PARSHVANATH CHARITABLE TRUST

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Department of Computer Engineering

CSL304 SKILL BASED LAB COURSE: OBJECT ORIENTED PROGRAMMING WITH JAVA

Mini Project Report

- **Title of Project** : Scientific Calculator
- **Year and Semester** : S.E. (Sem III)
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Problem Definition

Some students, especially those with disabilities, struggle in math.
A scientific calculator enables you to evaluate large and small arithmetic operations, roots, exponents, logarithms, trigonometric ratios, and many other calculations. One very important benefit is that you learn where the buttons are for different operations and save valuable time compared to using unfamiliar calculators. It would be very advantageous to use a calculator, if permitted, to ensure accurate calculations.

Offline calculators rely on a battery for maximum efficiency, reliability, and durability.
On the other hand, online calculators are an inexpensive and easy-to-find resource for a wide variety of information. They can help with finances, health care, and other day-to-day needs. This Internet resource is handy, and if you don't know how to use the calculator, there are often tools to help you.

Physical scientific calculators can be very inexpensive for simple models, often around 1000 rupees. However, these calculators often require replacement batteries, which can cost as much or more than the calculator itself.
It can make life easier for students as it is in digital format, so students need not worry about forgetting, losing, or carrying around a calculator. It can also be made available to all as it can be accessed free of cost
Online calculators are often found quickly and easily, usually for free. From tip calculators to imperial to metric conversion, all you need to do is use a search engine. A quick search for an online calculator brings up 1.5 billion results, the vast majority of which are free.
Online calculators are available at the push of a few buttons, whether you're sitting at your desk or on the go. Due to the increased connectivity of our world, you now have an online calculator in your pocket in addition to any other information you may need.

Introduction

A scientific calculator is an electronic calculator, either desktop or handheld, designed to perform mathematical operations. They have completely replaced slide rules and are used in both educational and professional settings.

When scientific calculators were originally made, they normally had only four of five capabilities (addition, subtraction, multiplication, division, and square root). Modern scientific calculators generally have many more capabilities than the original four or five function calculators, and the capabilities differ between manufacturers and models.

Scientific calculators are used widely in situations that require quick access to certain mathematical functions, especially those that were once looked up in mathematical tables, such as trigonometric functions or logarithms. They are also used for calculations of very large or very small numbers, as in some aspects of astronomy, physics, and chemistry.

They are very often required for math classes from the junior high school level through college, and are generally either permitted or required on many standardized tests covering math and science subjects; as a result, many are sold into educational markets to cover this demand, and some high-end models include features making it easier to translate a problem on a textbook page into calculator input, e.g. by providing a method to enter an entire problem in as it is written on the page using simple formatting tools.

A digital calculator is a calculator that has been implemented as a computer program, rather than as a physical hardware device. They are among the simpler interactive digital tools, and, as such, they provide operations for the user to select one at a time. They can be used to perform any process that consists of a sequence of steps each of which applies one of these operations, and have no purpose other than these processes, because the operations are the sole, or at least the primary, features of the calculator, rather than being secondary features that support other functionality that is not normally known simply as calculation.

As a calculator, rather than a computer, they usually have a small set of relatively simple operations, perform short processes that do not compute intensively, and do not accept large amounts of input data or produce many results.

An online scientific calculator that allows you to perform essential mathematical operations which are highly beneficial for students pursuing science.

Description

Scientific calculators perform the same functions as their standard electronic calculator counterparts, but they also have made other features available.
There are three main categories of calculators on the market today: business, basic, and scientific.
The scientific calculator, however, is the only one that can handle certain functions in fields such as trigonometry, physics, chemistry, and engineering.
A scientific calculator has additional features that allow you to work with exponents and logs, which require more memory in order to perform functions for the best results.
While you can also do basic calculations such as addition, subtraction, multiplication, and division, that barely scratches the surface of the types of equations this calculator can handle.

The capabilities of our modern digital scientific calculator include:

1. Basic functions and exponents

Calculate basic functions such as addition, subtraction, multiplication, and division. You should keep in mind that the addition & subtraction sign (+-) is different from a separate negative function. This can end up causing some confusion concerning negative and positive numbers when you start using your calculator at first because the signs look similar. They are used to change the sign of a number to the opposite sign.
Round off to nearest integer and modulus off a number, is also made possible without the need of manual work.
You can also raise numbers to another power and find a square root and cube root of a number or formula. Exponents are used in almost any math course past grade school, but only a scientific calculator can perform any algebraic function.
In addition to using your calculator to solve for a known number, you can use it for an unknown number. This is useful for algebra or any other more advanced math you may be studying.

2. Logarithms

Once you have increased your knowledge and you're learning new concepts related to calculus and trigonometry, it's likely that you will have to learn about logarithms. These formulas help you to calculate speed, area, and much more.
In the past, these were done almost completely by hand. Now it takes only a moment to input the proper information and solve the problem using a calculator.
Logarithms are mostly used by those involved in the medical and engineering fields, but other careers may encounter them at some point. They can be tricky to solve by hand, but with the help of a scientific calculator, the process can be much easier.

Your device will probably solve for the natural logarithm of an equation in most classes. Some teachers may only explain logarithms through the use of a scientific calculator because all it requires is knowing how to enter the correct formula.

3. Sine, cosine, and tangent functions

For those taking a trigonometry or calculus course, sine functions are a given. They also often pop up if your career path involves any sort of engineering or architectural field.
A sine function is used to find the measurement of a certain angle, especially when other sides or angles are unknown.
Like logarithms, this calculation once took a while to solve as you went through one piece of paper after the next. With scientific calculators, you can get the answer almost immediately once you have properly entered the function. Look for sin, cos, and tan buttons on any calculator to make sure it includes these functions.
Similarly, you can also solve for cosine functions. The cosine of an angle is the measurement of the length of a triangle, and it is most often used in trigonometry courses. You'll most likely use cosines to find the length of the hypotenuse of a triangle.
Cosines can be found for any angle, even if they are large or negative. Again, you may be required to show that you know what cosines are by using your calculator to create a graph.
Tangents are another concept you will have to learn in a trigonometry class, and this too involves finding unknown quantities. In geometry, you'll most likely encounter tangents when calculating perpendicular lines.
Hyperbolic trigonometric functions are also provided to ease advanced calculus mainly from derivation and integration point of view.
Again, a scientific calculator is the only kind of calculator that can find the answer these types of equations, and it's likely that at some point you will need them in your schooling.

4. Scientific notation

A scientific calculator isn't just used for more complicated math problems. In fact, one of its best uses may be that it can calculate scientific notation. For numbers that can't be written in decimal point form because they are too large, a normal calculator won't be able to cover it.
You'll most likely use scientific notation if you plan to work in a field related to science, engineering, and mathematics, and you will definitely need a more complex calculator to handle your homework.
If you're wondering how to do scientific notation on a calculator, it's not that complicated. In order to perform the operation:

- Locate the 10^x on your device
- Enter in your x value
- Press the " = " button in order to receive the answer

Unlike basic calculators that can only handle smaller values, a scientific calculator can handle numbers on a much vaster scale, which can be useful when it comes to collecting data or working as a physicist or chemist. It can also calculate negative scientific notation.

5. Conversion functions

Similar to how you would enter equations into your calculator to compute notations or logs, tangents, and sines, a scientific calculator can solve for binary octal and hexadecimal conversions. These equations require two inputs.

You'll most likely encounter this in algebra or calculus when you are solving for an unknown, but you may also discuss it when learning about the Cartesian product and subsets.

This is another type of equation that is difficult to track without having a calculator that has memory, because if you can store the results the calculator gives you, you can build off the work that you have accomplished before or save your efforts for another time.

Implementation

```
//Block of code to perform arithmetic operations//

//for addition
      if (operations == "+")
      {
         result = firstnum + secondnum;
         answer = String.format("%.2f",result);
         textField.setText(answer);
      }

//for subtraction
      else if (operations == "-")
      {
         result = firstnum - secondnum;
         answer = String.format("%.2f",result);
         textField.setText(answer);
      }

//for division
      else if (operations == "/")
      {
         result = firstnum / secondnum;
         answer = String.format("%.2f",result);
         textField.setText(answer);
      }

//for multiplication
      else if (operations == "x")
      {
         result = firstnum * secondnum;
         answer = String.format("%.2f",result);
         textField.setText(answer);
      }

//to calculate percentage
      else if (operations == "%")
      {
         result = firstnum / secondnum * 100;
         answer = String.format("%.2f",result);
         textField.setText(answer);
      }

//any number raised to two
         JButton btnraise2 = new JButton("x^2");
         btnraise2.addActionListener(new ActionListener() {
                  public void actionPerformed(ActionEvent e) {
                  double ops = Double.parseDouble(String.valueOf(textField.getText()));
```

```
                ops=(ops*ops);
                textField.setText(String.valueOf(ops));
        }
        });

//for sinh function
        JButton btnsinh = new JButton("Sinh");
        btnsinh.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                                     =
        Double.parseDouble(String.valueOf(textField.getText()));
                        ops = Math.sinh(ops);
                        textField.setText(String.valueOf(ops));
                }
        });

//for modulus funcion
        JButton btnmod = new JButton("Mod");
        btnmod.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {

                        firstnum = Double.parseDouble(textField.getText());
                        String iNum = textField.getText() +btn7 .getText();
                        textField.setText(" ");
                        operations = "Mod";
                }

//for logarithmic functions
        JButton btnln = new JButton("lnx");
        btnln.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                                     =
        Double.parseDouble(String.valueOf(textField.getText()));
                        ops=Math.log10(ops);
                        textField.setText(String.valueOf(ops));

                }
        });

//exponentialfunctions
        JButton btnsciclear = new JButton("exp");
        btnsciclear.setBackground(new Color(192, 192, 192));
        btnsciclear.setFont(new Font("Segoe UI", Font.BOLD, 9));
        btnsciclear.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        firstnum = Double.parseDouble(textField.getText());
                        String iNum = textField.getText() +btn7 .getText();
                        textField.setText(" ");
                        operations = "Exp";
                }
```

```
        });

    //for 2 Pi
        JButton btn2pi = new JButton("2PI");
        btn2pi.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent e) {
                double ops;
                ops=(3.14592653589793384626433832795)*2;
                textField.setText(String.valueOf(ops));
            }
        });

    //To convert decimal to Octal
        JButton btnoctal = new JButton("Octal");
        btnoctal.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent e) {
                        int a = Integer.parseInt(textField.getText());
                        textField.setText(Integer.toString(a,8));
            }
        });


    //To convert decimal to HexaDecimal
        JButton btnhex = new JButton("Hex");
        btnhex.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent e) {
                        int a = Integer.parseInt(textField.getText());
                        textField.setText(Integer.toString(a, 16));
            }
        });



    //to convert decimal to Binary
        JButton btnbin = new JButton("Bin");
        btnbin.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent e) {
                int a = Integer.parseInt(textField.getText());
                textField.setText(Integer.toString(a, 2));
            }
        });

    //to perform cuberoot
        JButton btncbr = new JButton("Cbr");
        btncbr.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent e) {
                double                                  ops                                 =
        Double.parseDouble(String.valueOf(textField.getText()));
                ops= Math.cbrt(ops);
                textField.setText(String.valueOf(ops));
```

```
                }
        });

//to convert decimal to COS value
        JButton btncos = new JButton("Cos");
        btncos.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                             =
        Double.parseDouble(String.valueOf(textField.getText()));
                        ops = Math.cos(ops);
                        textField.setText(String.valueOf(ops));
                }
        });


//to convert decimal to cosh  value
        JButton btncosh = new JButton("Cosh");
        btncosh.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                             =
        Double.parseDouble(String.valueOf(textField.getText()));
                ops = Math.cosh(ops);
                textField.setText(String.valueOf(ops));
                }
        });


//to convert decimal to Tanh value
        JButton btntanh = new JButton("Tanh");
        btntanh.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                             =
        Double.parseDouble(String.valueOf(textField.getText()));
                        ops = Math.tanh(ops);
                        textField.setText(String.valueOf(ops));
                }
        });


//to find absolute value i.e round off
        JButton btnrunf = new JButton("Rnd");
        btnrunf.addActionListener(new ActionListener() {
                public void actionPerformed(ActionEvent e) {
                        double                                  ops                             =
        Double.parseDouble(String.valueOf(textField.getText()));
                        ops= Math.round(ops);
                        textField.setText(String.valueOf(ops));
                }
        });
```

```
        //to find tan value of any decimal number
                JButton btntan = new JButton("Tan");
                btntan.addActionListener(new ActionListener() {
                        public void actionPerformed(ActionEvent e) {
                                double ops =
                JButton btntan = new JButton("Tan");
                btntan.addActionListener(new ActionListener() {
                        public void actionPerformed(ActionEvent e) {
                                double ops =
                Double.parseDouble(String.valueOf(textField.getText()));
                                ops = Math.tan(ops);
                                textField.setText(String.valueOf(ops));
                        }
                });

        //currency convertingg
                JButton btnconvert = new JButton("Convert");
                btnconvert.addActionListener(new ActionListener() {
                        public void actionPerformed(ActionEvent e) {
                                double British_Pound =
                Double.parseDouble(unitconvtextfield.getText());
                                if (combobox01.getSelectedItem().equals("Nigeria"))
                                {
                                        String cConvert1 = String.format("N%.2f",
British_Pound*Nigerian_Naira);
                                        jlblconverts.setText(cConvert1);
                                }
                                if (combobox01.getSelectedItem().equals("USA"))
                                {
                                        String cConvert2 = String.format("$%.2f",
British_Pound*US_Dollar);
                                        jlblconverts.setText(cConvert2);
                                }
                   if (combobox01.getSelectedItem().equals("Kenyan"))
                                {
                                        String cConvert3 = String.format("KS%.2f",
British_Pound*Kenyan_shilling);
                                        jlblconverts.setText(cConvert3);
                                }
                                if (combobox01.getSelectedItem().equals("Canada"))
                                {
                                        String cConvert4 = String.format("C$%.2f",
British_Pound*Canadian_Dollar);
                                        jlblconverts.setText(cConvert4);
                                }
                                if (combobox01.getSelectedItem().equals("India"))
                                {
                                        String cConvert5 = String.format("INR %.2f",
British_Pound*Indian_Rupee);
                                        jlblconverts.setText(cConvert5);
                                }
                                if (combobox01.getSelectedItem().equals("Brazil"))
                                {
```

```
                                        String cConvert6 = String.format("BR %.2f",
British_Pound*Philippine_Peso);
                                        jlblconverts.setText(cConvert6);
                                }
                                if (combobox01.getSelectedItem().equals("Philippine"))
                                {
                                        String cConvert6 = String.format("PHP %.2f",
British_Pound*Philippine_Peso);
                                        jlblconverts.setText(cConvert6);
                                }
                                if (combobox01.getSelectedItem().equals("Indonesia"))
                                {
                                        String cConvert7 = String.format("IDR %.2f",
British_Pound*Indonesian_Rupiah);
                                        jlblconverts.setText(cConvert7);
                                }

                        }});
```

Learning Outcome

We have learned, practiced and used:

- Understanding the basic functions on a scientific calculator
- Understanding what may go wrong when entering calculations and know how to fix them and apply knowledge of calculator functions to a range of mathematical calculations.
- Learning concept of packages and importing.
- Coding concepts like for while loops, if-else statements, object making, inheritance, abstraction, setting bounds, try and catch, etcetera.
- Making a GUI/Interface as well as making a login page.

We have also used :

1. AWT

AWT stands for Abstract window toolkit is an Application programming interface (API) for creating Graphical User Interface (GUI) in Java. It allows Java programmers to develop window-based applications.

AWT provides various components like buttons, labels, checkboxes, etc. used as objects inside a Java Program. AWT components use the resources of the operating system, i.e., they are platform-dependent, which means, the component's view can be changed according to the view of the operating system. The classes for AWT are provided by the Java.awt package for various AWT components.

2. JSWING

Java Swing tutorial is a part of Java Foundation Classes (JFC) that is used to create window-based applications. It is built on top of AWT (Abstract Windowing Toolkit) API and entirely written in java. Unlike AWT, Java Swing provides platform-independent and lightweight components.

3. ECLIPSE

Eclipse is an integrated development environment (IDE) for Java and other programming languages like C, C++, PHP, Ruby, etcetera. The development environment provided by Eclipse includes the Eclipse Java development tools (JDT) for Java, Eclipse CDT for C/C++, and Eclipse PDT for PHP, among others.