Math 310 ■ Spring 2006 ♦ GEOquiz #1 ANSWERS & COMMENTS

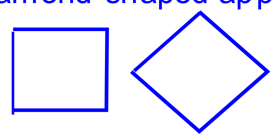
#1-8: Mark T for true statements, F for false.
If the statement is false, give a counterexample, or explanation.

1. TF A square is a rectangle.
True, a square has the required properties of a rectangle (quadrilateral with all right angles). If you said false, you probably perceive, incorrectly, that one of the properties of a rectangle is having two different length sides.

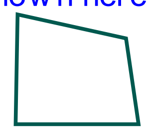
2. TF A rectangle is a parallelogram.
True, a rectangle has the required properties of a parallelogram (quadrilateral with opposite sides parallel).
If you said false, you probably perceive, incorrectly, that one of the properties of a parallelogram is having two different size interior angles.

3. TF A parallelogram is a quadrilateral.
True, a parallelogram has the required properties of a quadrilateral (polygon with four sides).

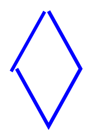
4. TF A square is a rhombus.
True, a square has the required properties of a rhombus (quadrilateral with four equal sides). It is NOT required that a rhombus have a "diamond" shape, with one diagonal shorter than the other. In fact a square turned 45° does indeed have a diamond-shaped appearance...



5. TF A quadrilateral may have exactly one right angle*
TF A quadrilateral may have exactly three right angles*
These references are all to interior angles.
Since the sum of all the interior angles of any quadrilateral is 360°, if three of those interior angles measure 90°, the fourth must also. The first statement is true, example shown here:



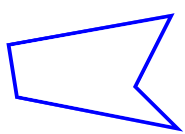
6. TF A rhombus is a regular quadrilateral.
No, a rhombus may have two different sizes of interior angles (➜)...
which violates the requirement that a regular polygon be equiangular.



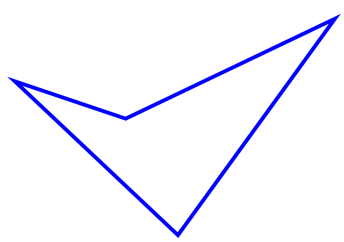
7. TF The sum of the measures of the interior angles of *any* hexagon is 720°.
True. Triangulation is probably the simplest way to demonstrate this fact.

8. TF The number of diagonals in a regular hexagon is 15.
No, the number of ways to connect 6 no-3-collinear points with line segments is $1+2+3+4+5 = 5•6/2 = 15$, but siz of those connecting segments are sides of the hexagon, not diagonals. So the number of diagonals is $15 - 6$, which is 9.

9. Sketch a concave pentagon.



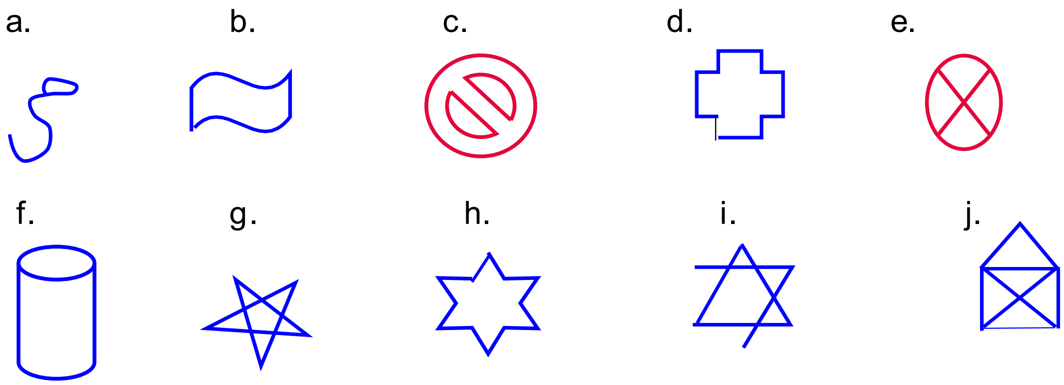
10. Sketch a concave quadrilateral.



Can you sketch a concave triangle?

11. Sketch a polygon with only two sides.
This is impossible. If the second segment comes back to the same point where the first segment began, then the second segment is identical with the first. (Two points determine ONE line segment.) So the second segment retraces all the points covered by the first. This is not even a curve, let alone a polygon.

12. Which of the following is a curve? a b d f g h i & j.



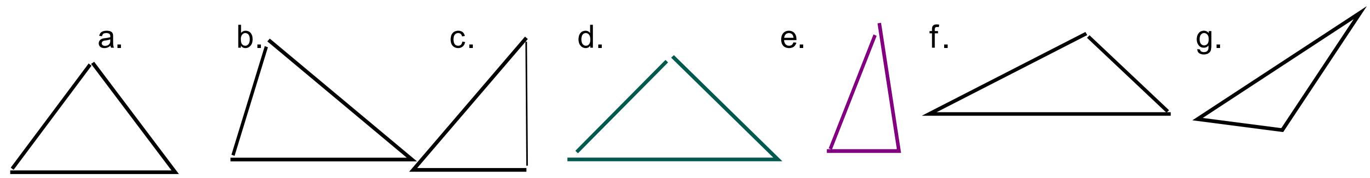
c. fails because it is not connected (you have to lift your pencil to draw it).
e. fails because the "curve" cannot be traversed (or drawn) without retracing paths. (Those four ODD vertices give it away as untraversable.)

13. Which of the above figures is a simple closed curve? (If it is not, why not?)
Only b and d and h are simple closed curves.
a. is not closed (does not end where it began) and not simple.
c. is not even a curve (see #12).
e. is, likewise, not even a curve.
f. is not simple (it meets itself, and not just by ending where it began).
g. is also not simple (crosses over itself).
i & j are not simple.

14. Which of the figures in #12, if any, is a polygon?
Since a polygon is a simple closed plane curve consisting of straight segments, the only ones to consider are b and d and h. Curve b does not consist entirely of straight segments, so it is not a polygon. The other two are polygons.

15. Identify each of the following triangles as

A acute B obtuse C right D scalene E isosceles F equilateral (**all** that apply!)



a.	b.	c.	d.	e.	f.	g.
A, E Acute Isosceles	A, D Acute Scalene	C, D Right Scalene	B, E Obtuse ✼ Isosceles	A, D Acute Scalene✷	B, D Obtuse Scalene	B, D Obtuse Scalene

✼ Use the corner of your paper to check the angle!
✷ Yes, it is *close* to being isosceles. But notice how the top "leans right" – the vertex is not centered over the base; if isosceles, should be symmetric!
(*Problem should have been stated:*
Identify to which classes of triangles each the following triangles belongs.)