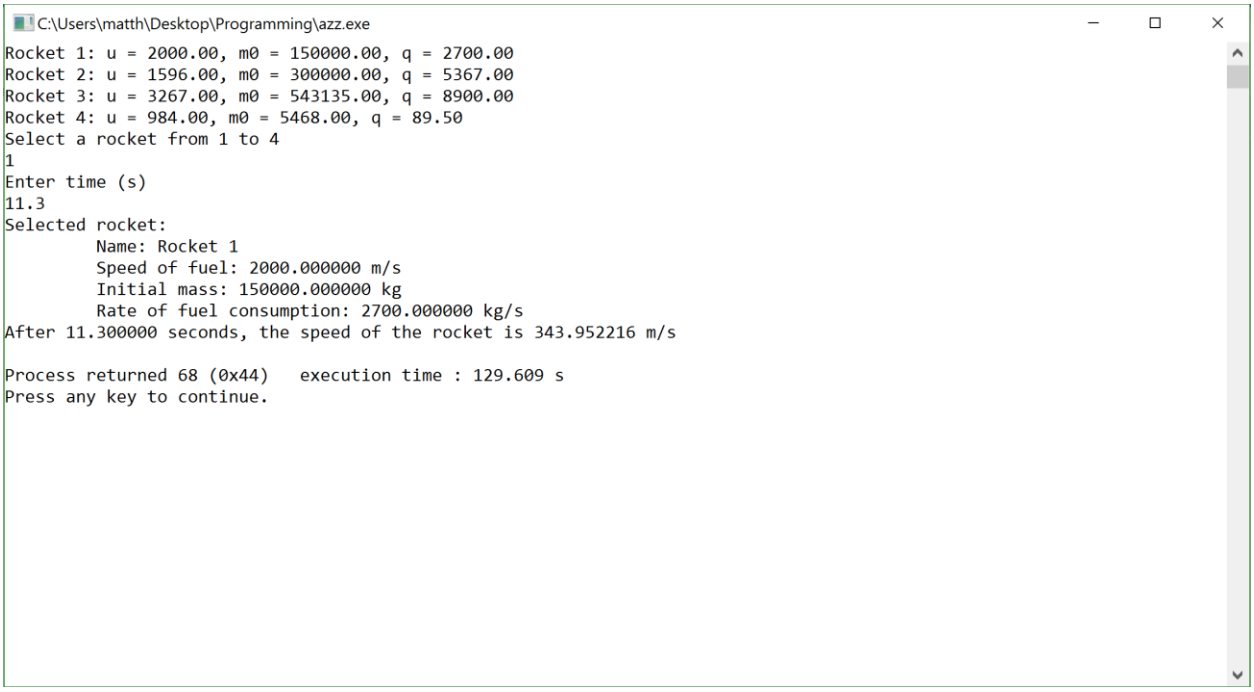
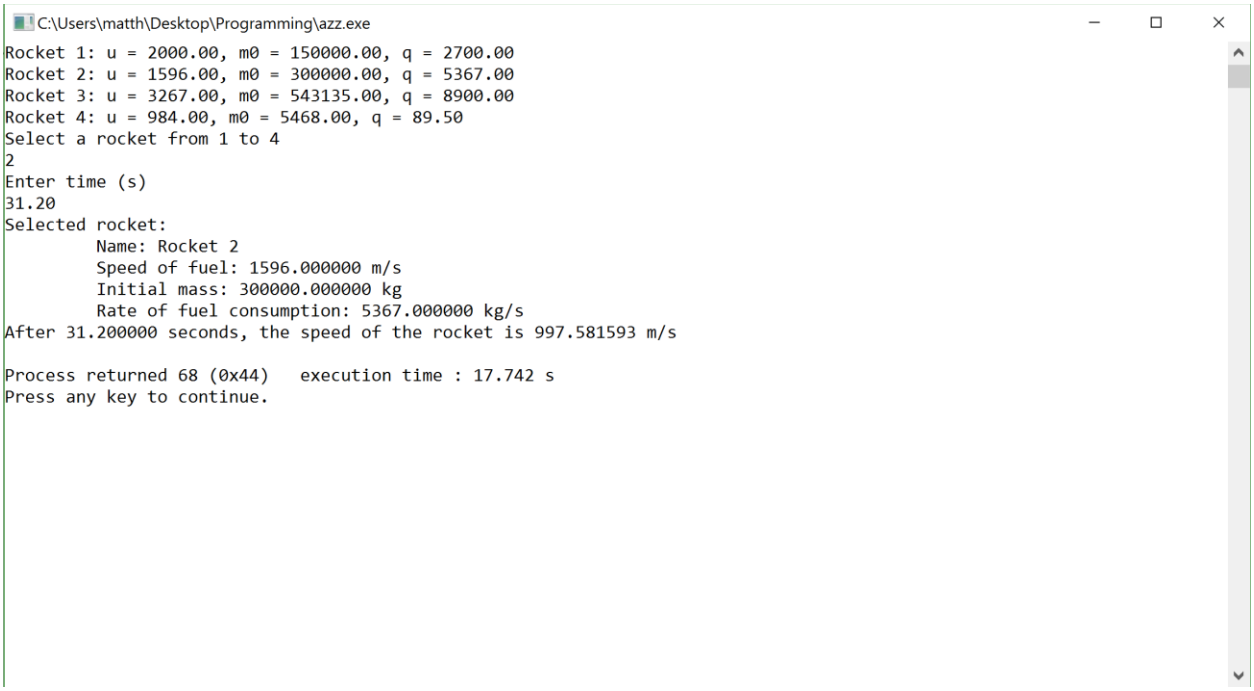
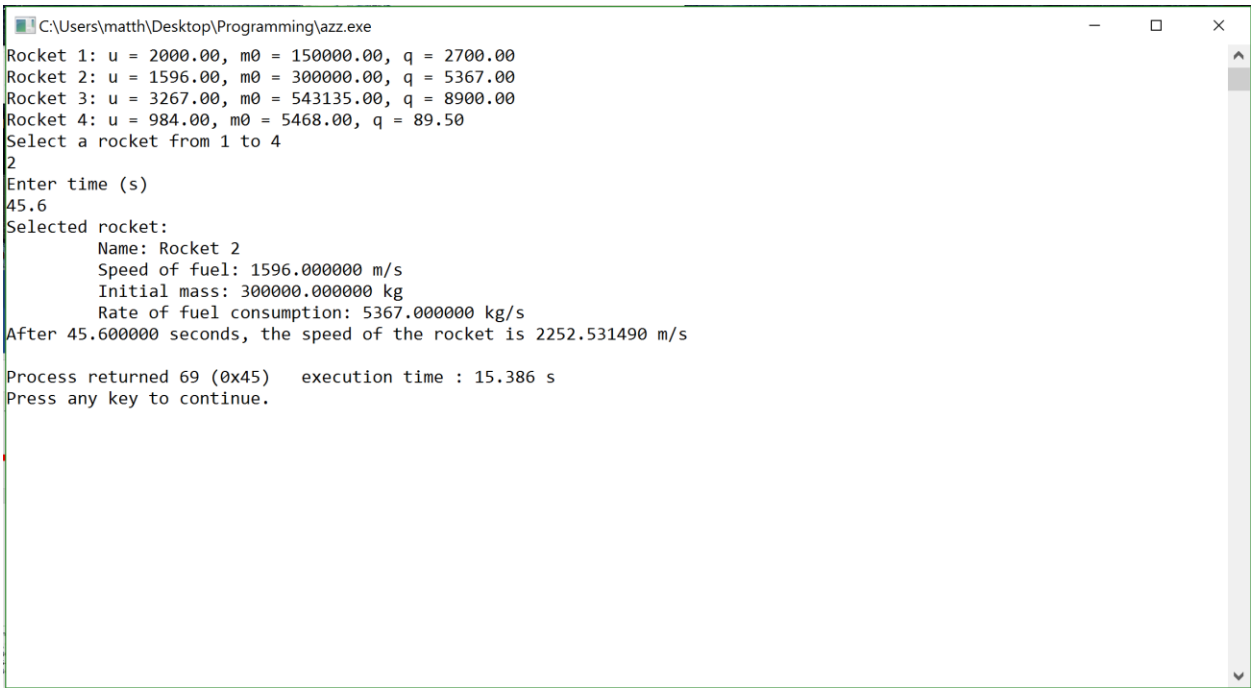
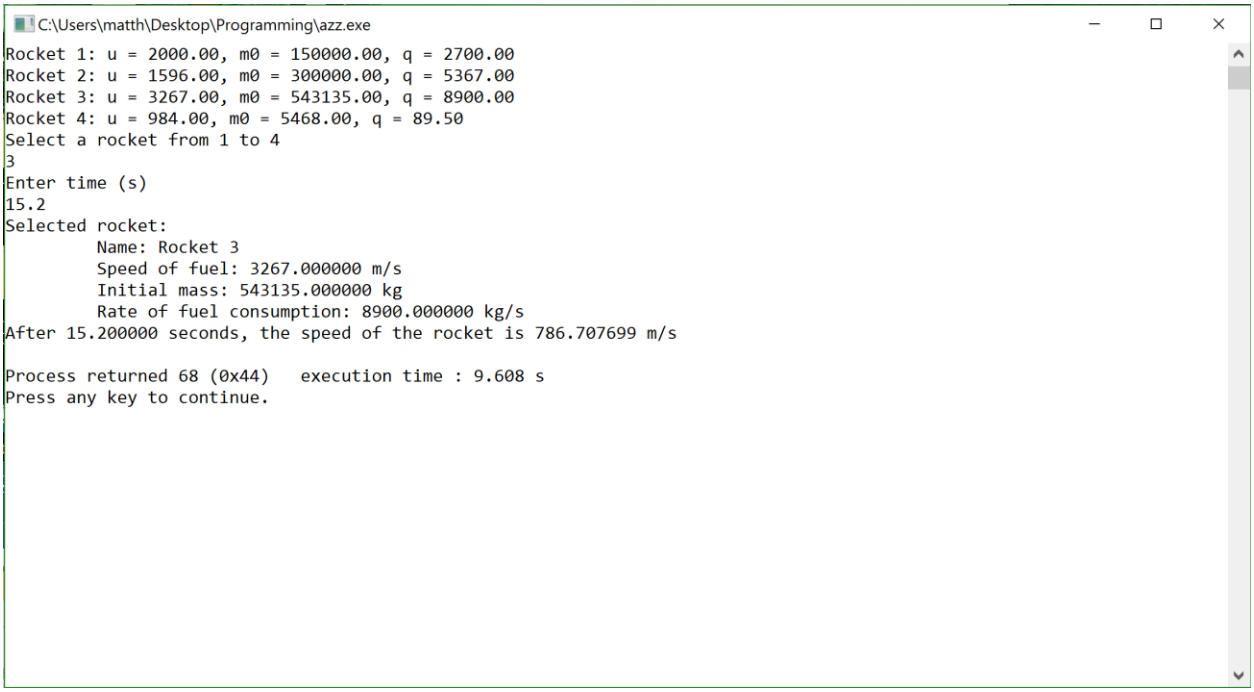
   double t, vel;
   ROCKET rockets[4] =
   {
   {"Rocket 1", 2000.0, 150000.0, 2700.0},
   {"Rocket 2", 1596.0, 300000.0, 5367.0},
   {"Rocket 3", 3267.0, 543135.0, 8900.0},
   {"Rocket 4", 984.0, 5468.0, 89.5}
   };
   rocketNumber = selectRocket(which);
   printf("Enter time (s)\n");
   scanf("%lf",&t);
   vel = calcSpeed(rockets[rocketNumber], t);
   printf("Selected rocket:\n");
   printf("\t Name: Rocket %d \n",rocketNumber+1);
   printf("\t Speed of fuel: %lf m/s \n",rockets[rocketNumber].u);
   printf("\t Initial mass: %lf kg \n",rockets[rocketNumber].m);
   printf("\t Rate of fuel consumption: %lf kg/s \n",rockets[rocketNumber].q);
   printf("After %lf seconds, the speed of the rocket is %lf m/s \n", t, vel);
}
/*-----------------------------------------------------------------------------------------
Function: selectRocket
Parameters:
   which=the inputted value of the rocket chosen by the user
Return: The value for the location of the rocket within the array.
Description: The value for the rocket selected out of the 4 holds a value of 1 less within the array
so 1 is subtracted from the value so it can be properly found.
-----------------------------------------------------------------------------------------*/
int selectRocket(which)
{
   int selected;
```

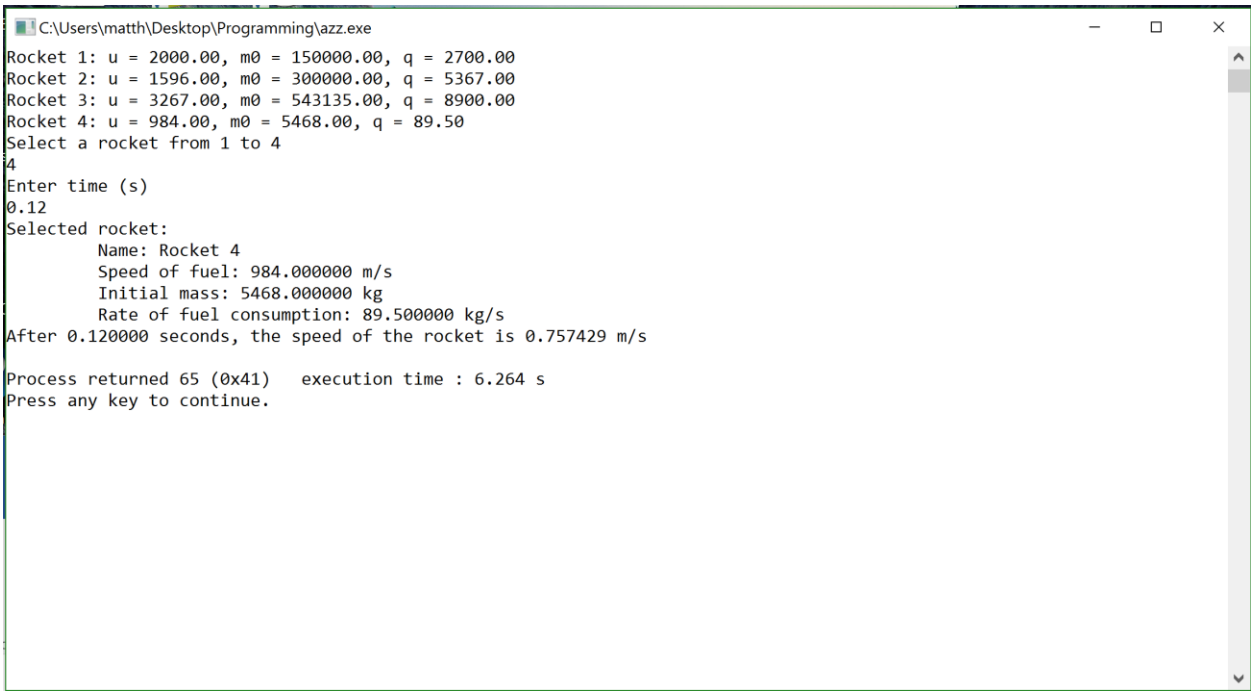
```
   printf("Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00 \n"); //printing the values for the 4 rockets
   printf("Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00 \n");
   printf("Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00 \n");
   printf("Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50 \n");
   printf("Select a rocket from 1 to 4 \n"); //requesting imput
   scanf("%d",&which);
   selected = which-1; //calculation
   return (selected); //returning new value
}
/*-------------------------------------------------------------------------------------------
Function: calcSpeed
Parameters:
   rocket number=location of the rocket's values within the array, t=time selected by user
Return: velocity of the rocket
Description: Calculates the velocity of a rocket at the selected time.
-------------------------------------------------------------------------------------------*/
double calcSpeed(ROCKET r, double t)
{
   double vel; //variaible for calculatoin
   vel = r.m-(r.q*t); //calculation
   vel = (r.m)/(vel);
   vel = (r.u) * log(vel);
   vel = vel - (G*t);
   return (vel); //returns velocity
}
```


C:\Users\matth\Desktop\Programming\azz.exe
Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00
Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00
Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00
Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50
Select a rocket from 1 to 4
1
Enter time (s)
11.3
Selected rocket:
Name: Rocket 1
Speed of fuel: 2000.000000 m/s
Initial mass: 150000.000000 kg
Rate of fuel consumption: 2700.000000 kg/s
After 11.300000 seconds, the speed of the rocket is 343.952216 m/s
Process returned 68 (0x44) execution time : 129.609 s
Press any key to continue.


C:\Users\matth\Desktop\Programming\azz.exe
Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00
Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00
Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00
Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50
Select a rocket from 1 to 4
2
Enter time (s)
31.20
Selected rocket:
Name: Rocket 2
Speed of fuel: 1596.000000 m/s
Initial mass: 300000.000000 kg
Rate of fuel consumption: 5367.000000 kg/s
After 31.200000 seconds, the speed of the rocket is 997.581593 m/s
Process returned 68 (0x44) execution time : 17.742 s
Press any key to continue.


C:\Users\matth\Desktop\Programming\azz.exe
Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00
Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00
Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00
Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50
Select a rocket from 1 to 4
2
Enter time (s)
45.6
Selected rocket:
Name: Rocket 2
Speed of fuel: 1596.000000 m/s
Initial mass: 300000.000000 kg
Rate of fuel consumption: 5367.000000 kg/s
After 45.600000 seconds, the speed of the rocket is 2252.531490 m/s
Process returned 69 (0x45) execution time : 15.386 s
Press any key to continue.


C:\Users\matth\Desktop\Programming\azz.exe
Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00
Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00
Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00
Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50
Select a rocket from 1 to 4
3
Enter time (s)
15.2
Selected rocket:
Name: Rocket 3
Speed of fuel: 3267.000000 m/s
Initial mass: 543135.000000 kg
Rate of fuel consumption: 8900.000000 kg/s
After 15.200000 seconds, the speed of the rocket is 786.707699 m/s
Process returned 68 (0x44) execution time : 9.608 s
Press any key to continue.


C:\Users\matth\Desktop\Programming\azz.exe
Rocket 1: u = 2000.00, m0 = 150000.00, q = 2700.00
Rocket 2: u = 1596.00, m0 = 300000.00, q = 5367.00
Rocket 3: u = 3267.00, m0 = 543135.00, q = 8900.00
Rocket 4: u = 984.00, m0 = 5468.00, q = 89.50
Select a rocket from 1 to 4
4
Enter time (s)
0.12
Selected rocket:
Name: Rocket 4
Speed of fuel: 984.000000 m/s
Initial mass: 5468.000000 kg
Rate of fuel consumption: 89.500000 kg/s
After 0.120000 seconds, the speed of the rocket is 0.757429 m/s
Process returned 65 (0x41) execution time : 6.264 s
Press any key to continue.