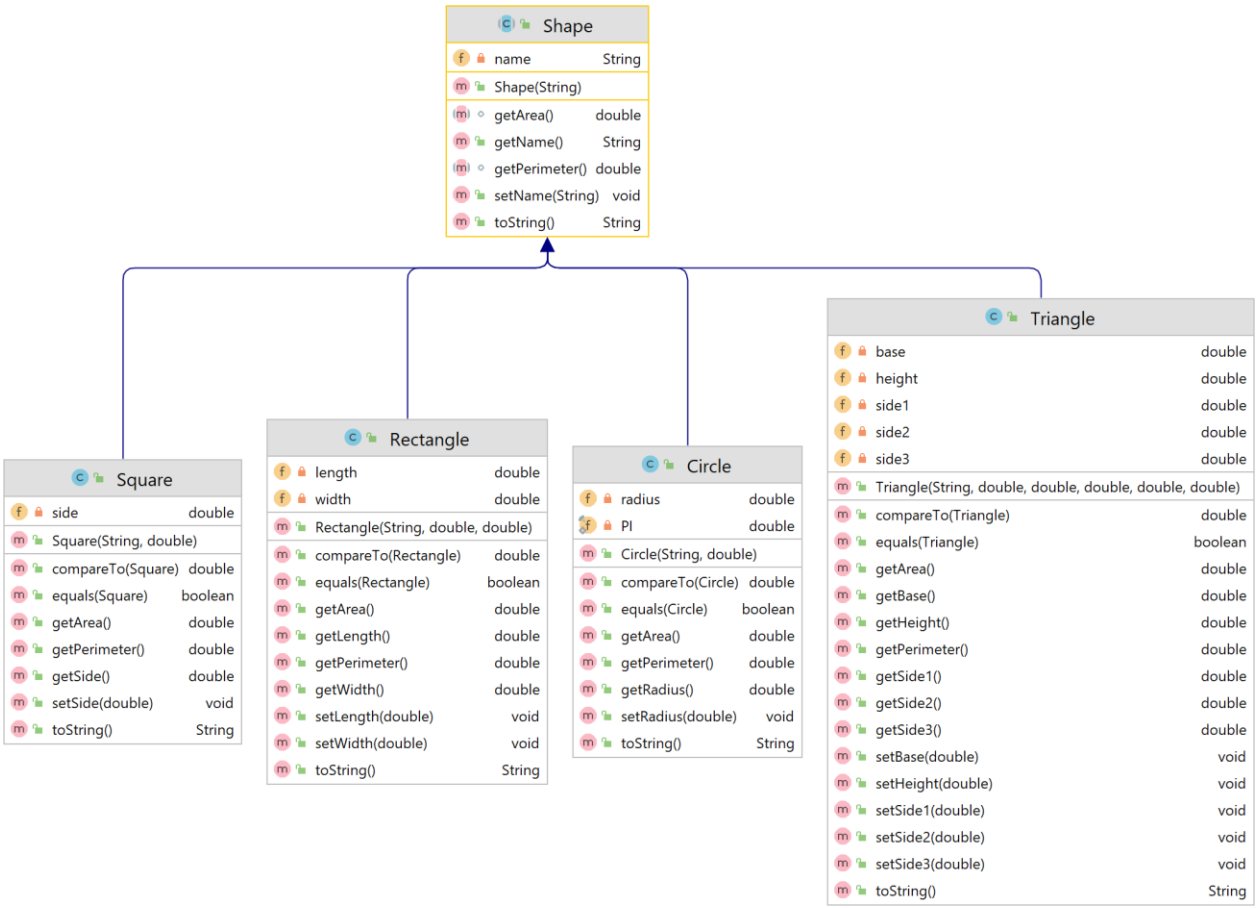
Name [ ] Date [ ]

Instructions

The **`Shape`** and **`TestClass`** classes are given to you. Write the ***`Square`***, ***`Rectangle`***, ***`Triangle`*** and ***`Circle`*** classes according to the class diagram below:



You may want to use **`Math.PI`** in your Circle class instead of defining your own constant.

Work through the test from the beginning. Your Time class should build and grow –do not start a new program for each point.

During this test, you may use any resources that you have created, but you may **not** use Internet.

<<< Please Turn Over >>>

Marks Distribution

1. Successfully implement ***inheritance*** in all your classes.
2. Successfully implement ***data hiding*** in the fields/attributes of all your classes.
3. Successfully implement ***constructors*** in all your classes.
4. Successfully implement ***accessors/getters*** and ***mutators/setters*** in all your classes.
5. Successfully implement methods to calculate ***areas*** in all your classes.
6. Successfully implement methods to calculate ***perimeters*** all in your classes.
7. Make sure that your classes ***only positive numbers*** (constructors, setters)
8. Successfully implement ***toString*** methods in all your classes. They should return Strings as similar as possible to the display output on next page.
9. Successfully implement ***equals*** methods in all your classes. Use data/methods that you have already written do so to accomplish this.
10. Successfully implement ***compareTo*** methods in all your classes. Use data/methods that you have already written do so to accomplish this.

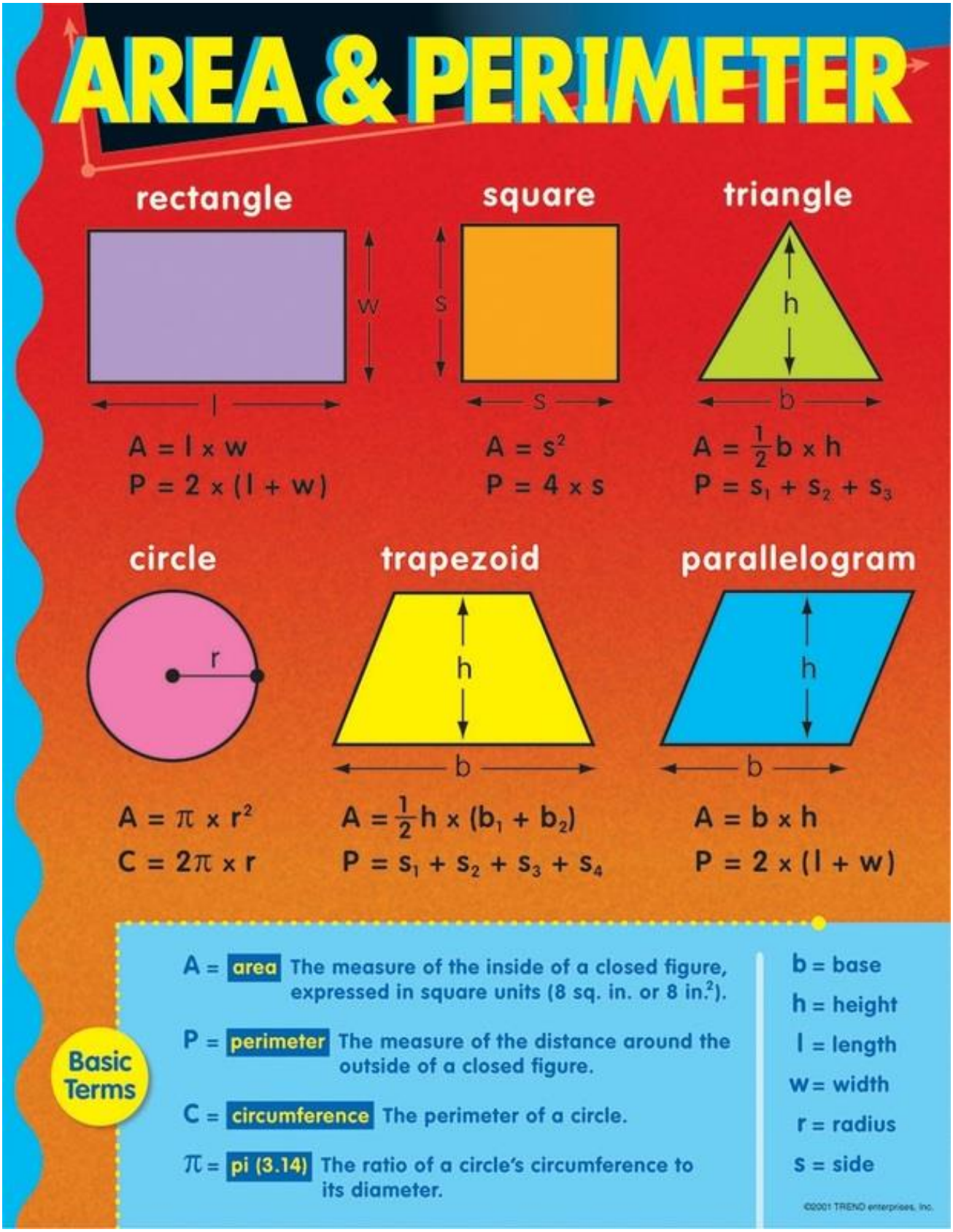
    Extra challenge: Format the perimeter and area to three (3) decimals, as shown in the display output on next page.

<<< Please Turn Over >>>

Display Output

```
Squares
Shape: ABCD     Side: 4.0  Area: 16.000    Perimeter: 16.000
Shape: EFGH     Side: 10.0 Area: 100.000   Perimeter: 40.000
Equals (T): true
Equals (F): false
compareTo : -84.0

Rectangles
Shape: ABCD Length: 10.0   Width: 5.0 Area: 50.000    Perimeter: 30.000
Shape: EFGH Length: 3.0    Width: 7.0 Area: 21.000    Perimeter: 20.000
Equals (T): true
Equals (F): false
compareTo : 29.0

Triangles
Shape: ABC Base: 4.0  Height: 1.4524   Side 1: 2.0     Side 2: 4.0
           Side 3: 3.0     Area: 2.905     Perimeter: 9.000
Shape: DEF Base: 5.0  Height: 4.33     Side 1: 5.0     Side 2: 5.0
           Side 3: 5.0     Area: 10.825    Perimeter: 15.000
Equals (T): true
Equals (F): false
compareTo : -7.9201999999999995

Circles
Shape: C1  Radius: 3.0     Area: 28.274    Circumference: 18.850
Shape: C2  Radius: 1.7     Area: 9.079     Circumference: 10.681
Equals (T): true
Equals (F): false
compareTo : 19.1951149

Process finished with exit code 0
```

<<<Formulae on next page>>>


AREA & PERIMETER
rectangle
w
l
A = l x w
P = 2 x (l + w)
square
s
s
A = s²
P = 4 x s
triangle
h
b
A = ½b x h
P = s₁ + s₂ + s₃
circle
r
A = π x r²
C = 2π x r
trapezoid
h
b
A = ½h x (b₁ + b₂)
P = s₁ + s₂ + s₃ + s₄
parallelogram
h
b
A = b x h
P = 2 x (l + w)
Basic Terms
A = area The measure of the inside of a closed figure, expressed in square units (8 sq. in. or 8 in.²).
P = perimeter The measure of the distance around the outside of a closed figure.
C = circumference The perimeter of a circle.
π = pi (3.14) The ratio of a circle's circumference to its diameter.
b = base
h = height
l = length
w = width
r = radius
s = side
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