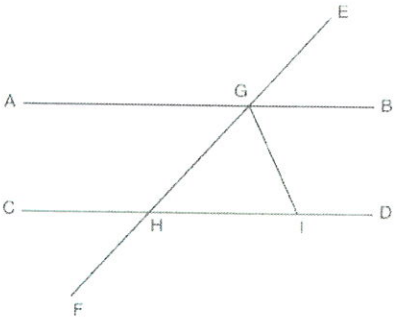
MAT 222, Exam #1, Summer 2017 Name KEY

Instructions: You may use a protractor, compass, ruler and calculator for this exam. You may also use a 3x5 index card, which you will turn in with the exam along with any scrap paper provided by the testing center. It's important to show all work, and explain your reasoning. It is helpful to put a box or circle around your final answer after calculations. Give exact answers unless specifically asked to round.

1. Determine if each statement is True or False. If you mark false, explain why the statement is false, or rewrite the statement as a true one. In the figure, assume lines $\overleftrightarrow{AG}$ and $\overleftrightarrow{DI}$ are parallel. (1 point each)



a. T (F) The points A, H and D are collinear. C, H, D are

b. (T) F Another name for the line $\overleftrightarrow{AB}$ is $\overleftrightarrow{GB}$.

c. (T) F Angles $\angle CHG$ and angle $\angle BGE$ are supplementary.

d. (T) F $\angle FHC$ and $\angle DHE$ are vertical angles.

e. T (F) $\angle IGB$ and $\angle IGE$ are adjacent angles. ∠IGB and ∠BGE are

f. T (F) If $\overline{GH}$ and $\overline{HI}$ have the same length, then $\angle IHG$ and $\angle HGI$ are congruent. ∠HGI and ∠GIH are

g. (T) F If $\overrightarrow{GB}$ bisects angle $\angle IGE$, then $m\angle IGB$ and $m\angle BGE$ are equal.

h. T (F) $p \to q$ is logically equivalent to $q \to p$. eq. to $\sim q \to \sim p$

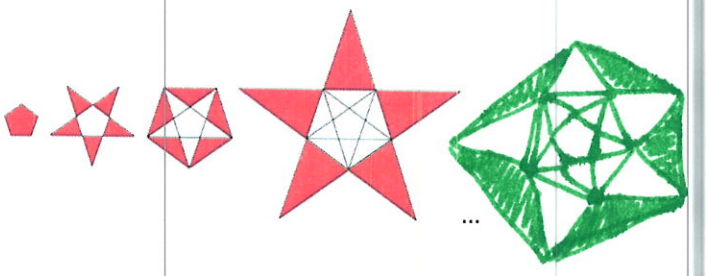
i. (T) F If $q \leftrightarrow \sim p$, then $\sim q \leftrightarrow p$.

j. (T) F "If $m\angle FHD = m\angle HGB$, and $m\angle HGB = m\angle AGE$, then $m\angle FHD = m\angle AGE$" is an example of the transitive property.

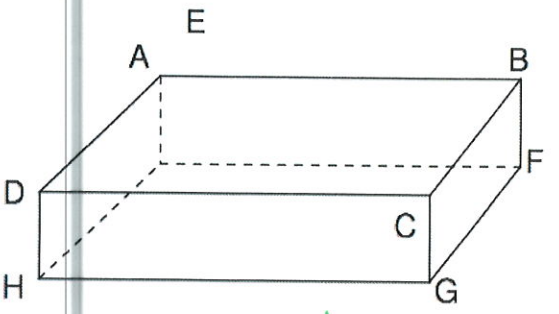
2. Look for a pattern (or two) to determine the next term or element in the sequence. (3 points each)

a. $2, 6, 18, 54, \ldots$ ×3 ×3 ×3 162

54 × 3 = 162

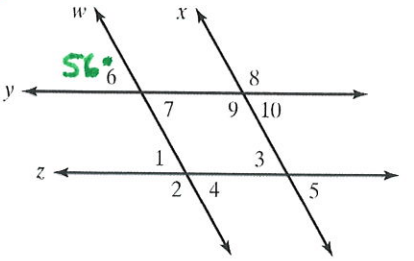
b.  ...

3. If we determine that planes ADH and BFG are parallel, and planes ABF and DHC are parallel, and planes HGF and ADC are parallel, is that enough to conclude that the figure drawn on the right is a rectangular box (i.e. all its surfaces are rectangles)? Why or why not? Explain. (4 points)



no. because this only gives a parallelepiped (3D parallelogram). it does not guarantee all the angles are right angles

4. Suppose that $\overrightarrow{w} \parallel \overrightarrow{x}$, and that $\overrightarrow{y} \parallel \overrightarrow{z}$. Use the diagram at the right to state two angles that are: (2 points each) answers may vary



a. Alternate interior angles

$\angle 1, \angle 7$

$\angle 10, \angle 3$

b. Consecutive/same-side interior angles

$\angle 9, \angle 3$

c. Corresponding angles

$\angle 1, \angle 6$ $\angle 7, \angle 4$

$\angle 8, \angle 5$

d. Alternate exterior angles

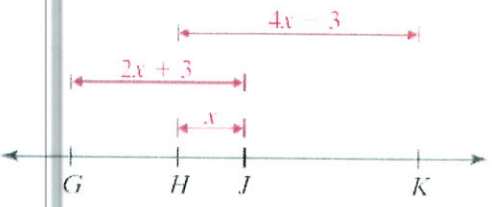
$\angle 6, \angle 4$

$\angle 8, \angle 5$

5. Using the same diagram as in #4, if $\angle 6$ has measure $56°$, find the measure of $\angle 9$. (3 points)

$180° - 56° = 124°$

6. Using the diagram at the right,
   a. write an algebraic expression for the length of GH, and for the length of JK. (4 points)



$GH = x + 3$

$JK = 3x - 3$

   b. If $GK = 30$, find the lengths of each segment GH, HJ, and JK. (4 points)

$30 = x + 3 + x + 3x - 3$

$30 = 5x$

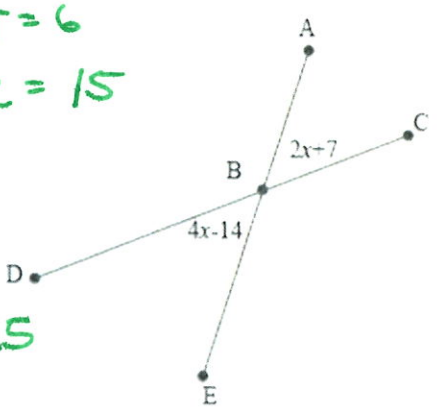
$x = 6$

$GH = 9$

$HJ = 6$

$JK = 15$

7. Find the measure of each angle. (4 points each)
   a. $\angle ABC$



$2x + 7 = 4x - 14$

$21 = 2x$

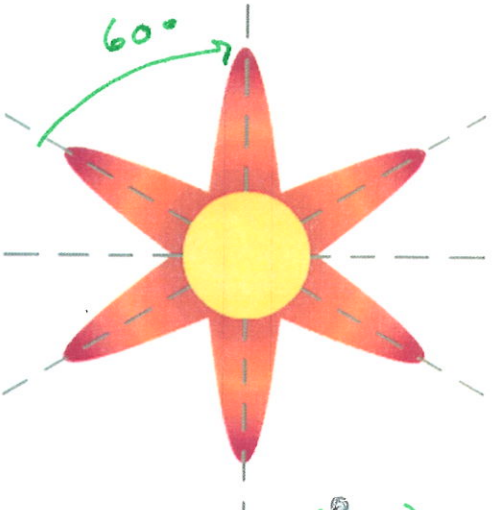
$x = \frac{21}{2} = 10.5$

$2(10.5) + 7 = 28$

   b. $\angle EBC$

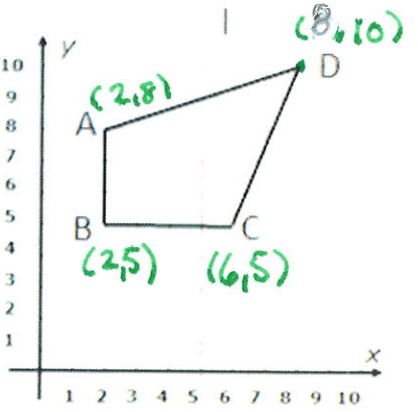
$180 - 28 = 152°$

8. A flower has 6 petals. How far apart in degrees are the centers of each petal if the petals are evenly spaced? (5 points)



$\frac{360°}{6} = 60°$

9. Use the graph shown to answer the following questions.
   a. Find the length of side AD. (4 points)



$d = \sqrt{(8-2)^2 + (10-8)^2} = \sqrt{36+4} = \sqrt{40}$

$= 2\sqrt{10}$

≈ 6.32

   b. Find the length of side CD. (4 points)

$d = \sqrt{(8-6)^2 + (10-5)^2} = \sqrt{4+25} = \sqrt{29}$

≈ 5.39

c. What is the perimeter of the quadrilateral $ABCD$? (4 points)

$3+4+2\sqrt{10}+\sqrt{29} = 7+2\sqrt{10}+\sqrt{29} \approx 18.71$

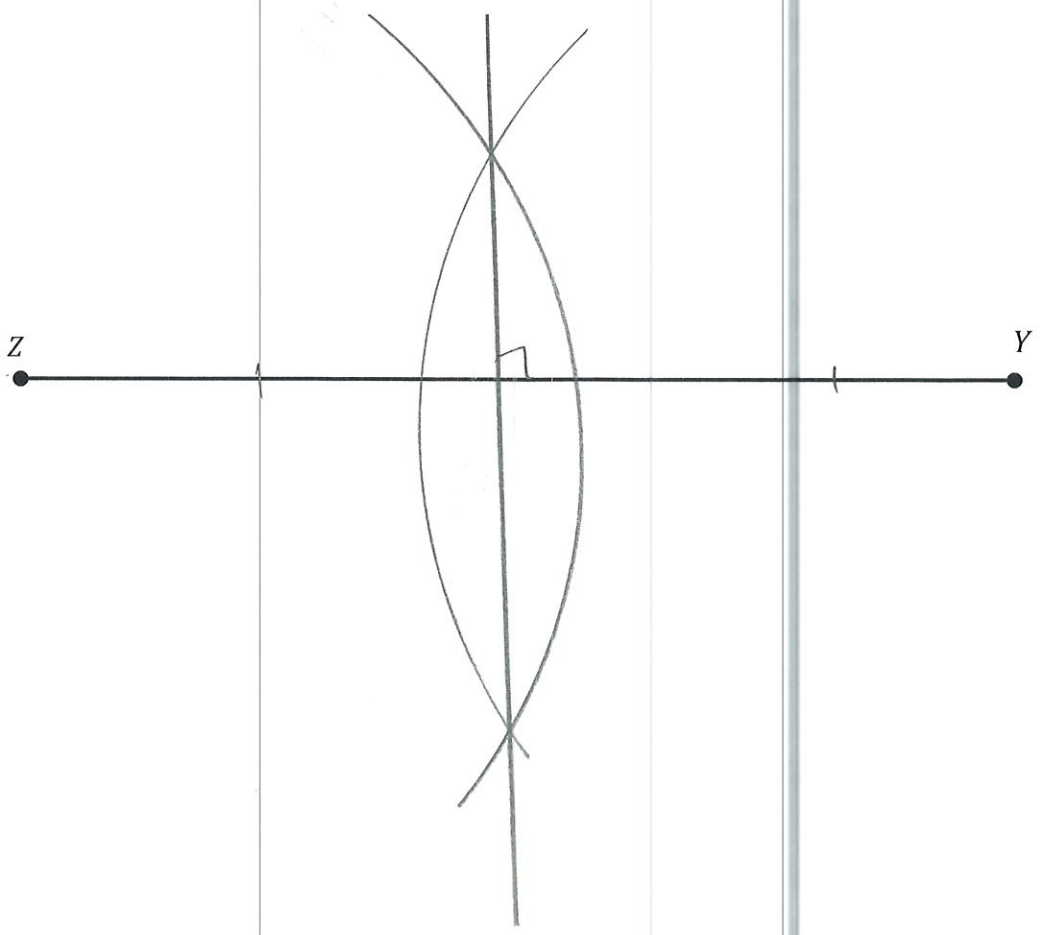
d. What is the midpoint of side AD? (4 points)

$\left(\frac{8+2}{2}, \frac{10+8}{2}\right) = \left(\frac{10}{2}, \frac{18}{2}\right) = (5,9)$

e. What is the slope of the line $\overleftrightarrow{CD}$? (5 points)

$m = \frac{10-5}{8-6} = \frac{5}{2}$

10. Find the perpendicular bisector of the line shown below. (7 points)



11. Write the contrapositive of the statement "If the Sun is a star, then it's not a planet." (5 points)

If the sun is a planet, it is not a star.

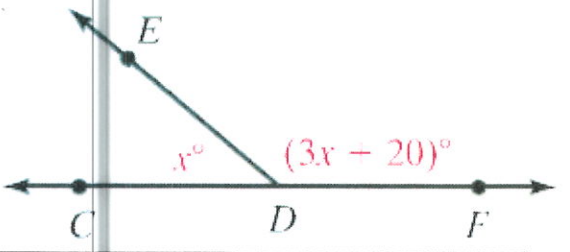
12. What conclusion can you draw from the following pairs of statements? (7 points)
All national parks are interesting.
Mammoth Cave is a national park.

Mammoth Cave is interesting.

What law of deductive reasoning does your conclusion illustrate?

Syllogism

13. Given: $\angle CDE$ and $\angle EDF$ are supplementary. Complete the table below. Fill in the missing reasons. (10 points)

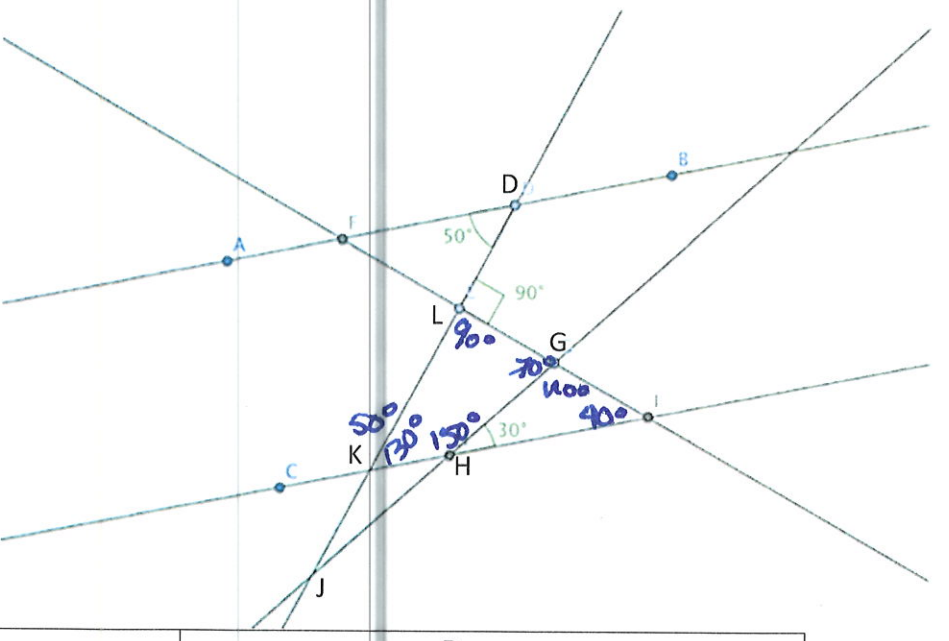


Statements	Reasons
$m\angle CDE + m\angle EDF = 180°$	from diagram / def of supp angles
$x° + (3x + 20)° = 180°$	Substitution / from diagram
$4x° + 20° = 180°$	Simplification / combine like terms
$4x° = 160°$	subtraction prop of equality
$x° = 40°$	division property of equality

14. Use the diagram to the right to determine the measures of the missing angles in ΔGHI. You may assume that $\overleftrightarrow{AB}$ and $\overleftrightarrow{CI}$ are parallel. Write your reasoning out in the form of a proof. (12 points)

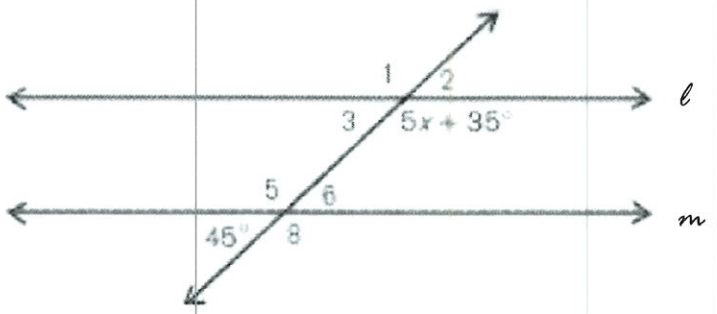
Hint: Two facts that you may find useful:

1) The interior angles of quadrilaterals add to 360°.
2) The interior angles of triangles add to 180°.



Statement	Reasons
$\overleftrightarrow{AB} \parallel \overleftrightarrow{CI}$	Given
$m\angle FDL = 50°$ $m\angle IHG = 30°$ $m\angle DLG = 90°$	Given by diagram
$m\angle IHG + m\angle GHK = 180°$ $m\angle GLK + m\angle GLD = 180°$ $m\angle HKL + m\angle CKL = 180°$	Definition of supplementary angles
$m\angle FDL = m\angle IKD$	alt. interior angles
$30° + m\angle GHK = 180°$ $m\angle GLK + 90° = 180°$ $50° + m\angle CKL = 180°$	Substitution
$m\angle GHK = 150°$; $m\angle GLK = 90°$; $m\angle CKL = 130°$	Subtraction prop. of equality
$m\angle GLK + m\angle LKH + m\angle KHG + m\angle HGL = 360°$	quadrilateral prop above
$90° + 130° + 150° + m\angle HGL = 360°$	Substitution
$m\angle HGL = 70°$	Subtraction prop of eq.
$70° + m\angle IGH = 180°$	Substitution
$m\angle IGH = 110°$	Subtraction prop of eq.
$m\angle IGH + m\angle GHI + m\angle HIG = 180°$	triangle prop above
$110° + 30° + m\angle HIG = 180°$	Substitution
$m\angle HIG = 40°$	Subtraction prop of eq.

15. What must be the value of x if the two lines ℓ and m are parallel? (6 points)



$45° + (5x + 35)° = 180°$

$5x° + 80 = 180°$

$5x° = 100°$

$x = 20°$

16. Write the equation of the line perpendicular to the line $y = \frac{1}{3}x - 2$, passing through the point $(3,8)$. (6 points)

$m = -3$

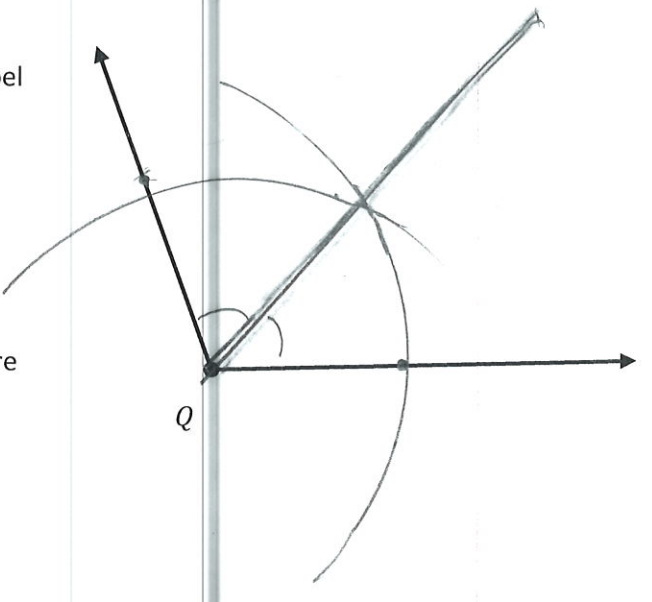
$y - 8 = -3(x - 3)$

$y - 8 = -3x + 9$

$+8 \qquad +8$

$y = -3x + 17$

17. Find the angle bisector of the angle shown below. Leave all markings and arcs, and label your points. (7 points)



18. Use your protractor to estimate the measure of $\angle Q$. (4 points)

$\approx 110°$