

Solutions to Compass and Straightedge Worksheet

Look at the problem-solving hints on p. 127. Make a sketch and mark off the pieces of information you have been given. Remember distances away from points should usually lead to circles. Distances away from lines usually lead to parallel lines. Don't expect to get there in one step - construct what you can, even if it only gets you a little way towards your goal.

Problem 1

1. Draw a line segment of length $|AB|$
2. Bisect the line segment to find its midpoint.
3. Draw a circle of radius equal to the length of the median, centred at the midpoint. (These steps use the information given about the length of the median.)
4. Draw a circle of radius $|BC|$, centred at the right endpoint of the line from step 1.
5. These two circles meet at the 3rd vertex of the triangle. Join the vertices with line segments.

Problem 2

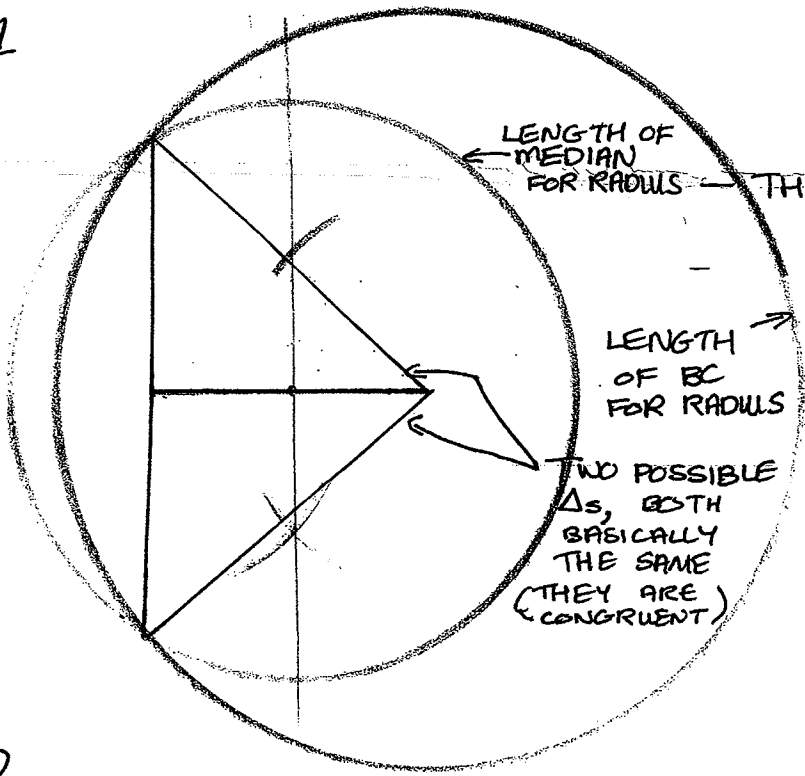
1. Draw a line segment of length $|AB|$
2. Bisect the line segment to find its midpoint.
3. Draw a circle of radius equal to the length of the median, centred at the midpoint. (These steps use the information given about the length of the median.)
4. Pick a free point P on the line segment AB . Draw a perpendicular line through this point, perpendicular to AB . (We could also reuse the perpendicular line we found in step 2.)
5. Mark the length of the altitude on this perpendicular line to get a point Q . The point Q is now the correct perpendicular distance away from AB .
6. Draw a parallel line through the point Q , parallel to AB . (These steps use the information given about the length of the altitude.)
7. The line and the circle meet at the 3rd vertex of the triangle. Join the vertices with line segments. (There are two different triangles that answer this question correctly, but they are congruent.)

Problem 3 See p. 125 of the notes.

Problem 4 Construct a triangle given the length, x , of an altitude, the length, y , of another altitude and an angle touching the second altitude.

1. Draw the given angle.
2. Draw a perpendicular line to the bottom leg of the angle. Use this to find a point a distance x away from the bottom leg of the angle.
3. Draw a line through this point, parallel to the bottom leg of the angle. Mark the point A where this line meets the other leg of the angle. This is one of the vertices of the triangle we seek. (So this uses the information about the altitude x and the angle.)
4. Draw a circle of radius y centred at the vertex of the angle.
5. The third side goes through the point from step 3 and is also tangent to the circle from step 4. Draw this side of the triangle using the basic construction: tangent to a circle through a point. (This uses the information about the altitude y .)

#1



LENGTH OF MEDIAN FOR RADII

THIS GUARANTEES Δ HAS THE CORRECT LENGTH OF MEDIAN

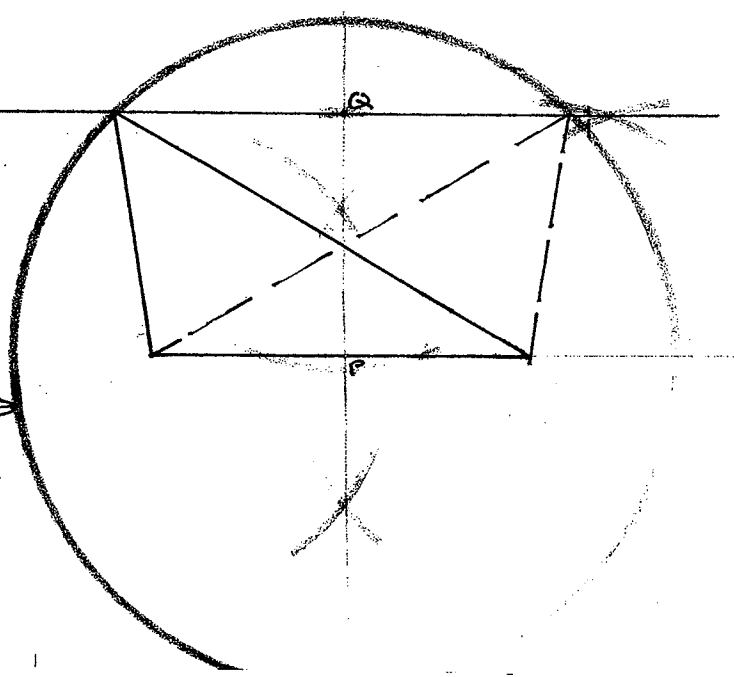
LENGTH OF BC FOR RADII

THIS GUARANTEES Δ HAS THE CORRECT SIDE LENGTH.

TWO POSSIBLE Δ s, BOTH BASICALLY THE SAME (THEY ARE CONGRUENT)

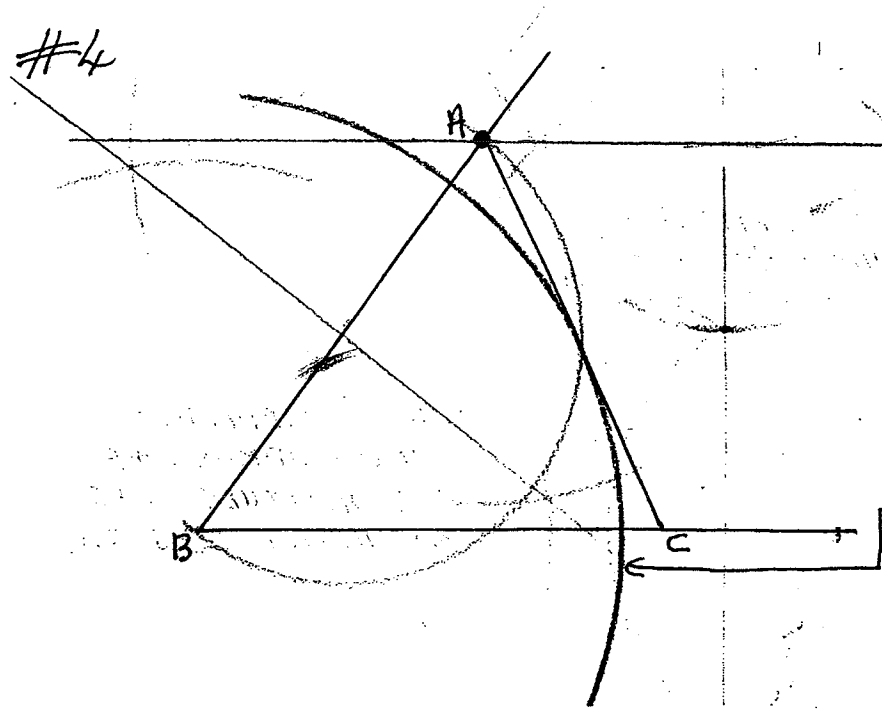
#2

THIS PARALLEL LINE \rightarrow IS THE CORRECT PERPENDICULAR HEIGHT AWAY FROM THE BASE AND GUARANTEES OUR Δ HAS THE CORRECT ALTITUDE.



THIS CIRCLE GUARANTEES OUR Δ HAS A MEDIAN OF THE CORRECT LENGTH.

#4



THIS PARALLEL LINE GUARANTEE THE ALTITUDE THROUGH A IS THE CORRECT LENGTH.

(AND THIS GIVES US A)

THIS \odot GUARANTEES THE ALTITUDE THROUGH B IS THE CORRECT LENGTH. THE SIDE AC SHOULD BE TANGENT TO THIS \odot .