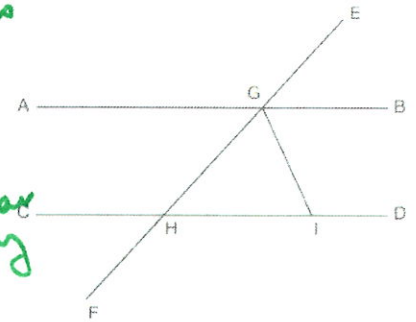


Instructions: You may use a protractor, compass, ruler and calculator for this exam. You may also use a 3x5 index card, which you will turn in with the exam along with any scrap paper provided by the testing center. It's important to show all work, and explain your reasoning. It is helpful to put a box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

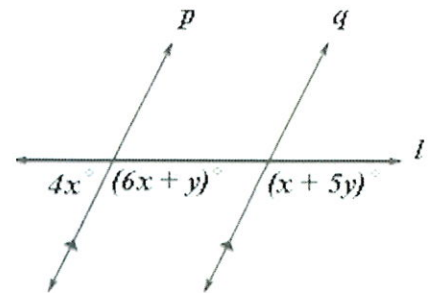
1. Determine if each statement is True or False. If you mark false, explain why the statement is false, or rewrite the statement as a true one. In the figure, assume lines \overleftrightarrow{AG} and \overleftrightarrow{DI} are parallel. (1 point each)

- a. T F All isosceles triangles are equilateral triangles.
all equilaterals are isosceles
- b. T F $m\angle IHG + m\angle HGI + m\angle HIG = 180^\circ$.
- c. T F All right triangles have two acute angles.
- d. T F If two triangles have the same three angles, then the triangles are congruent.
Similar only
- e. T F The circumcenter is the center of the inscribed circle around a triangle.
incenter
- f. T F The intersection of the medians of a triangle mark ~~a~~ the centroid.
- g. T F Another name for an indirect proof is proof by contradiction.
- h. T F An n -gon is a general term for a polygon with n sides.
- i. T F The image to the right is a convex polygon.
Concave
- j. T F A quadrilateral with a pair of parallel sides is a parallelogram.
could be trapezoid
- k. T F Two skew lines are coplanar.
not by definition



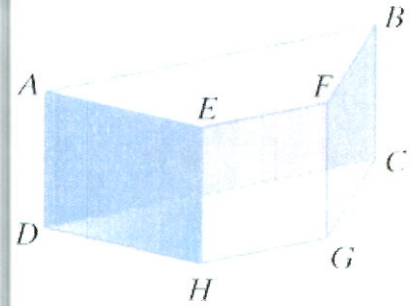
2. Find the values of x and y that make the lines p and q parallel. (5 points)

$$\begin{aligned}
 4x + 6x + y &= 180 \Rightarrow 10x + y = 180 \\
 6x + y &= x + 5y \Rightarrow 5x = 4y \\
 2(4y) + y &= 180 \\
 9y &= 180 \\
 \boxed{y = 20} \\
 5x &= 80 \\
 \boxed{x = 16}
 \end{aligned}$$

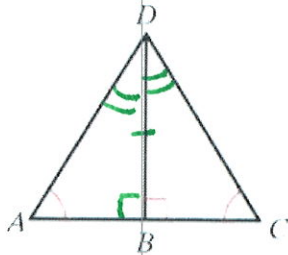


3. Planes AEF and DHG are parallel, and planes ADB and EHG are parallel. Find expressions for two lines that are skew. (3 points)

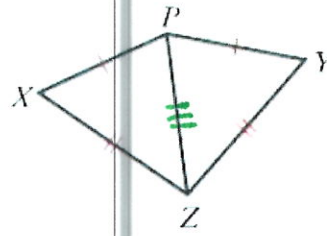
\vec{AE} skew to \vec{HG}
 answers will vary



4. For each pair of triangles shown below, determine whether the triangles are congruent. If so, explain the postulate that proves it. If they are not, explain why not. (3 points each)



a.
 all 3 angles & one side
 Congruent



b.
 SSS congruent

5. Given that $\triangle ACD$ is isosceles, with base \overline{CD} , $\angle 1 \cong \angle 2$, and $\overline{BD} \cong \overline{DE}$, prove that $\triangle ABC \cong \triangle AED$. Be sure to state each step, and each theorem or postulate that justifies the step. (7 points)

Given $\triangle ACD$ isosceles \Rightarrow
 $\overline{AC} \cong \overline{DA}$ given $\angle 1 \cong \angle 2$
 sides opposite congruent angles are congruent in isosceles triangle.

$\overline{BD} \cong \overline{DE}$ given

$BD = BC + CD$
 $CE = CD + DE$ } given by diagram

$BC + CD = CD + DE$ transitive prop eq.
 $BC = DE$ subtract prop eq.

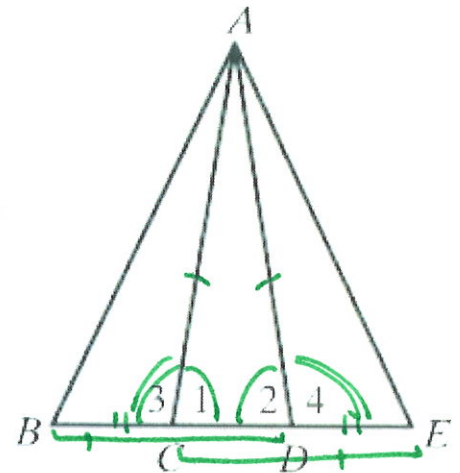
$m\angle 1 + m\angle 3 = 180^\circ$
 $m\angle 2 + m\angle 4 = 180^\circ$ } def. of suppl.

$m\angle 1 + m\angle 3 = m\angle 2 + m\angle 4$ trans. prop eq.

$m\angle 1 + m\angle 2 = m\angle 1 + m\angle 4$ subst.

$m\angle 2 = m\angle 4$ subst. prop eq.

$\triangle ABC \cong \triangle AED$ SAS



6. Using the figure at the right, answer the following questions. (3 points each)

a. Find $m\angle 1$.

$$180 = 52 + 55 + m\angle 1$$

$$m\angle 1 = 73$$

- b. Find $m\angle 3$.

$$m\angle 1 + m\angle 2 = 180$$

$$m\angle 2 = 107$$

$$m\angle 2 + m\angle 3 + 48 = 180$$

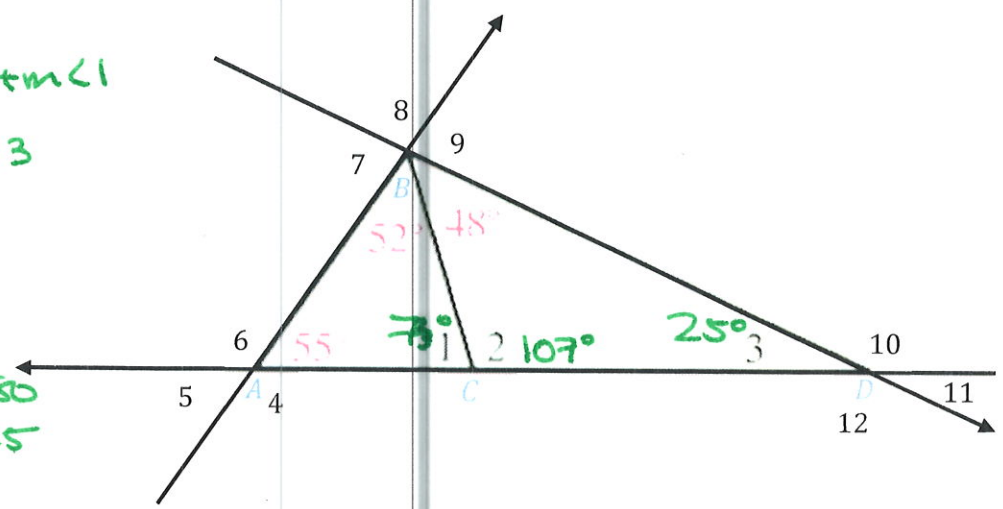
$$m\angle 3 = 25$$

- c. Consider $\triangle ABD$. Which angles are exterior angles? List at least three.

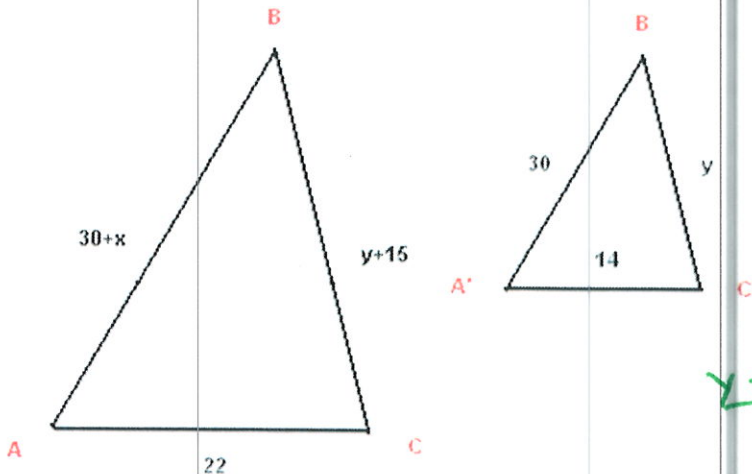
$\angle 6, \angle 4, \angle 7, \angle 9$ $\angle 10, \angle 12$
answers will vary

- d. Is $\triangle BCD$ similar to $\triangle ABD$? Why or why not.

no $\angle ABD$ is 100° which is not congruent to $\angle 2$ (48° not congruent to 55°)



7. Use the diagram below to find the values of x and y that will make the two triangles similar. (6 points)



$$\frac{30+x}{30} = \frac{22}{14}$$

$$14(30+x) = 30(22)$$

$$420 + 14x = 660$$

$$14x = 240$$

$$x = \frac{120}{7}$$

$$\frac{y+15}{y} = \frac{22}{14}$$

$$14(y+15) = 22y$$

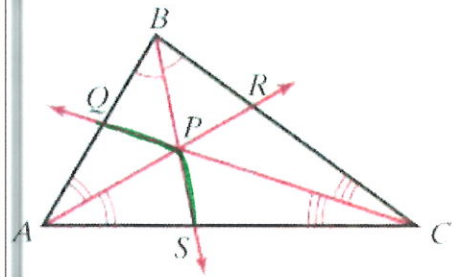
$$14y + 210 = 22y$$

$$210 = 8y$$

$$y = \frac{105}{4} = 26.25$$

8. Use the diagram to the right to explain why we are unable to claim that $PQ = PS$. State any theorems you use. (6 points)

angle bisectors do not imply anything about where sides are divided so we can't say $AQ = AS$ which would imply congruence by SAS.



answers may vary

9. The $\triangle ABC$ is shown on the coordinate plane. Use the diagram to find the following. (3 points each)
- The coordinates of point M (midpoint of \overline{BC}).

$$\left(\left(\frac{2+8}{2} \right), \left(\frac{6+0}{2} \right) \right) = (5, 3)$$

- The coordinates of point L (the midpoint of \overline{AB}).

$$\left(\left(\frac{0+2}{2} \right), \left(\frac{6+0}{2} \right) \right) = (1, 3)$$

- The equation of the line \overline{LC} .

$$m = \frac{3-0}{1-8} = \frac{3}{-7}$$

$$y - 3 = -\frac{3}{7}(x - 1)$$

$$y - 3 = -\frac{3}{7}x + \frac{3}{7}$$

$$y = -\frac{3}{7}x + \frac{24}{7}$$

- The equation of the line \overline{MA} .

$$m = \frac{3}{5}$$

$$y = \frac{3}{5}x$$

- The point of intersection P.

$$\left(-\frac{3}{7}x + \frac{24}{7} = \frac{3}{5}x \right) \text{ 35}$$

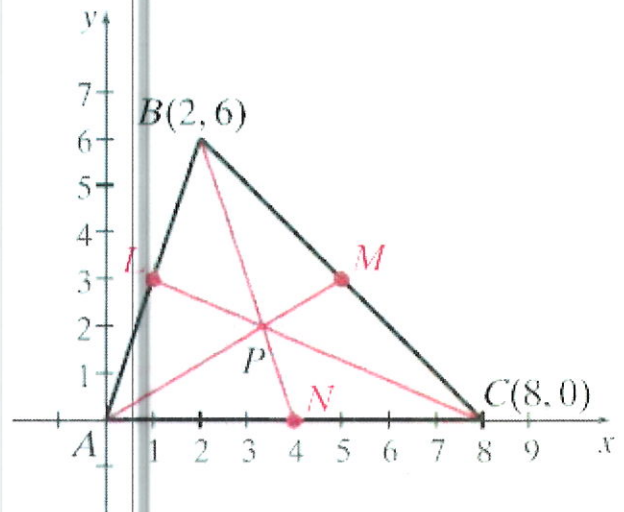
$$-15x + 120 = 21x$$

$$120 = 36x$$

$$x = \frac{10}{3}$$

$$y = \frac{3}{5} \left(\frac{10}{3} \right) = 2$$

$$\left(\frac{10}{3}, 2 \right)$$

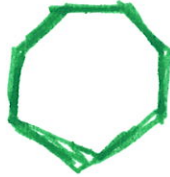


f. What triangle center term does the intersection represent? Explain your reasoning.

Centroid

10. Draw an example of each n -gon described with the given properties. (3 points each)

a. Regular heptagon



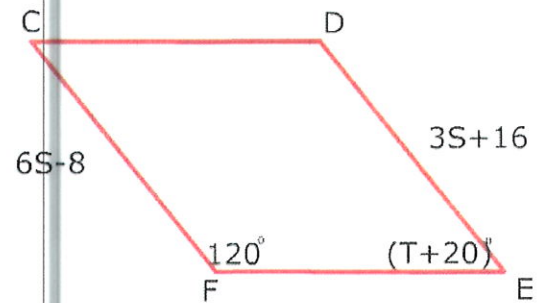
b. Concave hexagon



11. Find the values of S and T so that the figure is a parallelogram. (5 points)

$$\begin{aligned}6S - 8 &= 3S + 16 \\3S &= 24 \\ \boxed{S = 8}\end{aligned}$$

$$\begin{aligned}120^\circ + T + 20 &= 180^\circ \\T + 140 &= 180 \\ \boxed{T = 40}\end{aligned}$$



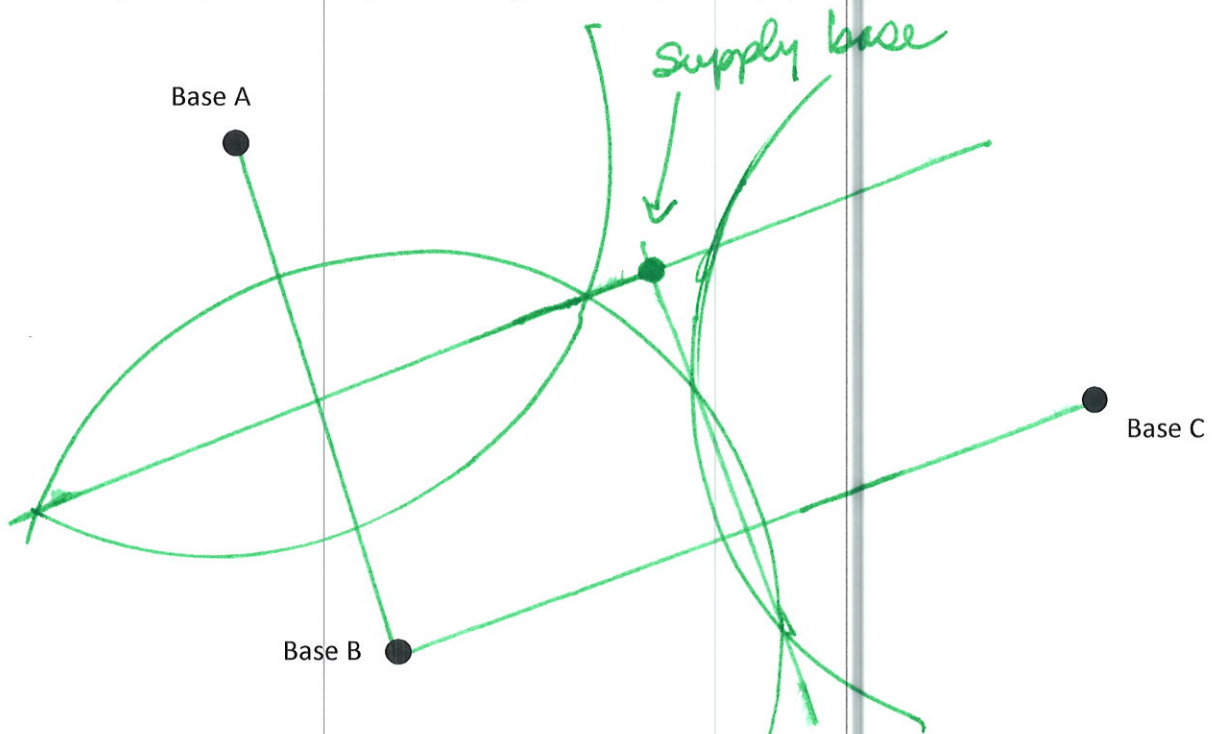
12. Describe a property that the diagonals of rhombi and kites have in common. (3 points)

The diagonals are \perp

13. Find the geometric mean of 11 and 19. (3 points)

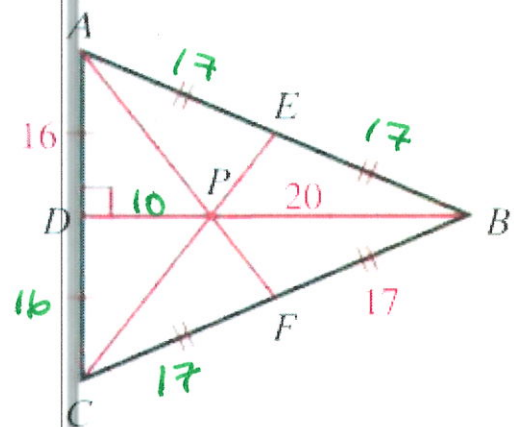
$$\sqrt{11 \cdot 19} \approx 14.4568\dots$$

14. A supply depot is to be located **equidistant** from three forward bases: A , B , and C . Use your geometry tools (ruler, protractor, compass) to construct the location of the supply depot (call it point P). Leave all of your markings and label point P . (7 points)



15. Use the information in the diagram below to find the perimeter of the triangle. (6 points)

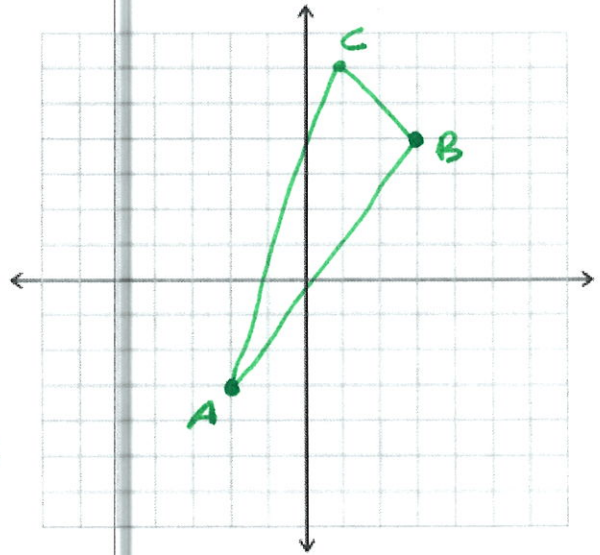
$$17(4) + 16(2) = 100$$



16. A triangle has two sides of length 6 and 9 meters. What is the range of possible values for the missing side? (3 points)

$$3 < S < 15 \quad (3, 15)$$

17. The coordinates of a triangle are at $A(-2, -3)$, $B(3, 4)$, and $C(1, 6)$.
- a. Draw the triangle. (2 points)



- b. Find the equation of line of altitude perpendicular to line \overline{AB} . (4 points)

$$m_{AB} = \frac{4 - (-3)}{3 - (-2)} = \frac{7}{5} \quad m_{\perp} = -\frac{5}{7}$$

$$y - 6 = -\frac{5}{7}(x - 1) \quad \text{through } C$$

$$y - 6 = -\frac{5}{7}x + \frac{5}{7}$$

$$y = -\frac{5}{7}x + \frac{45}{7}$$

- c. Find the equation of the line of altitude perpendicular to line \overline{BC} . (4 points)

$$m_{BC} = \frac{6 - 4}{1 - 3} = -\frac{2}{2} = -1 \quad m_{\perp} = 1$$

through A

$$y + 3 = +1(x + 2) \Rightarrow y = x - 1$$

- d. Find the location of the orthocenter of $\triangle ABC$. (6 points)

$$\left(-\frac{5}{7}x + \frac{45}{7} = x - 1\right) 7$$

$$-5x + 45 = 7x - 7$$

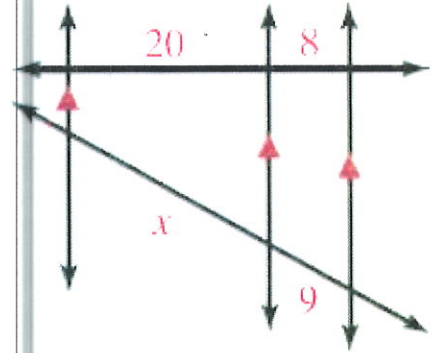
$$52 = 12x$$

$$x = \frac{13}{3}$$

$$y = \frac{13}{3} - 1 = \frac{10}{3}$$

$$\left(\frac{13}{3}, \frac{10}{3}\right)$$

18. Use the diagram to the right to find the value of x . (4 points)

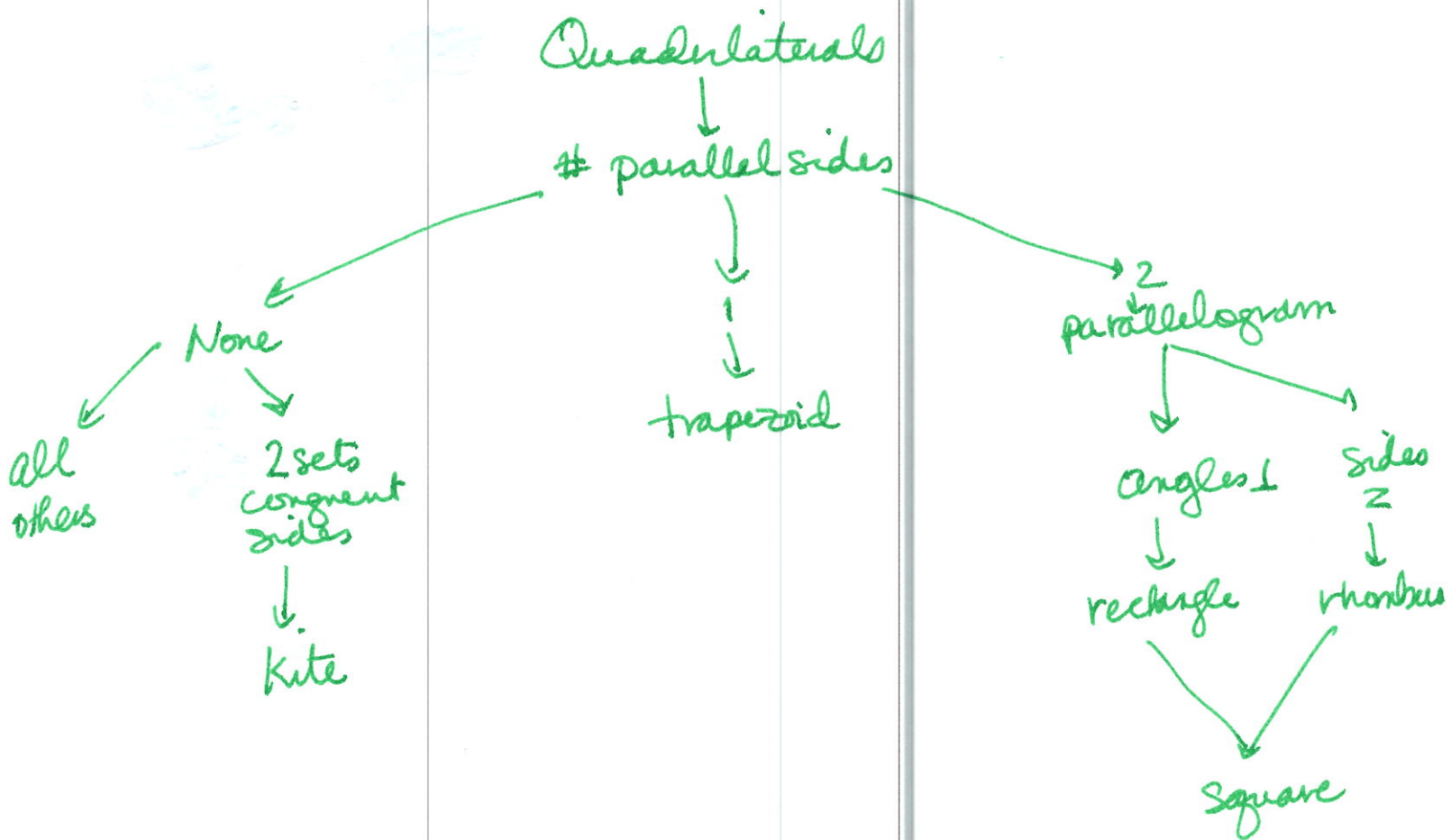


$$\frac{20}{x} = \frac{8}{9}$$

$$180 = 8x$$

$$x = \frac{45}{2} = 22.5$$

19. Draw a diagram that describes the relationships between the different types of quadrilaterals. (5 points)



diagrams may vary