```cpp
#include <iostream>
#include <string>
using namespace std;

// Names: Celina Wang & Chaitanya

class Wheel
{
    private:
        double diameter;
        double width;
        string material;

    public:
        // Default constructor with default viable values
        Wheel()
        {
            diameter = 1;
            width = 1;
            material = "rubber";
        }

        // Data constructor, makes Wheel object with given values
        Wheel(double dia, double wid, string mat)
        {
            setDiameter(dia);
            setWidth(wid);
            setMaterial(mat);
        }

        // Setters with appropriate value checking
        void setDiameter(double dia)
        {
            while (dia < 1)
            {
                cout << "Invalid. Diameter has to be at least 1. ";
                cin >> dia;
            }
            diameter = dia;
        }

        void setWidth(double wid)
        {
            while (wid < 1)
            {
                cout << "Invalid. Width has to be at least 1. ";
                cin >> wid;
            }
            width = wid;
        }
```

```
51:
52:         void setMaterial(string mat)
53:         {
54:             material = mat;
55:         }
56:
57:         // Getters
58:         double getDiameter() const
59:         { return diameter; }
60:
61:         double getWidth() const
62:         { return width; }
63:
64:         string getMaterial() const
65:         { return material; }
66:
67:         // Function to return distance travelled
68:         double distance(double rotations) const
69:         {
70:             const double PI = 3.14159;
71:             double circumference = PI * diameter;
72:             return rotations * circumference;
73:         }
74:
75:         // Function to print parameters
76:         void printParameters() const
77:         {
78:             cout << "Diameter: " << diameter << " cm." << endl;
79:             cout << "Width: " << width << " cm." << endl;
80:             cout << "Material: " << material << "." << endl;
81:         }
82: };
83:
84: int main()
85: {
86:     const int SIZE = 3;
87:     Wheel wheels[SIZE]; // Array of three wheel objects
88:
89:     double dia, wid = 0.0;
90:     string mat = " ";
91:
92:     for (int i = 0; i < SIZE; i++)
93:     {
94:         cout << "Wheel " << (i + 1) << " Diameter, Width, and Material: ";
95:         cin >> dia >> wid >> mat;
96:         wheels[i].setDiameter(dia);
97:         wheels[i].setWidth(wid);
98:         wheels[i].setMaterial(mat);
99:     }
100:
```

```
101:     double rotations = 0.0;
102:     cout << endl << "Number of Rotations: ";
103:     cin >> rotations;
104:
105:     for (int i = 0; i < SIZE; i++)
106:     {
107:         cout << "Wheel " << (i + 1) << " travelled "
108:              << wheels[i].distance(rotations) << " cm." << endl;
109:     }
110:
111:     cout << endl;
112:     for (int i = 0; i < SIZE; i++)
113:     {
114:         cout << "Wheel " << (i + 1) << ":" << endl;
115:         wheels[i].printParameters();
116:         cout << endl;
117:     }
118:
119:     return 0;
120: }
121:
122: /* Test Case 1:
123: Wheel 1 Diameter, Width, and Material: -1 5 rubber
124: Invalid. Diameter has to be at least 1. 3
125: Wheel 2 Diameter, Width, and Material: 4 -3 polyurethane
126: Invalid. Width has to be at least 1. 4
127: Wheel 3 Diameter, Width, and Material: 6 3 rubber
128:
129: Number of Rotations: 5
130: Wheel 1 travelled 47.1238 cm.
131: Wheel 2 travelled 62.8318 cm.
132: Wheel 3 travelled 94.2477 cm.
133:
134: Wheel 1:
135: Diameter: 3 cm.
136: Width: 5 cm.
137: Material: rubber.
138:
139: Wheel 2:
140: Diameter: 4 cm.
141: Width: 4 cm.
142: Material: polyurethane.
143:
144: Wheel 3:
145: Diameter: 6 cm.
146: Width: 3 cm.
147: Material: rubber.
148:
149:
150: --------------------------------
```

```
151: Process exited after 24.8 seconds with return value 0
152: Press any key to continue . . .
153: */
154:
```