

1. [14 pts - 2 each] Refer to the diagram below (extra copies are on the back page):

- (a) Name a set of three noncollinear points.
- (b) Name three different objects that \overline{FH} is part of.
- (c) Name a pair of adjacent angles that are not a linear pair.
- (d) Name a pair of acute vertical angles having F as a vertex.
- (e) Find $\overrightarrow{FE} \cup \overline{EG}$.
- (f) Find $\overrightarrow{FC} \cap \angle DCA$.
- (g) Find $\angle GCF \cap \angle IFC$.

2. [8 pts] Find the exact size of the non-reflex angle formed by the hands of a working clock at 11:20. Show clear work.

3. [10 pts] In this diagram, $\overrightarrow{CF} \parallel \overrightarrow{AE}$, $m(\angle IKG) = 75^{\circ}$, and $m(\angle JDE) = 35^{\circ}$.



(a) Find $m(\angle JKF)$, clearly explaining your reasoning.

(b) Find $m(\angle HBE)$, clearly explaining your reasoning.

4. (a) [3 pts] Circle all possible points C in the grid that would make $\angle BCA$ an obtuse angle.



(b) [3 pts] Circle all possible points D in the grid that would make $\angle DEF$ a straight angle.



5. [8 pts] Determine the total number of diagonals of a 140-gon, explaining your process thoroughly and clearly. (If you use a memorized formula, you must still explain why that formula works.)

6. [6 pts] Is it possible for a polygon to have an interior angle total of 50, 280°? Justify your response with a suitable computation or verbal reasoning.

7. [6 pts] Find the missing angle measures, rounded to the nearest tenth. Show work.



- 8. [8 pts 2 each] Classify each statement below as always, sometimes, or never true.
 (a) A square is a quadrilateral.
 - (b) An equilateral triangle is acute.
 - (c) The diagonals of a rhombus are congruent.
 - (d) A trapezoid has no congruent sides.

- 9. [24 pts 4 each] Draw and mark examples as indicated of the following; if not possible, say so.
 - (a) a bisector of an angle (circle the actual bisector to mark it)

(b) a right equilateral triangle (mark the right angle; mark the sides to show same or different lengths)

(c) a trapezoid having no congruent sides (mark the sides to show same or different lengths)

(d) a parallelogram that is not a square (mark the parallel sides with matching arrows; mark the sides to show same or different lengths)

(e) a curve that is closed but not simple (no marking required)

(f) a quadrilateral that is equiangular but not equilateral (mark all sides and angles to show same or different sizes)

- 10. [10 pts 2 each] Complete each sentence with the correctly spelled term being defined.(a) The point where the two rays creating an angle are joined together is called the ...
 - (b) A polygon having twelve sides is called a ...
 - (c) Two angles whose measurements total 90° are called ...
 - (d) Three or more lines that intersect at the same point are called ...
 - (e) A polygon that is both equiangular and equilateral is called ...

