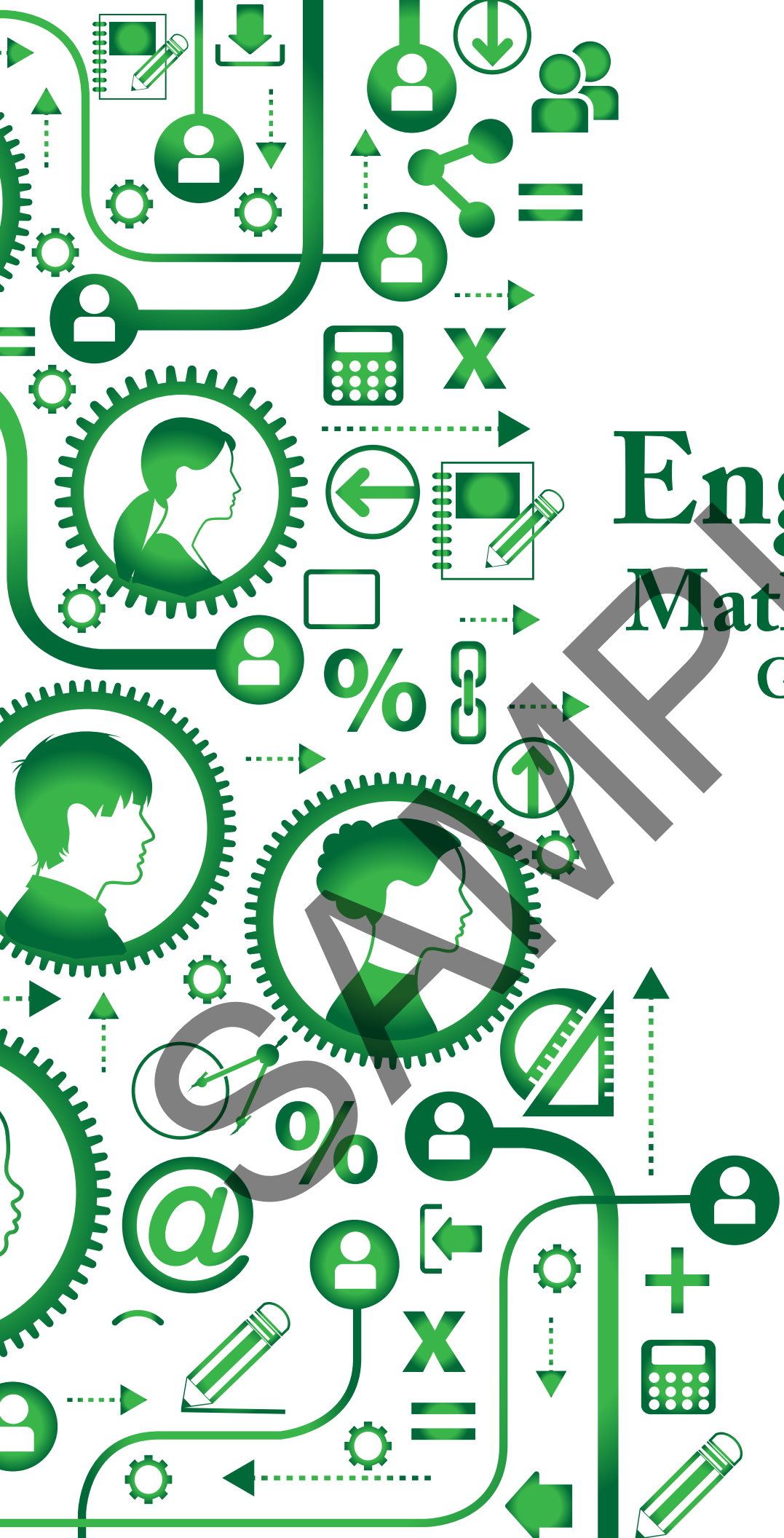

Engaging Mathematics, Geometry

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region4®

Engaging Mathematics, Volume I: Geometry

Teacher Edition

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What is *Engaging Mathematics, Volume I: Geometry*?

1 An instructional resource featuring over 75 Texas Essential Knowledge and Skills (TEKS)-based, classroom-ready mathematics activities that each take approximately 10 to 15 minutes to complete. We took the best activities of the original series, refreshing and revising them, and then added new activities where needed to create a complement for *Engaging Mathematics, Volume II*.

2 A TEKS-based resource that addresses the all of the Geometry TEKS. *Engaging Mathematics, Volume I* complements teachers' existing resources and provides—

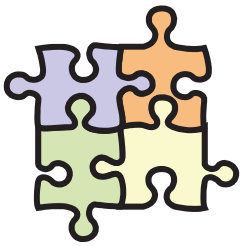
- Rigorous problem-solving tasks;
- Manipulative-based tasks;
- Vocabulary development tasks; and
- Sorting and classifying tasks.

3 A resource that supports high-quality, research-based practices by providing activities that can be used for various purposes, including—

- Engaging warm-ups and opening tasks that draw students into relevant and challenging mathematics;
- Instructional support for all students to help learners articulate, refine, and retain important mathematical concepts, processes, and skills;
- Short-cycle, formative assessments that provide immediate and ongoing feedback to guide instruction for the teacher and learning for the student; and
- Supplemental tasks to support intervention strategies.

4 A resource that incorporates the mathematical process standards by promoting—

- Reasoning, generalizing, and problem-solving in mathematical and real-world contexts;
- Modeling, using tools, and connecting representations;
- Analysis; and
- Communication.



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What is found in an Engaging Mathematics TEKS-based activity?

Each activity addresses a specific student expectation that is reflected in the content objective.

Common classroom materials are used for ease of preparation. Materials are listed 1-per-student unless otherwise noted. Page titles for student handouts are represented with bold font.

Students should have continuous access to graphing technology and reference materials.

Facilitation questions are provided for teacher use when supporting student thinking and discourse.

Making Conjectures about Figures, Activity 2
G(5)(A)

Activity Objective
The student will determine the validity of a conjecture about properties related to the diagonals of parallelograms.

Materials
- **With Which Conjecture Do You Agree?**
- Patty paper (optional)

Facilitation Questions
- **What are the characteristics of a parallelogram? What quadrilaterals are parallelograms?**
  A parallelogram has two pairs of parallel sides. Rectangles, squares, and rhombi are all parallelograms.
- **How can it be determined if two segments are congruent?**
  A figure will have tick marks on the segments that are congruent.
- **How can it be determined if two segments are perpendicular?**
  Two segments are perpendicular if a right angle is formed where the segments intersect.
- **How can it be determined if two segments bisect each other?**
  Two segments bisect each other if the segments intersect at the midpoint of both segments.

Answer
Answers may vary.
I agree with conjecture *3* because *when each parallelogram is traced onto patty paper and folded along the diagonals, the midpoint for each diagonal is the intersection of the diagonals.*

I disagree with conjecture *1* because *when each diagonal was sketched onto patty paper they were not the same length for the rhombus or the first parallelogram. I disagree with conjecture 2 because when each diagonal was sketched onto patty paper, they were only perpendicular for the square. I disagree with conjecture 3 because when each diagonal was sketched onto patty paper and the paper was folded on the diagonal, the angles did not match in the parallelogram or the rectangle.*

An answer key is included for each activity.

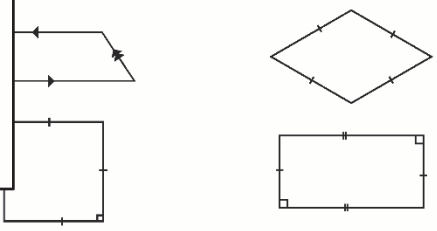
Date: _____

With Which Conjecture Do You Agree?

Mr. Smith's geometry class were asked to write a conjecture about the
llelograms. The following conjectures were written.

diagonals of a parallelogram are congruent.
diagonals of a parallelogram are perpendicular.
diagonals of a parallelogram bisect each other.
diagonals of a parallelogram bisect the angles whose vertices they connect.

parallelograms shown below to test each conjecture.



I agree with conjecture(s) _____ because . . .

I disagree with conjecture(s) _____ because . . .

Communicating about Mathematics
Are you able to determine if the conjecture with which you agreed is always true? Why or why not?

Each activity includes an opportunity for students to articulate and summarize aspects of their learning.

SAMPLE

# Parallel and Perpendicular Lines through a Point
G(2)(C)

Activity Objective
The student will determine the equation of a line parallel or perpendicular to a given line that passes through a given point.

Materials
- **Lines through a Point**
- **Number Tiles**
- Scissors
- Tape or glue

Facilitation Questions
- **How can the slope of a line parallel to a given line be determined? Perpendicular to a given line?**
  Determine the slope of the given line. The slope of a parallel line is equal to this slope. The slope of the perpendicular line is the negative reciprocal of the slope of the given line.
- **When given the slope of a line and a point on the line, how can the equation of the line be determined?**
  Substitute the point and the slope values into the point-slope form of a linear equation.Then, manipulate the equation into other forms.

Answers

The line perpendicular to $y = \frac{2}{3}x + 5$ passing through $(4, -3)$ is $2y + 3x = 6$.
The line parallel to $y + 4x = -3$ that passes through $(1, 5)$ is $y = -4x + 9$.
$y = -\frac{1}{8}x + 5$ is perpendicular to $y = 8x - 7$ and passes through $(0, 5)$.

SAMPLE

Student Name: _____ Date: _____

Lines through a Point

Use the **Number Tiles** to complete the puzzle.

The line perpendicular to $y = \frac{2}{3}x + 5$ passing through $(4, -3)$ is $\square\, y + \square\, x = \square$.

The line parallel to $y + \square\, x = -3$ that passes through $(1, 5)$ is $y = -4x + \square$.

$y = -\frac{\square}{\square}x + \square$ is perpendicular to $y = 8x - \square$ and passes through $(\square, 5)$.

Communicating about Mathematics
Is it possible for there to be more than one line that is parallel to a given line and passes through a given point? Explain your reasoning.

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Number Tiles

Cut along the bold dashed lines. Five sets are provided.

1	2	3	4	5
6	7	8	9	0

1	2	3	4	5
6	7	8	9	0

1	2	3	4	5
6	7	8	9	0

1	2	3	4	5
6	7	8	9	0

1	2	3	4	5
6	7	8	9	0

# Relationships in Triangles, Activity 1
G(6)(D)

Activity Objective
The student will determine unknown angle measures by applying angle relationships in triangles.

Materials
- **Angles in Triangles: Side by Side**

Facilitation Questions
- **What is true about the sum of the measures of the interior angles of a triangle?**
  The sum of the interior angles of a triangle is 180 degrees.
- **What is true about the exterior angles of a triangle?**
  The measures of an exterior angle of a triangle is equal to the sum of the measures of the two non-adjacent angles in the triangle.

Answers

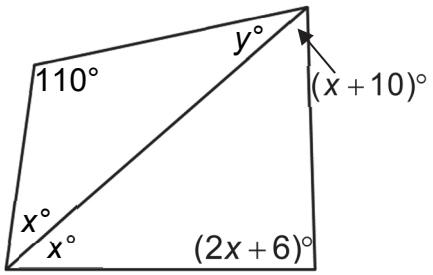
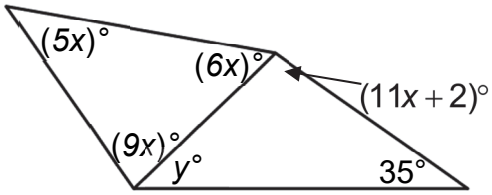
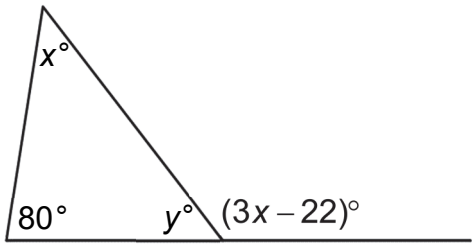
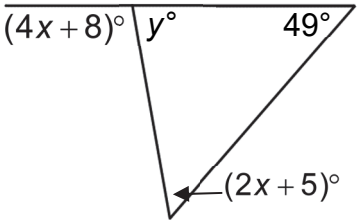
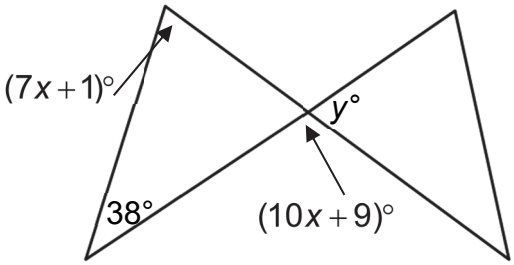
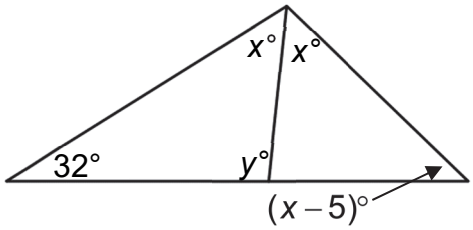
Student A	Student B
1. x = *41* y = *29*	1. x = *9* y = *44*
2. x = *51* y = *49*	2. x = *23* y = *80*
3. x = *10* y = *71*	3. x = *51* y = *97*

SAMPLE

Student Name: _____ Date: _____

Angles in Triangles: Side by Side

- Determine which student is A and which is B.
- Determine the missing angle measures of the first figure in your column.
- Discuss your solution method with your partner.
- Repeat this process for the remaining two figures.

Student A	Student B
1. 	1. 
2. 	2. 
3. 	3. 

Communicating about Mathematics

List the angle relationships you used to determine the missing values. Can you determine the missing values using different angle relationships? Explain your reasoning.

_____

_____

_____

_____

_____

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