

Math 202 Section 4

QUIZ 3

Jan 30, 2008

Show your work in all problems.

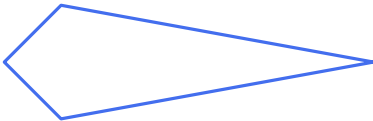
1. Give an example of each, if possible. If not explain why (either using the definition or with a figure).

(a) A rhombus that is a rectangle.



It is necessarily a square, because rhombus has all sides of equal length and rectangles have perpendicular corners. Both conditions together gives the definition of a square.

(b) A kite that is not a rhombus.



Clearly not a rhombus.

(c) A rhombus that is not a trapezoid.

Not possible. All rhombuses are trapezoids.

Reason: A rhombus has all sides of equal length, and this forces it to be a parallelogram, hence there is at least one pair of parallel sides, so it's also a trapezoid.

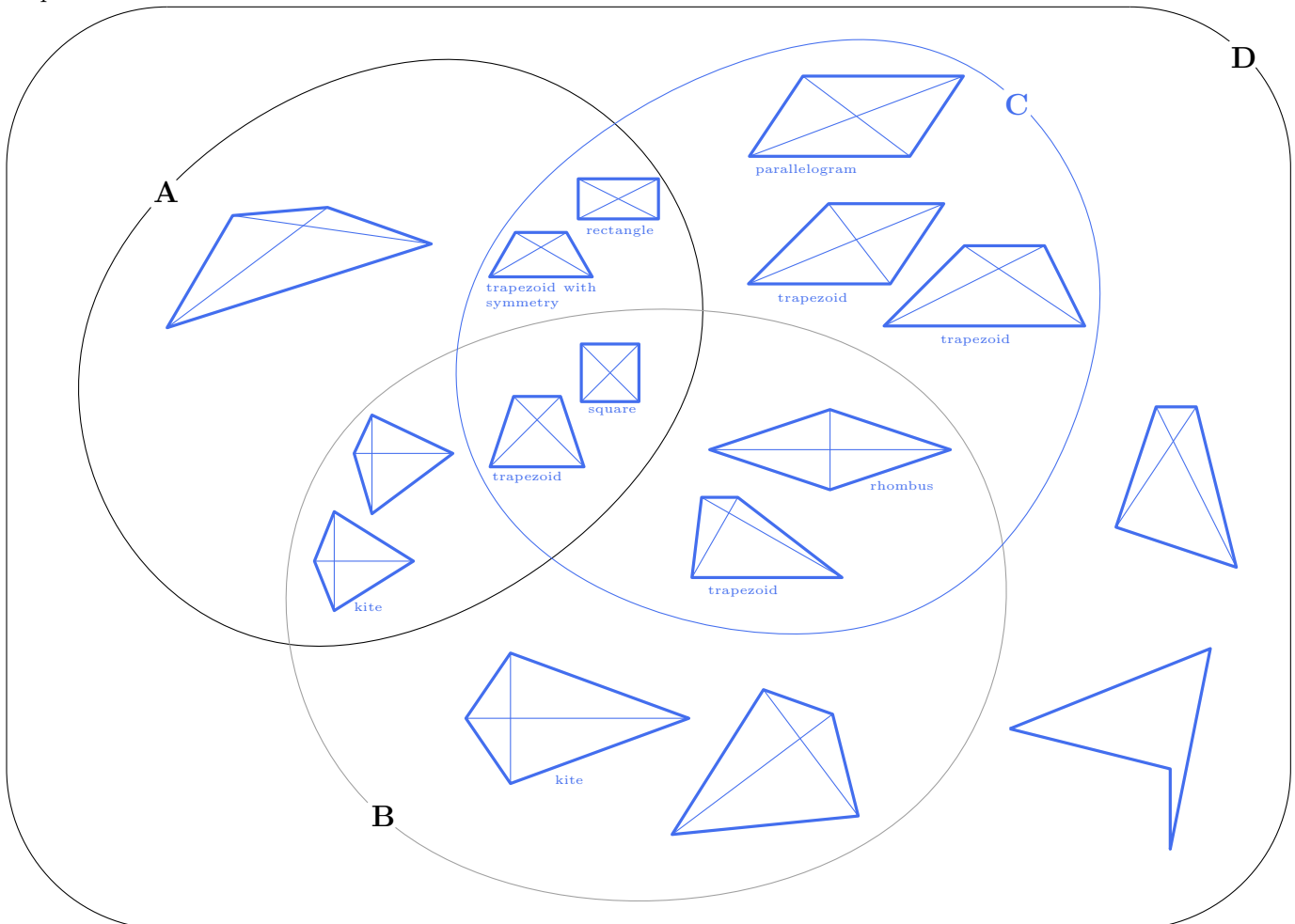
2. Show the relationships between the following categories by drawing a Venn diagram. In each region draw an example if not empty. Categories (objects):

A : quadrilaterals with two diagonals of equal length

B : quadrilaterals with perpendicular diagonals

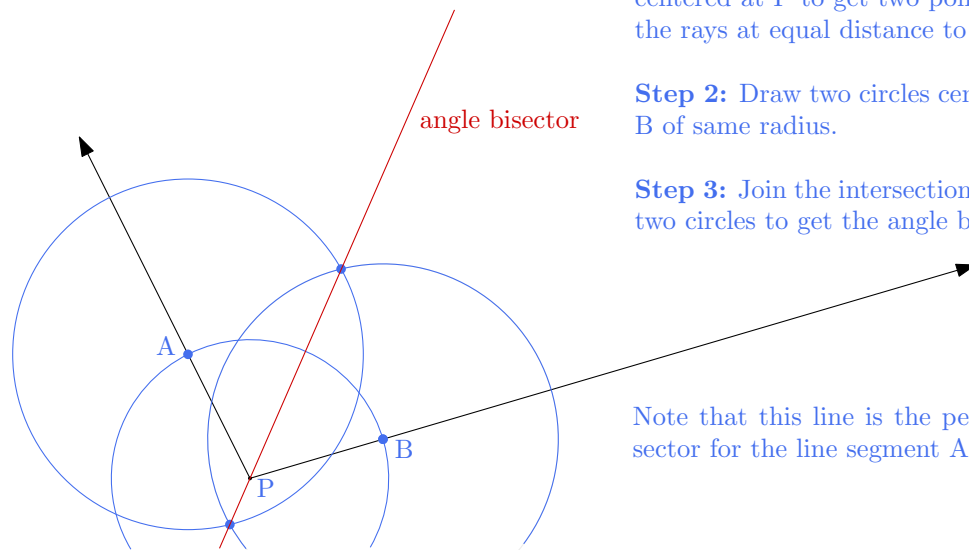
C : quadrilaterals with at least two sides parallel (this is the definition for trapezoids, includes parallelograms, rectangles, ...)

D : all quadrilaterals



3. Construct the following using straightedge and compass only. This means there should be no guessing involved, only using measurable distances (with compass) and drawing a line only when two points on it are already known. Don't erase your intermediate drawings (unless they turned out wrong).

(a) The angle bisector for the following given angle:



Step 1: Draw circle with arbitrary radius centered at P to get two points A and B on the rays at equal distance to P.

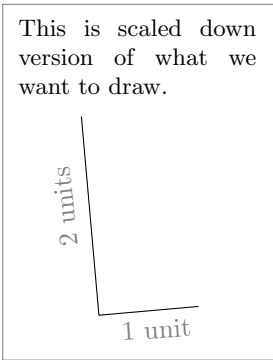
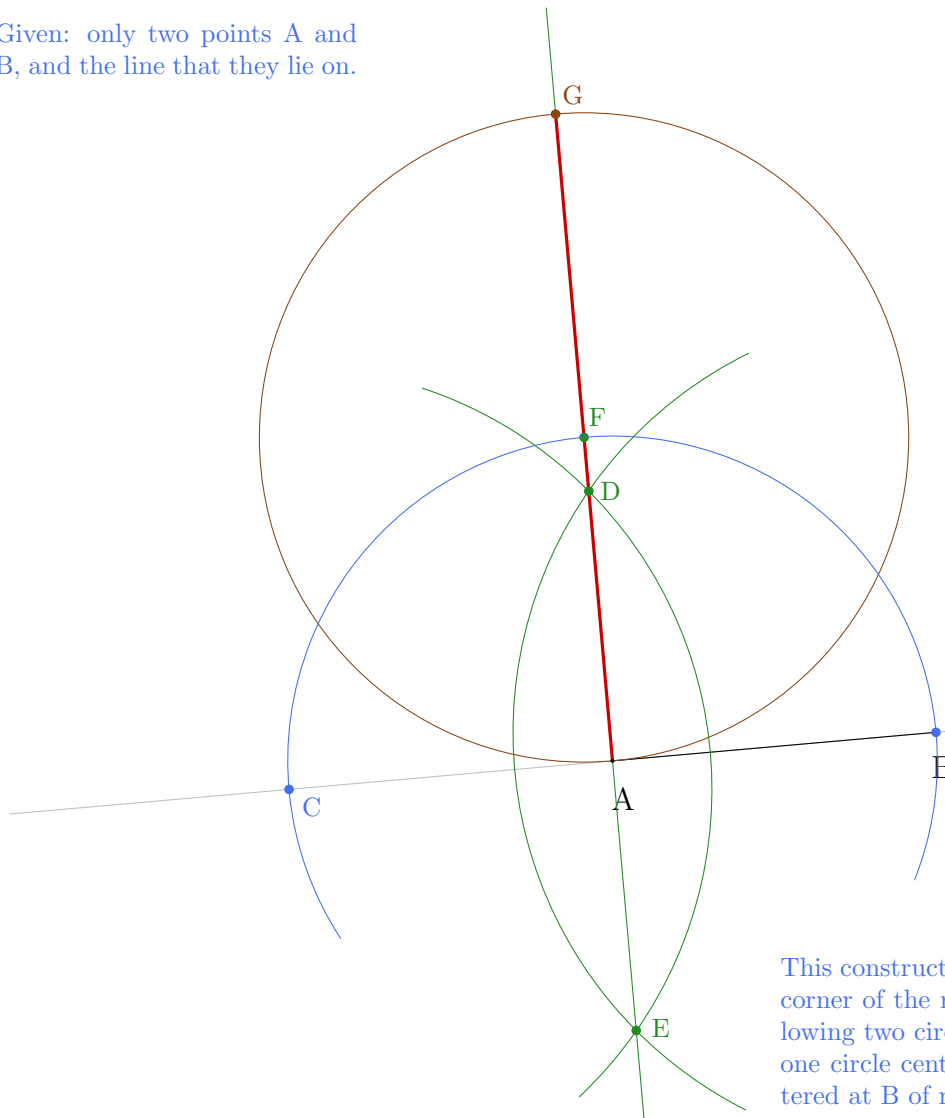
Step 2: Draw two circles centered at A and B of same radius.

Step 3: Join the intersection points of these two circles to get the angle bisector.

Note that this line is the perpendicular bisector for the line segment AB.

(b) An "L" shape with the given base, whose height is twice the base length. The base is given in black and there is a grey line to help you with the construction. (Hint: draw a perpendicular at A using the perpendicular bisector, but you will need to find an auxiliary point first, just like in the square construction) Note that this gives half of a rectangle.

Given: only two points A and B, and the line that they lie on.



Step 1: Draw a circle centered at A, of radius same as the length of AB. This gives a new point C. We did this so that A is the midpoint of C and B.

Step 2: Draw the perpendicular bisector of CB by drawing two circles of same radius centered at C and B respectively, and joining their two intersection points D and E. Draw this line long enough.

Step 3: We got one more point F on the new line, now draw a circle of radius same as the length of AB centered at F. The new intersection point G has the property that GA is twice as long as AB.

This construction gives half of a rectangle. To find the last corner of the rectangle, look at the intersection of the following two circles:

one circle centered at G of radius AB, and the other centered at B of radius GA.