2023 Honors Geometry Quarter 1 Exam Notes

Ratio of two segment lengths #1 (Mimic 2017 Question 2)

$\overline{AB}$ has endpoints $A\ (0, -5)$ and $B\ (12.5, 0)$. Point C is on $\overline{AB}$ and is located at $(26, 5.4)$. What is the ratio of $\frac{AB}{BC}$?

$AB = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

$AB = \sqrt{(12.5)^2 + (5)^2}$

$AB = \sqrt{156.25 + 25}$

$AB = \sqrt{181.25}$

$AB \approx 13.462912$

$BC = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

$BC = \sqrt{(13.5)^2 + (5.4)^2}$

$BC = \sqrt{182.25 + 29.16}$

$BC = \sqrt{211.41}$

$BC \approx 14.539945$

$$\frac{AB_x}{BC_x} = \frac{12.5}{13.5} \approx .925926$$

$$\frac{AB}{BC} = \frac{\sqrt{181.25}}{\sqrt{211.41}} \approx .925926$$

$$\frac{AB_y}{BC_y} = \frac{5}{5.4} \approx .925926$$

only pick one to do

$$\therefore \frac{AB}{BC} = \frac{AB_x}{BC_x} = \frac{AB_y}{BC_y} \text{ if A, B and C are collinear.}$$

Ratio of two segment lengths #2 (Mimic 2017 Question 2)

$\overline{AB}$ has endpoints $A\ (-8, 0)$ and $B\ (13, -10.5)$. Point C is on $\overline{AB}$ and is located at $(0, -4)$. Find the ratio of $\frac{AC}{BC}$.

A B C

$$\frac{AC}{BC} = \frac{AC_x}{BC_x} = \frac{AC_y}{BC_y}$$

$$\frac{AC_x}{BC_x} = \frac{8}{13}$$

$$\frac{AC_y}{BC_y} = \frac{4}{6.5}$$

Equivalent ratios

Find Coordinates of an Endpoint #1 (Mimic 2019 Question 11)

Point A is located at $A\ (-5, -3)$. The midpoint of $\overline{AB}$ is point C$(4, 2)$. What are the coordinates of B?

$M = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$

$(4,2) = \left(\frac{-5+x}{2}, \frac{-3+y}{2}\right)$

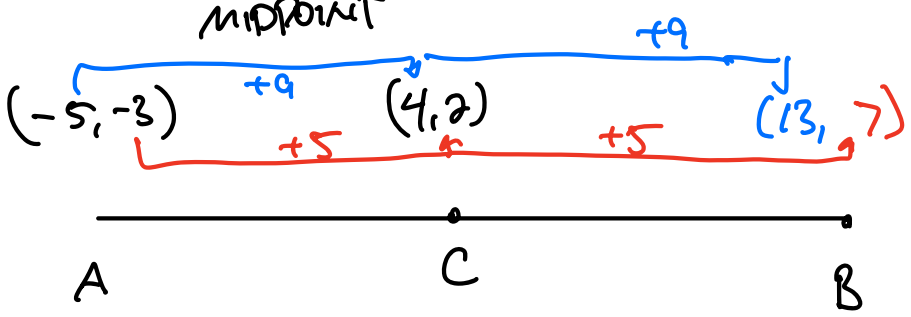
$4 = \frac{-5+x}{2}$ $\quad 2 = \frac{-3+y}{2}$

$8 = -5+x$ $\quad 4 = -3+y$

$13 = x$ $\quad 7 = y$

$B(13,7)$

MIDPOINT

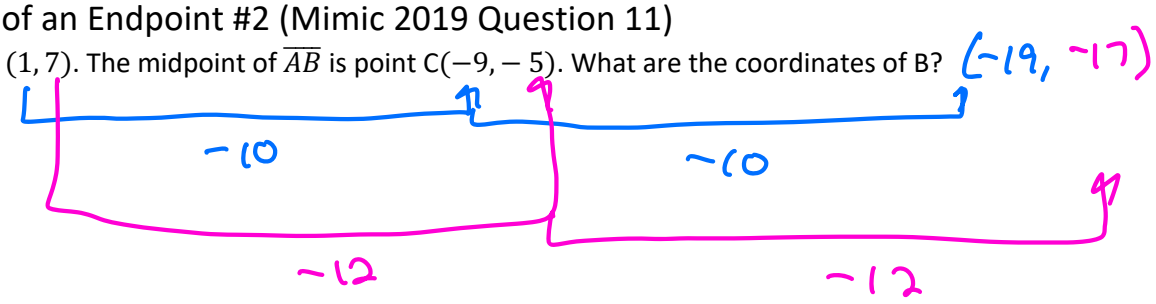


Pick 1 method

$B(13,7)$

Find Coordinates of an Endpoint #2 (Mimic 2019 Question 11)

Point A is located at $A\ (1, 7)$. The midpoint of $\overline{AB}$ is point C$(-9, -5)$. What are the coordinates of B?



$B(-19,-17)$

Gnaden's Population Density (Mimic 2017 Question 7)

A study reports that in 2021 the population of Gnadenhutten was 1,229 people and the land area was approximately 0.92 square miles.

Based on the study, what was the population density, in people per square mile, of Gnadenhutten in 2021? Round your answer to the nearest tenth.

$$\text{Density} = \frac{\text{people}}{\text{mile}^2} = \frac{1229 \text{ people}}{.92 \text{ miles}^2} \approx 1335.9$$

Port's Population Density (Mimic 2017 Question 7)

A study reports that in 2021 the population of Port was 546 people and the land area was approximately 0.51 square miles.

Based on the study, what was the population density, in people per square mile, of Port in 2021? Round your answer to the nearest tenth.

$$\text{Density} = \frac{\text{people}}{\text{mile}^2} = \frac{546 \text{ people}}{.51 \text{ miles}} \approx 1070.6$$

Jimmy's Uncracked Corn (Mimic 2018 Question 11)

Jimmy Crack Corn wants to know the density of his uncracked corn in grams per cubic centimeter. The uncracked corn has a mass of 1.98 kilograms and a volume of 500 cubic centimeters.

→ 1980 grams

What is the density of the uncracked corn, in grams per cubic centimeter $\left(\frac{g}{cm^3}\right)$?

$$\text{Density} = \frac{\text{grams}}{cm^3} = \frac{1980\ g}{500\ cm^3} \approx 3.96\ g/cm^2$$

Miss Muffet's Tuffet (Mimic 2023 Question 27)

Little Miss Muffet wants to know the density of her tuffet in grams per cubic centimeter. Her tuffet has a mass of 20.453 grams and a volume of 1200 cubic centimeters.

What is the density of her tuffet, in grams per cubic centimeter $\left(\frac{g}{cm^3}\right)$?

$$\text{Density} = \frac{\text{grams}}{cm^3} = \frac{20.453\ g}{1200\ cm^3} \approx 0.01704$$

Crushing Turts (Mimic 2022 Question 23)

The Mushroom Kingdom has a land area of 50 square miles. In 1981, the population density was 10.4 turtles per square mile.

Enter Super Mario who is as cool as yesterday's French fries. Who knows why he has an unsatiable desire to crush turts? Is it in his pursuit for the mythical Dr. Pepper? Perchance.

Yet, fast forward to the year 1987, and a peculiar shift occurred. The population of this whimsical land decreased to a pathetic 57 turties, creating a buzz in the kingdom like never before.

By how many turts did the population of the Mushroom Kingdom decrease between 1981 and 1987 due to Mario, simply a one percenter, stomping all the turties? Perchance.

# of turts in 1981

$$\text{Density} = \frac{\text{turts}}{\text{mi}^2}$$

$$10.4 = \frac{\text{turts}}{50}$$

$$520 = \text{turts}$$

# of turts in 1987

57

Answer = 520 − 57

Answer = 463 turts

Bikini Bottom (Mimic 2022 Question 23)

Bikini Bottom has a sea volume of 2.5 cubic miles. In 2015, the population density was 20,000 creatures per cubic mile.

In 2018, the population was 55,125 creatures.

By how many creatures did the population of Bikini Bottom increase between 2015 and 2018?

2015

$$\text{Density} = \frac{\text{creatures}}{\text{mi}^3}$$

$$20{,}000 = \frac{\text{creatures}}{2.5}$$

$$50{,}000 = \text{creatures}$$

2018

55,125 creatures

Answer = 55,125 − 50,000

Answer = 5125 creatures

Question 16 2017

Skew → Parallel

Kevin asked Olivia what parallel lines are. Olivia responded, "They are lines that never intersect."

What important piece of information is missing from Olivia's response?

Ⓐ The lines must be straight.

Ⓑ The lines must be coplanar.

Ⓒ The lines can be noncoplanar.

Ⓓ The lines form four right angles.

Question 16 2023

Which statement most accurately defines a ray?

??

Ⓐ all points of a line that are on either side of a fixed point — line

● all points of a line that are on one side of a fixed point including the fixed point — ray

Ⓒ all points of a line that are between two fixed points of the line — ?

Ⓓ all points of a line that are between two fixed points of the line including the two fixed points — Segment

Question 31 2018

Which term is defined as two intersecting lines that form four right angles in a plane?

Ⓐ skew lines

Ⓑ straight lines

Ⓒ parallel lines

Ⓓ perpendicular lines

Create Linear Equation #1 (Mimic 2018 Question 9)

Line l has a slope of $-\frac{2}{5}$. Line p is perpendicular to line l and passes through the point $(-4, 8)$. Create the equation for line p.

Point	Slope	P. S. f
$(-4, 8)$	l's $= -\frac{2}{5}$ $\perp m = \frac{5}{2}$	$y - y_1 = m(x - x_1)$ $y - 8 = \frac{5}{2}(x + 4)$

Create Linear Equation #2 (Mimic 2018 Question 9)

Line l has a slope of 2. Line p is perpendicular to line l and passes through the point $(5, -7)$. Create the equation for line p.

Point	Slope	P. S. f
$(5, -7)$	l's $= 2$ $\perp m = -\frac{1}{2}$	$y - y_1 = m(x - x_1)$ $y + 7 = -\frac{1}{2}(x - 5)$

Find perpendicular slope #1 (Mimic 2023 Question 47)

What is the slope of a line that is perpendicular to the graph of $y = -\frac{3}{2}x + \frac{4}{5}$?

slope $= -\frac{3}{2}$

$\perp$ slope $= \frac{2}{3}$

Find perpendicular slope #2 (Mimic 2023 Question 47)

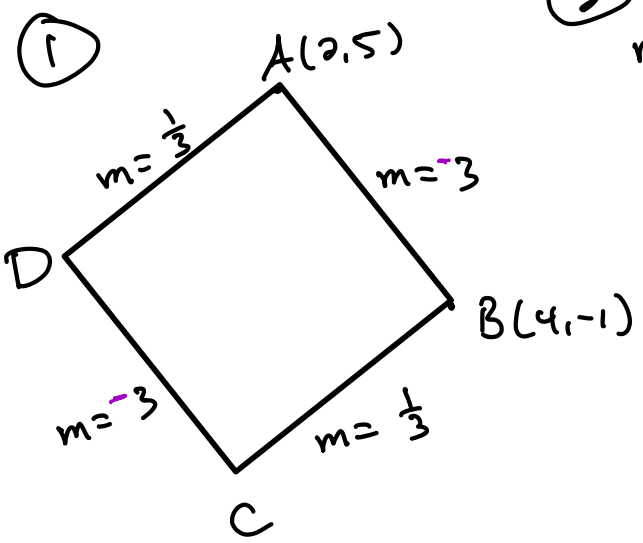
What is the slope of a line that is perpendicular to the graph of $y = \frac{3}{5}x - 2$?

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

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

Square Slopes #1 (Mimic 2017 Question 15)

Square ABCD has vertices of $A(2,5)$ and $B(4,-1)$. What is the slope of $\overline{AD}$?



2

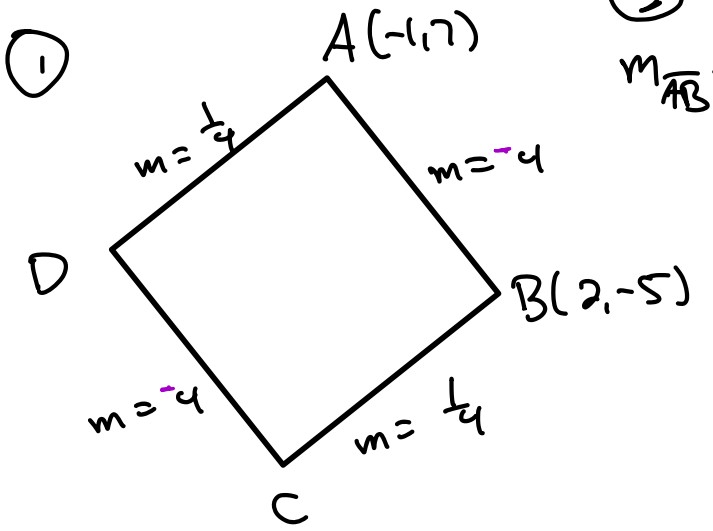
$m_{\overline{AB}} = \frac{\Delta y}{\Delta x} = \frac{-6}{2} = -3$

3

$m_{\overline{AD}} = \frac{1}{3}$

Square Slopes #2 (Mimic 2017 Question 15)

Square ABCD has vertices of $A(-1,7)$ and $B(2,-5)$. What is the slope of $\overline{BC}$?



2

$m_{\overline{AB}} = \frac{\Delta y}{\Delta x} = \frac{-12}{3} = -4$

3

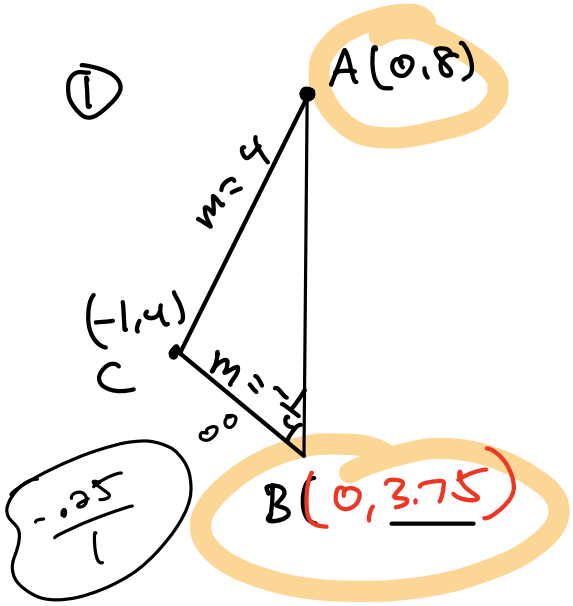
$m_{\overline{BC}} = \frac{1}{4}$

Slopes and Right Angles #1 (Mimic 2023 Question 6)

Triangle ABC is on the coordinate plane and has the following characteristics.

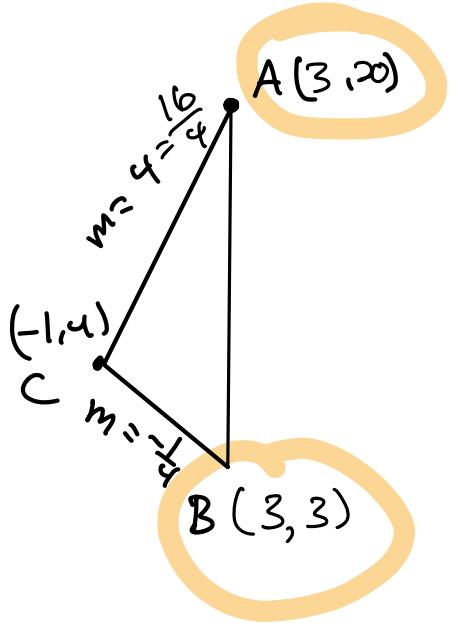
- ☐ $\overline{AB}$ is on a vertical line.
- ☐ $\angle C$ is a right angle
- ☐ Point C is located at $(-1, 4)$
- ☐ The slope of $\overline{AC}$ is 4.

What are possible coordinates for points A and B?



Since A and B are on same vertical line, they have same x-value.
∴ we need to use slope so we go same distance to the right.

OR

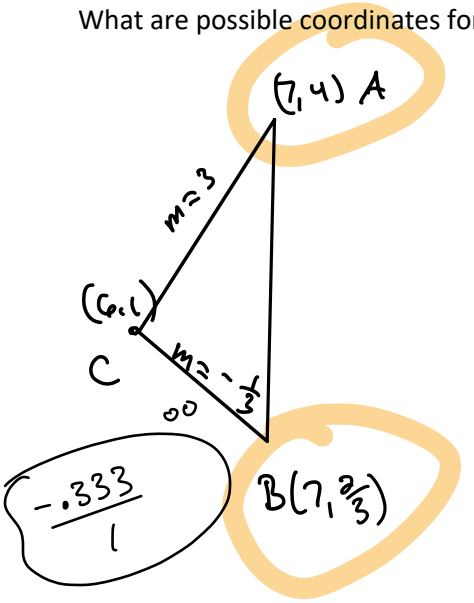


Slopes and Right Angles #2 (Mimic 2023 Question 6)

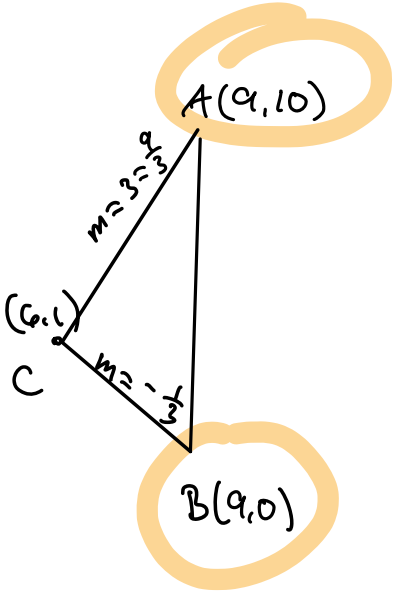
Triangle ABC is on the coordinate plane and has the following characteristics.

- ☐ $\overline{AB}$ is on a vertical line.
- ☐ $\angle C$ is a right angle
- ☐ Point C is located at $(6, 1)$
- ☐ The slope of $\overline{AC}$ is 3.

What are possible coordinates for points A and B?



Since A and B are on same vertical line, they have same x-value.
∴ we need to use slope so we go same distance to the right.

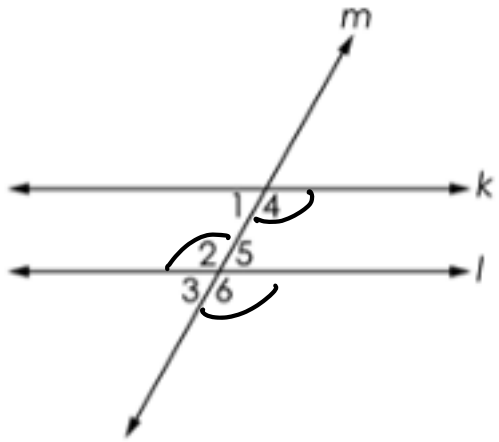


(Mimic 2018 Question 39)

Before completing this proof, first decide what theorem it is trying to prove. State it here.

Alternate Interior angle theorem

A diagram is shown, where $k \parallel l$ and m is a transversal.



Prove: $\angle 2 \cong \angle 4$

	Statement	Reason
1	$k \parallel l$	GIVEN
2	$\angle 2 \cong \angle 6$	vertical $\angle$ Theorem
3	$\angle 6 \cong \angle 4$	Corresponding $\angle$'s Post.
4	$\angle 2 \cong \angle 4$	Congruence of angles is transitive
5		
6		
7		

(Mimic 2019 Question 40)

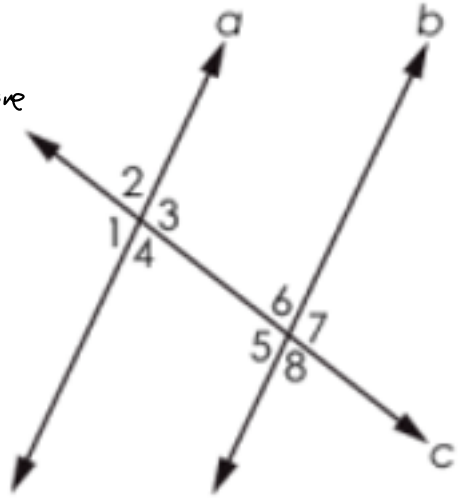
Before completing this proof, first decide what theorem it is trying to prove. State it here.

Prove Alternate Ext ∠ Theorem

OPTION 2

a ∥ b GIVEN
∠1 ≅ ∠3 vertical angle Theorem
∠3 ≅ ∠7 Corresponding ∠'s Post
∠1 ≅ ∠7 Congruence of angles is transitive

Two parallel lines, *a* and *b*, are cut by a transversal *c* as shown.



There are many correct ways to do this. Perchance.

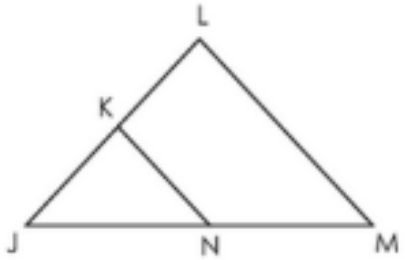
Prove: ∠1 ≅ ∠7

OPTION 1

	Statement	Reason
1	a ∥ b	GIVEN
2	∠1 ≅ ∠5	Corresponding ∠'s Post
3	∠5 ≅ ∠7	vertical angle Theorem
4	∠1 ≅ ∠7	Congruence of angles is transitive
5		
6		
7		

(Mimic 2021 Question 22)

A triangle JLM and line segment KN are given.



A proof of $\frac{JK}{JL} = \frac{JN}{JM}$ is shown.

This is only true if we have parallel lines

Statements	Reasons
△ JLM	Given
?	Given
∠JNK = ∠JML ∠JKN = ∠JLM	Corresponding angles are congruent.
△ JKN = △ JLM	Angle-angle similar triangle postulate
$\frac{JK}{JL} = \frac{JN}{JM}$	Corresponding parts of similar triangles are proportional.

Which statement must be added to the given to keep this proof valid?

Ⓐ $\overline{JL} \perp \overline{LM}$

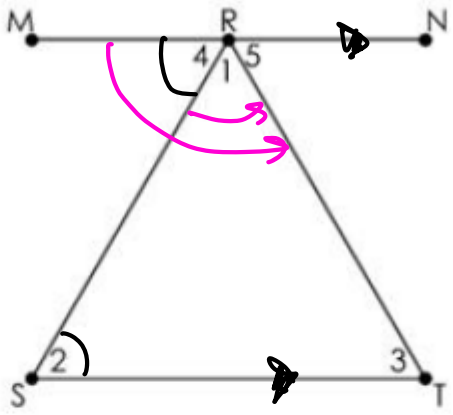
Ⓑ $\overline{KN} \perp \overline{LM}$

Ⓒ $\overline{JL} \parallel \overline{LM}$

Ⓓ $\overline{KN} \parallel \overline{LM}$

(Mimic 2022 Question 43)

In the figure shown, $\overline{MN} \parallel \overline{ST}$.



Move statements and reasons into the blank boxes to complete the proof that $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

Statements	Reasons
1. $\overline{MN} \parallel \overline{ST}$	1. Given
2. $m\angle 2 = m\angle 4$ and $m\angle 3 = m\angle 5$	2. Alternate int ∠ Th'm
3. $m\angle 4 + m\angle 1 = m\angle MRT$	3. Angle addition postulate
4. $m\angle MRT + m\angle 5 = 180$	4.
5. $m\angle 4 + m\angle 1 + m\angle 5 = 180°$	5. Substitution
6. $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	6. Substitution

weak

weak

$m\angle 1 + m\angle 2 + m\angle 3 = 180°$

$m\angle MRT + m\angle 5 = 180°$

$m\angle MRT + m\angle 2 = 180°$

Linear pair theorem

Definition of complementary angles

Vertical angles are congruent.

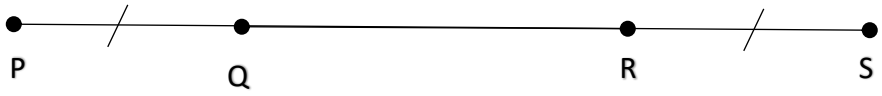
Alternate exterior angles are congruent.

Alternate interior angles are congruent.

$m\angle 4 + m\angle 1 + m\angle 5 = 180$

 Name_____

Problem A
Given $PQ = RS$
Prove: $PR = QS$



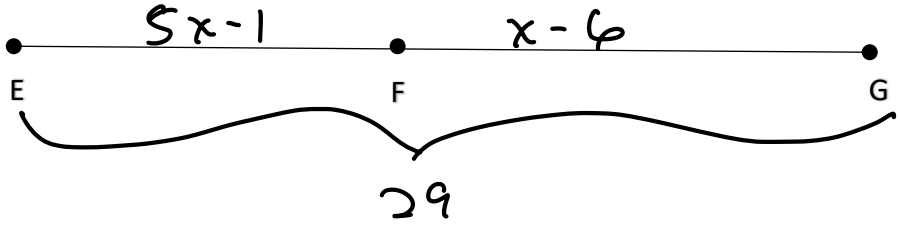
	Statement	Reason
1	$PQ = RS$	Given
2	$PR = PQ + QR$	Segment Add'n Post
3	$QS = QR + RS$	Segment Add'n Post
4	$PR = RS + QR$	Subst PoE
5	$PR = QS$	Subst PoE
6		
7		

Problem B
Given: $\frac{1}{2}x + \frac{3}{2} = -7$
Solve: $x = -17$

	Statement	Reason
1	$\frac{1}{2}x + \frac{3}{2} = -7$	Given
2	$x + 3 = -14$	Mult PoE
3	$x = -17$	Subtr. PoE
4		
5		
6		
7		

Problem C

If F is between E and G, and $EF = 5x - 1$, $FG = x - 6$ and $EG = 29$, solve for x.



$EF + FG = EG$

$(5x-1)+(x-6) = 29$

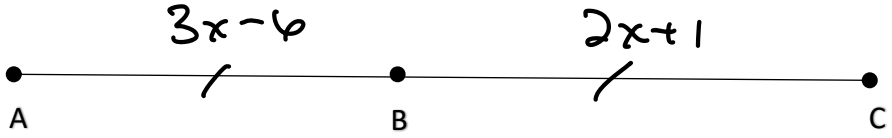
$6x - 7 = 29$

$6x = 36$

$x = 6$

Problem D

If B is the midpoint of $\overline{AC}$, and $AB = 3x - 6$, and $BC = 2x + 1$ solve for x.



$AB = BC$

$3x - 6 = 2x + 1$

$x - 6 = 1$

$x = 7$