Planet - Robert P.

Test Outputs:

```
Set the name of the first planet: bob
Set the mass of the first planet: 124124
Set the diameter of the first planet: 2392
Information of First Planet:
The name of this planet is bob
The mass of this planet is 124124
The diameter of this planet is 2392
The surface area of this planet is 1.79751e+07
The density of this planet is 1.7321e-05
The acceleration due to gravity of the planet is 5.79142e-12
Set the name of the second planet: banana
Set the mass of the second planet: 1241949
Set the diameter of the second planet: 203
Information of Second Planet:
The name of this planet is banana
The mass of this planet is 1.24195e+06
The diameter of this planet is 203
The surface area of this planet is 129462
The density of this planet is 0.283542
The acceleration due to gravity of the planet is 8.04569e-09
Set a distance between the two planets 1319499
The force exerted between the two planets by eachother is: 5.89765e-12
e_prevost@ares:~/final_project$
```

Source Code:

finalProj1.C - /home/students/e_prevost/final_project/

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```
#include <iostream>
#include <cmath>
#include <string>
#include <climits>

using namespace std;

const long double G = 6.67408 * pow(10.0,-11.0);
template<typename inputType>
inputType ReadValue(std::string prompt)
{
	inputType returnValue=0;
	std::cout << prompt;
	std::cin >> returnValue;
	while (std::cin.fail()==1) {
		std::cout << "Error! Cannot read input.\n";
		std::cin.clear();
		std::cin.ignore(INT_MAX,'\n');
		std::cout << prompt;
		std::cin >> returnValue;
	}
	return returnValue;
}


template<typename inputType>
inputType ReadValue(std::string prompt, inputType minValue)
{
	inputType returnValue=0;
	returnValue=ReadValue<inputType>(prompt);
	while (returnValue < minValue) {
		std::cout << "Error!  Value must be >= " << minValue << std::endl;
		returnValue=ReadValue<inputType>(prompt);
	}
	return returnValue;
}


template<typename inputType>
inputType ReadValue(std::string prompt, inputType minValue, inputType maxValue)
{
	inputType returnValue=0;
	returnValue=ReadValue<inputType>(prompt,minValue);
	while (returnValue > maxValue) {
		std::cout << "Error!  Value must be <= " << maxValue << std::endl;
		returnValue=ReadValue<inputType>(prompt,minValue);
	}
```

```
        return returnValue;
}
class Planet
{
        private:
                string name;
                double mass;
                double diameter;
        public:
                Planet();
                void SurfaceArea();
                void Density();
                void Acceleration();
                void setName(string n);
                void setMass(double m);
                void setDiameter(double d);
                string getName();
                double getMass();
                double getDiameter();
};

Planet::Planet()
{
        name = "";
        mass = 0.0;
        diameter = 0.0;
}
void Planet::setName(string n)
{
        name = n;
}
void Planet::setMass(double m)
{
        mass = m;
}
void Planet::setDiameter(double d)
{
        diameter = d;
}
void Planet::SurfaceArea()
{
        double sa = pow(diameter,2.0) * M_PI;
        cout << "The surface area of this planet is " << sa <<endl;
}
void Planet::Density()
{
        double v = (M_PI * pow(diameter,3.0))/6.0;
```

```
        double density = mass/v;
        cout<< "The density of this planet is " << density <<endl;
}
void Planet::Acceleration()
{
        double a = (G * mass)/pow((diameter/2.0),2.0);
        cout<< "The acceleration due to gravity of the planet is " << a <<endl;
}
string Planet::getName()
{
        return name;
}
double Planet::getMass()
{
        return mass;
}
double Planet::getDiameter()
{
        return diameter;
}
int main()
{
        Planet a;
        Planet b;

        string name1 = "";
        cout<<"Set the name of the first planet: ";
        getline(cin,name1);
        double mass1 = ReadValue<double>("Set the mass of the first planet: ");
        double diameter1 = ReadValue<double>("Set the diameter of the first planet: ");

        a.setName(name1);
        a.setMass(mass1);
        a.setDiameter(diameter1);

        cout<< "Information of First Planet: " << endl;
        cout<< "The name of this planet is "<< a.getName() << endl;
        cout<<"The mass of this planet is " <<a.getMass() << endl;
        cout<< "The diameter of this planet is "<< a.getDiameter() << endl;

        a.SurfaceArea();
        a.Density();
        a.Acceleration();

        cin.clear();
        cin.ignore(INT_MAX, '\n');
```

```
        string name2 = "";
        cout<<"Set the name of the second planet: ";
        getline(cin,name2);

        double mass2 = ReadValue<double>("Set the mass of the second planet: ");
        double diameter2 = ReadValue<double>("Set the diameter of the second planet: ");

        b.setName(name2);
        b.setMass(mass2);
        b.setDiameter(diameter2);

        cout<< "Information of Second Planet: " << endl;
        cout<< "The name of this planet is "<< b.getName() << endl;
        cout<<"The mass of this planet is " <<b.getMass() << endl;
        cout<< "The diameter of this planet is "<< b.getDiameter() << endl;

        b.SurfaceArea();
        b.Density();
        b.Acceleration();

        double x = ReadValue<double>("Set a distance between the two planets ");
        double radius1 = diameter1/2.0;
        double radius2 = diameter2/2.0;

        double d = x + radius1 + radius2;
        double F = ((mass1*mass2)/(pow(d,2.0)))*G;

        cout<< "The force exerted between the two planets by eachother is: " << F << endl;
}
```