9th Grade Assignments – Week #7

Individual Work

- *Algebra*. See how much you can do with ***Exponents & Polynomials*** **– Problem Set #7.**

Group Work

for Tuesday

- Work together on ***Exponents & Polynomials*** **– Problem Set #8.**
- Consider the question about the dodecahedron drawing given at the end of the lecture:
  In the front view, points 1-5 are all located on a horizontal line located near the top of the front view. After we have located the exact locations of points 1-5 in the front view, how can we know exactly where point 10 is in the front view? (Recall that the endpoints of edge "A" are points 5 and 10, and edge A in the top view is parallel to the front face.)

Further Geometry Work: **(Worked on either in your group session, or individually.)**

1. If you haven't done so already, complete Problem Set C (from "Desc Geom - Problem Sets").
2. Warm-up 3-D drawing – *Three views of a Pentagonal Pyramid*. Print out the below template (on the below page), and then complete the front and profile (side) views. Things to note:
   - If you believe that this drawing is too easy, the you can go straight to the dodecahedron (below), and then plan to do other, more complicated drawings.
   - The height of the pyramid can be anything that you choose.
   - All edges that are visible in a given view, should be drawn in solid black ink lines. Edges that are in the background (not visible) should be draw in dashed black ink lines.
3. *Three views of a Dodecahedron*. See how far you can get with the drawing of the dodecahedron, as I described in my lecture. If you don't follow the instructions exactly, then you'll start over!
   - Do the **top view** (exactly as I did in the lecture). Important things to note:
   - Lightly draw a large circle in top view. Then, starting with the horizontal diameter to locate two points on the circle, use trial and error to find a total of ten equally-spaced points (exactly!) on the circle. Lightly in pencil, draw the five diagonals of the decagon, then draw the resulting decagon in black ink.
   - Now we will draw a second circle – the size of this inner circle is not random. The radius of the inner circle is equal to the length of the edge of the (above) decagon.
   - The diagonals of the decagon give us ten points on the inner circle. Starting with the rightmost point on the inner circle, draw a pentagon in black ink by connecting every other point on the inner circle.
   - With black ink go over the short line segments on the diagonals that join the vertices (points) of the inner pentagon to the corresponding vertex of the outer decagon.
   - Lightly (and small) in pencil, label the 20 points of the dodecahedron.
   - See how far you can get with the **front view**. Important things to note:
   - All 20 points in the front view lie in groups of five points along four horizontal lines. The spacing between these four lines is not arbitrary!
   - We have intentionally arranged that some of the edges of the dodecahedron are parallel to the front face. These edges must then be full size in the front view, which will then allow us to determine the spacing of the four horizontal lines. I will tell you how we can determine this spacing in the next lecture. Perhaps you can figure it out before then!

Group Work

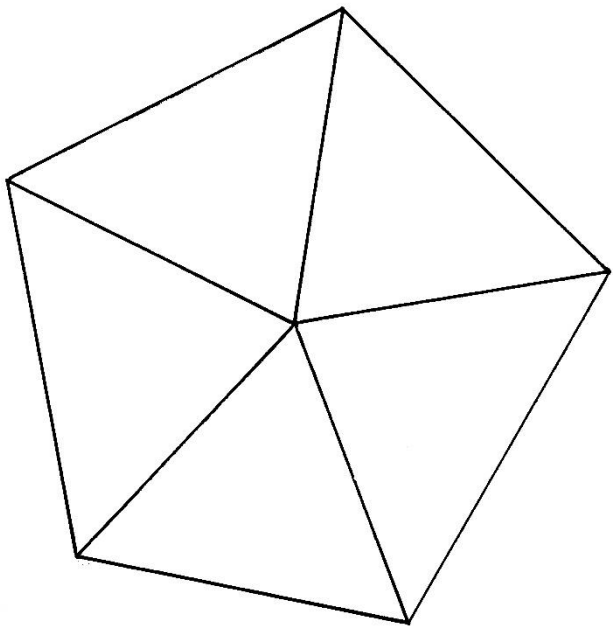
for Thursday (Help each other out in your group meeting!)

Your assignment is to finish the entire dodecahedron drawing – all three views! This includes:

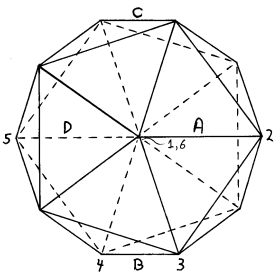
- Start with the instructions on the previous page.
- Work with great care and precision. All construction lines should be done lightly in pencil. Points should be labeled lightly in pencil with small numbers.
- All edges of the dodecahedron should be in black ink. Lines in the background should be dotted (except in the case of two edges lying on top of one another, in which case the dotted line can be left out).
- All visible faces should be nicely shaded in with color pencil – every face a different color. Important: any face that is visible from different views must be shaded in with the same color. The dodecahedron has 12 faces – two of which (the floor, and the back-left-bottom face) are not visible from any of the three views. Therefore, you will need to use a total of ten colors.
- The title of the drawing ("*The Three Views of a Dodecahedron*") should be done very neatly in black ink.

Optional Geometry Individual Work

- If you finish the dodecahedron drawing, and would like an extra drawing to do, then do the three views of the icosahedron, for which you can find the instructions below.



Instructions for an Icosahedron

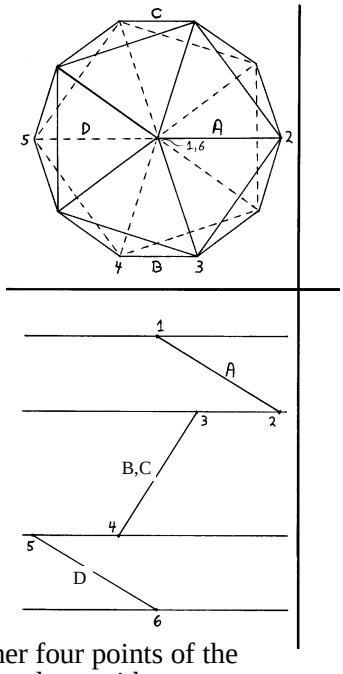


The Top View:

- Start with ten evenly spaced points on a circle, such that two of the points are placed on the circle's horizontal diameter. In black ink, draw the decagon that connects these ten points. Now the top view can be completed as shown in the drawing on the right.

The Front View: (Read through these instructions before trying them!)

- In the front view, one point is at the top, five points are located on a horizontal line a bit lower than the top, five more points are then located on another horizontal line somewhat further down, and the last point is the bottom point. *In order to draw the front view, we must first determine exactly how far apart the spacing between these four horizontal lines must be*. This spacing is not arbitrary!
- Of the icosahedron's 30 edges, four of them will be drawn to actual size in the front view. These edges are the ones that are parallel to the front view, and are drawn horizontally across the page; they are labeled as A, B, C, D in the top-view drawing, shown here. The end points of edge A are labeled #1 and #2.
- Through each point in the top view, draw vertical lines (lightly in pencil) that run down through the front view. In most cases, two points share the same vertical line. Label the vertical line through point #2 as line ***ℓ***, and the vertical line through point #1 as ***m***. (These lines are not shown in the drawing here.)
- Point #1 in the front view of the drawing must be located somewhere on line ***m***. Choose point #1 to be conveniently about one inch from the top of the front view. (The rest of the points of the icosahedron are now fixed.)
- Now, we need to determine the location of point #2 in the front view. The location of point #2 in the front view is determined by two things: the length of edge A must be actual size, and point #2 must be located on line ***ℓ***. To do this, we set our compass to the length of any edge that is of actual size in the top view drawing (i.e., the edge connecting points #2 and #3), place the compass needle on point #1 in the front view drawing, and then mark the place where point #2 must be located on line ***ℓ***.



- Lightly draw a horizontal line through point #2, and locate the positions of the other four points of the icosahedron that must also appear on this same horizontal line. (These four points, along with point #2, are all at the same elevation above the table on which the icosahedron sits.)
- In the same way that we used edge A to determine the spacing between the top two horizontal lines, we can now determine the spacing between the middle two horizontal lines by using edge B (or C), and we can determine the spacing between the bottom two horizontal lines by using edge D. Again, the key to this stems from the fact that these edges appear in actual size in the front view. (See above drawing.)
- Once the placement of the four horizontal lines has been determined, the rest of the front view, as well as the side view, can easily be completed according to the normal procedures. Notice that there should be no dotted lines in the front view.

— Exponents & Polynomials —

Problem Set #7

Section A

1) Leave answers with positive exponents, and with the square roots assume that x is positive.

a) $\sqrt{x^6}$ b) $\sqrt{16x^{16}}$

c) $\frac{x^7}{x^2}$ d) $\frac{x^2}{x^7}$

e) $\frac{x^{-4}}{x^{-6}}$ f) $\frac{3x^8y^5}{6x^2y^6}$

Simplify.

2) $3x^4 + 10x^4$

3) $(3x^4)(10x^4)$

4) $6a^4d^2 – a^4d^2$

5) $(6a^4d^2)(–3a^4d^2)$

6) $5x^2(3x^4 – 7x^2 + 3)$

7) $4x^3y^5(3x^2y^3 + 5x^2 – 7y)$

8) $x^5 – 3x^3 + 2x^2(x^3 – 4)$

9) $(½x^3y)(5x^2y^5)(8x)$

10) $(2x^5y^2)^3$

11) $5x^2(3x^4y)^2$

12) $(–3x^3y^4)^3$

13) $(4x^3y^2)^2(–2xy^3)^4$

14) $(4x – 3)(2x + 5)$

15) $(x – 3)(x + 3)$

16) $(4x + 3y)(2x + 5y)$

17) $(4x – 3y)(2x + 5y)$

18) $(3x^2 + 1)(x^2 + 7)$

19) $(3x^2 + 1)(x + 7)$

20) $3(x – 5)(x + 6)$

21) $3x^4(x – 5)(x + 6)$

22) $(x – 7)^2$

23) $(x + 7)(x – 7)$

24) $(x – 4)^3$

25) given x = 7; y = – ½
Evaluate $y^2 – y(x^2 – 8y)$

Solve.

26) $5(x – 3) = 5 – (x – 3)$

27) $½x + 3 = ¾x – 2$

28) $\frac{1}{2}(x+2) = \frac{2}{3}(3x + 9)$

29) $\frac{4+x}{3} = \frac{3–x}{4}$

30) $(x + 2)^2 = (x – 7)^2$

Section B

Simplify.

31) $(½x + 6)^2$

32) $(4x^3 + 5y^2)(4x^3 – 5y^2)$

33) $(x – 4)(x + 1)(x – 3)$

34) $(x^2 – 3x + 2)(x^2 + 4x – 2)$

35) $\frac{6x^3y^8}{15x^6y^2}$

36) $\frac{(–2x^3y^2)^3}{(–4xy^3)^2}$

Solve.

37) $(3x + 4)(4x + 3) = (6x – 2)(2x – 6)$

38) $(x + 1)^3 = x(x^2 + 3x – 4)$

39) $\frac{7}{12} – \frac{5}{12}\left(3\frac{9}{10}x – \frac{4}{5}\right) + 2x = \frac{3}{4}x – \frac{1}{12} – \left(\frac{5}{6}x – \frac{3}{16}\right)$

Problem Set #8 (for groups!)

1) Fill in all of the tables on the next page starting with N = 1 and going down to N = 10.

2) Use the tables to answer the following questions:
   a) What is 3^7 ? b) What is 5^6 ?
   c) What is 2^{10} ? d) What is 10^5 ?

3) On the three's table, every time you move down one step, the answer gets multiplied by 3. Answer the following:
   a) What happens when you move *down* one step on the five's table?
   b) What happens when you move *up* one step on the five's table?
   c) Given that the five's table says that $5^1 = 5$, what is the answer when you move one step up to 5^0 ? And another step up to 5^{-1} ?

4) Fill in each of the tables starting with N = 0 and going up to N = –5. Leave your answers as fractions. (You shouldn't have to do any calculations.)

5) Given what you now know, complete each of the following statements:
   a) Anything to the zero power equals…
   b) Anything to a negative exponent is the same as…

6) Find the values of each of the following:
   a) 7^{-2} b) 8^0 c) 2^{-10}

7) Rewrite each expression without using a negative exponent:
   a) x^{-5} b) $5x^3y^{-4}$ c) $\frac{3x^{-4}}{5x^3}$

Base Tables

Two's

N	2^N
−5	
−4	
−3	
−2	
−1	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Three's

N	3^N
−5	
−4	
−3	
−2	
−1	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Five's

N	5^N
−5	
−4	
−3	
−2	
−1	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Ten's

N	10^N
−5	
−4	
−3	
−2	
−1	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	