



PROPERTIES OF A PARALLELOGRAM

A. Directions: Use parallelogram $EARL$ to complete each statement. (5 points)

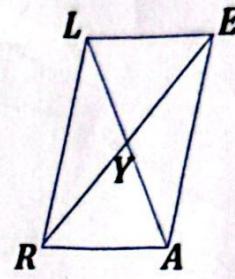
1.) $LR \parallel EA$

2.) $YE \cong XR$

3.) $\angle YLE \cong \angle RAY$

4.) $\angle R \cong \angle E$

5.) $\angle LYR \cong \angle ATR$



B. Directions: In parallelogram $GAIN$, $GA = 80$, $GS = 47$, $m\angle GAI = 62^\circ$ and $m\angle NSI = 48^\circ$. Find each measure. (5 points)

1.) $NI = 80$

2.) $\overline{NI} \cong \overline{GA}$

5.) $m\angle GSA = m\angle NSI$
 $= 48^\circ$

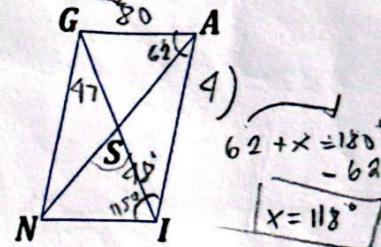
2.) $IS = 47$

3.) $m\angle GNI = 62^\circ$

4.) $m\angle NIA = 118^\circ$

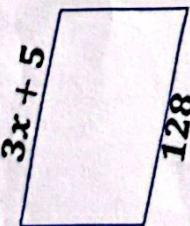
5.) $m\angle GSA = 48^\circ$

3.) $118 + x = 180$
 $= 180 - 118$
 $x = 62^\circ$



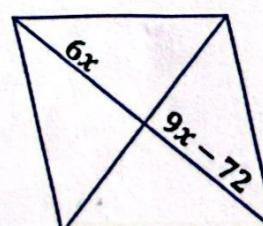
C. Directions: Find the value of the unknown variable. (5 points; 1 point each value of the variable)

1.)



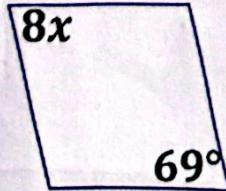
$$\begin{aligned} 3x + 5 &= 128 \\ 3x &= 128 - 5 \\ 3x &= 123 \\ x &= 41 \end{aligned}$$

3.)



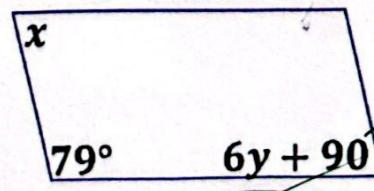
$$\begin{aligned} 6x &= 9x - 72 \\ 72 &= 9x - 6x \\ 72 &= 3x \\ x &= 24 \end{aligned}$$

2.)



$$\begin{aligned} 4x &= \frac{69}{3} \\ x &= \frac{69}{8} \end{aligned}$$

4.)



$$\begin{aligned} x + 79 &= 180 \\ x &= 180 - 79 \\ x &= 101 \\ 6y + 90 &= 101 \\ 6y &= 101 - 90 \\ 6y &= 11 \\ y &= \frac{11}{6} \end{aligned}$$



Worksheet 2

20/20

SPECIAL PARALLELOGRAMS; KITES AND TRAPEZIODS

A. Directions: Determine if the statement is true or false. (5 points)

- True 1. All parallelograms are quadrilaterals.
False 2. A parallelogram is a square.
True 3. All squares are rhombi.
True 4. A parallelogram with four congruent sides is a rhombus.
True 5. A parallelogram with congruent diagonals is a rectangle.

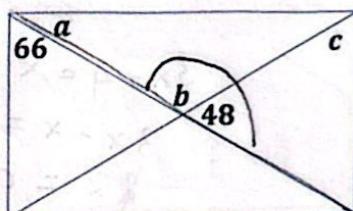
B. Directions: Find the measure of the unknown angle/side in each special parallelogram. (5 points)

1. $a = 24^\circ$

2. $b = 132^\circ$

3. $c = 66^\circ$

Rectangle:



$$\begin{array}{l} \textcircled{1} 90 \\ - 66 \\ \hline 24 \end{array}$$

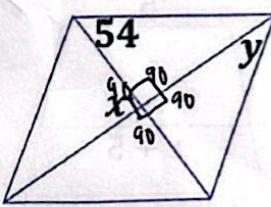
$$\begin{array}{l} \textcircled{2} 180 \\ - 48 \\ \hline 132 \end{array}$$

$$\begin{array}{l} \textcircled{3} 90 \\ - 24 \\ \hline 66 \end{array}$$

4. $x = 90^\circ$

5. $y = 36^\circ$

Rhombus:



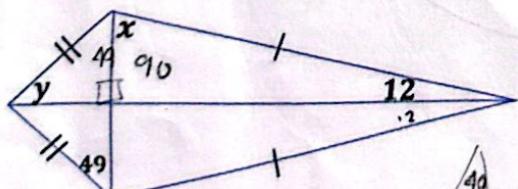
$$180 - (90 + 54)$$

$$180 - 144 = 36$$

Property #6

C. Directions: Refer to the kite. Find the value of x and y . (5 points)

1.

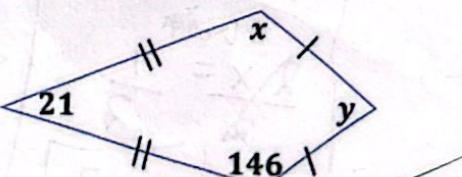


$$180 - (49 + 90) = y$$

$$180 - 139 = y$$

$$41 = y$$

3.



$$x = 146$$

$$y = 146 + 146 + 21 = 313$$

$$360 - 313$$

$$y = 47$$

$$180 - (90 + 12) = x$$

$$180 - 102 = x$$

$$78 = x$$

2.

$$4x - 3 = 49$$

$$4x = 49 + 3$$

$$4x = \frac{52}{4}$$

$$x = 13$$

D. Directions: Refer to the trapezoid. Find the value of x and y . (5 points)

1.

$$3x + 2x = 5x$$

$$186 - 10 = 176$$

$$\frac{5x}{5} = \frac{176}{5}$$

$$x = 34$$

$$y = 112$$

3.

$$3x - 4 = x + 5$$

$$3x - x = 5 + 4$$

$$\frac{2x}{2} = \frac{9}{2}$$

$$x = \frac{9}{2}$$

2.

$$15 = \frac{12 + x}{2}$$

$$30 = 12 + x$$

$$x = 30 - 12$$

$$x = 18$$

$$5 + 12 = x + 5$$

$$17 = 2x + 10$$

$$2x = 17 - 10$$
~~$$2x = \frac{7}{2}$$~~

$$x = \frac{7}{2}$$

4.

$$5$$

$$x + 5$$

$$12$$



15/15

PROPORTION AND SIMILARITY; TRIANGLE SIMILARITY THEOREMS

A. Solve each proportion. (5 points)

$$1.) \frac{6}{7} = \frac{x}{5} \quad \boxed{x = 3\frac{10}{7}}$$

$$\Rightarrow \frac{30}{7} = \frac{x}{5}$$

$$2.) \frac{2}{3} = \frac{7}{x-2} \quad \boxed{x = 25}$$

$$21 = 2(x-2)$$

$$21 = 2x - 4$$

$$2x = 25$$

$$3.) \frac{1}{x+2} = \frac{x+3}{2}$$

$$(x+2)(x+3) = 2$$

$$x^2 + 5x + 6 = 2$$

$$x^2 + 5x + 4 = 0$$

$$4.) \frac{8}{7} = \frac{x+5}{5}$$

$$40 = 7(x+5)$$

$$40 = 7x + 35$$

$$7x = 40 - 35$$

$$\boxed{x = \frac{5}{7}}$$

$$5.) \frac{6}{x+9} = \frac{4}{x+5}$$

$$6(x+5) = 4(x+9)$$

$$6x + 30 = 4x + 36$$

$$6x - 4x = 36 - 30$$

$$2x = 6$$

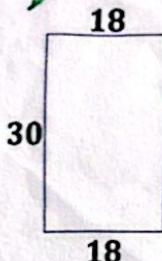
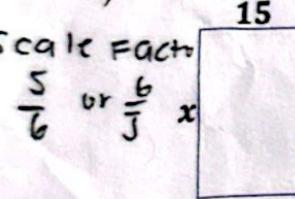
$$x = 3$$

$$x+4=0 \quad \boxed{x=-4}$$

$$x+1=0 \quad \boxed{x=-1}$$

B. Find the scale factor and the missing length in each similar polygon. (6 points)

1.)



$$3.) \frac{5}{30} = \frac{18}{x}$$

$$5x = 18 \cdot 30$$

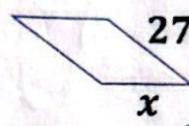
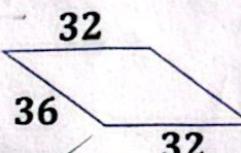
$$5x = 540$$

$$x = 108$$

$$\boxed{x = 25}$$

Scale Factor: $\frac{3}{4}$ or $\frac{4}{3}$

3.)



$$\frac{x}{32} = \frac{27}{36}$$

$$\frac{x}{32} = \frac{3}{4}$$

$$\frac{3}{32} = \frac{4}{x}$$

$$3x = 128$$

$$x = 24$$

$$\boxed{x = 24}$$

2.)

$$\text{Scale Factor: } \frac{10}{35} = \frac{45}{x}$$

$$\frac{10}{5} = \frac{45}{x}$$

$$2x = 45$$

$$x = 22.5$$

$$\frac{9}{2} = \frac{x-1}{1}$$

$$9 = 2(x-1)$$

$$9 = 2x - 2$$

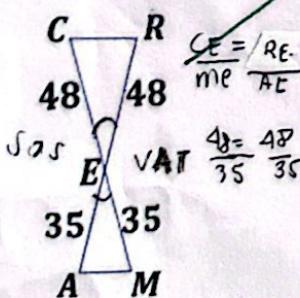
$$11 = 2x$$

$$x = 5.5$$

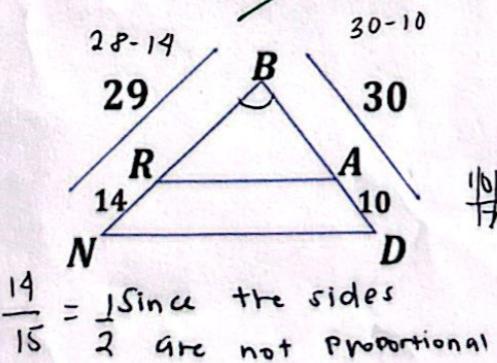
$$\boxed{x = 8}$$

C. Determine if the triangles are similar. If they are, write the similarity theorem. (4 points)

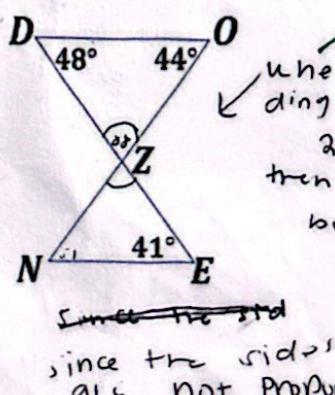
1.) $\triangle CER \sim \triangle MFA$



2.) $\triangle BAR \sim \triangle BDN$



3.) $\triangle DOZ \sim \triangle ENZ$





15/15

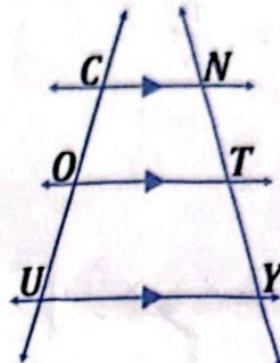
THEOREMS ON PROPORTIONAL SEGMENTS

A. Use the figure to complete the proportion. (6 points)

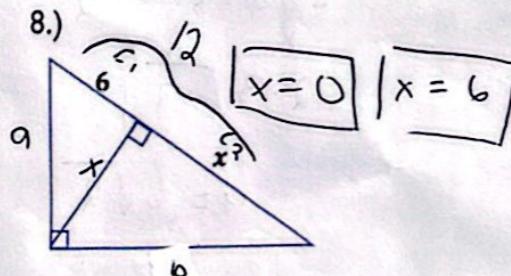
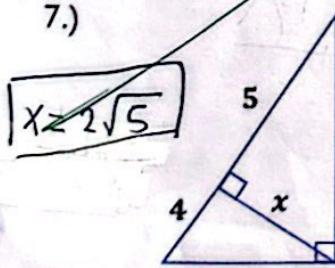
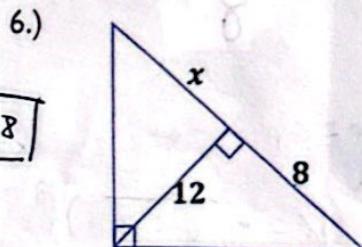
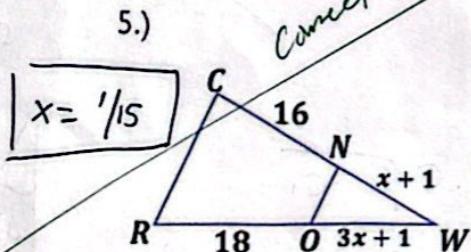
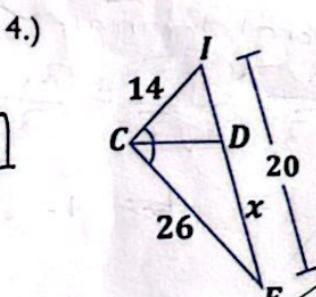
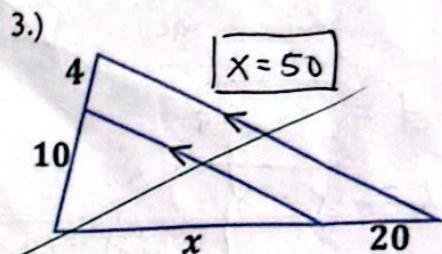
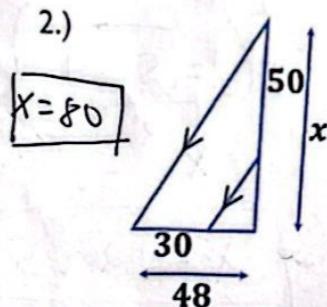
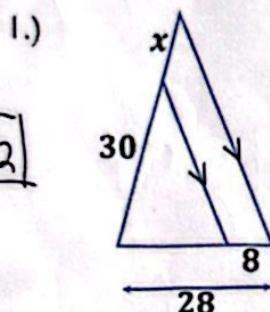
$$1.) \frac{CO}{CU} = \frac{NT}{TY}$$

$$2.) \frac{NT}{TY} = \frac{CO}{OU}$$

$$3.) \frac{UC}{UO} = \frac{YN}{YT}$$



B. Solve for the value of x . (9 points)



$$\textcircled{1} \quad \frac{30}{20} = \frac{x}{8}$$

$$\frac{3}{2} \cancel{\times} \frac{x}{8} \quad \boxed{12 = x}$$

$$\frac{24}{2} = \frac{2x}{2}$$

$$\textcircled{2} \quad \frac{30}{50} = \frac{18}{x}$$

$$\frac{3}{5} \cancel{\times} \frac{18}{x} \quad x =$$

$$\frac{3x}{5} = \frac{90}{3}$$

$$x = 30 + 50$$

$$\boxed{x = 80}$$

$$\textcircled{3} \quad \frac{10}{4} = \frac{x}{20}$$

$$\frac{5}{2} \cancel{\times} \frac{x}{20}$$

$$\frac{100}{2} = \frac{2x}{2}$$

$$\boxed{x = 50}$$

$$\textcircled{4} \quad \frac{10}{CE} = \frac{14}{26} = \frac{7}{13}$$

$$20 = \frac{7}{13} x + x$$

$$(13)(20) = \left(\frac{7}{13}x + x\right)13$$

$$260 = 7x + 13x \quad \boxed{13 = x}$$

$$\textcircled{5} \quad \frac{16}{x+1} = \frac{18}{3x+1}$$

$$48x + 16 = 18x + 18$$

$$48 - 18x = -16 + 18$$

$$30x = -16 + 8$$

$$\frac{30x}{30} = \frac{-8}{30}$$

$$x = \frac{1}{15}$$

$$\frac{260}{20} = \frac{26x}{20}$$

$$\textcircled{6} \quad d = \sqrt{c_1 \cdot c_2}$$

$$\textcircled{7} \quad (12 = \sqrt{x \cdot 8})^2$$

$$\frac{144}{8} = \frac{x^2}{8}$$

$$\textcircled{7} \quad (d = \sqrt{5 \cdot 4})^2$$

$$\sqrt{x^2} = \sqrt{5 \cdot 4}$$

$$\boxed{x = 2\sqrt{5}}$$

$$\textcircled{8} \quad b = c_1 \quad x = c_2 \quad x = d$$

$$(x = \sqrt{b \cdot x})^2$$

$$x^2 = bx$$

$$x^2 - bx = 0$$

$$x(x-b) = 0$$

$$\boxed{x=0} \quad \boxed{x=b}$$

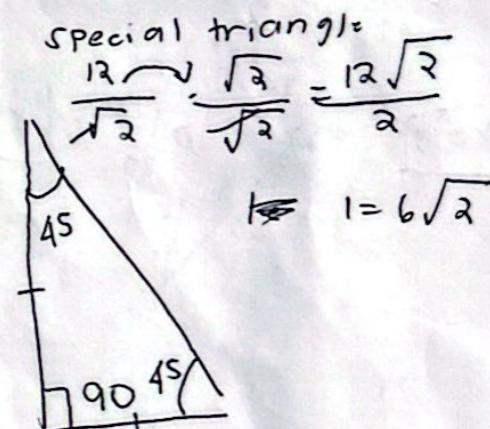
$$a = \sqrt{c_1 \cdot c_2}$$

$$= 12 \cdot 6$$

$$= \sqrt{4 \cdot 3 \cdot 3 \cdot 2}$$

$$2 \cdot 3\sqrt{2}$$

$$a = 6\sqrt{2}$$





Drill 1

G9 Q3 DI: PROPERTIES OF A PARALLELOGRAM

Directions: Solve for the measure of the indicated segment/angle. (5 points)

SET A

$CABI$ is a parallelogram. Given $CA = 16$, $AN = 10$, $m\angle ACB = 35^\circ$, $m\angle CIB = 115^\circ$.

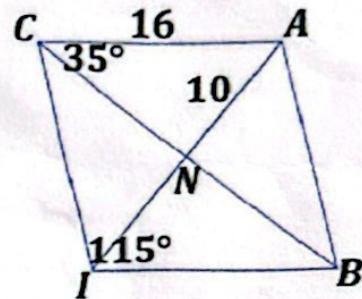
1.) $IN = \underline{\hspace{2cm}}$

4.) $\angle CAB = \underline{\hspace{2cm}}$

2.) $BI = \underline{\hspace{2cm}}$

5.) $\angle IBC = \underline{\hspace{2cm}}$

3.) $\angle ABI = \underline{\hspace{2cm}}$



SET B

$EARL$ is a parallelogram. Given $ER = 20$, $LY = 15$, $m\angle LER = 120^\circ$, $m\angle REA = 40^\circ$.

1.) $EY = \underline{10^\circ}$

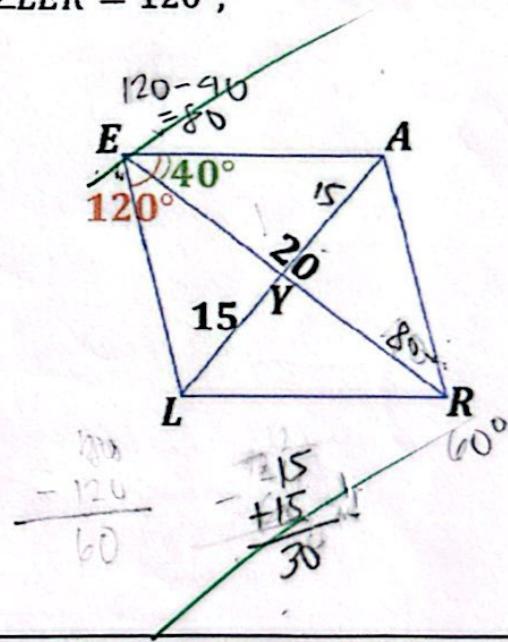
4.) $\angle EAR = \underline{60^\circ}$

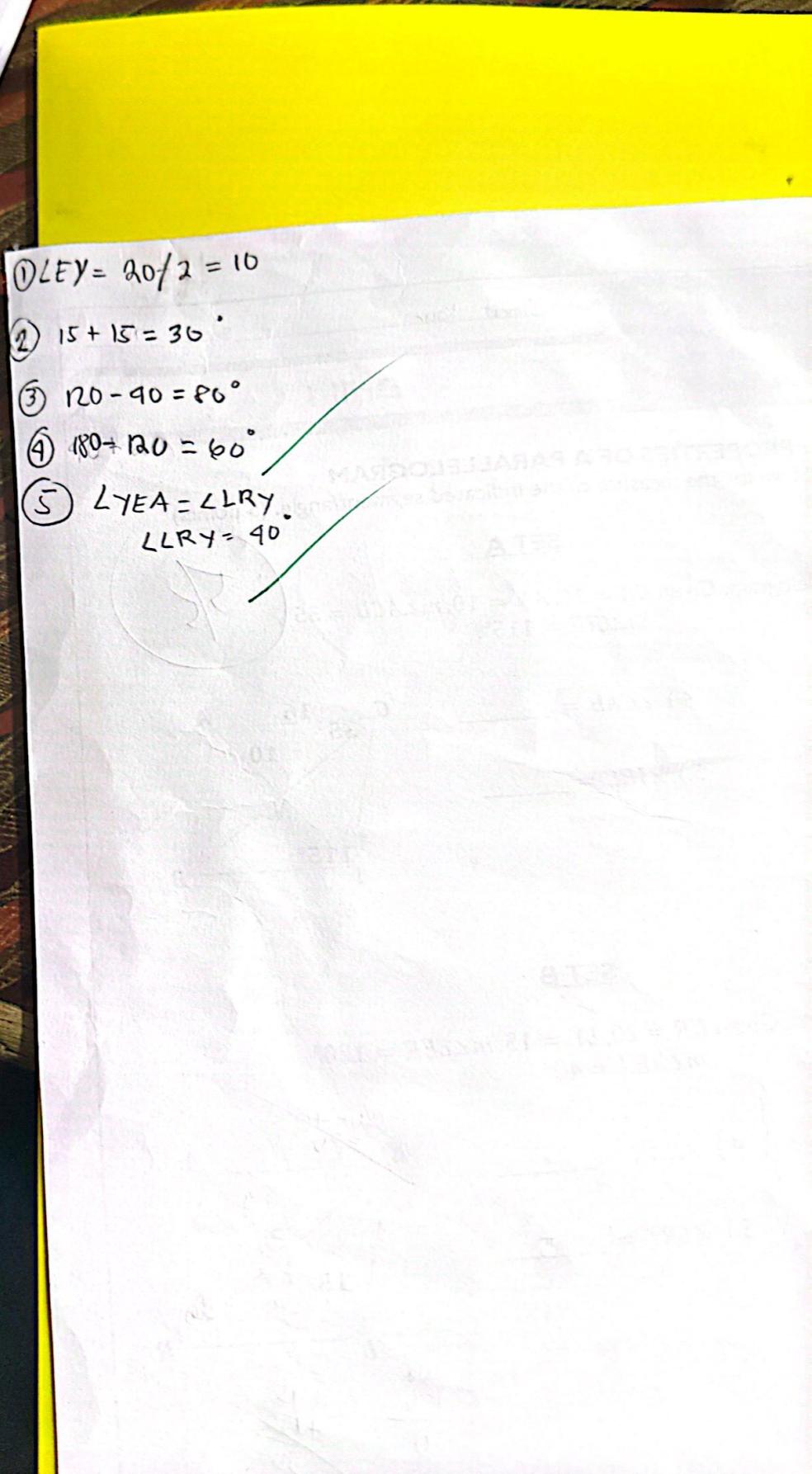
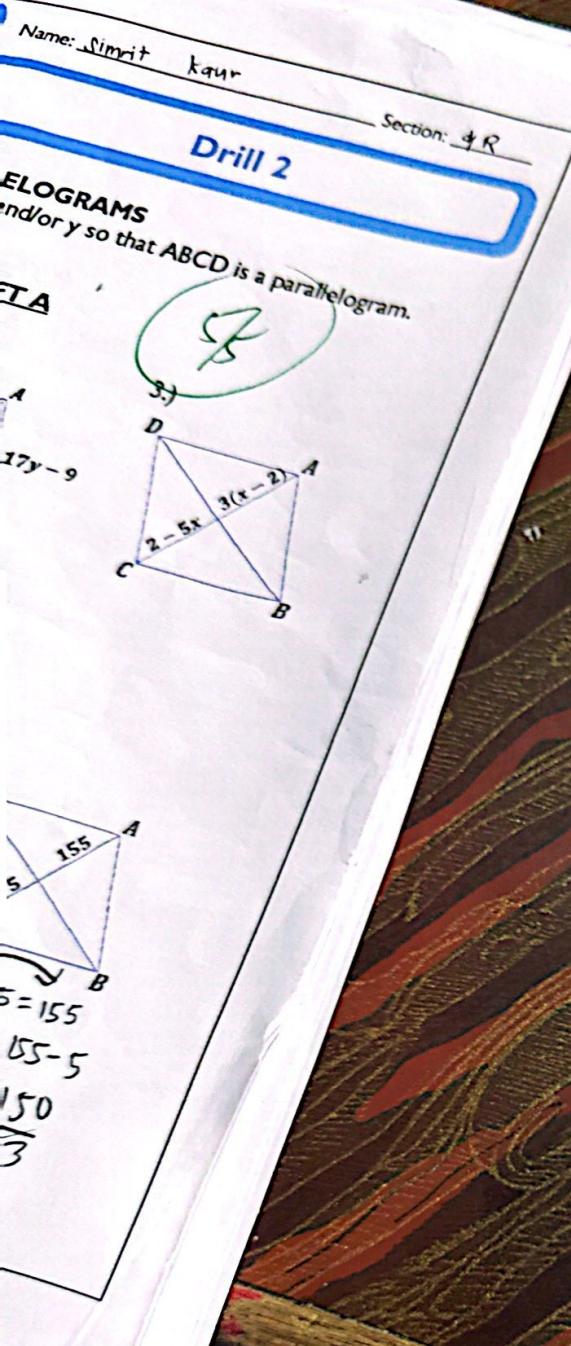
2.) $LA = \underline{30^\circ}$

5.) $\angle LRY = \underline{40^\circ}$

3.) $\angle LEY = \underline{80^\circ}$

$LEY = 20 \div 2$







Drill 2

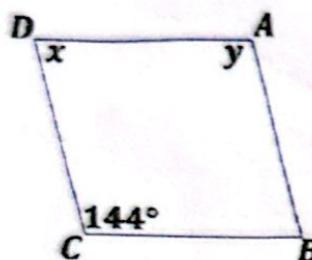
G9 Q3 D2: PROVING PARALLELOGRAMS

Directions: Solve for the values of x and/or y so that $ABCD$ is a parallelogram.
(5 points)

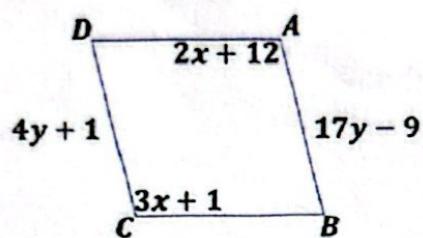
SK

SET A

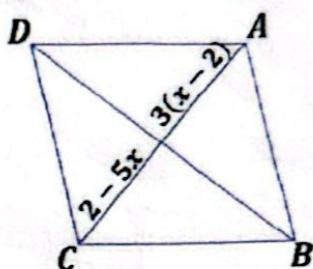
1.)



2.)

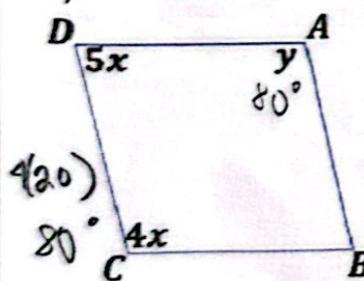


3.)



SET B

1.)



$$\angle C + \angle D = 180$$

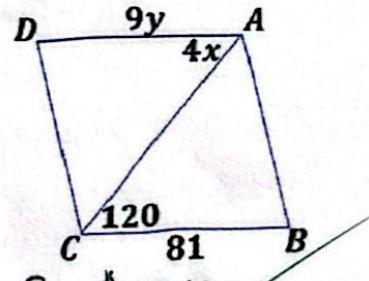
$$5x + 4x = 180$$

$$\frac{9x}{9} = \frac{180}{9}$$

$$\boxed{① \quad x = 20}$$

$$\boxed{② \quad \angle C = 80^\circ}$$

2.)



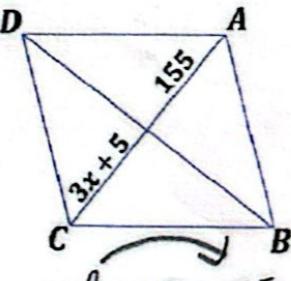
$$\boxed{① \quad \frac{4x}{4} = \frac{120}{4}}$$

$$\boxed{X = 30}$$

$$\boxed{② \quad \frac{9y}{9} = \frac{81}{9}}$$

$$\boxed{Y = 9}$$

3.)



$$3x + 5 = 155$$

$$3x = 155 - 5$$

$$\frac{3x}{3} = \frac{150}{3}$$

$$\boxed{X = 50}$$

Name: Kaur

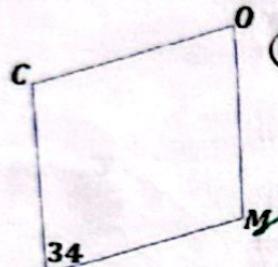
Section: _____

Drill 3**G9 Q3 D3: RHOMBUS**

Directions: In each rhombus, find the measure of the indicated angle. (5 points)

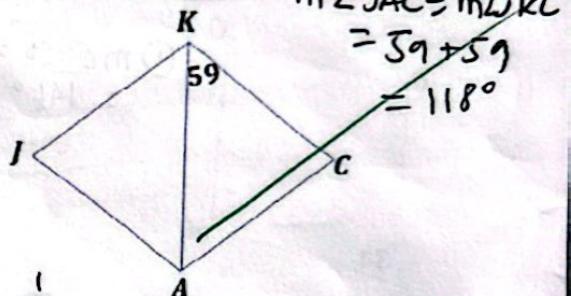
SET A

1.) $m\angle ECO = \underline{146}$



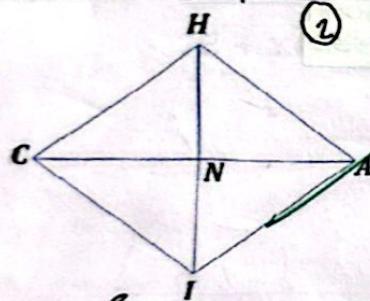
$$\textcircled{1} \quad m\angle ECO = 180^\circ - 34^\circ = 146^\circ$$

4.) $m\angle JAC = \underline{118^\circ}$



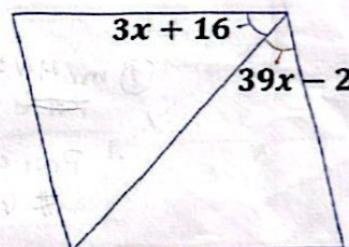
$$\begin{aligned} m\angle JAC &= m\angle JKC \\ &= 59 + 59 \\ &= 118^\circ \end{aligned}$$

2.) $m\angle HNA = \underline{90^\circ}$



$$\textcircled{1} \quad m\angle HNA = 90^\circ \quad * \text{Property #6}$$

5.) $x = \underline{\frac{1}{2}}$



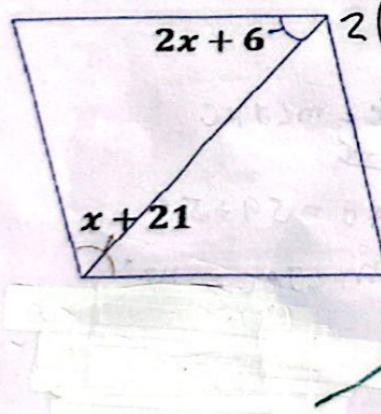
$$3x + 16 = 39x - 2$$

$$16 + 2 = 39 - 3x$$

$$\frac{18}{3x} = \frac{36}{3x}$$

$$x = \frac{1}{2}$$

3.) $x = \underline{3}$



$$2(2x + 6)$$

$$4x + 12 = x + 21$$

$$4x - 9 = -12 + 21$$

$$\begin{aligned} 3x &= 9 \\ x &= 3 \end{aligned}$$



Drill 4

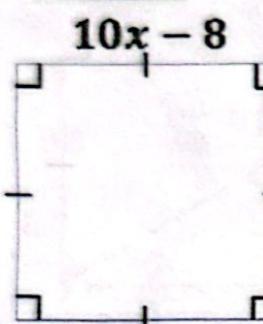
(5/5)

G9 Q3 D4: RECTANGLE AND SQUARE

Directions: Solve for the value of x . (5 points)

SET A

1.) $x = \frac{8}{3}$



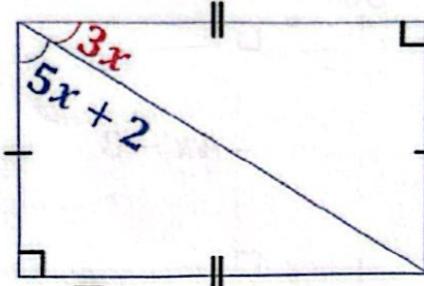
$$\textcircled{1} \quad 10x - 8 = 4x + 8$$

$$10x - 4x = 8 + 8$$

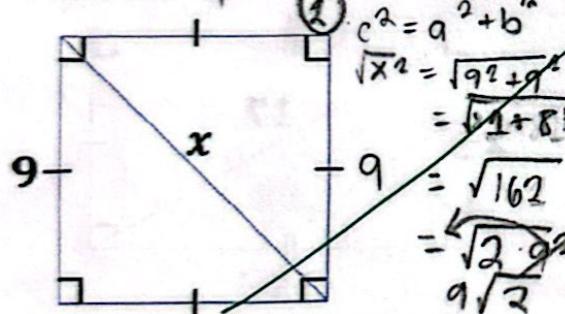
$$6x = 16$$

$$x = \frac{8}{3}$$

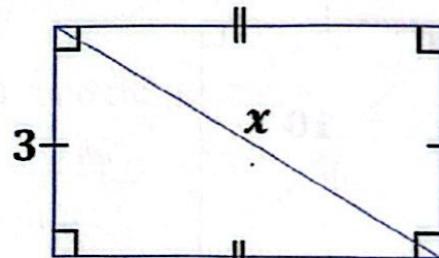
4.) $x = 11$



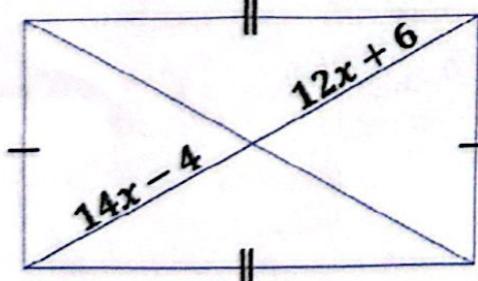
2.) $x = \frac{9\sqrt{2}}{2}$



5.) $x = 5$



3.) $x = \frac{5}{9}$



$$\textcircled{5} \quad 14x - 4 = 12x + 6$$

$$14x - 12x = 4 + 6$$

$$2x = \frac{10}{2} = 5$$

$$\textcircled{5} \quad \text{hyp}^2 = 10^2 + 10^2$$

$$\sqrt{x^2} = \sqrt{10^2 + 10^2}$$

$$= \sqrt{100 + 100}$$

$$= \sqrt{200}$$

$$= 10\sqrt{2}$$



Drill 5

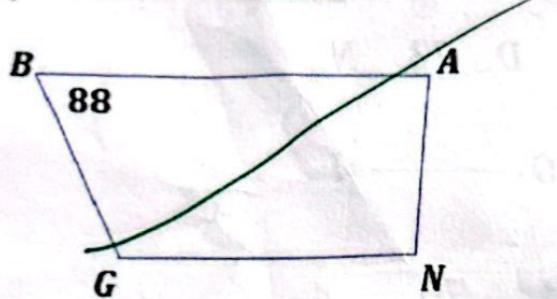
55

G9 Q3 D5: TRAPEZOID

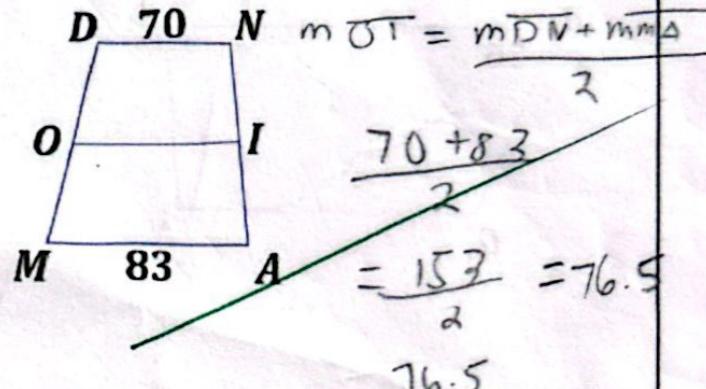
Directions: In each trapezoid, find the measure of the indicated segment/angle.
(5 points)

SET A

1.) $m\angle BGN = 92$

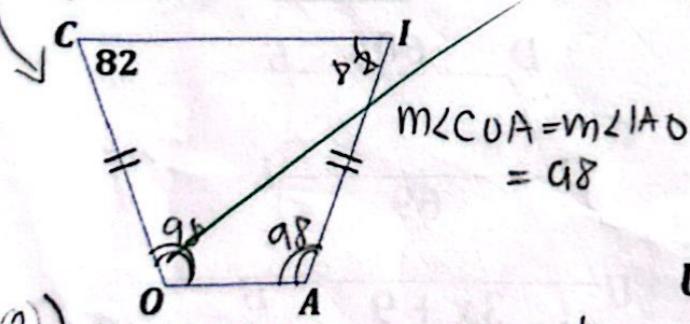


4.) Find the length of the median OI .

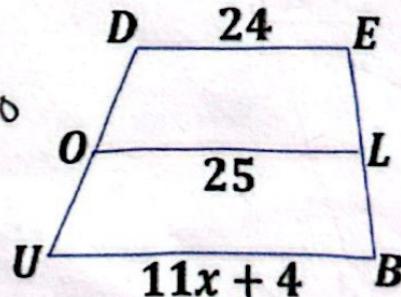


Isosceles Trapezoid

2.) $m\angle IAO = 98$



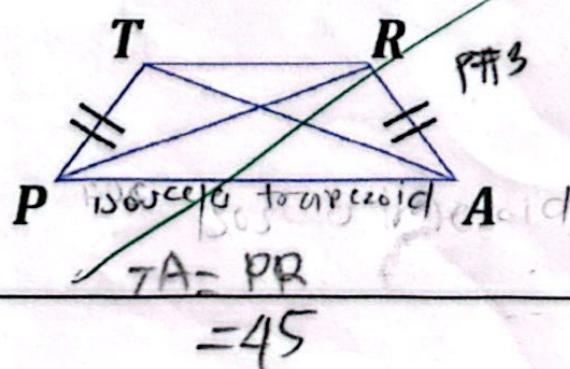
5.) Find the value of x .



2.) $m\angle OCL + m\angle COA = 180^\circ$

$$82 + m\angle COA = 180$$

3.) If $TA = 45$, find PR .



1.) $m\angle ABD + m\angle BGN = 80^\circ$

$88 + m\angle BGN = 180$

5.) $m\overline{OL} = m\overline{DE} + m\overline{LB}$

$$25 = 24 + 11x + 4$$

$$50 = 11x + 28$$

$$\frac{50 - 28}{11} = \frac{11x}{11}$$

$$2 = x$$



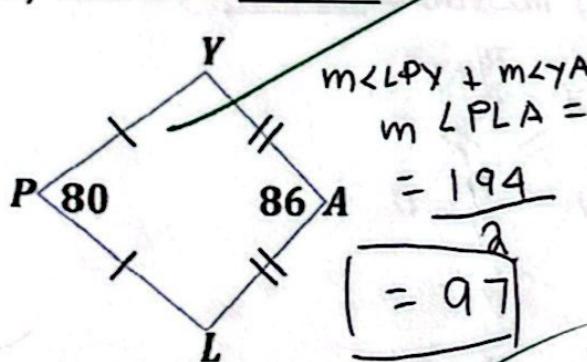
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G9 Q3 D6: KITE

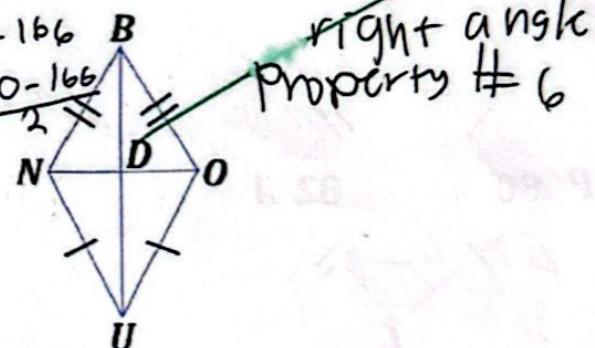
Directions: In each kite, find the measure of the indicated segment/angle. (5 points)

SET A

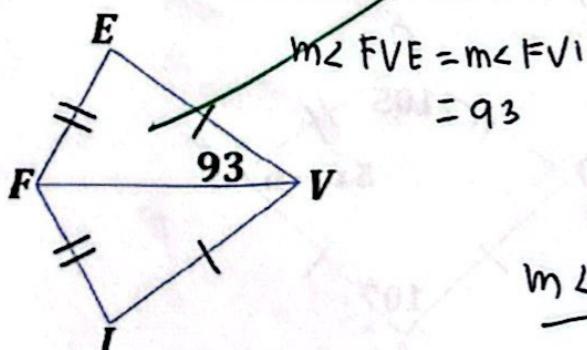
1.) $m\angle PLA = 97$



4.) $m\angle BDO = 90$



2.) $m\angle FVI = 93$

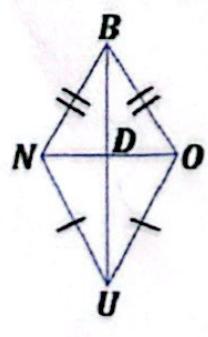


5.) Find the value of x .

$m\angle DGC + m\angle A = \frac{95+111}{2} = \frac{206}{2} = 103$

$5x + 7 + 103 = 180$
 $5x = 180 - 103 - 7$
 $5x = 70$
 $x = 14$

3.) If $OD = 29$, find NO .



$OD = ND$

$OD + ND = NO$

$29 + 29 = NO$
 $58 = NO$



Drill 7

55

G9 Q3 D7: SOLVING EQUATIONS INVOLVING PROPORTIONS

Directions: Solve for the value of the unknown variable. (5 points)

SET A

1.) $\frac{6}{4} = \frac{x}{6}$

$$\rightarrow \frac{56}{4} = 4x \Rightarrow x = 9$$

2.) $\frac{2}{5} = \frac{10}{x}$

$$\frac{50}{2} = \frac{2x}{2} \Rightarrow x = 25$$

3.) $\frac{9}{x-10} = \frac{5}{6}$

$$54 = 5(x-16)$$

$$54 = 5x - 50 \Rightarrow$$

$$5x = 54 + 50 = 104$$

1.) $\frac{7}{9} = \frac{x}{7}$

2.) $\frac{6}{10} = \frac{6}{x}$

3.) $\frac{5}{x-10} = \frac{3}{6}$

4.) $\frac{7}{4} = \frac{2x+9}{8}$

$$56 = 4(2x+9)$$

5.) $\frac{10}{x+9} = \frac{3}{x}$

$$10x = 3(x+9)$$

$$10x = 3x + 27 \Rightarrow x = \underline{\underline{27}}$$

$$27 = 10x - 3x$$

$$\frac{27}{7} = \frac{7x}{7}$$

SET B

4.) $\frac{1}{2} = \frac{3x+7}{8}$

5.) $\frac{7}{x+2} = \frac{9}{x}$



Drill 8

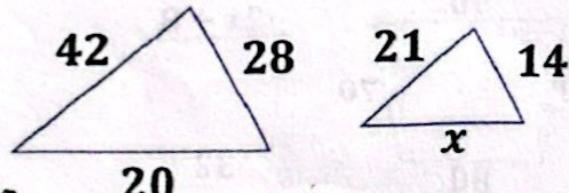
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G9 Q3 D8: SIMILAR POLYGONS

Directions: Given two similar polygons, identify the scale factor and the measure of the indicated side/angle. (5 points)

SET A

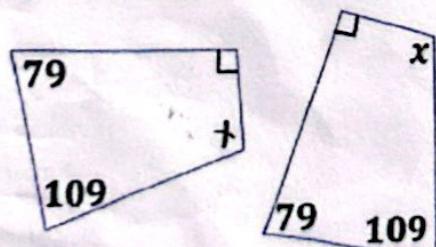
1.) Scale Factor: $\frac{2}{1}$
 $x = 10$



$$\frac{42}{21} = \frac{20}{x} \Rightarrow \frac{2}{1} = \frac{20}{x} \Rightarrow x = 10$$

$$\frac{2}{1} = \frac{20}{x} \Rightarrow \frac{2}{1} = \frac{20}{x} \Rightarrow x = 10$$

2.) $x = 81$



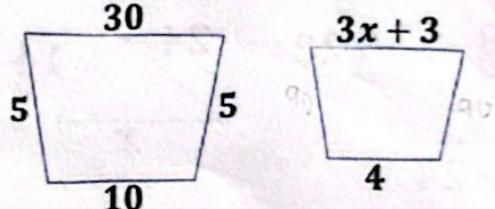
$$90 + 79 + 109 + x = 360$$

$$278 + x = 360$$

$$278 = 360 - x$$

$$x = 82$$

3.) Scale Factor: $\frac{5}{2}$
 $x = 3$



$$\frac{10}{4} = \frac{30}{3x+3}$$

$$\frac{5}{2} = \frac{30}{3x+3} \Rightarrow 5(3x+3) = 60$$

$$15x + 15 = 60$$

$$15x = 45$$

$$x = 3$$

Total Quadrilateral = 360
Total triangle = 180



Drill 9

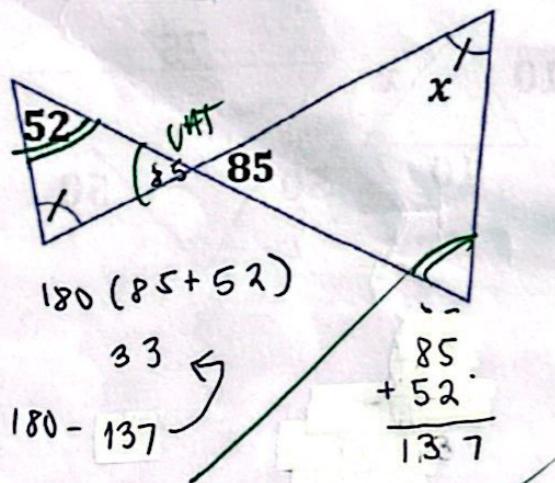
(6/6)

G9 Q3 D9: TRIANGLE SIMILARITY THEOREMS

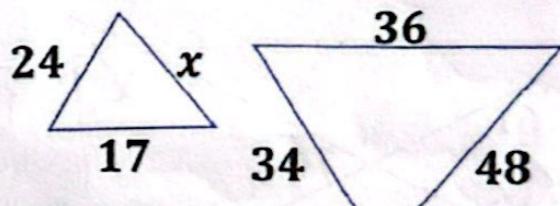
Directions: Identify the Theorem which proves the similarity of the two triangles, then find the measure of the indicated segment/angle. (6 points)

SET A

1.) Theorem: AA
 $x = \underline{43}$



3.) Theorem: SSS
 $x = \underline{18}$

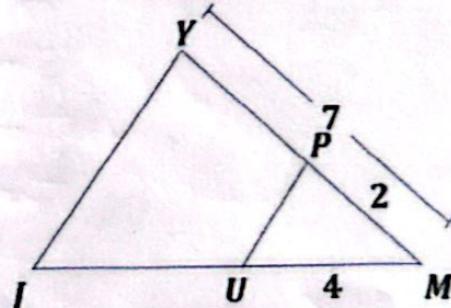


$$\frac{24}{48} = \frac{17}{34} = \frac{x}{36}$$

$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2}$$

$$\frac{2x}{2} = \frac{34}{2} \\ = 18$$

2.) Theorem: SAS
 $JM = \underline{14}$



$$\frac{2}{7} = \frac{4}{JM} = \frac{PU}{7J}$$

$$\frac{2}{7} = \frac{4}{JM} = \frac{2JM}{2} = \frac{28}{2} = JM = 14$$



Drill 10

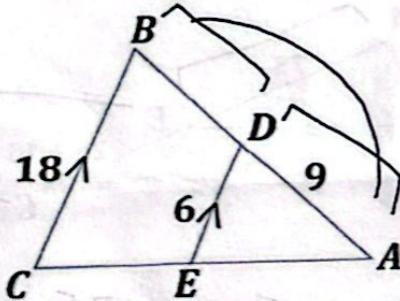


G9 Q3 D10: THEOREMS ON PROPORTIONAL SEGMENTS (PART I)

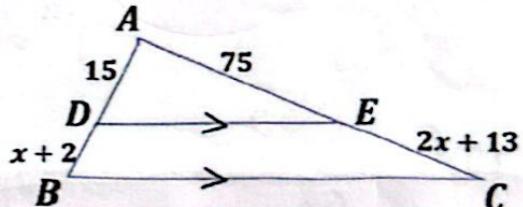
Directions: Given that segments BC and DE are parallel, find the length of the indicated segment. (6 points)

SET A

$$1.) \frac{BD}{AB} = \frac{27}{36}$$



$$3.) \frac{x}{DB} = \frac{1}{3}$$

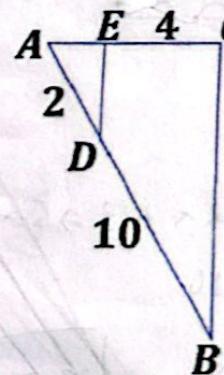


(3)

$$\frac{AD}{DB} = \frac{6}{18} = \frac{9}{DB} = \frac{6}{18} \quad | \frac{27+9=}{AB=36} \quad | \boxed{DB=27}$$

~~$$\rightarrow \frac{9}{DB} = \frac{1}{3} \quad | \boxed{DB=27}$$~~

$$2.) AE = \frac{1}{5}$$



$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$= \frac{2}{10} = \frac{AE}{4} = \frac{1}{5} \quad | \boxed{A = \frac{4}{5}}$$



Drill I

4/5

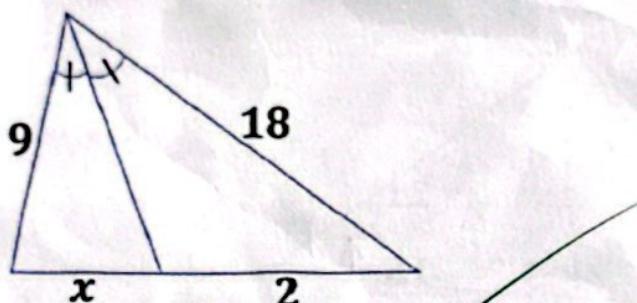
G9 Q3 DII: THEOREMS ON PROPORTIONAL SEGMENTS (PART II)

Directions: Solve for the value of the unknown variables. (Parallel lines/Angle Bisector) (5 points)

$$\frac{9}{18} = \frac{x}{2} \rightarrow \cancel{\frac{1}{2}} \cancel{\frac{1}{2}}$$

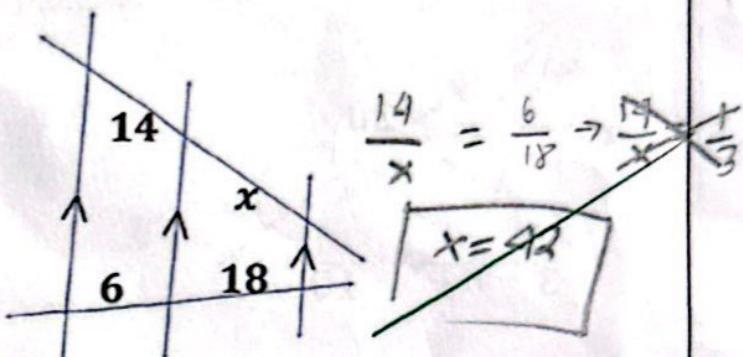
SET A

1.) $x = \underline{1}$

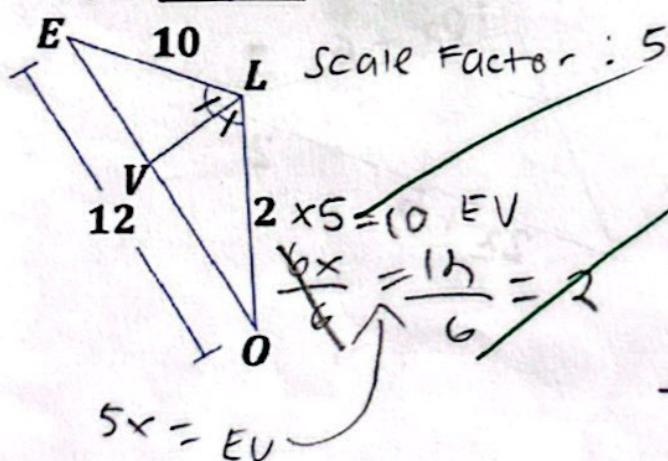


$$\frac{x}{2} = \frac{2}{2} \rightarrow \cancel{x = 1}$$

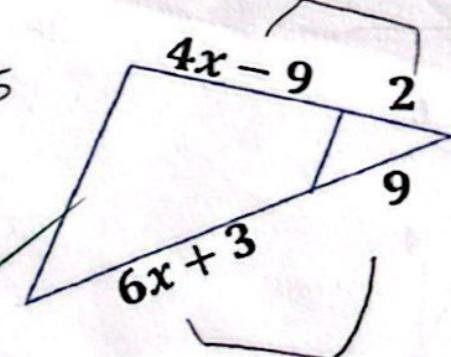
3.) $x = \underline{12}$



2.) $EV = \underline{10}$
 $VO = \underline{2}$



4.) $x = \underline{29/8}$



$$\frac{4x - 9}{2} = \frac{6x + 3}{9}$$

$$2(6x + 3) = 9(4x - 9)$$

$$\frac{21}{8} = \frac{87}{24} = \cancel{21x} \quad 12x + 6 = 36x - 81$$



6/6

G9 Q3 D12: ALTITUDE TO THE HYPOTENUSE

Directions: Complete the statement by identifying the corresponding proportional segment then find the length of the indicated segment. (6 points)

SET A

1.) $\frac{CO}{EO} = \frac{EO}{CE}$

$$OM = \cancel{5}/\cancel{2}$$

$$d = \sqrt{c_1 \cdot c_2}$$

$$(5 = \sqrt{c_1 \cdot 10})^2$$

$$25 = c_1 \cdot 10$$

$$\frac{25}{10} = 5$$

$$\frac{10}{5} = 2$$

3.) $\frac{HO}{HE} = \frac{EO}{HO}$

$$x = \cancel{c}/\cancel{1}$$

$$x + 3$$

$$3 = b$$

$$6 = \sqrt{(x+3) \cdot 3}$$

$$6 = \sqrt{(x+3) \cdot 3}$$

2.) $\frac{BE}{EN} = \frac{BN}{BE}$

$$BE = \cancel{5}/\cancel{5}$$

$$b = \sqrt{c \cdot c_1}$$

$$b = \sqrt{25 \cdot 5}$$

$$a = 10\sqrt{5}$$

$$b = 5\sqrt{5}$$

$$a = \sqrt{c \cdot c_1}$$

$$= \sqrt{25 \cdot 5}$$

$$d = \sqrt{20 \cdot 5}$$

$$d = \sqrt{2 \cdot 5 \cdot 2 \cdot 5}$$

$$d = 2 \cdot 5$$

$$= 10$$

$$36 = 3x + 18$$

$$3x = 36 - 18$$

$$\frac{18}{3} = \frac{3x}{3}$$

$$x = 6$$

$$d = 2 \cdot 5$$

$$= 10$$