CSCI251
Advanced Programming
Abstract Class Q&A
Assignment 2

Outline

Object Oriented Programming in C++

Abstract Class
1. **Interface**
2. **Abstract class**
3. **Virtual Function**

Assignment 2:
4. **Diagram and report**
5. **Issues**
6. **Parties**
7. **Stance**
8. **Why inheritance?**

Q&A

1. Abstract Class

What is interface?

Concept: An interface describes the behavior or capabilities of a C++ class without committing to a particular implementation of that class.

The C++ interfaces are implemented using abstract classes and these abstract classes should not be confused with data abstraction which is a concept of keeping implementation details separate from associated data.

What is interface?

A class is made abstract by declaring at least one of its functions as pure virtual function. A pure virtual function is specified by placing "= 0"

```cpp
class Rect {
   public:
      // pure virtual function
        virtual double getArea() = 0;

   private:
      double width;      // Width of a rectangle
      double breadth;    // Breadth of a rectangle

};
```

What is Abstract class?

The purpose of an abstract class (often referred to as an A) is to provide an appropriate base class from which other classes can inherit. Abstract classes cannot be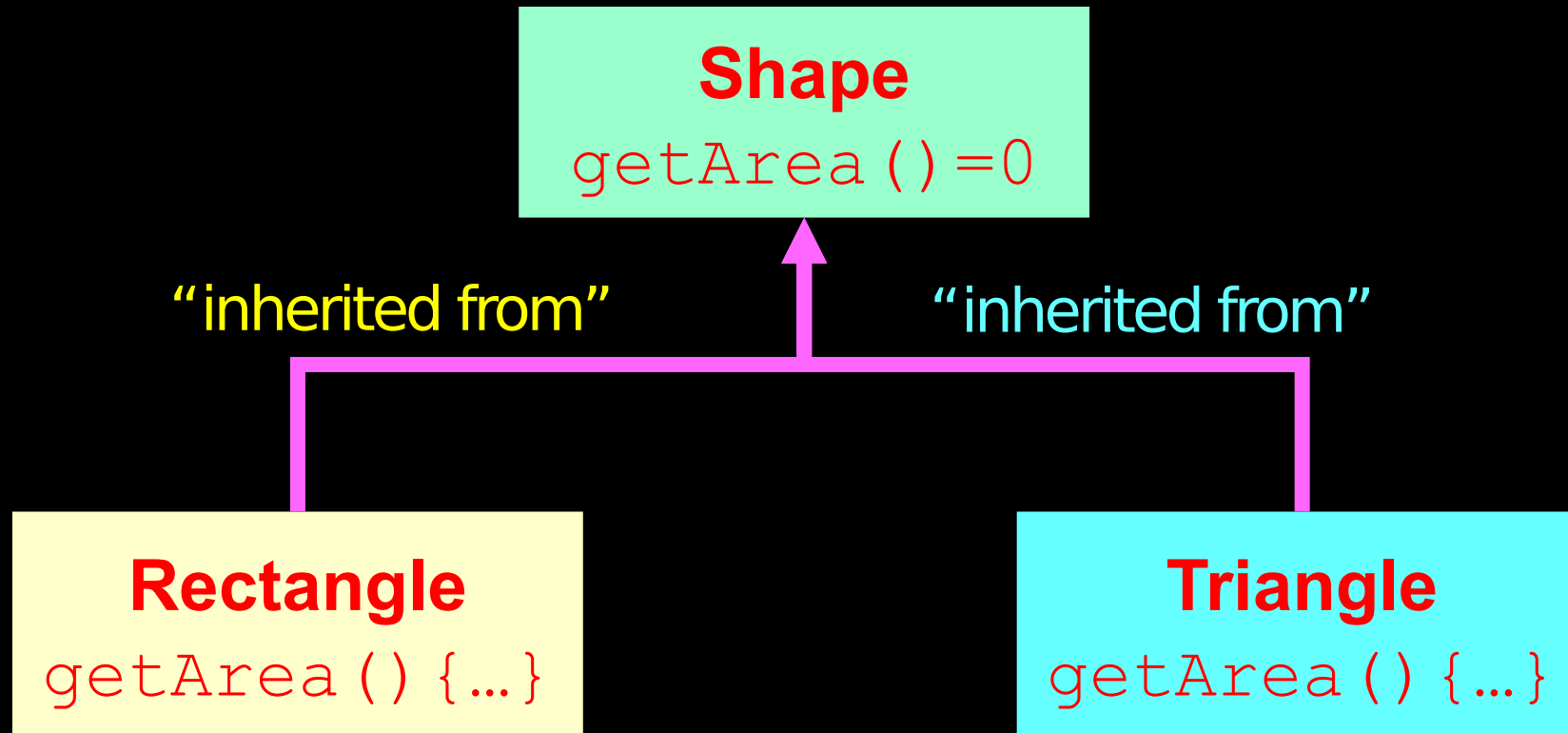 used to instantiate objects and serves only as an interface. Attempting to instantiate an object of an abstract class causes a compilation error.

What is Abstract class?

Thus, if a subclass of an A (abstract class) needs to be instantiated, it has to implement each of the virtual functions, which means that it supports the interface declared by the A. Failure to override a pure virtual function in a derived class, then attempting to instantiate objects of that class, is a compilation error.

Classes that can be used to instantiate objects are called concrete classes.

How to use abstract class?

Shape
`getArea()=0`

"inherited from"   "inherited from"

Rectangle
`getArea(){…}`

Triangle
`getArea(){…}`

How to use abstract class?

```cpp
#include <iostream>
using namespace std;
// Base class
class Shape {
   public:
       // Pure virtual function
       //
providing interface framework.
       virtual int getArea() = 0;
       void setWidth(int w) {
         width = w;
       }
       void setHeight(int h) {
         height = h;
       }
   protected:
       int width;
       int height;
};
```

```cpp
// Derived classes
class Rectangle: public Shape {
    public:
        int getArea() {
            return (width * height);
        }
};
class Triangle: public Shape {
    public:
        int getArea() {
            return (width * height)/2;
        }
};
```

How to use abstract class?

```cpp
int main(void) {
    Rectangle Rect;
    Triangle  Tri;
    Rect.setWidth(5);
    Rect.setHeight(7);
    // Print the area of the object.
    cout << "Total Rectangle area: " << Rect.getArea() << endl;
    Tri.setWidth(5);
    Tri.setHeight(7);
    // Print the area of the object.
    cout << "Total Triangle area: " << Tri.getArea() << endl;
    return 0;
}
```

Practice 1

```
Rectangle area: 35
Triangle area: 17
```

2. Assignment 2

Overview

- The diagram and report

- The electorates

- Issues

- Parties and people

- Stances, and electorate stances

Diagram and Report

- These are important.

- They help us understand what you are trying to do.

- Even if you don't actually get as far as implementing aspects you can still describe your intentions and get marks for the diagram and report parts.

The Nation and Electorates/Electoral Division

The nation of ...

| Electorate One | Electorate Three |
| Electorate Two | Electorate Four |

What is an electorate?

- The term refers to a physical area, part of the nation.

- You don't need to model it as an area, for the purposes of this assignment, each division only has one stance for one issue.

- There are different divisions.

Electorates

➢ What do I call my electorates/(candidates and other people)?

  ▪ Whatever you like as long as the names aren't offensive and contain only printable characters, even like A, B and C.

Issues

❑ The idea of an issue is clear.

Parties and People

❑ We have three parties. You can choose whatever name you like.

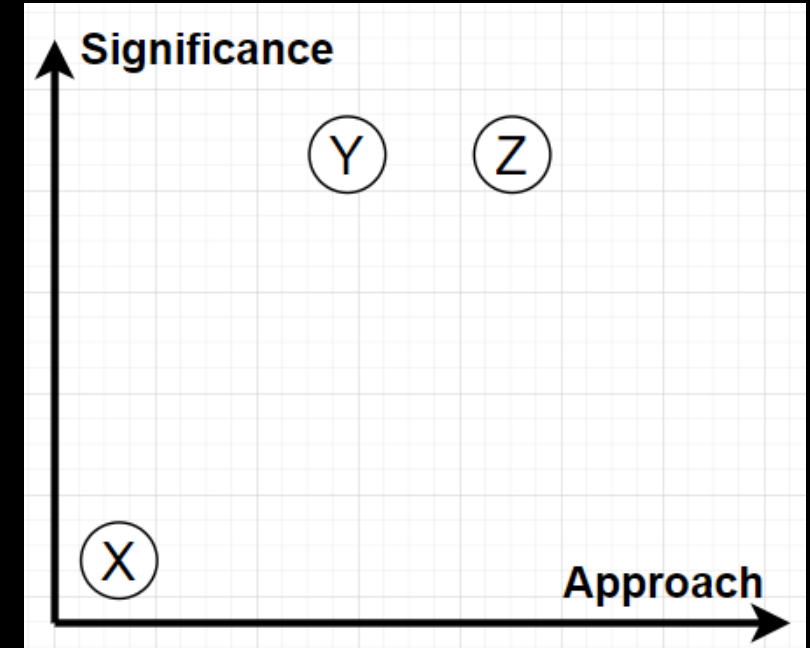❑ Each person is unique. You can define by yourself.

Stance

- A stance is a viewpoint or attitude towards an issue.

- We model it using two components: Significance and Approach.

- The scale refers to each of these being measurable/comparable.
  - They don't have to be numerical but it would be easier to work with them if they are.

- The stance values should be initialized randomly from a party-specific range.

  E.g., if the range is [0,100], a stance [80,90] indicates high significance and a highly powerful apporach.

Stance: Example

- ➢ Consider the two components.
- ➢ Example: 3 party leaders: X, Y, and Z.
- ➢ Issue : Concern about invasions by giant spiders.
  - Leader X doesn't think it's important. It is reported as "Fake news!"

  - The other parties think this is a major concern …
  - Leader Y thinks strengthening defence is the way to go.
  - Leader Z thinks we need to get the company SpiderKill to exterminate the nests.

APE: The campaign and election day ...

➤ APE should start by setting up the nation for the election, with the n electorates.

➤ There are then m days of campaigning.

➤ In each day, an local event occurs.

➤ The event may impact properties like popularity, stances, etc.

➤ These properties will impact the voting score.

➤ Report each day.

Management Team

- At least one characterististic which has impact on events

Events

- ✓ They impact popularity or stances.

- ✓ You decide the event content.

- ✓ You decide the probability of each event.

- ✓ You decide the impact.

Questions to think about

- ✓ What factors impacts the voting score?

- ✓ How these factors are impacted during the campaign days?

- ✓ What are involved in the factor impact and how they are involved?

Q&A

✓ Q: Will electorate stance values change as a result of events?

- A: Yes, Issue-related events.

✓ Q: Is it possible to have a day with no local events?

- A: Yes.

Q&A

✓ Q: Can events occur again? Even in the same electorate?

- A: Yes.

Q&A

- ✓ Q: How many candidates are there?
  - A: One per party per electorate, so in total 3n.
- ✓ Q: I don't get the idea of a stance range and getting values from it.
  - A: Here goes an example, for a single issue.
- ✓ Let's say I'm representing stances by integers in the range of 0-10 for significance and 0-10 for approach. I can represent it as (significance, approach).

  *This doesn't mean you have to use integers or this range.

Q&A

- ✓ Party A might have a stance range on this issue of
  - Significance 5-7 : Approach: 1-3
  - The leader and candidates have the same initial stance say (6,2).