

3-2 NOTES Angles and Parallel Lines

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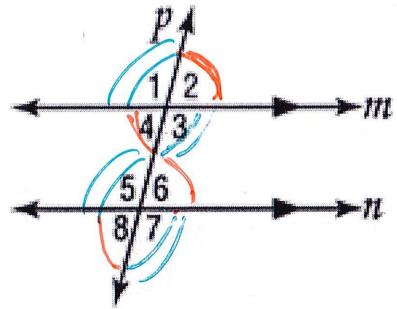
• Transversal *line p*

• corresponding angles $\angle 2 \hat{=} \angle 6$ $\angle 3 \hat{=} \angle 7$

$\angle 4 \hat{=} \angle 8$ $\angle 1 \hat{=} \angle 5$

• alternate interior angles $\angle 3 \hat{=} \angle 5$ $\angle 4 \hat{=} \angle 6$

• alternate exterior angles $\angle 2 \hat{=} \angle 8$ $\angle 1 \hat{=} \angle 7$



• consecutive interior $m\angle 3 + m\angle 6 = 180^\circ$

Supplementary

$m\angle 4 + m\angle 5 = 180^\circ$

Exercises

In the figure, $m\angle 3 = 102^\circ$. Find the measure of each angle. Tell which postulate(s) or theorem(s) you used.

1. $\angle 5$ 102° Alt Interior

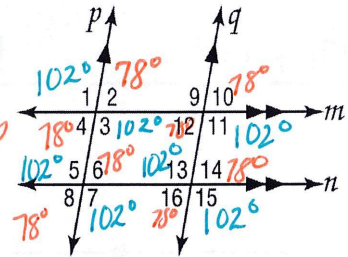
2. $\angle 6$ 78° Consec ^{Supp} Interior Angles

3. $\angle 11$ 102° Corresponding Angles

4. $\angle 7$ 102° Corresponding

5. $\angle 15$ 102° Corresponding $\angle 5$

6. $\angle 14$ 78° Consec Inter angles



In the figure, $m\angle 9 = 80^\circ$ and $m\angle 5 = 68^\circ$. Find the measure of each angle. Tell which postulate(s) or theorem(s) you used.

7. $\angle 12$ 100° Supplementary

8. $\angle 1$ 68° Corresponding $\angle 5$

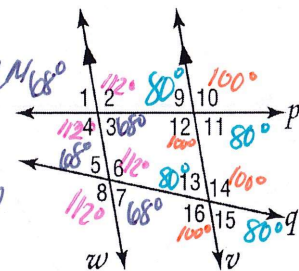
9. $\angle 4$ 112° Consec Interior $\angle 5$

10. $\angle 3$ 68° Alt interior angles

11. $\angle 7$ 68° Vertical angles

12. $\angle 16$ 100° Consecutive Vertical Angles

Or Vertical because you know $\angle 14$



3-2 NOTES Angles and Parallel Lines

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13. If $m\angle 1 = 3x+15$, $m\angle 2 = 4x-5$, and $m\angle 3 = 5y$, find the value of x and y .

P11q, $m\angle 1 = m\angle 2$

$$\begin{array}{r} 3x+15 = 4x-5 \\ -3x \quad +5 \quad -3x \quad +5 \\ \hline 20 = x \end{array}$$

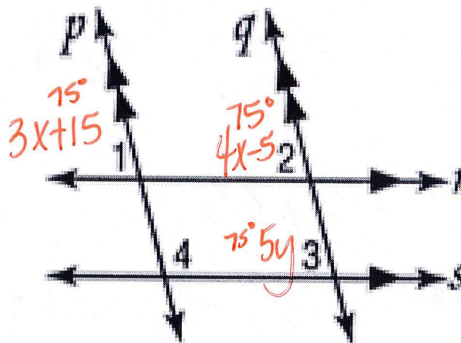
 $m\angle 2 = 4(20) - 5$

$$\begin{array}{r} 80 - 5 \\ \hline 75 \end{array}$$

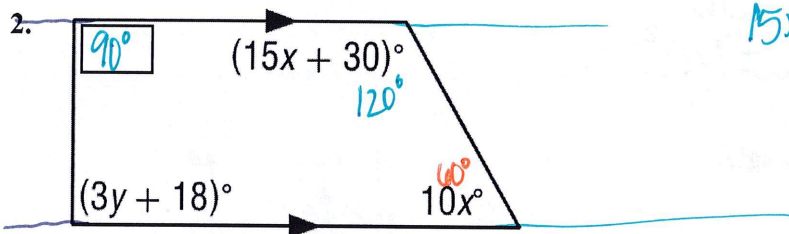
$\parallel \text{ lines } m\angle 2 = m\angle 3$

$$\frac{75}{5} = \frac{5y}{5}$$

$$15 = y$$



Find the value of the variable(s) in each figure. Explain your reasoning.



$15x + 30 + 10x = 180$

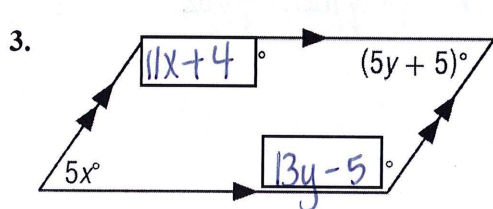
$$\begin{array}{r} 15x + 30 + 10x = 180 \\ -30 \quad -30 \\ \hline 25x = 150 \\ x = 6 \end{array}$$

 $15(6) + 30$

$$\begin{array}{r} 90 + 30 \\ \hline 120 \end{array}$$

Corresp inter \angle 's
 $90 + 3y + 18 = 180$

$$\begin{array}{r} 90 + 3y + 18 = 180 \\ -108 \quad -108 \\ \hline 3y = 72 \\ y = 24 \end{array}$$

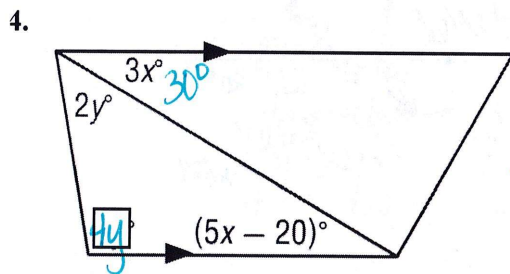


$5y + 5 + 13y - 5 = 180$

$$\begin{array}{r} 18y = 180 \\ y = 10 \end{array}$$

$11x + 4 + 5x = 180$

$$\begin{array}{r} 16x + 4 = 180 \\ 16x = 176 \\ x = 11 \end{array}$$



$3x = 5x - 20$

$$\begin{array}{r} 3x = 5x - 20 \\ -5x \quad -5x \\ \hline -2x = -20 \\ x = 10 \end{array}$$

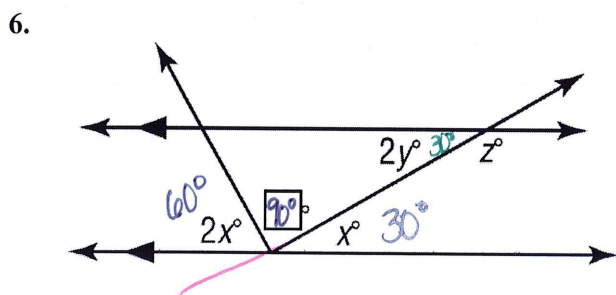
$30 + 2y + 4y = 180$

$$\begin{array}{r} 6y = 150 \\ y = 25 \end{array}$$

 $2y + 30 + 4y = 180$

$$\begin{array}{r} 6y + 30 = 180 \\ -30 \quad -30 \\ \hline 6y = 150 \\ y = 25 \end{array}$$

Find the value of the variable(s) in each figure. Explain your reasoning.



$2x + 90 + x = 180$

$$\begin{array}{r} 3x = 90 \\ x = 30 \end{array}$$

$2y = 30$

$$\begin{array}{r} y = 15 \end{array}$$

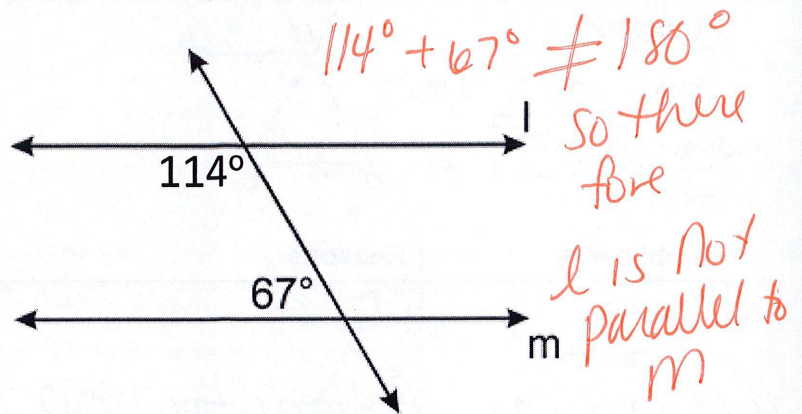
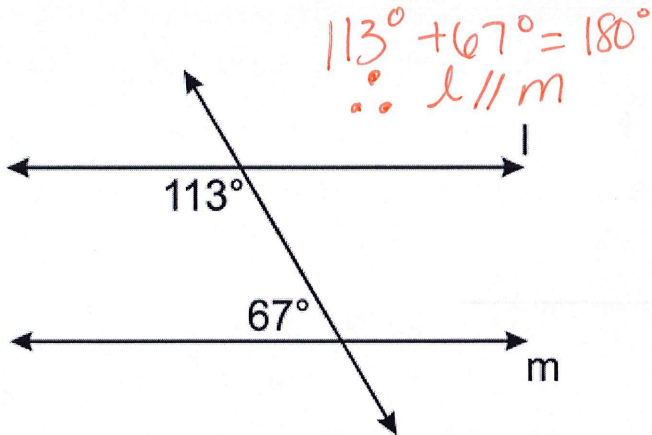
$180 - 30 = z$

$$\begin{array}{r} z = 150 \end{array}$$

3-5 NOTES Proving Parallel Lines

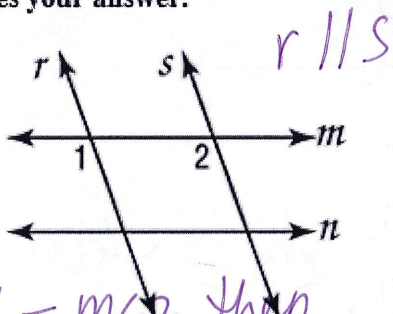
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What's different about these two scenarios? What can we say about the sets of lines?

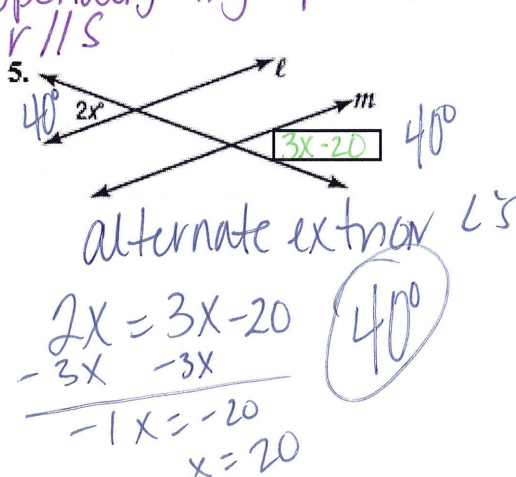


If	Then
<ul style="list-style-type: none"> • corresponding angles are congruent, • alternate exterior angles are congruent, • consecutive interior angles are supplementary, • alternate interior angles are congruent, or • two lines are perpendicular to the same line, 	<p><i>the lines are parallel</i></p>

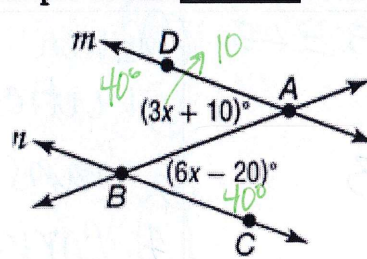
Example 1: If $m\angle 1 = m\angle 2$, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.



If $m\angle 1 = m\angle 2$ then $\angle 1$ & $\angle 2$ are corresponding \angle 's
 So by the converse of the Corresponding Angles post: we know $r \parallel s$



Example 2: Find \square so that $m \parallel n$.



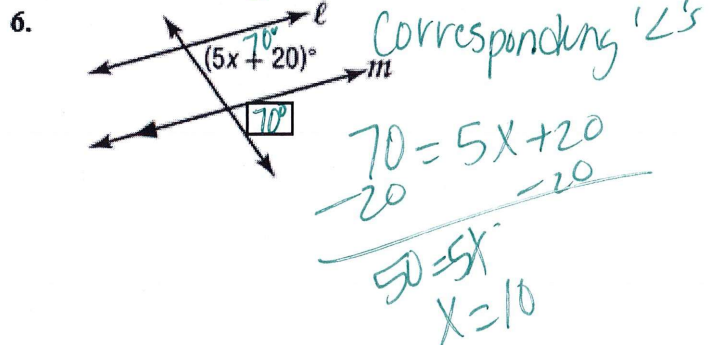
$m\angle ABC = 40^\circ$
 So m is $\parallel n$

$$3x + 10 = 6x - 20$$

$$\begin{array}{r} -3x \\ \hline 10 = 3x - 20 \end{array}$$

$$\begin{array}{r} +20 \\ \hline 30 = 3x \end{array}$$

$$x = 10$$



3-5 NOTES Proving Parallel Lines

Name: _____

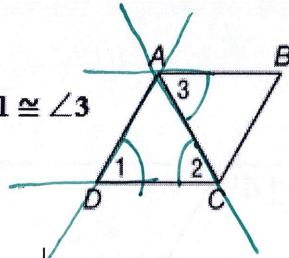
Prove Lines Parallel You can prove that lines are parallel by using postulates and theorems about pairs of angles.

Example:

Given: $\angle 1 \cong \angle 2, \angle 1 \cong \angle 3$

Prove: $\overline{AB} \parallel \overline{DC}$

Proof:



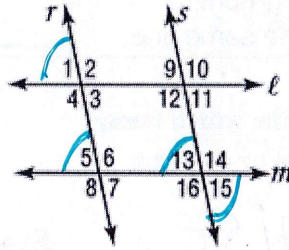
Statements	Reasons
① $\angle 1 \cong \angle 2$ $\angle 1 \cong \angle 3$	① Given
② $\angle 2 \cong \angle 3$	② transitive prop
③ $\overline{AB} \parallel \overline{DC}$	③ Alternate interior angles are \cong then lines are parallel. Converse of Alt Inter \angle 's thm

1. Complete the proof.

Given: $\angle 1 \cong \angle 5, \angle 15 \cong \angle 5$

Prove: $l \parallel m$ rlls

Proof:



Statements	Reasons
① $\angle 1 \cong \angle 5$ $\angle 5 \cong \angle 5$	① Given
② $\angle 13 \cong \angle 5$	② vertical angle
③ $\angle 5 \cong \angle 13$	③ transitive prop.
④ rlls	④ Corresponding \angle 's \cong then lines parallel
⑤ $\angle 1 \cong \angle 5$	⑤ Given
⑥ $l \parallel m$	⑥ If Corre \angle 's \cong then lines are \parallel

3-6 NOTES Perpendiculars and Distance

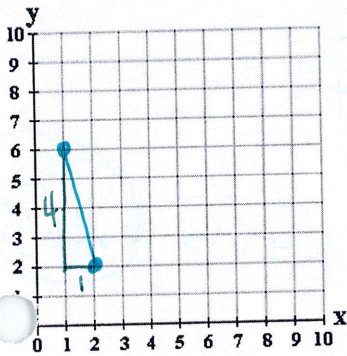
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What is the Slope of a line?

What can we say about Parallel lines?

What can we say about Perpendicular lines?

Flash Back: **Distance Formula!** Find the distance between (2,2) and 1,6



$$1^2 + 4^2 = C^2$$

$$1 + 16 = C^2$$

$$17 = C^2$$

$$\sqrt{17} = C$$

$$d = \sqrt{(2-1)^2 + (2-6)^2}$$

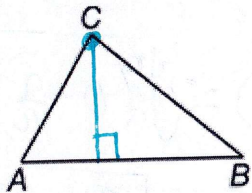
$$d = \sqrt{1^2 + (-4)^2}$$

$$d = \sqrt{17}$$

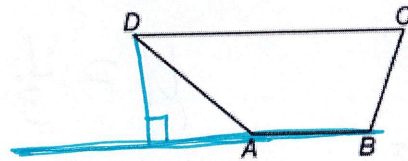
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Distance From a Point to a Line: The distance from a point to a line is the perpendicular distance between that point and the line.

1. C to AB



2. D to AB



COORDINATE GEOMETRY
Line s contains points at (0, 0) and (-5, 5). Find the distance between line s and point

V(1, 5)

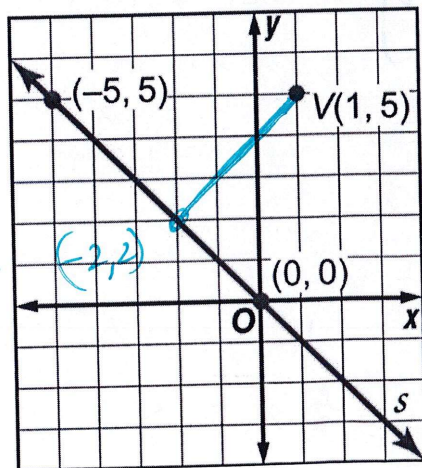
$$d = \sqrt{(-2-1)^2 + (2-5)^2}$$

$$d = \sqrt{(-3)^2 + (-3)^2}$$

$$d = \sqrt{9 + 9}$$

$$d = \sqrt{18}$$

$$d = 3\sqrt{2}$$



$$\begin{pmatrix} -2, 2 \\ 1, 5 \end{pmatrix}$$

$$m = \frac{2-5}{-2-1}$$

$$m = \frac{-3}{-3} \quad (m=1)$$

so slope of perpendicular

needs to be $m = -1$

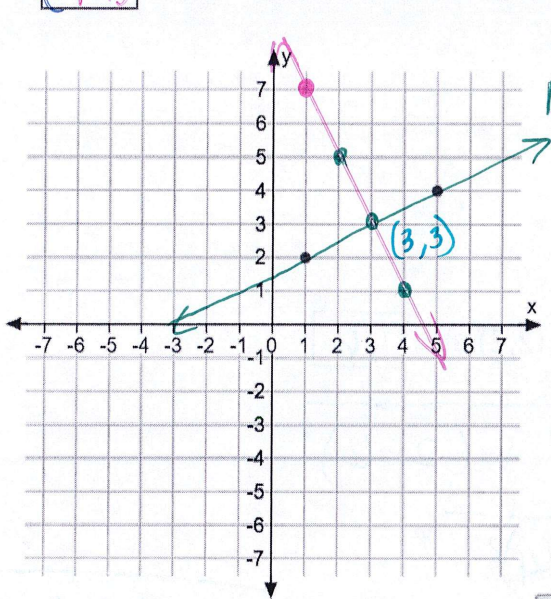
$$m = \frac{5-2}{-5-2} \quad m = \frac{3}{-3}$$

$$\begin{pmatrix} -5, 5 \\ -2, 2 \end{pmatrix}$$

3-6 NOTES Perpendiculars and Distance

Name: _____

2. Line ℓ contains points at (1, 2) and (5, 4). Construct a line perpendicular to ℓ through $(1, 7)$. Then find the distance from P to ℓ .



$$M = \frac{(1, 2)}{(5, 4)} \quad m = \frac{2-4}{1-5} \quad M = \frac{-2}{-4} \quad \left(\frac{1}{2}\right)$$

Slope Must be

$$M = -2$$

$$D = \sqrt{(1-3)^2 + (7-3)^2}$$

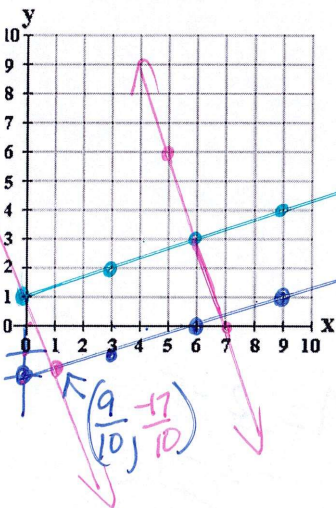
$$D = \sqrt{(-2)^2 + 4^2}$$

$$D = \sqrt{4+16}$$

$$\sqrt{20} = 2\sqrt{5}$$

Find the distance between the parallel lines a and b

whose equations are $y = \frac{1}{3}x + 1$ and $y = \frac{1}{3}x - 2$ respectively.



Slope Must be -3

$$y = \frac{1}{3}x - 2$$

$$y = -3x + 1$$

$$\frac{1}{3}x - 2 = -3x + 1$$

$$y = -3\left(\frac{9}{10}\right) + 1$$

$$y = -\frac{27}{10} + \frac{10}{10}$$

$$y = -\frac{17}{10}$$

$$3\left(\frac{1}{3}x\right) - 2 = 1$$

$$x - 2 = 1$$

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

Distance between $(0, 1)$ & $\left(\frac{9}{10}, -\frac{17}{10}\right)$

$$D = \sqrt{\left(0 - \frac{9}{10}\right)^2 + \left(\frac{10}{10} - \frac{-17}{10}\right)^2}$$

$$\sqrt{\frac{81}{100} + \left(\frac{27}{10}\right)^2}$$

$$\sqrt{\frac{81}{100} + \frac{729}{100}}$$

$$\sqrt{\frac{810}{100}}$$

$$x = \frac{9}{10}$$

$$\frac{\sqrt{810}}{10} = 2.85$$