EXAMPLE 55: MULTIPLE INHERITANCE, AND A DIAMOND HIERARCHY

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C++ ALLOWS A CLASS TO INHERIT FROM MULTIPLE BASE CLASSES

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(IN JAVA YOU CAN INHERIT FROM MULTIPLE INTERFACES, BUT ONLY 1 BASE CLASS)

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EXAMPLE 48: BASICS OF INHERITANCE: LET'S GET ONE CLASS TO INHERIT FROM ANOTHER

WE HAVE A CLASS REPRESENTING A SHAPE

WE NOW NEED TO CREATE A CLASS REPRESENTING A CIRCLE

CLEARLY A CIRCLE IS-A SHAPE

RECAP

CLEARLY A CIRCLE IS-A SHAPE

WE HAVE A CLASS REPRESENTING A SHAPE

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INHERITANCE IS PERFECT FOR MODELLING IS-A RELATIONSHIPS

RECAP

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WE HAVE A CLASS REPRESENTING A SHAPE

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THE CIRCLE CLASS SHOULD "INHERIT FROM" THE SHAPE CLASS

RECAP

IS-A RELATIONSHIP

REAL-WORLD RELATIONSHIP

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WE NOW NEED TO CREATE A CLASS REPRESENTING A CIRCLE

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CODE RELATIONSHIP

THE CIRCLE CLASS SHOULD "INHERIT FROM" THE SHAPE CLASS

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THE CIRCLE CLASS SHOULD "INHERIT FROM" THE SHAPE CLASS

WHAT EXACTLY DOES THIS MEAN?

EVERY OBJECT OF THE CIRCLE CLASS WILL HAVE INSIDE IT AN OBJECT OF THE SHAPE CLASS

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THE CIRCLE CLASS SHOULD "INHERIT FROM" THE SHAPE CLASS

WHAT EXACTLY DOES THIS MEAN?

THERE IS A LOT GOING ON - LET'S TAKE IT ONE AT A TIME

THE OBJECTS OF THE CIRCLE CLASS WILL HAVE ITS OWN OBJECT OF THE SHAPE CLASS

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RECAP

EVERY OBJECT OF THE CIRCLE CLASS WILL HAVE INSIDE IT AN OBJECT OF THE SHAPE CLASS

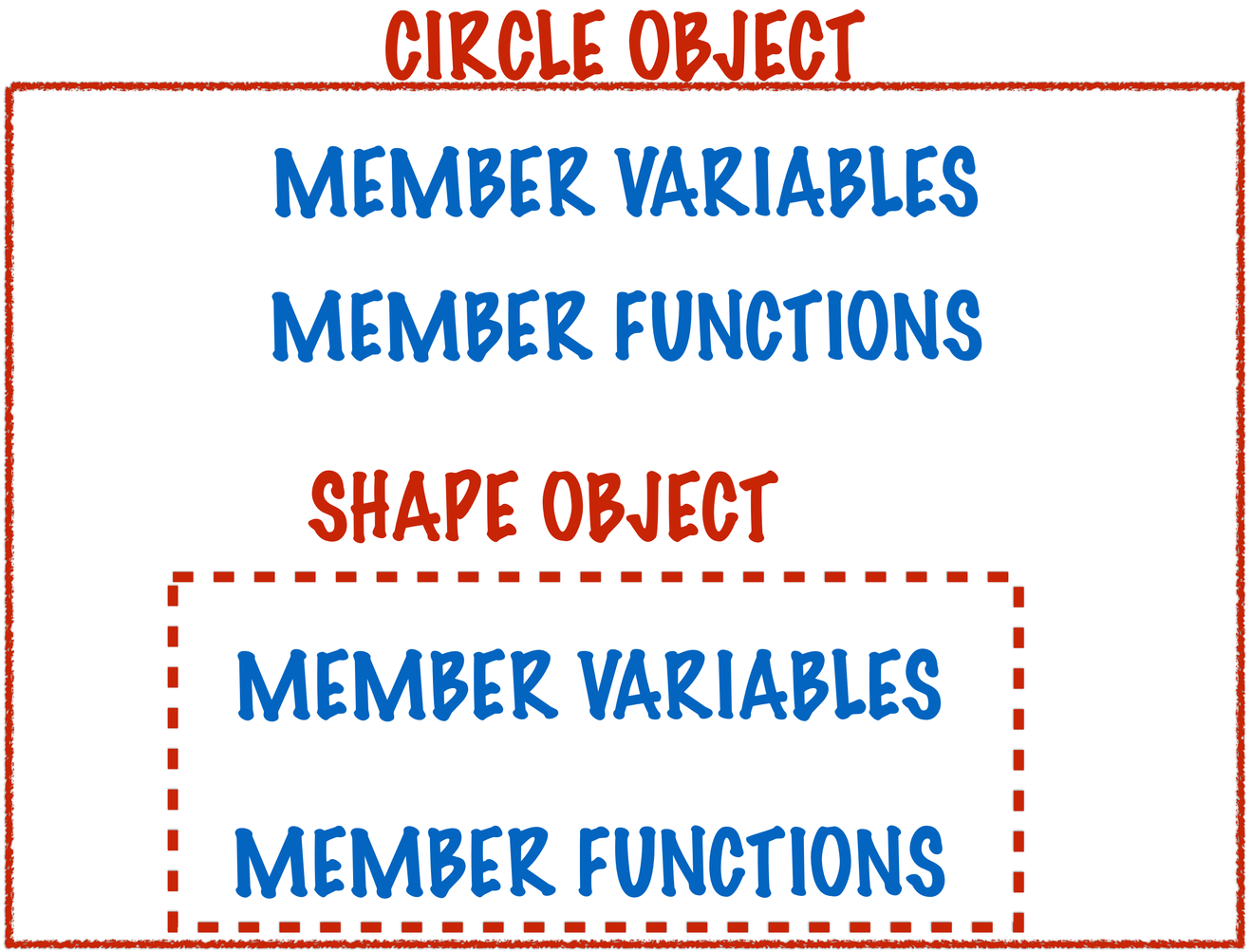
SHAPE OBJECT

MEMBER VARIABLES

MEMBER FUNCTIONS

RECAP

EVERY OBJECT OF THE CIRCLE CLASS WILL HAVE INSIDE IT AN OBJECT OF THE SHAPE CLASS



RECAP

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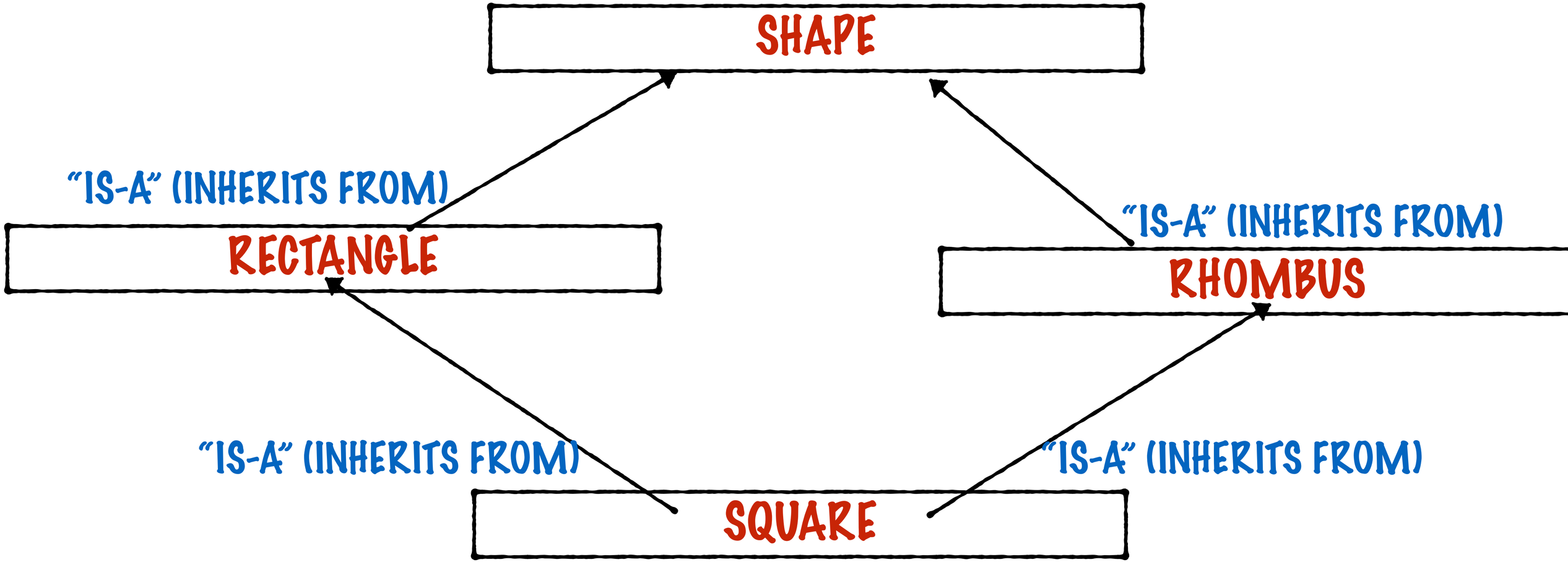
THERE IS NOTHING INHERENTLY WRONG WITH THIS, BUT IT GETS COMPLICATED TO WORK WITH

FOR INSTANCE, IT IS POSSIBLE FOR A DERIVED CLASS OBJECT TO END UP WITH 2 COPIES OF A BASE CLASS OBJECT INSIDE IT



NOW THIS IS ALL PERFECTLY REASONABLE FROM A REAL-WORLD POINT-OF-VIEW..

..BUT THIS DIAMOND-SHAPED CLASS DIAGRAM LEAVES THE SQUARE OBJECT WITH 2 COPIES OF THE SHAPE OBJECT

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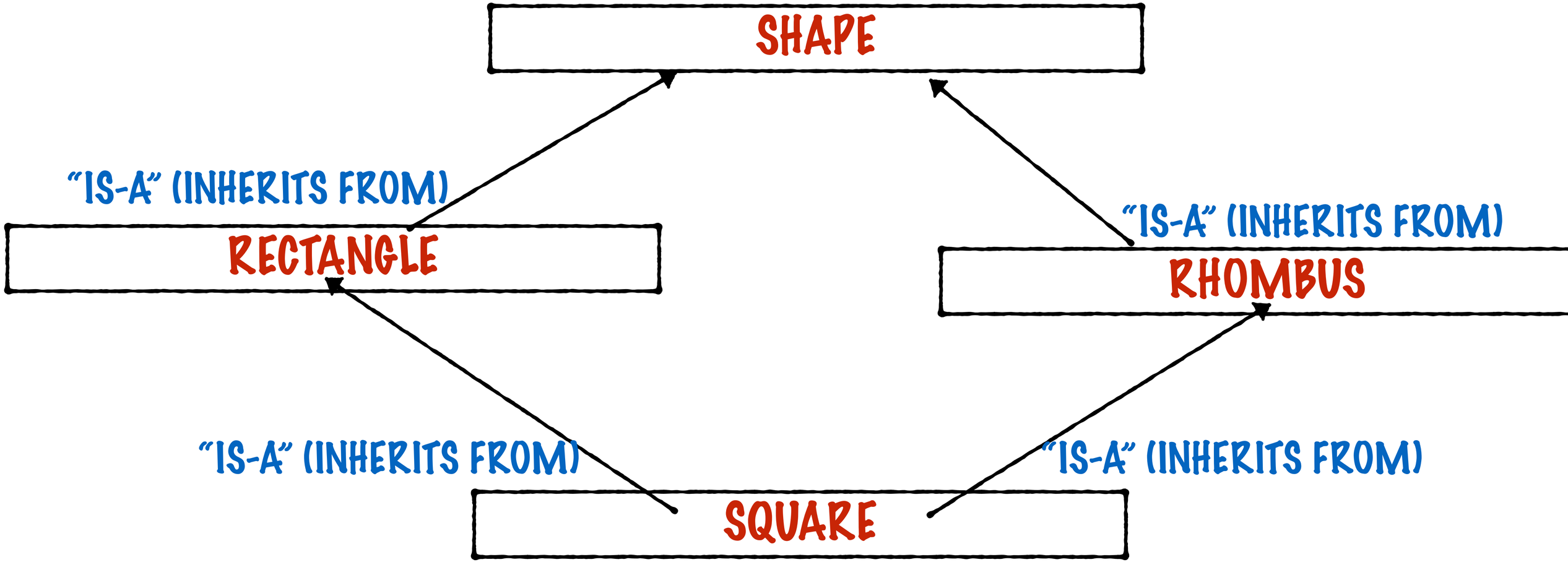

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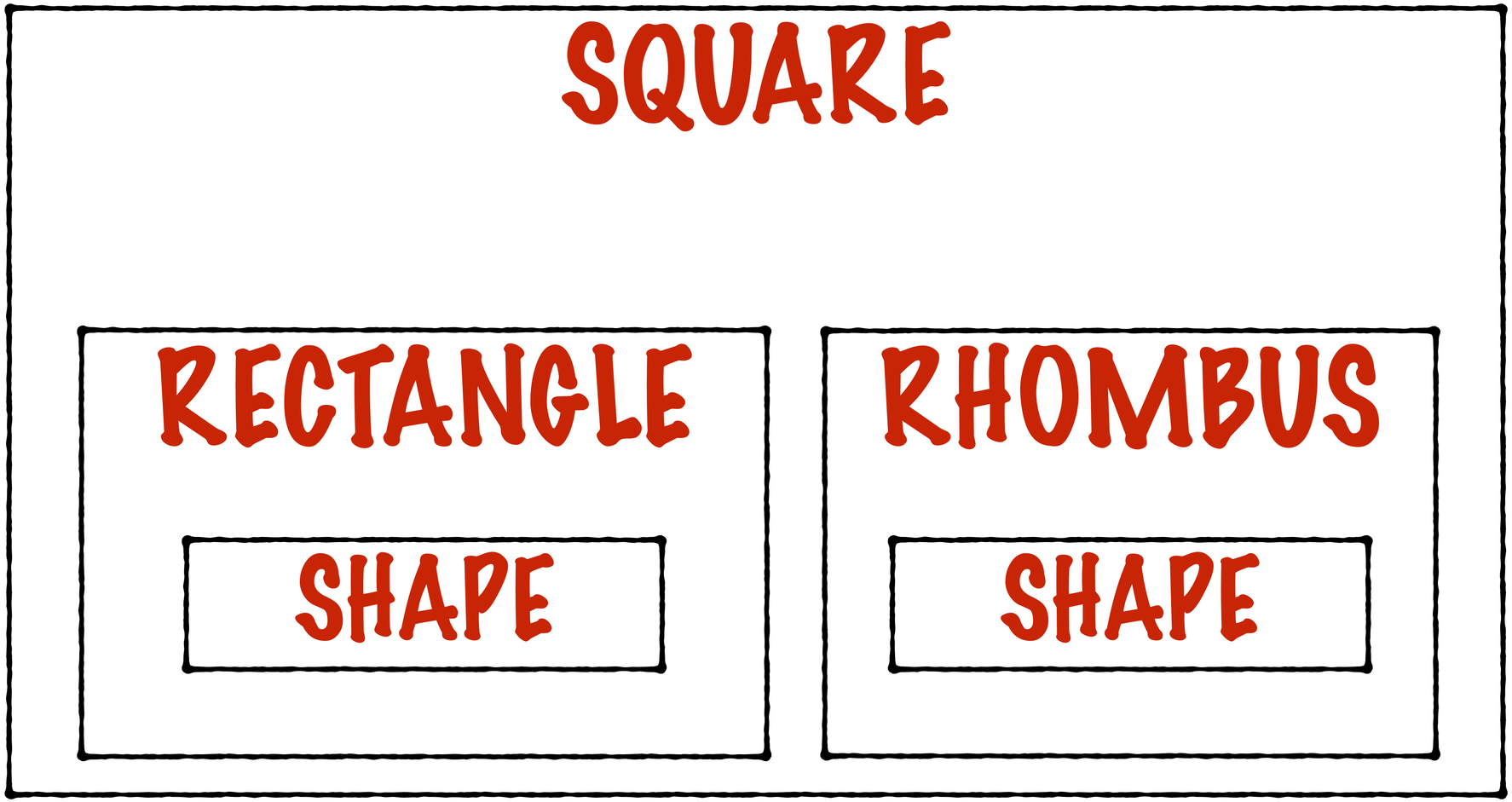
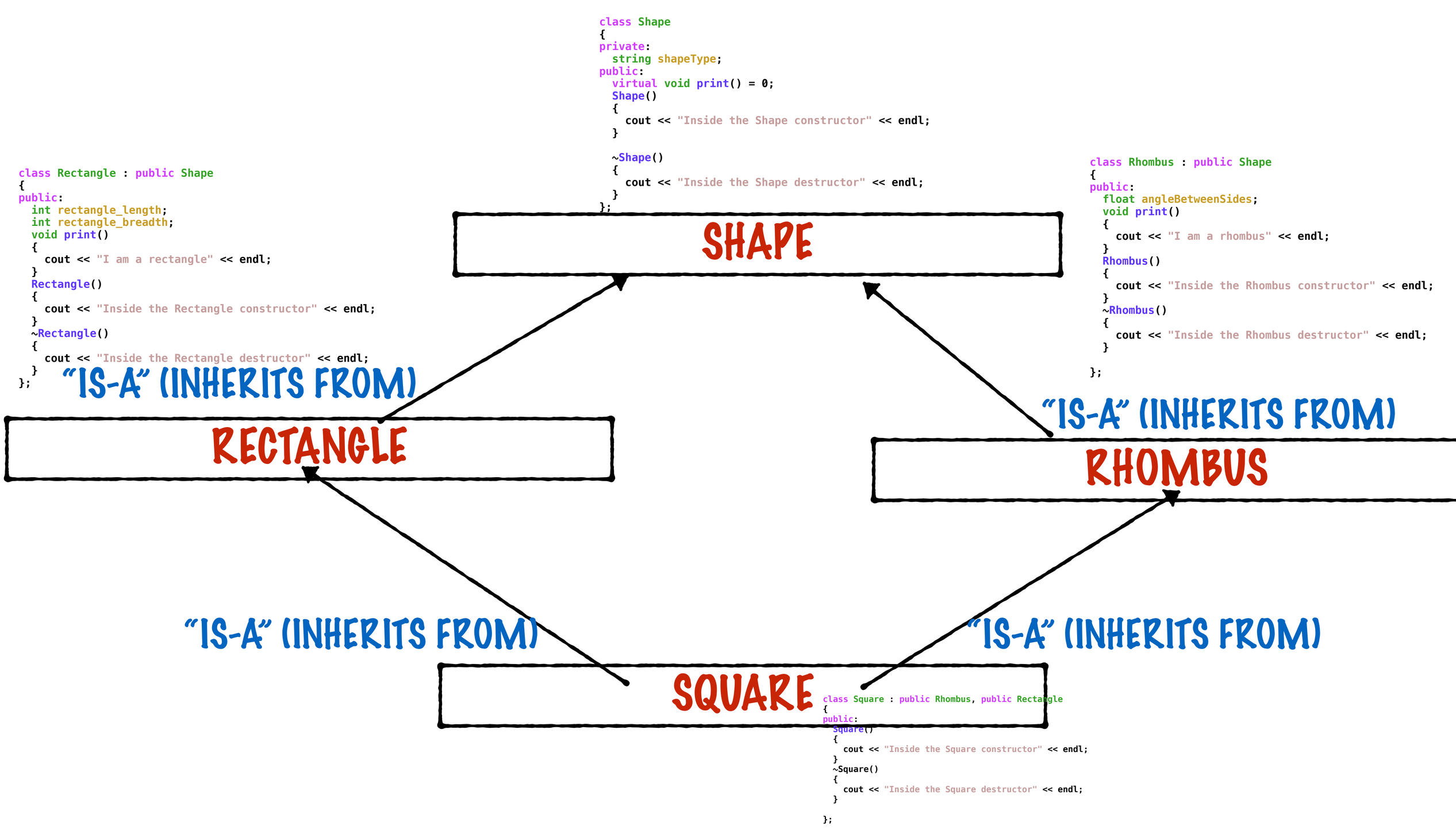


LAYOUT OF AN OBJECT OF CLASS SQUARE

NOW IF YOU WANT TO CALL A METHOD OF THE SHAPE CLASS, YOU HAVE EXPLICITLY SPECIFY WHICH OF THE 2 VERSIONS YOU ARE REFERRING TO

DO SO USING THE SCOPE RESOLUTION OPERATOR.


class Shape
{
private:
string shapeType;
public:
virtual void print() = 0;
Shape()
{
cout << "Inside the Shape constructor" << endl;
}
~Shape()
{
cout << "Inside the Shape destructor" << endl;
}
};
SHAPE
class Rectangle : public Shape
{
public:
int rectangle_length;
int rectangle_breadth;
void print()
{
cout << "I am a rectangle" << endl;
}
Rectangle()
{
cout << "Inside the Rectangle constructor" << endl;
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~Rectangle()
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};
"IS-A" (INHERITS FROM)
RECTANGLE
class Rhombus : public Shape
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public:
float angleBetweenSides;
void print()
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cout << "I am a rhombus" << endl;
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Rhombus()
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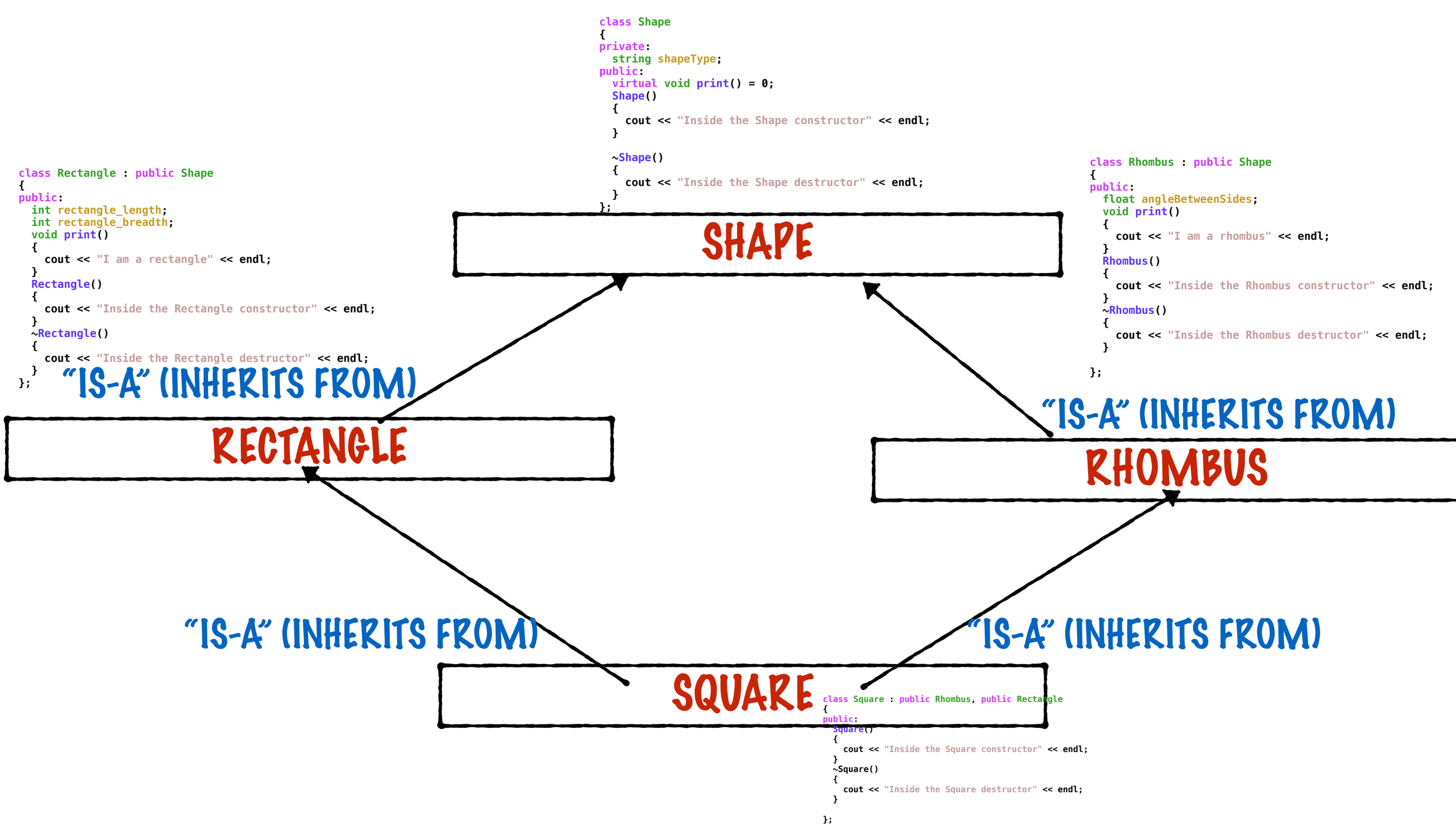
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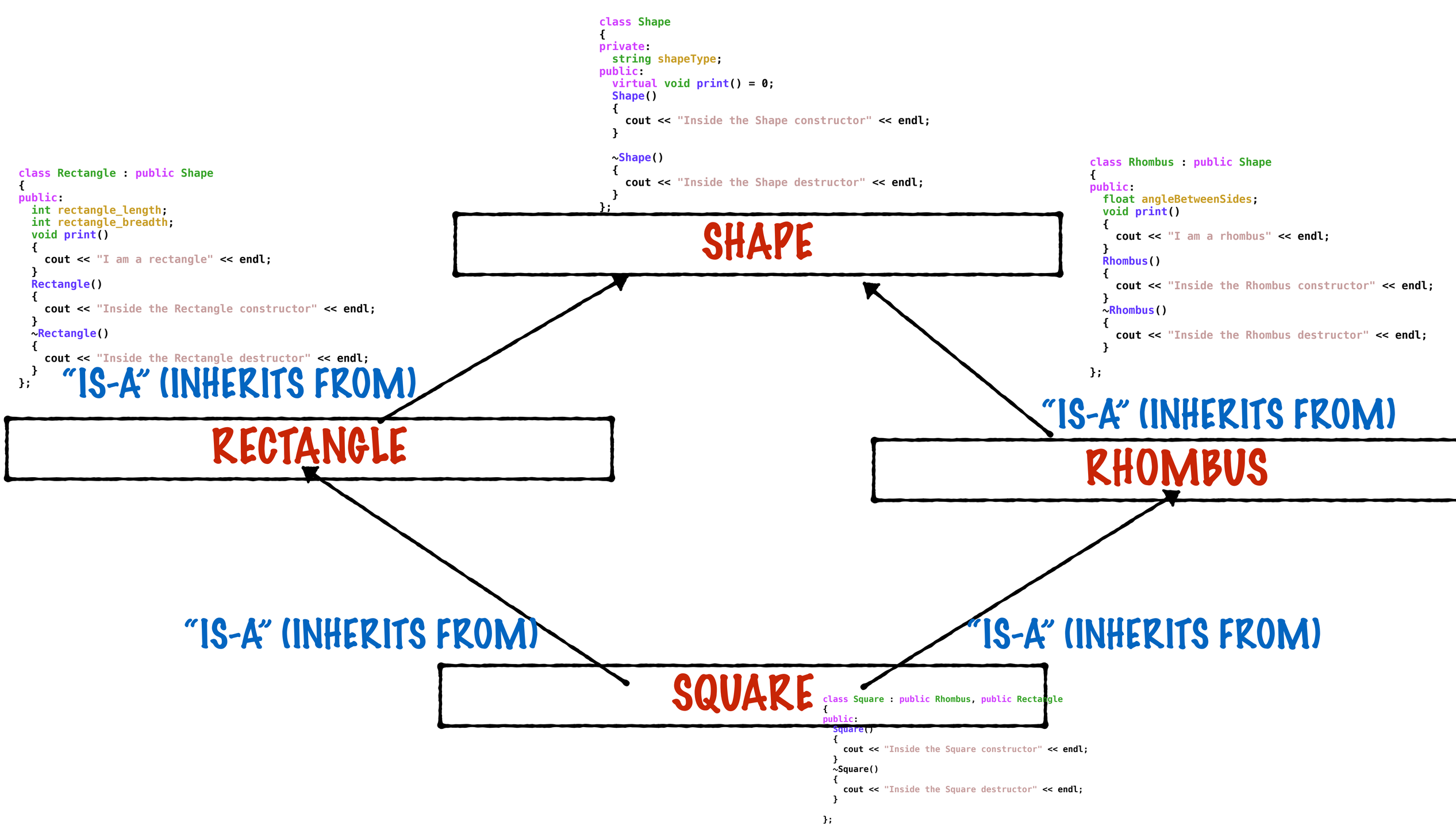
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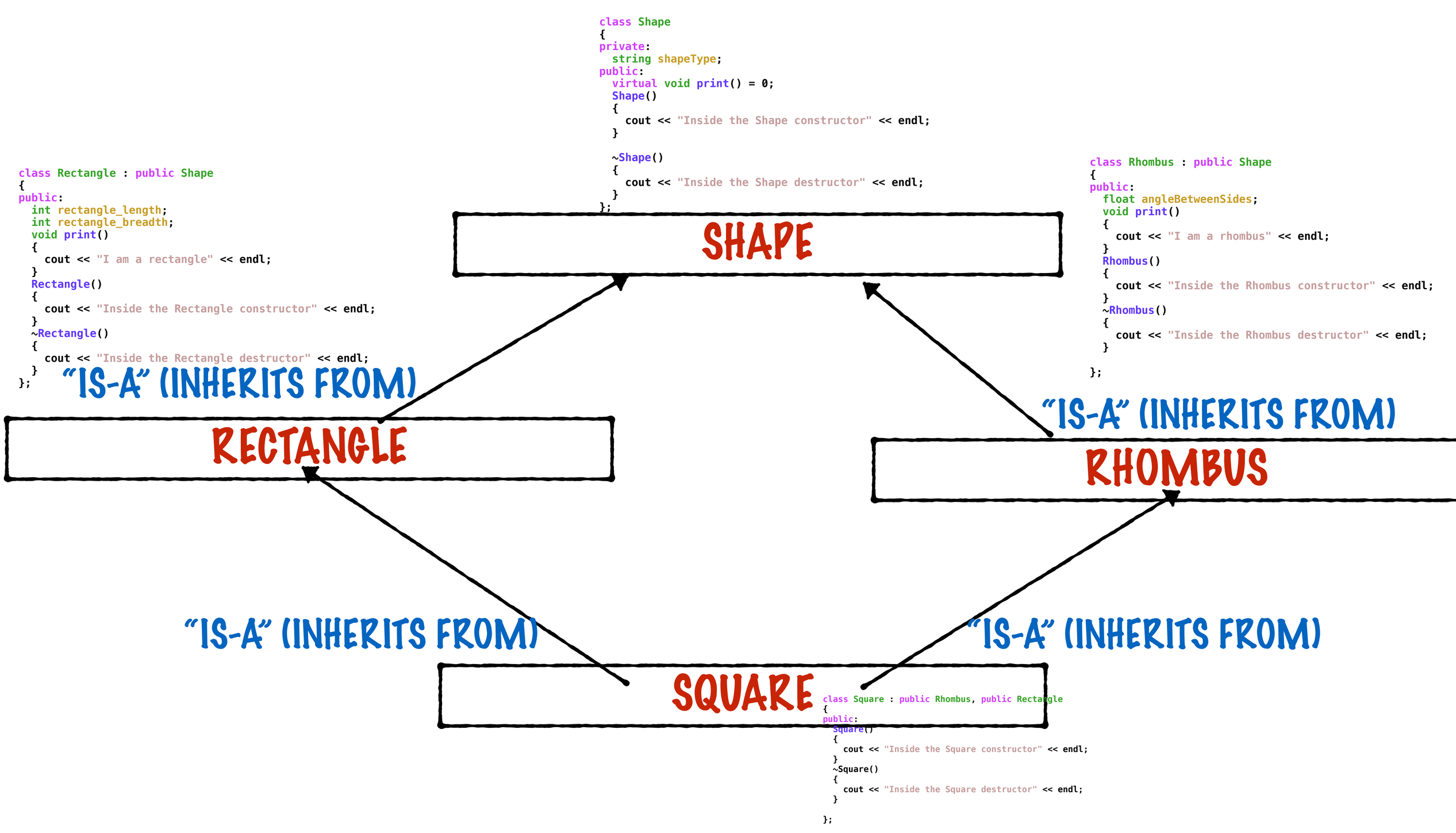
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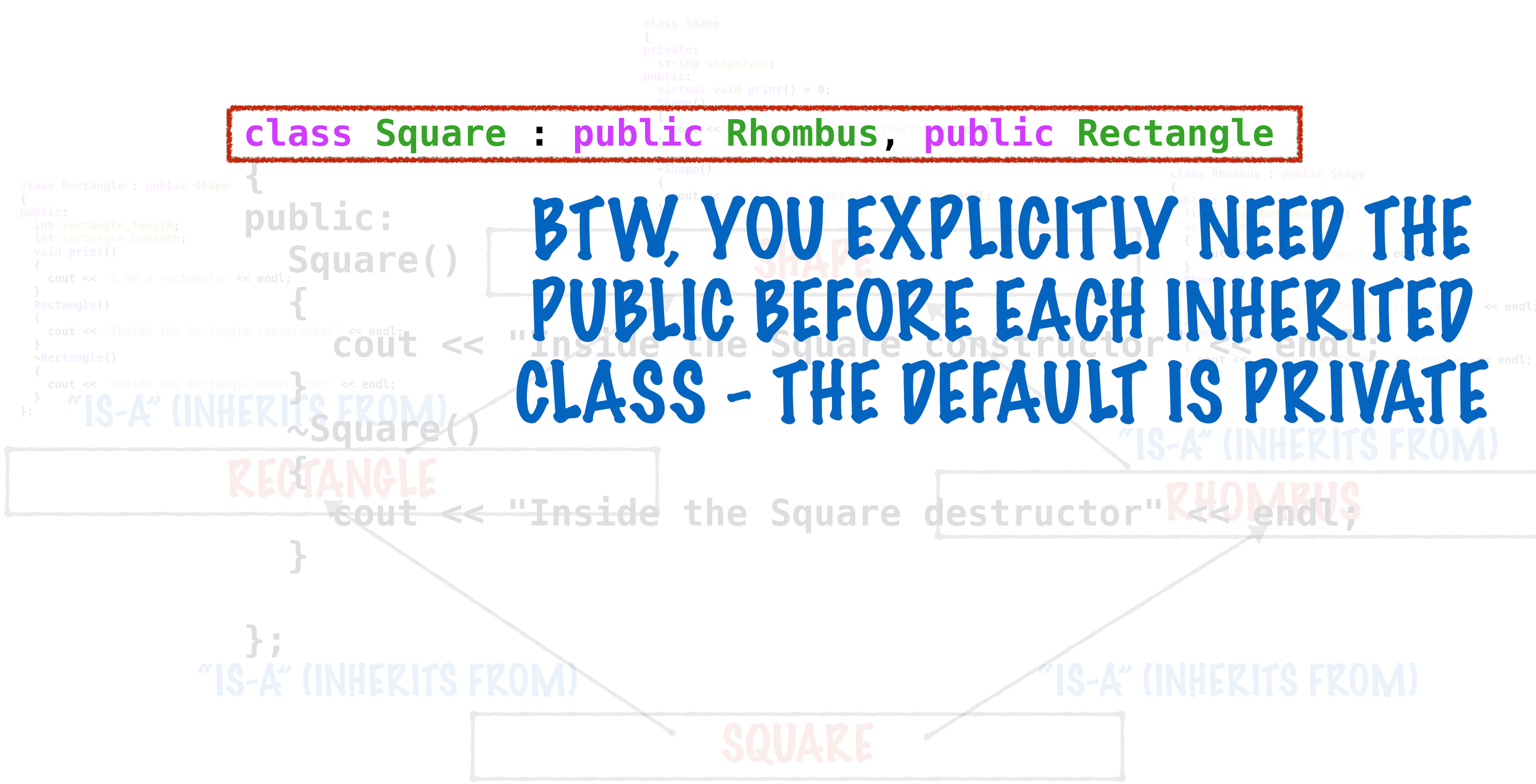
    }

};
```

DOES NOT IMPLEMENT THE PRINT METHOD!
NEED TO USE ONE OF THE BASE CLASS VERSIONS

```
class Square : public Rhombus, public Rectangle
```

BTW, YOU EXPLICITLY NEED THE PUBLIC BEFORE EACH INHERITED CLASS - THE DEFAULT IS PRIVATE



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```
Square s1;
s1.print();
```

```
Vitthals-MacBook-Pro:~ vitthalsrinivasan$ g++ -Wall Example55.cpp
Example55.cpp:80:6: error: member 'print' found in multiple base classes of different types
  s1.print();
     ^
Example55.cpp:46:8: note: member found by ambiguous name lookup
  void print()
       ^
Example55.cpp:28:8: note: member found by ambiguous name lookup
  void print()
       ^
1 error generated.
```

DOES NOT IMPLEMENT THE PRINT METHOD!
NEED TO USE ONE OF THE BASE CLASS VERSIONS

```
Square s1;
s1.Rectangle::print();
s1.Rhombus::print();
```

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DO SO USING THE SCOPE RESOLUTION OPERATOR.

DOES NOT IMPLEMENT THE PRINT METHOD!
NEED TO USE ONE OF THE BASE CLASS VERSIONS

```
Square s1;
s1.Rectangle::print();
s1.Rhombus::print();
```

RECTANGLE VERSION OF PRINT

NOW IF YOU WANT TO USE A METHOD IN A BASE CLASS, YOU HAVE
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```
Square s1;
s1.Rectangle::print();
```

```
s1.Rhombus::print();
```

RHOMBUS VERSION OF PRINT

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