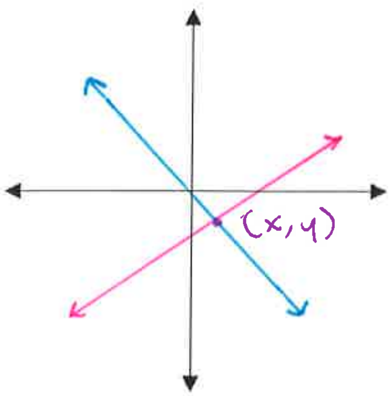
## 2.1-2.4 Guided Notes

### 2.0 Algebra Skills Review: Solving Systems of Linear Equations Algebraically

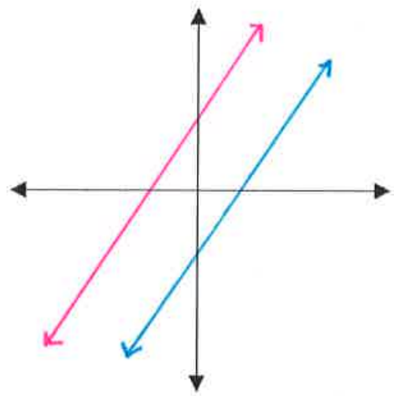
**System of Linear Equations:** two (or more) linear equations in the same variable

**Solution to a System of Linear Equations:** All ordered pairs $(x, y)$ where the lines intersect. These ordered pairs simultaneously satisfy all equations.

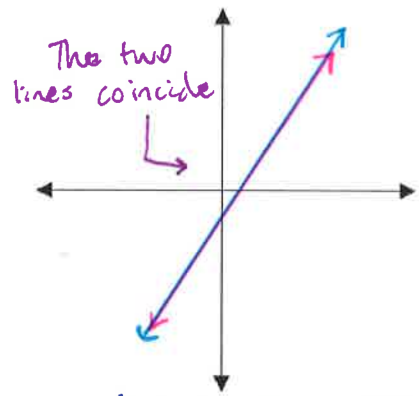
### Three Cases for a System of Two Equations




One Solution $(x, y)$



No Solutions; Parallel Lines




Infinitely Many Solutions; Same Line!

### Example: Solving Systems Algebraically with Substitution and Elimination

**a. Solve by Substitution**

$$\begin{cases} -7x - 2y = -13 \\ x - 2y = 11 \end{cases}$$

$x = 11 + 2y$

$-7(11 + 2y) - 2y = -13$

$-77 - 14y - 2y = -13$

$-77 - 16y = -13$

$-16y = 64$

$\boxed{y = -4}$

$x = 11 + 2y$

$x = 11 + 2(-4)$

$x = 11 - 8$

$\boxed{x = 3}$

$\therefore (3, -4)$ is the solution

**b. Solve by Elimination**

$$\begin{cases} -4x + 9y = 9 \\ (x - 3y = -6)\cdot 3 \end{cases}$$

notice, we need to multiply one equation so coefficients match

$-4x + \cancel{9y} = 9$

$+\ 3x - \cancel{9y} = -18$

$-x = -9$

$\boxed{x = 9}$

$x - 3y = -6$

$(9) - 3y = -6$

$-3y = -15$

$\boxed{y = 5}$

$\therefore (9, 5)$ is the solution

**You Try! Solve with Substitution**

$$\begin{cases} 2x + y = 20 \\ 6x - 5y = 12 \end{cases}$$

$y = 20 - 2x$

$6x - 5(20 - 2x) = 12$

$6x - 100 + 10x = 12$

$16x - 100 = 12$

$16x = 112$

$\boxed{x = 7}$

$y = 20 - 2x$

$y = 20 - 2(7)$

$y = 20 - 14$

$\boxed{y = 6}$

$\therefore (7, 6)$ is the solution

**You Try! Solve with Elimination**

$$\begin{cases} 8x + 14y = 4 \\ (-6x - 7y = -10)\cdot 2 \end{cases}$$

$8x + \cancel{14y} = 4$

$+\ -12x - \cancel{14y} = -20$

$-4x = -16$

$\boxed{x = 4}$

$8x + 14y = 4$

$8(4) + 14y = 4$

$32 + 14y = 4$

$14y = -28$

$\boxed{y = -2}$

$\therefore (4, -2)$ is the solution

## 2.1-2.4 Guided Notes

### Example: Special Cases

**a. Solve using any method.**

$$\begin{cases} 2x+8y=6 \\ -5x-20y=-15 \end{cases}$$

$\frac{2x+8y}{2}=\frac{6}{2}$

$x+4y=3$

$x=3-4y$

$-5(3-4y)-20y=-15$

$-15+20y-20y=-15$

$-15=-15$

* All variables disappear! Since the statement is true $(-15=-15)$, then this means infinitely many solutions!

$\boxed{\therefore \text{Infinitely many solutions!}}$

**b. Solve using any method.**

$$\begin{cases} -3x+3y=4 \\ (-x+y=3)\,{-3} \end{cases}$$

$\cancel{-3x}+\cancel{3y}=4$

$+\ \cancel{3x}-\cancel{3y}=-9$

$0=-5$

* All variables disappear! Since the statement is false, this means no solutions! (parallel lines)

$\boxed{\therefore \text{No solutions!}}$

**You Try! Solve using any method.**

$$\begin{cases} 2x+14y=4 \\ (x+7y=7)\,2 \end{cases}$$

$2x+14y=4$

$-(2x+14y=14)$

$0=-10$ FALSE!

$\boxed{\therefore \text{No Solutions!}}$

**You Try! Solve using any method.**

$$\begin{cases} -3x+12y=9 \\ x=4y-3 \end{cases}$$

$-3(4y-3)+12y=9$

$-12y+9+12y=9$

$9=9$ TRUE!

$\boxed{\therefore \text{Infinitely Many Solutions!}}$

### Example: Word Problems (Standardized Test Questions)

a. SAT A food truck sells salads for \$6.50 each and drinks for \$2.00 each. The food truck's revenue from selling a total of 209 salads and drinks in one day was \$836.50. How many salads + drinks were sold?

Let $s$ = # of salads and $d$ = # of drinks

$$\begin{cases} 6.5s+2d=836.5 \\ s+d=209 \end{cases}$$

* try eliminating d!

$6.5s+2d=836.5$

$-(2s+2d=418)$

$4.5s=418.5$

$\boxed{s=93}$

$s+d=209$

$(93)+d=209$

$\boxed{d=116}$

$\therefore$ 93 salads and 116 drinks were sold

b. SBA The basketball team sold t-shirts and hats as a fund-raiser. They sold a number of 23 items and made a profit of \$246. If they made a profit of \$10 for each t-shirt sold and a profit of \$12 for each hat sold, how many of each item did the basketball team sell?

Let $s$ = # of shirts and $h$ = # of hats

$$\begin{cases} 10s+12h=246 \\ s+h=23 \end{cases}$$

$s=23-h$

$10(23-h)+12h=246$

$230-10h+12h=246$

$2h=16$

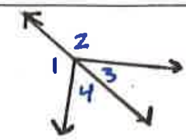
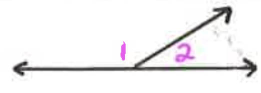
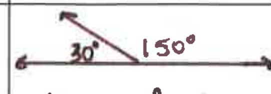
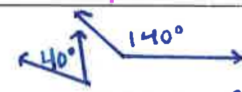
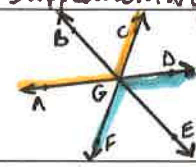
$\boxed{h=8}$

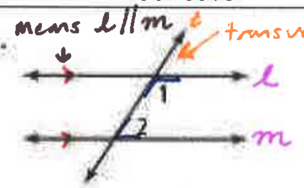
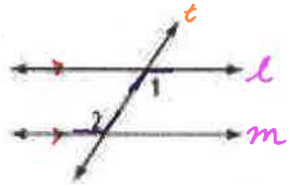
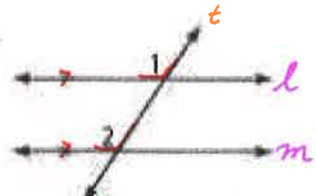
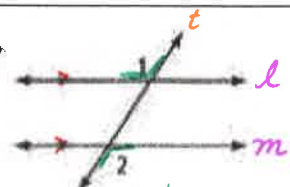
$s=23-8$

$\boxed{s=15}$

$\therefore$ 8 hats and 15 t-shirts were sold

# 2.1-2.4 Guided Notes

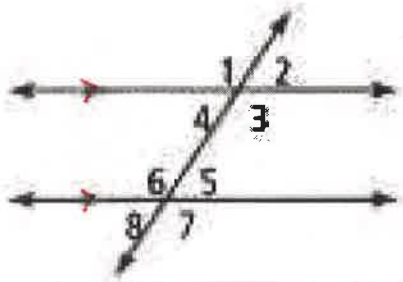
| 2.1 Parallel and Perpendicular Lines | |
|---|---|
| **Description** | **Example** |
| **Adjacent Angles:** two angles that share a common vertex and a common side and don't overlap. |  ∠1 + ∠2<br>∠1 + ∠4<br>∠2 + ∠3<br>∠3 + ∠4 |
| **Linear Pair of Angles:** adjacent angles formed by two supplementary angles |  ∠1 + ∠2 are a linear pair |
| **Supplementary Angles:** two angles whose sum is 180°. All linear pairs are supplementary! |  - Linear Pair<br>- Supplementary<br> - NOT Linear Pair<br>- Supplementary |
| **Vertical Angles:** opposite angles formed by two intersecting lines that share a common vertex, but have no common sides. All vertical ∠ pairs are ≅. |  ∠AGC + ∠DGF are vertical ∠s |

| Theorems | | |
|---|---|---|
| **Same Side Interior Angles Postulate (2-1):** If a transversal intersects two parallel lines, then same-side interior angles are supplementary. | If... means ℓ//m, transversal  - same side of transversal<br>- inside the // lines | **Conclusion:**<br>m∠1 + m∠2 = 180°<br>(∠1 and ∠2 are supplementary) |
| **Alternate Interior Angles Thm (2-1):** If a transversal intersects two parallel lines, then alternate interior angles are congruent. | If...  - alternate sides of transversal<br>- inside the // lines | **Conclusion:**<br>∠1 ≅ ∠2 |
| **Corresponding Angles Thm (2-2):** If a transversal intersects two parallel lines, then corresponding angles are congruent. | If...  - same position relative to transversal and // lines | **Conclusion:**<br>∠1 ≅ ∠2 |
| **Alternate Exterior Angles Thm (2-3):** If a transversal intersects two parallel lines, then the alternate exterior angles are congruent. | If...  - alternate sides of transversal<br>- outside the // lines | **Conclusion:**<br>∠1 ≅ ∠2 |

**Example 1**: Identify the pairs of angles of each angle type of angle from the figure below.

## 2.1-2.4 Guided Notes

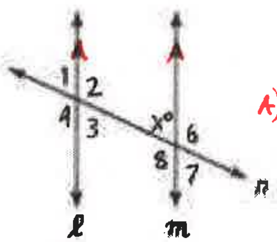
**Corresponding Angles:** $\angle 1 + \angle 6$ ; $\angle 4 + \angle 8$ ; $\angle 2 + \angle 5$ ; $\angle 3 + \angle 7$




Alternate Interior Angle: $\angle 4 + \angle 5$ ; $\angle 3 + \angle 6$

Alternate Exterior Angles: $\angle 1 + \angle 7$ ; $\angle 2 + \angle 8$

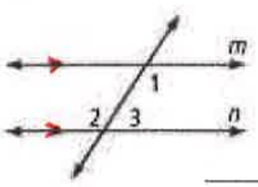
**Example 2**: How can you express each of the numbered angles in terms of x?




* Look for congruent relationships (Corresponding, AIA, AEA, Vertical)
AND
* Look for supplementary relationships (Linear Pair, Same-side Interior)

A) $m\angle 1 = x°$ (Corr. $\angle$s)
B) $m\angle 2 = 180° - x°$ (Same side Int)
C) $m\angle 3 = x°$ (AIA)
D) $m\angle 4 = 180° - x°$ (Substitution / Linear pair)
E) $m\angle 6 = 180° - x°$ (linear pair)
F) $m\angle 7 = x°$ (Vertical $\angle$s)
G) $m\angle 8 = 180° - x°$ (linear pair)

**Example 3:** Prove the Alternate Interior Angles Theorem.




**Given:** $m \parallel n$

**Prove:** $\angle 1 \cong \angle 2$

| Statement | Reason |
|---|---|
| 1) $m \parallel n$ | 1) Given |
| 2) $\angle 1$ and $\angle 3$ are same side interior $\angle$s | 2) Def. of Same side interior $\angle$s |
| 3) $m\angle 1 + m\angle 3 = 180°$ | 3) Same Side Interior $\angle$ Postulate |
| 4) $m\angle 2 + m\angle 3 = 180°$ | 4) Linear Pair Theorem |
| 5) $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$ | 5) Substitution |
| 6) $m\angle 1 = m\angle 2$ | 6) Subtraction Property of = |
| 7) $\angle 1 \cong \angle 2$ | 7) Def. of $\cong$ $\angle$s |

**Example 4:** The white trim shown for the wall of a barn should be constructed so that $\overline{AC} \parallel \overline{EG}$, $\overline{JA} \parallel \overline{HB}$ and $\overline{JC} \parallel \overline{KG}$ Find the measure of the missing angles.

## 2.1-2.4 Guided Notes


$\overline{AC} \parallel \overline{EG}$

$\overline{JA} \parallel \overline{HB}$

$\overline{JC} \parallel \overline{KG}$

$m\angle 1 = 180^\circ - 68^\circ = \boxed{112^\circ}$

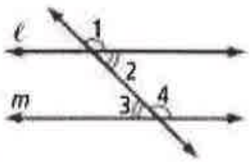
$m\angle 2 = 68^\circ$

$m\angle 3 = 68^\circ$

### 2.2 Proving Lines Parallel

### Warm-Up

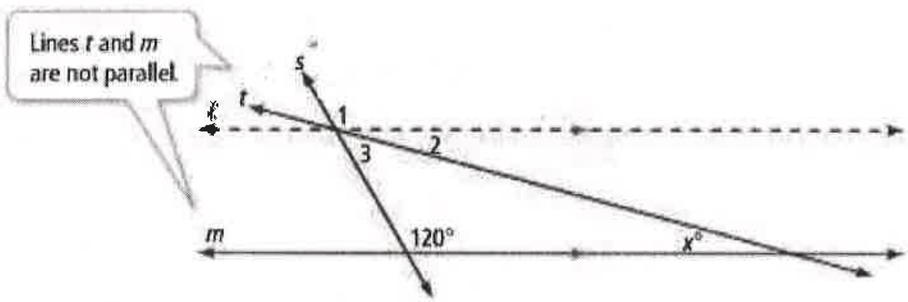
Analyze the diagram to see if line *l* is parallel to line *m*. Is there enough information to determine if the lines are parallel?




Yes, since we see congruent alternate interior angles and congruent corresponding angles.

However, we don't have a theorem for this yet!

**Example 1:** Line *l* is parallel to line *m*, find the missing angle measures. Explain your reasoning.

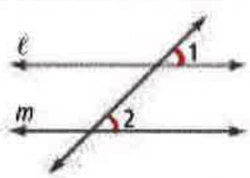
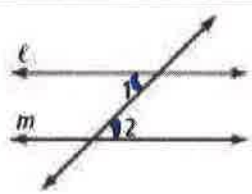
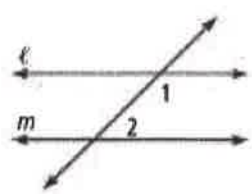



$\boxed{m\angle 1 = 120^\circ}$

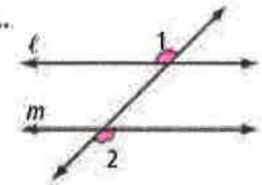
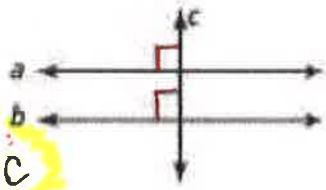
$\boxed{m\angle 2 = x^\circ}$

$\boxed{m\angle 2 + m\angle 3 + 120^\circ = 180^\circ, \text{ so } m\angle 2 + m\angle 3 = 60^\circ}$

### Theorems

| | | |
|---|---|---|
| **Converse of the Corresponding Angles Thm (2-4):** If two lines and a transversal form corresponding angles that are congruent, then the lines are parallel. | **If...**  | **Conclusion:** $l \parallel m$ |
| **Converse of the Alternate Interior Angles Thm (2-5):** If two lines and a transversal form alternate interior angles that are congruent, then the lines are parallel. | **If...**  | **Conclusion:** $l \parallel m$ |
| **Converse of the Same-Side Interior Angles Postulate(2-6):** If two lines and a transversal form same-side interior angles that are supplementary, then the lines are parallel. | **If...** $m\angle 1 + m\angle 2 = 180$  | **Conclusion:** $l \parallel m$ |

## 2.1-2.4 Guided Notes

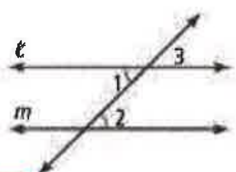
| | | |
|---|---|---|
| **Converse of the Alternate Exterior Angles Thm (2-7):** If two lines and a transversal form alternate exterior angles that are congruent, then the lines are parallel. | If...  | **Conclusion:** $l \parallel m$ |
| **Thm (2-8):** If two lines are parallel to the same line, then they are all parallel to each other. Parallel Transitivity | If...  | **Conclusion:** $a \parallel b$ |
| **Thm (2-9):** If two lines are perpendicular to the same line, then they are parallel to each other. Parallel Perpendicular Lines | If...  Notation: $a \perp c$ | **Conclusion:** $a \parallel b$ |

### Flow Chart Proof

Write a flow chart proof to prove the Converse of the Alternate Interior Angles Theorem.

**Given:** $\angle 1 \cong \angle 2$

**Prove:** $\ell \parallel m$



Statements up top

(reasons underneath)

**Proof:**

$\angle 1 \cong \angle 2$ ← statement

reason → Given

$\angle 1 \cong \angle 3$

$\boxed{\text{Vertical } \angle\text{s Thm}}$

$\boxed{\angle 2 \cong \angle 3}$

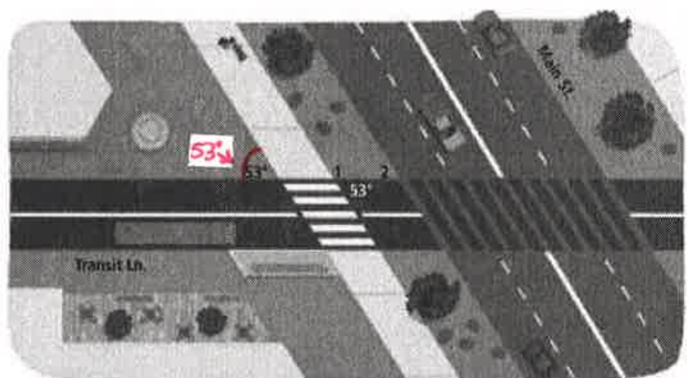
Transitive Prop. of $\cong$

$\ell \parallel m$

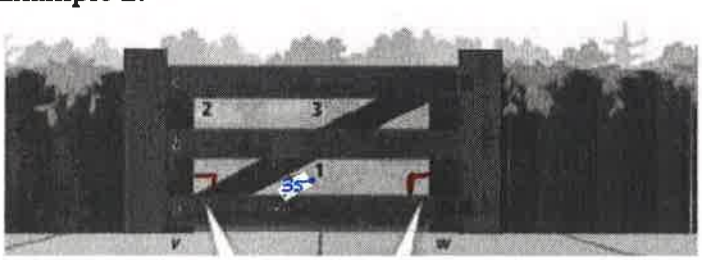
$\boxed{\text{Converse of Corresponding Angles Theorem}}$

**Example 1:** Determine whether the lines are parallel.
The edges of a new sidewalk must be parallel in order to meet accessibility requirements. Concrete is poured between straight strings. How does an inspector know that the edges of the sidewalk are parallel?

The inspector should ensure the alternate exterior $\angle$s are $\cong$. Since both $= 53°$, the edges are $\parallel$.




**Example 2:**



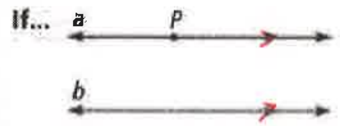
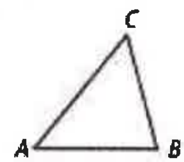
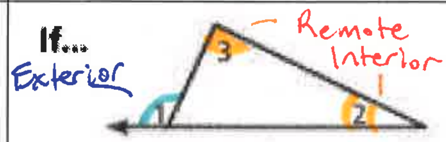

a) When building a gate, how does Bailey know that the vertical boards $v$ and $w$ are parallel?

Bailey can use a t-square to check $\perp$. The vertical boards should be $\perp$ to the bottom board.

b) What should the m$\angle$1 to ensure board b is parallel to board a?

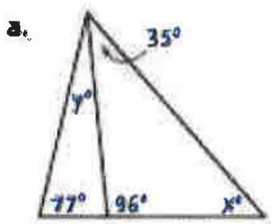
$m\angle 1 + 35° = 180°$, so $\boxed{m\angle 1 = 145°}$

# 2.1-2.4 Guided Notes

| 2.3 Parallel Lines and Triangle Angle Sums | | |
|---|---|---|
| **Theorems** | | |
| **Theorem (2-10):** Through a point not on a line, there is one and only one line parallel to the given line. Parallel Postulate |  | **Conclusion:** There is one unique line, a, that passes through P and is // to b |
| **Triangle Angle Sum Thm (2-11):** The sum of the measures of all the angles of a triangle is 180°. |  | **Conclusion:** $m\angle A + m\angle B + m\angle C = 180°$ |
| **Triangle Exterior Angle Thm (2-12):** The measure of each exterior angle of a triangle equals the sum of the measures of its two remote interior angles. |  | **Conclusion:** $m\angle 1 = m\angle 2 + m\angle 3$ |

**Example 1:** Determine the values of x and y.

**a.**




$96° = y + 77°$

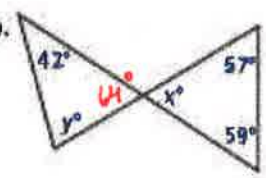
$\boxed{y = 19°}$

$x + 96 + 35 = 180°$

$x + 131 = 180$

$\boxed{x = 49°}$

**b.**




$x + 57 + 59 = 180$

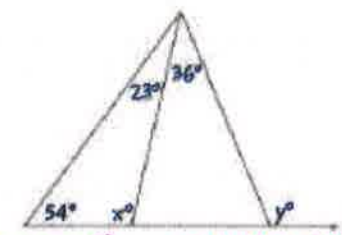
$x + 116 = 180$

$\boxed{x = 64°}$

$y + 42 + 64 = 180°$

$\boxed{y = 74°}$

**c.**




$x + 54 + 23 = 180$

$x + 77 = 180$

$\boxed{x = 103°}$

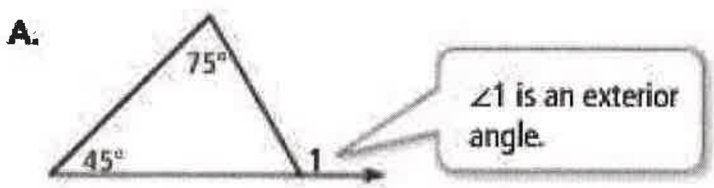
$54 + (23 + 36) = y$

$y = 54 + 59$

$\boxed{y = 113°}$

**Example 2:** What is the missing angle measure in each figure?

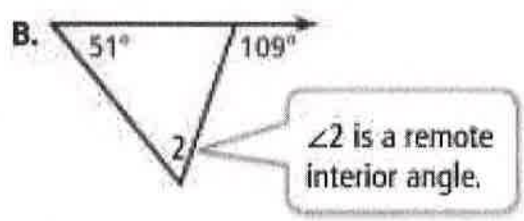
**A.**




$m\angle 1 = 75 + 45$

$\boxed{m\angle 1 = 120°}$

**B.**




$m\angle 2 + 51° = 109°$

$\boxed{m\angle 2 = 58°}$

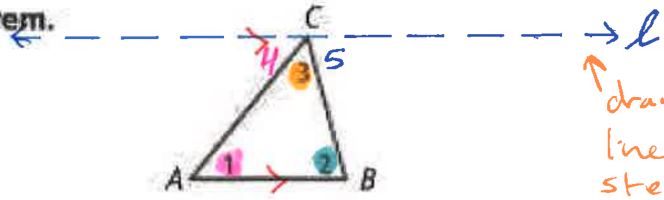
# 2.1-2.4 Guided Notes

**Example 2:**

**Prove the Triangle Angle-Sum Theorem.**

**Given:** $\triangle ABC$

**Prove:** $m\angle 1 + m\angle 2 + m\angle 3 = 180$



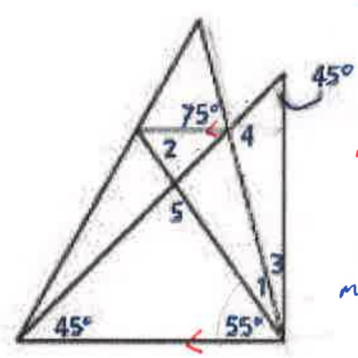

drawing this line is a step from below!

**Plan:** Draw a line through C, because a straight angle measures 180°. This line should be parallel to the line containing $\overline{AB}$ so that an alternate interior relationship is formed.

| Statement | Reason |
|---|---|
| ① $\triangle ABC$ | ① Given |
| ② draw $\ell$ through C so that $\ell \parallel \overline{AB}$ | ② Parallel Postulate |
| ③ Locate alternate interior angles $\angle 4$ and $\angle 5$ | ③ Definition of an angle |
| ④ $\angle 1 \cong \angle 4$ ; $\angle 2 \cong \angle 5$ | ④ Alternate Interior Angles Thm |
| ⑤ $m\angle 3 + m\angle 4 + m\angle 5 = 180°$ | ⑤ Angle Addition Postulate |
| ⑥ $m\angle 1 + m\angle 2 + m\angle 3 = 180°$ | ⑥ Substitution |

**Example 4:**

**Cheyenne built this display for her ornament collection. Each shelf is parallel to the base. She recalls only the angle measures shown in the diagram. Now she wants to build another just like it. What are the measures of ∠1, ∠2, and ∠3?**




$\boxed{m\angle 2 = 55°}$ (AIA)

$m\angle 1 + 55° = 75°$ (CA)

$\boxed{m\angle 1 = 20°}$

$m\angle 5 + 45 + 55 = 180$

$\boxed{m\angle 5 = 80°}$

$m\angle 1 + m\angle 3 + 55 + 45 + 45 = 180°$

$m\angle 3 + 20° + 55° + 45° + 45° = 180°$

$\boxed{m\angle 3 = 15°}$

$m\angle 3 + m\angle 4 + 45° = 180°$

$m\angle 4 + 15° + 45° = 180°$

$\boxed{m\angle 4 = 120°}$

# 2.1-2.4 Guided Notes

## 2.4 Slopes of Parallel and Perpendicular Lines

**Review Vocabulary:** Tell your partner what you remember about slope.

m **Slope:** = $\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$ = Average Rate of Change on an interval! = $\boxed{m}$

**Positive Slope:** $m > 0$. The line rises when looking left to right.

**Negative Slope:** $m < 0$. The line falls when looking left to right.

**Equation of a line:**

Slope-Intercept: $y = mx + b$ (slope: $m$, y-intercept: $b$)

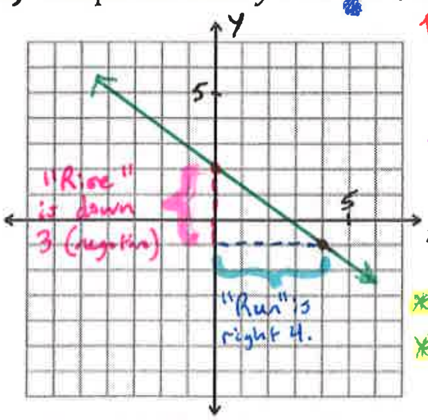
Point-Slope: $y - y_1 = m(x - x_1)$ (point: $(x_1, y_1)$, slope: $m$)

**Example 1:**

**a)** Graph the line: $y = -\frac{3}{4}x + 2$

y-int at (0,2)

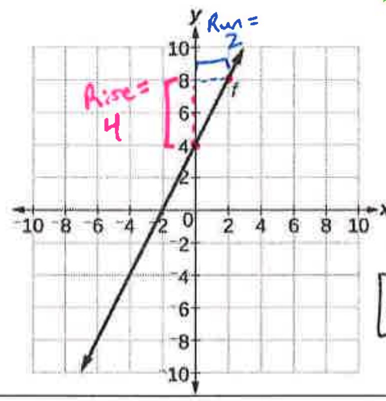
$m = -\frac{3}{4}$, so down 3, right 4.




* Arrowheads
* Straight Edge

**b.** Write the equation of the line.

* Always check units on grid!! *




$y = mx + b$

$m = \frac{\text{Rise}}{\text{Run}} = \frac{4}{2} = 2$

$b = \text{y-int} = 4$

$\boxed{\therefore y = 2x + 4}$

**Practice:** Find the slope between the set of points.

a. (2, 2) and (5, 4)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 2}{5 - 2} = \frac{2}{3}$

$\boxed{m = \frac{2}{3}}$

**b.** (-1, -2) and (2, 1)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - {}^-2}{2 - {}^-1} = \frac{3}{3} = 1$

$\boxed{m = 1}$

**Discuss:** Nadia and Jake begin climbing to the top of a 100-foot monument along two different sets of stairs at the same rate. The table shows their distances above ground level after a number of steps. (Rate of change = slope)

**Nadia**

| Steps | Distance (ft) |
|---|---|
| 1 | 2 |
| 3 | 3 |
| 17 | 10 |
| 25 | 14 |

**Jake**

| Steps | Distance (ft) |
|---|---|
| 1 | 5 |
| 7 | 8 |
| 15 | 12 |
| 29 | 19 |

a) How many feet does each student climb after 10 steps? Explain.

$m_N = \frac{3-2}{3-1} = \frac{1}{2}$ $\boxed{m_N = \frac{1}{2}}$

$m_J = \frac{8-5}{7-1} = \frac{3}{6} = \frac{1}{2}$ $\boxed{m_J = \frac{1}{2}}$

If a step is like the run, then $\frac{1}{2} = \frac{y}{10}$, so they each climb 5 feet.

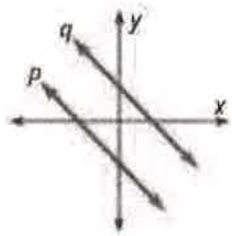
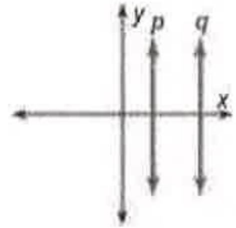
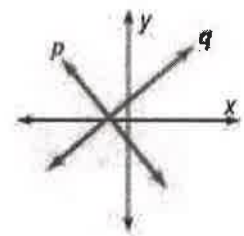
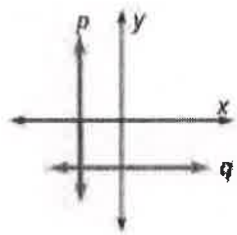
b) Will Nadia and Jake be at the same height at the same number of steps? Explain.

No, even though their average rate of change is the same (1 ft / 2 steps), they started @ different heights

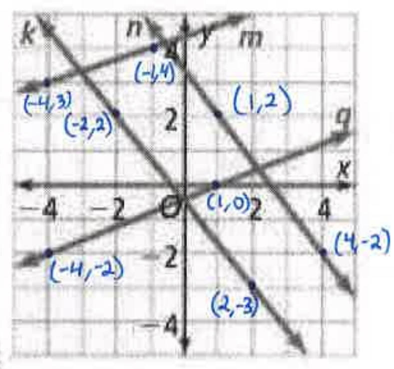
c) What would you expect the graphs of each to look like given your answers to parts A and B? Explain.

The graphs would have the same slope but different y-intercepts (parallel lines)

# 2.1-2.4 Guided Notes

| Theorems | | |
|---|---|---|
| **Theorem (2-13):** Two non-vertical lines are parallel if and only if their slopes are parallel.<br><br>Any two vertical lines are parallel. | If... *p* and *q* are both not vertical<br><br>Then $p \parallel q \Leftrightarrow$ their slopes are equal! | If... *p* and *q* are both vertical<br><br>Then $p \parallel q$ |
| **Theorem (2-14):** Two non-vertical lines are perpendicular if and only if the product of their slopes is -1.<br><br>A vertical line and a horizontal line are perpendicular to each other.<br><br>* ⊥ slopes are opposite reciprocals * | If... *p* and *q* are both not vertical<br><br>Then $p \perp q \Leftrightarrow$ their slopes are opposite reciprocals. | If... one of *p* and *q* is vertical and the other is horizontal<br><br>Then $p \perp q$ |

**Example 1:** Check Parallelism.
Are lines k and n parallel? Justify your answer.




① Find slopes of each line.

$m_k = \frac{2 - -3}{-2-2} = \frac{5}{-4}$ $\boxed{m_k = -\frac{5}{4}}$

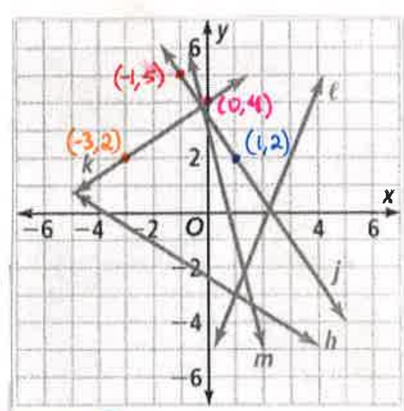
$m_n = \frac{2-2}{1-4} = \frac{4}{-3}$ $\boxed{m_n = -\frac{4}{3}}$

$m_m = \frac{4-3}{-1--4} = \frac{1}{3}$ $\boxed{m_m = \frac{1}{3}}$

$m_q = \frac{0--2}{1--4} = \frac{2}{5}$ $\boxed{m_q = \frac{2}{5}}$

② Answer question.
lines k + n aren't parallel. None of the lines are!

**Example 2:** Check Perpendicularity.
Are lines j and k perpendicular? Justify your answer.




① Find slopes of each line.

$m_j = \frac{2-5}{1--1} = -\frac{3}{2}$ $\boxed{m_j = -\frac{3}{2}}$

$m_k = \frac{4-2}{0--3} = \frac{2}{3}$ $\boxed{m_k = \frac{2}{3}}$

② Compare slopes.

$-\frac{3}{2}$ ⇄ $\frac{2}{3}$
Negative Positive
OPPOSITE RECIPROCALS!

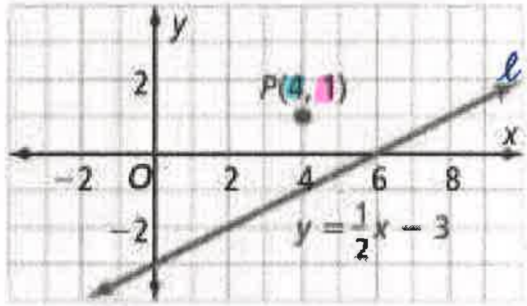
-OR-

Multiply to see if product is -1.
$\left(-\frac{3}{2}\right)\left(\frac{2}{3}\right) = -1$

$\boxed{\therefore j \perp k}$

## 2.1-2.4 Guided Notes

**Example 3:** Write the equation of parallel and perpendicular lines.




**a)** What is an equation of the line through P that is parallel to line *l*?

**Step 1:** Find the slope of the given line.

$\boxed{m = \frac{1}{2}}$ since the equation is in $y = mx + b$

**Step 2:** Solve for the y-intercept by substituting the slope and point into the equation y = mx +b.

$y = mx + b$

$(1) = \frac{1}{2}(4) + b$

$b + 2 = 1$

$\boxed{b = -1}$

* You could also use Point-Slope form! *

**Step 3:** Write the equation of the line.

$\boxed{\therefore y = \frac{1}{2}x - 1}$

**b)** What is the equation of the line through P perpendicular to line *l*?

**Step 1:** Identify the slope of the perpendicular line.

$\perp m$ = opposite reciprocal, ∴ so $\perp m = \frac{-2}{1} = -2$

$\boxed{\therefore m = -2}$

**Step 2:** Solve for the y-intercept by substituting the slope and point into the equation y = mx + b

$(1) = -2(4) + b$

$b - 8 = 1$

$\boxed{b = 9}$

* You could also use Point-Slope form! *

**Step 3:** Write the equation of the line. $\boxed{\therefore y = -2x + 9}$

**You try!**

What are the equations of the lines parallel and perpendicular to the given line y through point T?

**a.** $y = -3x + 2$; $T(3, 1)$

Parallel:

$y = mx + b$; $m = -3$

$(1) = -3(3) + b$

$b - 9 = 1$

$b = 10$

$\boxed{\therefore y = -3x + 10}$

Perpendicular:

$y = mx + b$; $m = \frac{1}{3}$

$(1) = \frac{1}{3}(3) + b$

$b + 1 = 1$

$b = 0$

$\boxed{\therefore y = \frac{1}{3}x}$

**b.** $y = \frac{3}{4}x - 5$; $T(12, -2)$

Parallel:

$y = mx + b$; $m = \frac{3}{4}$

$(-2) = \frac{3}{4}(12) + b$

$b + 9 = -2$

$b = -11$

$\boxed{\therefore y = \frac{3}{4}x - 11}$

Perpendicular:

$y = mx + b$; $m = -\frac{4}{3}$

$(-2) = -\frac{4}{3}(12) + b$

$b - 16 = -2$

$b = 14$

$\boxed{\therefore y = -\frac{4}{3}x + 14}$