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Geometry Bridge Proposal

Middle School

Algebra 1-2

Presenter:

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Purpose

The purpose of this presentation is to recommend a new High School Mathematics course, Geometry Bridge.

Rationale

- Too few of our students are entering high school with the skills they need to be successful in Algebra 1-2.

- Freshmen who are in the 30th percentile or below on MAP test scores are most likely to fail Algebra 1-2.
  - This is about 1,000 students across the district.

- The proposed Geometry Bridge course and subsequent math sequence was developed to provide students with the opportunity to develop Pre-Algebra skills, while still having the opportunity to enroll in a fourth year math course.

Aligned to the
District Strategic Plan

Student Achievement – Priority #1
We will implement and support a challenging, standards based curriculum across all content areas.

Student Achievement – Priority #2
We will coordinate our efforts to provide a nurturing and safe learning experience and a flexible approaching meeting the academic, social and emotional needs of each student.

Geometry Bridge Course Overview

▸ Designed to mirror the District's current Geometry course.
  ◦ Same reporting strands, standards, and rigor
  ◦ Units of study include:
    • Transformations in the Plane
    • Coordinate Geometry
    • Congruency
    • Similarity
    • Right Triangle Trigonometry
    • Area and Volume
   • Circles

Geometry Bridge Course Overview

▸ Embeds Pre–Algebra skills from 5th through 8th grade into the Geometry content to prepare students to be successful in Algebra 1-2 the following year

▸ Pre–Algebra skills include:
  ◦ Fraction Operations
  ◦ Proportional Relationships
  ◦ Slope
  ◦ Solving Linear Equations

Find the value of x.

79°

m

(2x-7)°

n
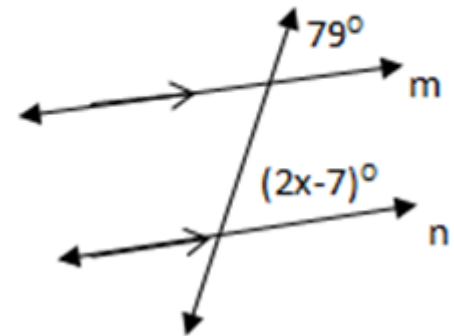
Description of Recommendation

▸ Pre–Algebra standards were added to the existing curriculum documents and rubrics.

▸ Indicates how to embed the Pre–Algebra practice into the Geometry content.

$$y = \frac{7}{4}x + 6$$

(-7,-6)

(-3,1)
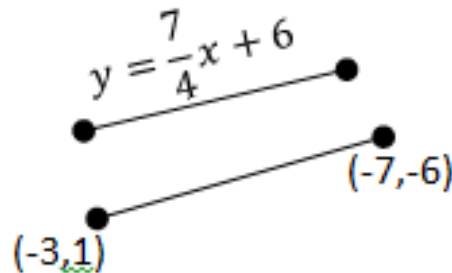
Reporting Strand: Similarity

Enduring Understanding: Students will use concepts and procedures to find missing measurements in various situations using proportional relationships.

Semester 2

Essential Question(s):
- What are the necessary conditions to know when two triangles are similar?
- What are the sufficient conditions to know that two triangles are similar?
- How can the Pythagorean Theorem be proven using the geometric relationships that come from proving triangles similar?
- How can the geometric relationships that come from proving triangles congruent or similar be applied in problems solving situations?

What Students Need To Know:
- Two triangles are similar if and only if corresponding pairs of angles are congruent and corresponding pairs of sides are proportional.
- It is possible to prove two triangles similar by proving that two pairs of corresponding angles of the triangles are congruent.
- Different observed relationships between geometric objects are provable using basic geometric building blocks and previously proven relationships between these building blocks and between other geometric objects.
- The geometric relationships that come from proving triangles congruent or similar may be used to prove relationships between geometric objects.
- The properties of congruent and similar triangles can be used to solve problems that either involve or can be modeled with triangles.

Knowledge: *Students will know…*	Skills: Students will be able to …
The definition of various geometric objects such as angle, triangle, parallel lines, perpendicular lines, parallelogram, etc.	• Sketch a figure that represents specific given information. • Construct a conditional statement that represents a given conjecture. • Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. • Prove theorems about triangles.

Content Standards and Essentials Skills

G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
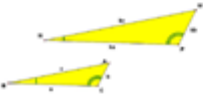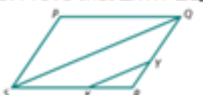
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Integrated Pre-Algebra Bridge Standards

7.RP.3 Use proportional relationships to solve multi-step ratio and percent problems.

8.EE.7 Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Instructional Focus: Explain and prove triangles similar.

	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Prove similar triangles (G.SRT.3) Given that $\triangle MNP$ is a dilation of $\triangle ABC$ with scale factor k, use properties of dilations to show that the AA criterion is sufficient to prove similarity. **Solve and prove relationships (G.SRT.5, 8.EE.7, 7.RP.3)** In the diagram, quadrilateral PQRS is a parallelogram, SQ is a diagonal, and SQ || XY. a. Prove that △XYR~△SQR. b. Prove that △XYR~△QSP.	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Prove **all** using transformations of the following theorems: • Angle-Angle (AA) criterion for two triangles to be similar • SAS for two triangles to be similar • SSS for two triangles to be similar Solve **and prove (by justifying proportionality and angle congruence)** geometric problems using congruence and similarity (include expressions with variables)	**Prove two using transformations** of the following theorem: • AA criterion for two triangles to be similar • SAS for two triangles to be similar • SSS for two triangles to be similar Solve geometric problems using angle congruence and proportionality **(include expressions with variables)**	**Identify** if triangles are similar by: • AA~ • SAS~ • SSS~ Solve geometric problems using angle congruence and proportionality (numeric values only)	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

Description of Recommendation

▶ The Geometry Bridge course is designed for students who need additional support before enrolling in Algebra 1-2.

▶ The target audience for this course is
  ◦ First time freshmen students
  ◦ 30th percentile or below based upon MAP
  ◦ Below basic proficiency on middle school expression and equation standards

Description of Recommendation

▸ Recommended Course Sequence
  ◦ 9th Grade: Geometry Bridge
  ◦ 10th Grade: Algebra 1-2
  ◦ 11th Grade: Algebra 3-4
  ◦ 12th Grade: Choice of a 4th year math course

Recommendation for Implementation

- 2017-2018
  - Select materials and resources to support the curriculum, to be submitted to the Board in the spring
  - Professional development for teachers about new curriculum and resources

- 2018-2019
  - Full Implementation
  - Ongoing professional development

Evaluation of Change

- Data will be reviewed from indicators such as:
  - STAR Math to monitor students' growth on pre-algebra skills.
  - District Common Assessment Data to ensure proficiency in geometry skills.
  - Long term cohort data to monitor performance in subsequent math courses and on the SAT.

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