Math 6d: Homework 6 **Due November 4**

Note to Parents: It's conference time. Please provide Mrs. DeMaio with your contact information so that we can arrange a time to discuss your child's progress.

Introduction to Geometric Constructions

Vocabulary

1. Geometry - branch of mathematics that deals with points, lines, planes and solids and examines their properties.
2. Point – has no size; length, width, or height. It is represented by a dot and named by a capital letter.
2. Line – set of points which has infinite length but no width or height. A line is named by a lower case letter or by any two points on the line.
3. Plane – set of points that has infinite length and width but no height. We name a plane with a capital letter.
4. Collinear points – points that lie on the same line.
5. Noncollinear points – points that do not lie on the same line.
6. Segment – part of a line that consists of two points called endpoints and all points between them.
7. Ray- is the part of a line that contains an endpoint and all points extending in the other direction.
8. Congruent segments – segments that have the same length.
9. Bisector of a segment – line, ray segment, or plane that divides a segment into two congruent segments.
10. Midpoint of a segment – a point that divides the segment into two congruent segments.
11. Acute angle – angle whose measure is between 0 degrees and 90 degrees.
12. Right angle – angle whose measure is 90 degrees.
13. Obtuse angle – angle whose measure is greater than 90 degrees but less than 180 degrees.
14. Straight angle – angle whose measure is 180 degrees.
15. Congruent angles – angles that have the same measure.
16. Angle bisector – ray that divides an angle into two congruent adjacent angles.
17. Triangle – the figure formed by three segments joining three noncollinear points. Each of the three points is a vertex of the triangle and the segments are the sides.
18. Acute triangle- triangle that has all acute angles.
19. Right triangle – triangle with a right angle.
20. Obtuse triangle – triangle with an obtuse angle.
21. Equiangular triangle – triangle with all angles congruent.
22. Scalene triangle – triangle with no sides congruent.
23. Isosceles triangle – triangle with at least two sides congruent.
24. Equilateral triangle – triangle with all sides congruent.

25. Adjacent angles – two coplanar angles with a common vertex and a common side between them
26. Vertical angles – the non-adjacent angles formed by two intersecting lines.
27. Complementary angles – two angles whose sum is 90 degrees.
28. Supplementary angles – two angles whose sum is 180 degrees.
29. Perpendicular lines – two lines that intersect to form right angles.
30. Parallel lines – two lines are parallel if they are coplanar and do not intersect.
31. Polygon – union of 3 or more coplanar segments that meet only at endpoints such that at most two segments meet at one endpoint and each segment meets exactly two other segments.
32. Regular polygon – polygon which is equilateral and equiangular.
33. Congruent triangles – two triangles are congruent if corresponding sides are congruent and corresponding angles are congruent.
34. Median of a triangle – segment from the vertex of a triangle to the midpoint of the opposite side.
35. Altitude of a triangle – segment from the vertex of a triangle perpendicular to the line containing the opposite side.
36. Parallelogram – quadrilateral with both pairs of opposite sides parallel.
37. Rectangle – parallelogram with a right angle.
38. Rhombus – parallelogram with consecutive sides congruent.
39. Square – all sides congruent and all four right angles.
40. Trapezoid – quadrilateral with exactly one pair of opposite sides parallel.
41. Circle – the set of points in a plane that are equidistant from a fixed point called the center.
42. Radius – segment whose endpoints are the center of the circle and a point on the circle.
43. Chord – segment that connects two points on the circle.
44. Diameter – chord that passes through the center of the circle.
45. Concentric circles – two or more circles in the same plane with the same center.
46. Congruent circles – circles that have congruent radii.
47. Arc – consists of two points and the continuous part of a circle between them.
48. Semi-circle – arc whose endpoints are the endpoints of a diameter.
49. Minor arc – arc whose measure is less than a semi-circle or 180 degree.
50. Major arc – arc whose measure is greater than a semi-circle or 180 degrees.
51. Congruent arcs – arcs with equal measure in the same circle or in congruent circles.
52. Altitude – segment joining the two base planes and perpendicular to both.
53. Line of symmetry – divides a figure into two congruent halves that reflect each other.
54. Circumference – the distance around a circle.

Homework: pages 3 – 9 are the handouts given in class. Please complete.
Note – Tutorial videos are linked at the bottom of each relevant page.

Geometric Construction Notes

A geometric construction is a drawing of geometric shapes using a compass and a straightedge.

When performing a geometric construction, only a compass (with a pencil) and a straightedge are allowed to be used.

We will be performing "process demonstrations" of each construction in class and you will be asked to perform additional process demonstrations as part of your homework. A process demonstration is showing a construction step by step including al the previous steps.

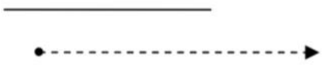
There are seven basic geometric constructions.

1. congruent segment
2. segment bisector
3. congruent angle
4. angle bisector
5. a line perpendicular to a given line through a point not on the line.
6. a line perpendicular to a given line through a point on the line.
7. a line parallel to a given line through a point not on the line.

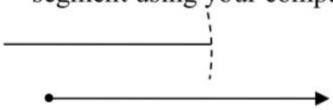
Other geometric shapes or figures, such as right triangles or equilateral triangles, can be constructed using these seven basic constructions.

Congruent Segment – construct a segment congruent to a given segment.

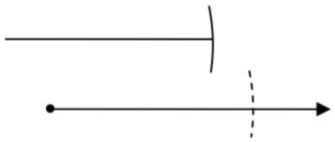
Step 1 draw a ray



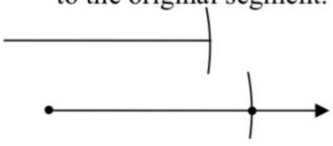
Step 2 – Measure the length of the original segment using your compass.



Step 3 – Mark the length on your ray.



Step 4 – Mark the intersection of the arc and ray to make a segment congruent to the original segment.



Process demonstration

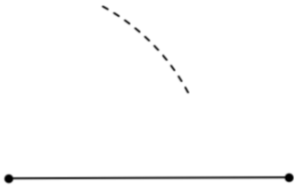
https://www.youtube.com/watch?v=-JFhACik7BA

Segment Bisector or Perpendicular Bisector

Process demonstration

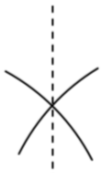
Step 1 Open your compass to a measure which is more than half of the length of your segment.

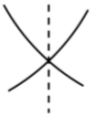
Step 2 Put the point of the compass on one end of the segment and construct an arc above and below the segment.



Step 3 Without changing the measure of the compass put the point of the compass on the other end of the segment and construct an arc above and below the segment.

Step 4 Draw a segment connecting the two intersections of the arcs.

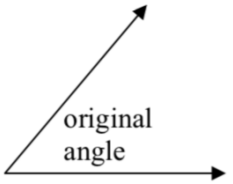




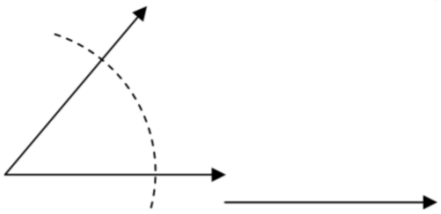
https://www.youtube.com/watch?v=VQ2dV8cIOnc

Congruent Angle

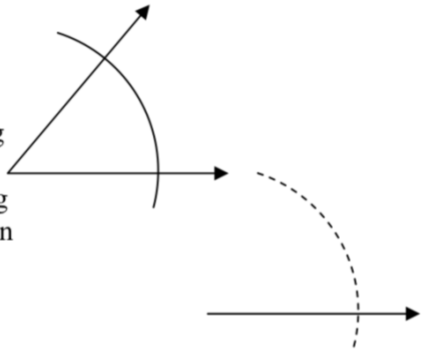
Step 1 – Draw a ray.



Step 2 – Construct an arc on the original angle with the point of the compass on the vertex of the angle and the arc crossing both sides of the angle.

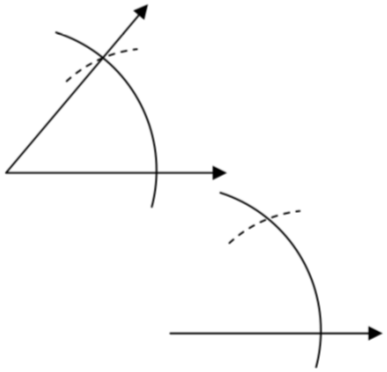


Step 3 – Without changing the compass, construct the same arc on the ray putting the point of the compass on the end of the ray.

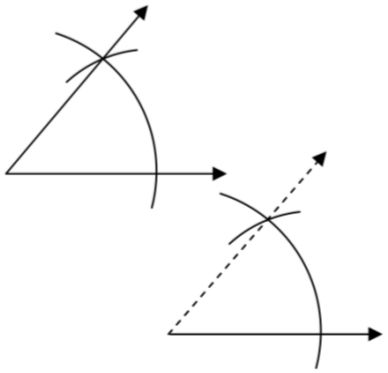


Step 4 – Measure the width of the original angle using the compass.

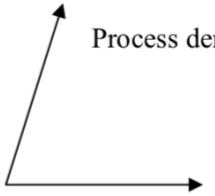
Step 5 – Without changing the measure on the compass mark off that width on your ray. Put the point of the compass on the point where the arc crosses the ray and construct an arc crossing your arc.



Step 6 – Draw the second side of the angle by connecting the endpoint of the ray (your vertex) with the point where the two arcs intersect.



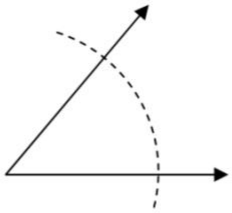
Process demonstration

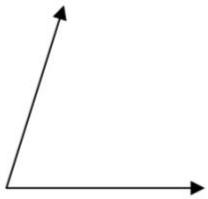


Process demonstration

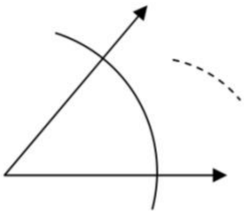
Angle Bisector

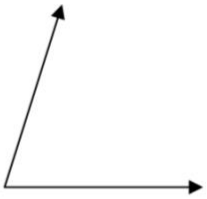
Step 1 – Construct an arc crossing both sides of the angle. Put the point of the compass on the vertex of the angle.



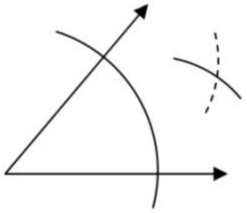


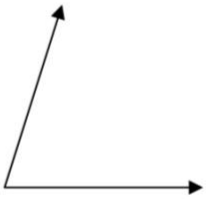
Step 2 – Construct an arc in the interior of the angle putting the compass on one side of the angle where the arc crosses it.



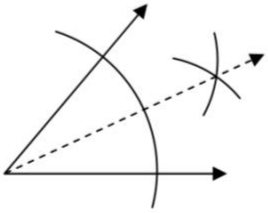


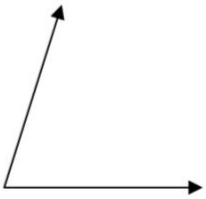
Step 3 – Without changing the compass measure from step 2, put the point if the compass on the other side of the angle where the arc crosses it and draw an arc on the interior of the angle.





Step 4 – Draw the angle bisector by connecting the vertex of the angle with the point where the two arcs from steps 2 and 3 cross.





https://www.youtube.com/watch?v=7Kd_cMzstHw

A line perpendicular to a line through a point on the line

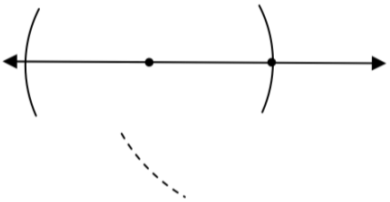
Process demonstration

Step 1 – Put the point of the compass on the point and construct two arcs crossing the line one on each side of the point.

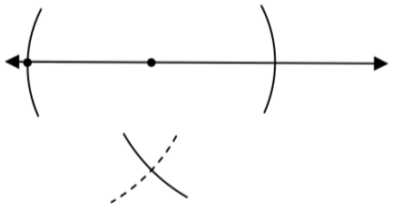
Construct a perpendicular bisector of the line segment.

Step 2 - Open your compass to a measure which is more than half of the length of your segment.

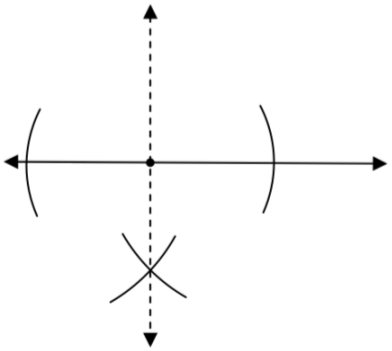
Step 3 – Put the point of the compass on one end of the segment and construct an arc above or below the segment.



Step 4 – Without changing the measure of the compass put the point of the compass on the other end of the segment and construct an arc above or below the segment.



Step 5 – Draw a segment connecting the intersection of the arcs and the given point.

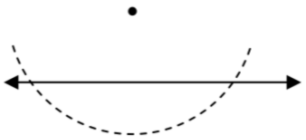


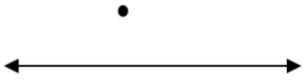
https://www.youtube.com/watch?v=vyEQ8rGtbdQ

A line perpendicular to a line through a point not on the line

Process demonstration

Step 1 – Put the point of the compass on the point and construct an arc crossing the line twice once on each side of the point.

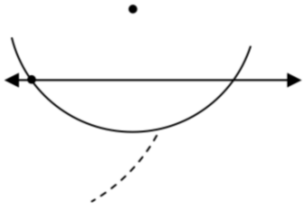


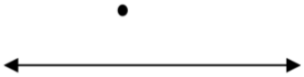


Construct a perpendicular bisector of the line segment.

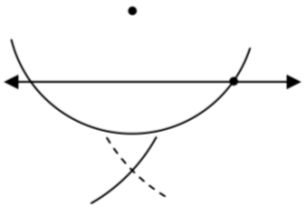
Step 2 - Open your compass to a measure which is more than half of the length of your segment.

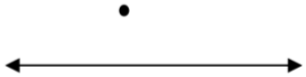
Step 3 – Put the point of the compass on one end of the segment and construct an arc above or below the segment.



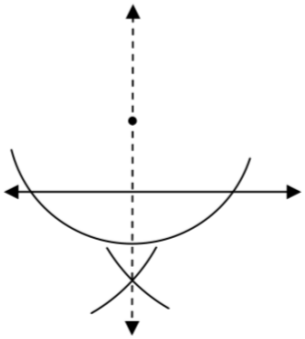


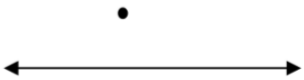
Step 4 – Without changing the measure of the compass put the point of the compass on the other end of the segment and construct an arc above or below the segment.





Step 5 – Draw a segment connecting the intersection of the arcs and the given point.

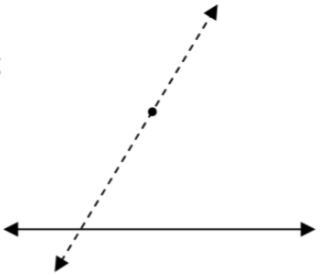




https://www.youtube.com/watch?v=vyEQ8rGtbdQ

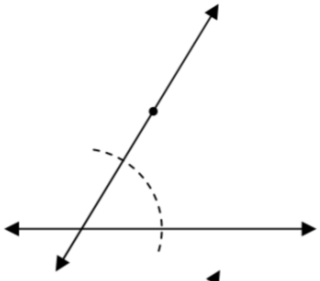
Construct a line parallel to a given line through a given point

Step 1 – Draw a transversal through the point intersecting the line.

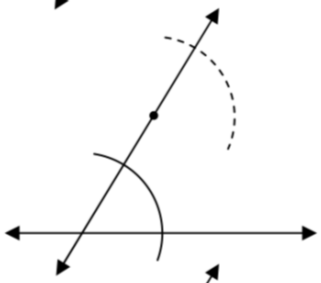


Construct a congruent angle because if the corresponding angles are congruent then the lines must be parallel.

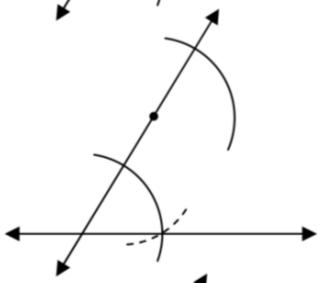
Step 2 – Construct an arc on the angle formed by the transversal and line with the point of the compass on the vertex of the angle and the arc crossing both sides of the angle.



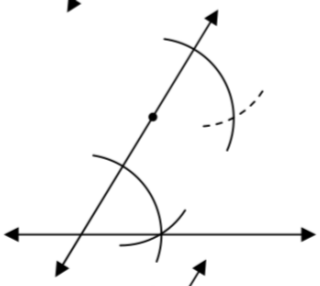
Step 3 – Without changing the compass, construct the same arc at the point crossing the transversal.



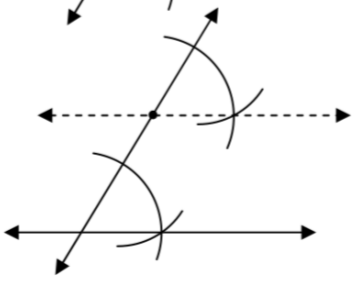
Step 4 – Measure the width of the angle formed by the transversal and the line using the compass.



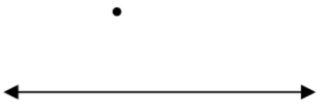
Step 5 – Without changing the measure on the compass mark off that width at the original point. Put the point of the compass on the point where the arc crosses the transversal and construct an arc crossing your arc.

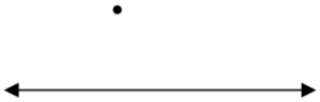


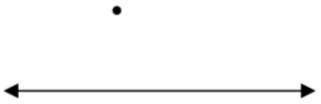
Step 6 – Draw line through the point where the two arcs cross and the given point.

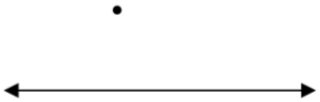


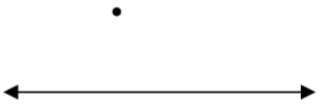
Process demonstration

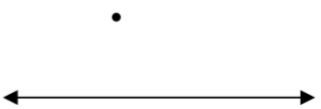












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https://www.youtube.com/watch?v=Q9w8QFOY4TE

Math 6d: Homework 6 **Due November 4**

Review: Copy the following questions onto lined paper and respond, showing all steps.

In problems 1 and 2, you need to (a) write the obvious conclusion from the given statements; and (b) justify the conclusion by writing a chain of arguments which leads to it. It may help to write the given statements and conclusion by logical formulas (denoting which are used by letters *A*, *B*, … connected by logical operations *OR*, *AND*, …).

1.	If today is Thursday, then Jane's class has library day. If Jane's class has library day, then Jane will bring home new library books. Jane brought no new library books. Therefore …	2.	If it is Tuesday and Bill is in a good mood, he goes to his favorite pub, and when he goes to his favorite pub, he comes home very late. Today Bill came home early. Therefore …
3.	**Suppose we know $a \to b$, $b \to c$. If we know b is true, may we infer c?** ○ No ○ Yes, by detachment ○ Yes, by syllogism ○ Yes, by transitivity ○ Yes, by reflexivity	4.	**Suppose that $p \to q$ and $p \to r$. May we infer that $q \to r$?** ○ Yes, by detachment ○ Yes, by symmetry ○ Yes, by syllogism ○ Yes, by addition ○ No
5.	$\frac{4}{9}x - 12 = -\frac{1}{6}(x-12) - 3$	6.	Find the values of x and y and of each of the four angles in the diagram below.