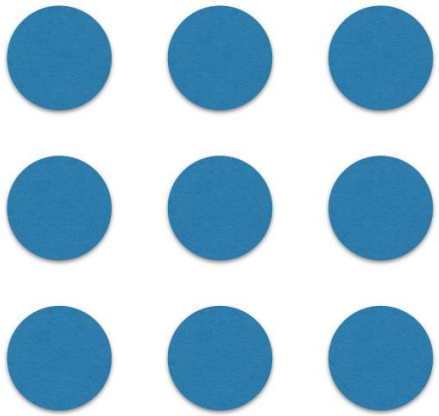
Warm-up Problem

Plant 10 trees to create five distinct lines with four trees in each line.



Example: 9 trees creating 8 lines with 3 trees on each line

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Meaningful Math for Every Student

Oregon Mathways Initiative:
Focusing High School Math

COSA Secondary School Leader Conference

October 17, 2019

Mark Freed – Oregon Department of Education

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Presentation Outline

- Oregon Context
- Oregon Mathways
- Specific actions
  - Engagement
  - Pathways
  - Focus
  - On Track

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Oregon Policy Context

- Mathematics requirements are standards-based rather than course-based.
- High school credits are proficiency-based rather than time-based.
- 3 credits of high school math required to graduate.
- Course sequences and options are local decisions.
- 40-40-20 Goal

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2020 VISION

Transformed math systems

2020 Oregon Math Standards Adoption

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Setting the Stage:

Why High School Math?

- Known Issues:
  - Too many high school math standards
  - Single pathway to calculus
  - Need for more relevant applications
  - Inequitable tracking practices for students and teachers

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Mathways Connections to ODE Priorities

- Reducing Chronic Absenteeism
  - Identify content necessary and meaningful to all students
  - Engage students with authentic applications
- Increase Graduation Rate
  - Create multiple pathways for mathematics
  - Meet diverse student needs as well as college and career goals
- Freshmen On-Track
  - Open up opportunities for innovation
  - Target instruction for student success

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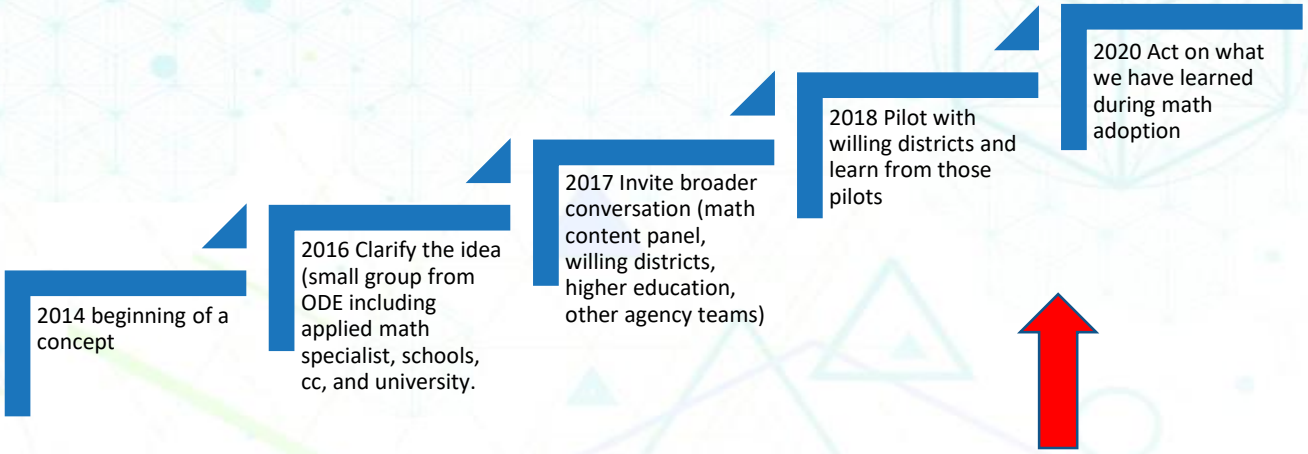
Participatory Leadership: Personal to Systemic



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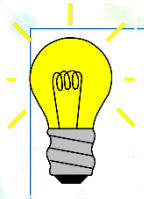
Mathways Initiative

On Track

Strong Focus



Engagement

Pathways

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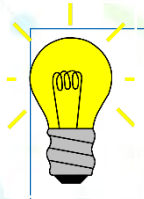

Engagement

Pathways

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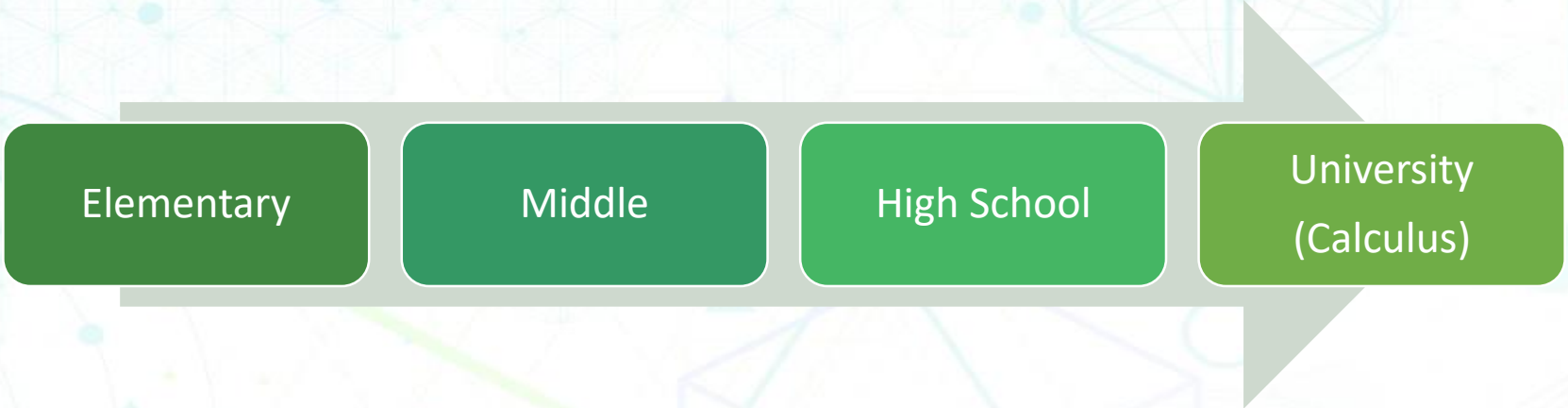
Current Pathway Model:

Engineered for Success in Calculus



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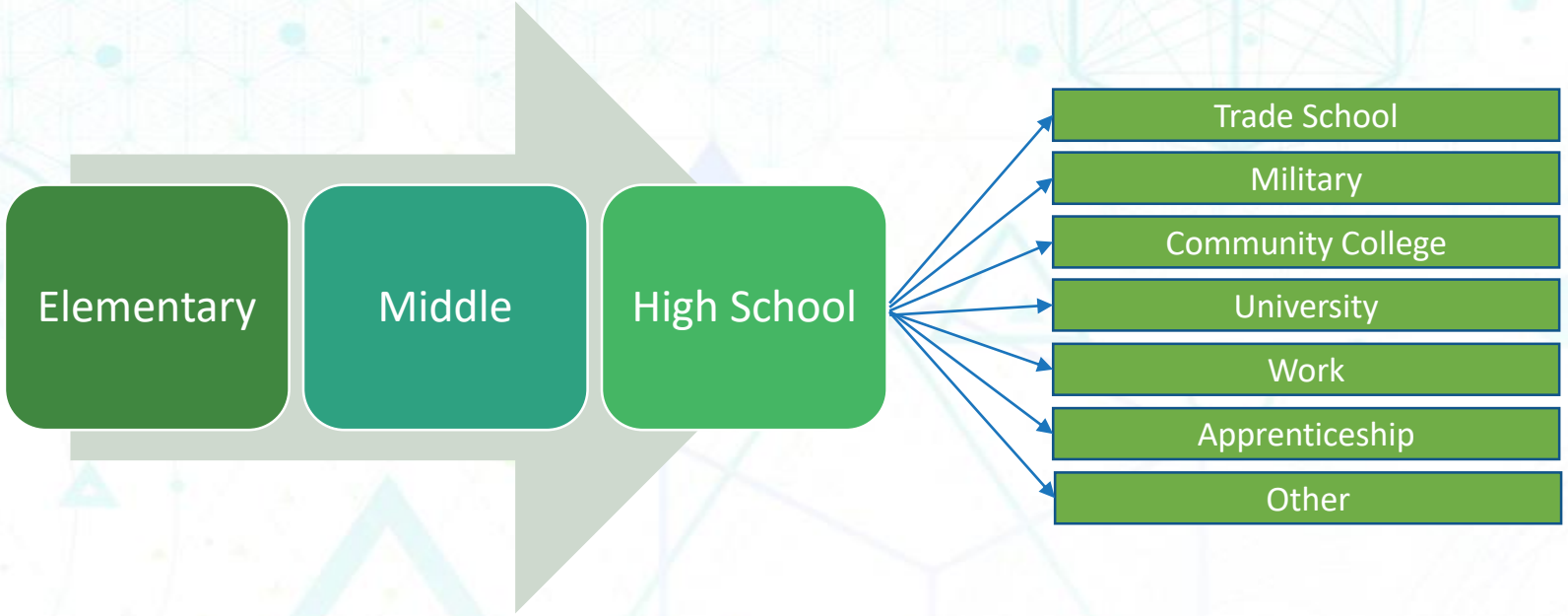
Pathways Model:

Student Math Reality



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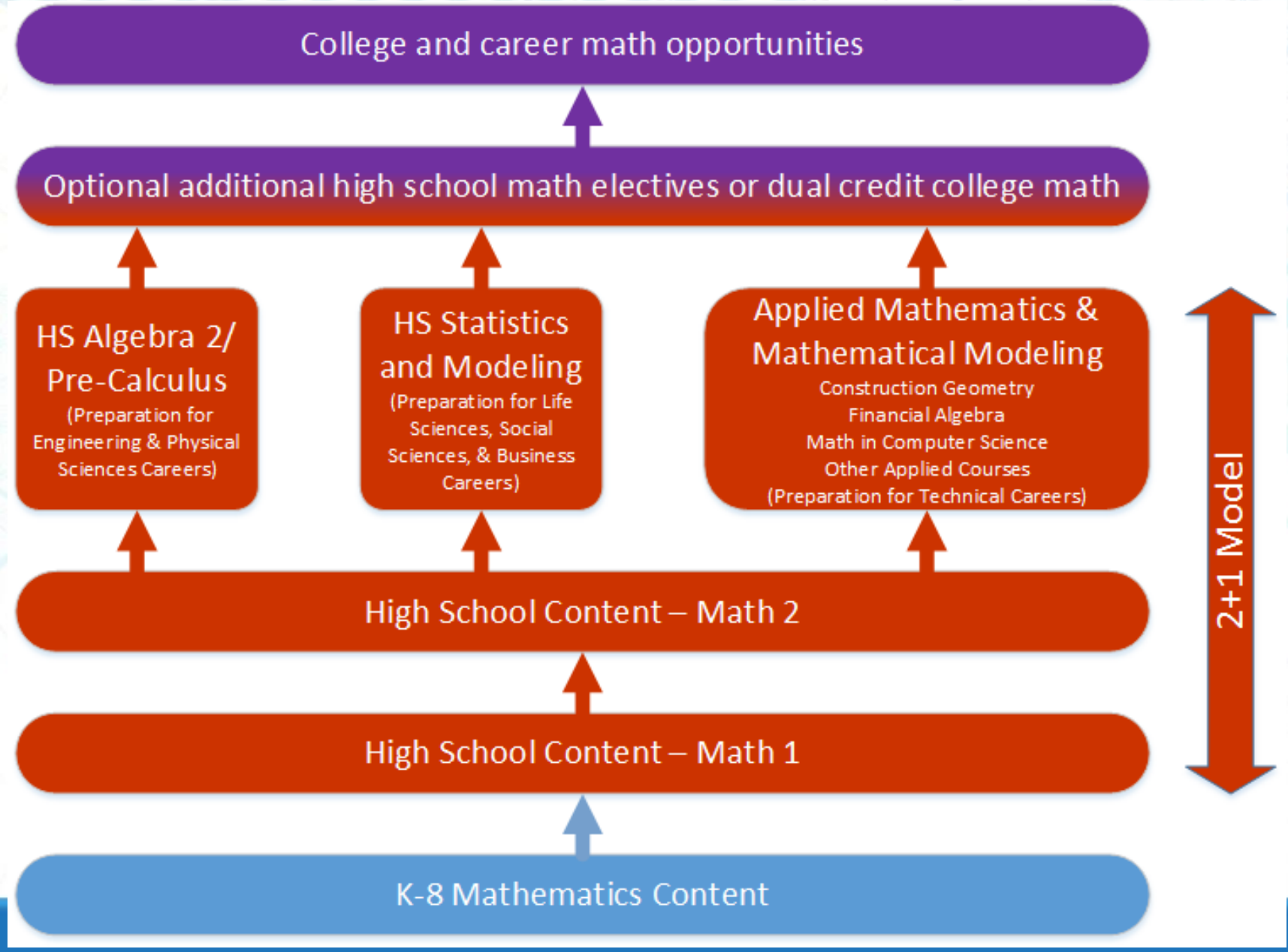
Proposed 2+1 Model



Warm-up Problem

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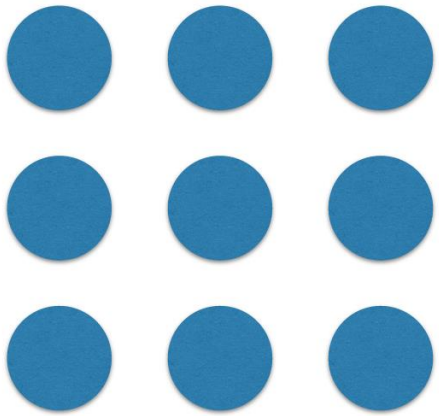
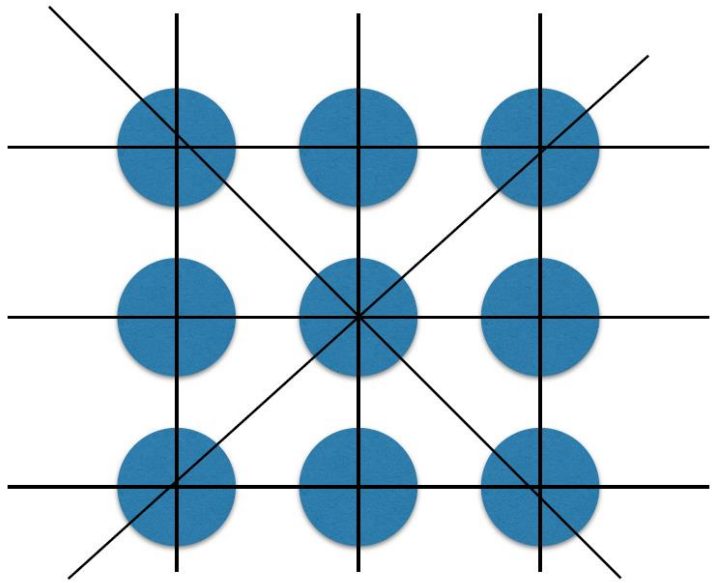


Example: 9 trees creating 8 lines with 3 trees on each line

Plant 10 trees to make five rows of four.



9 dots in 8 rows of 3

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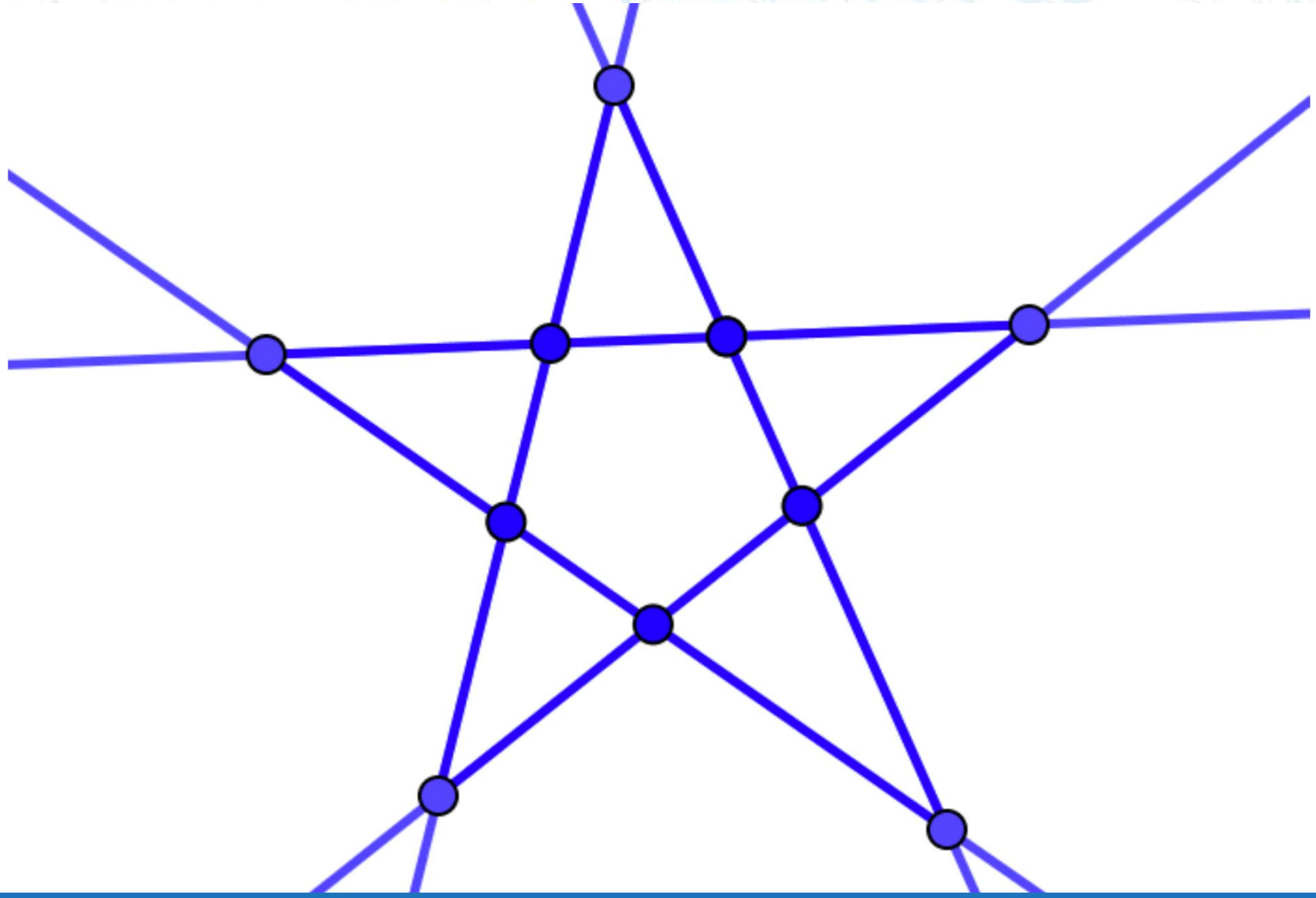
The “Answer”??



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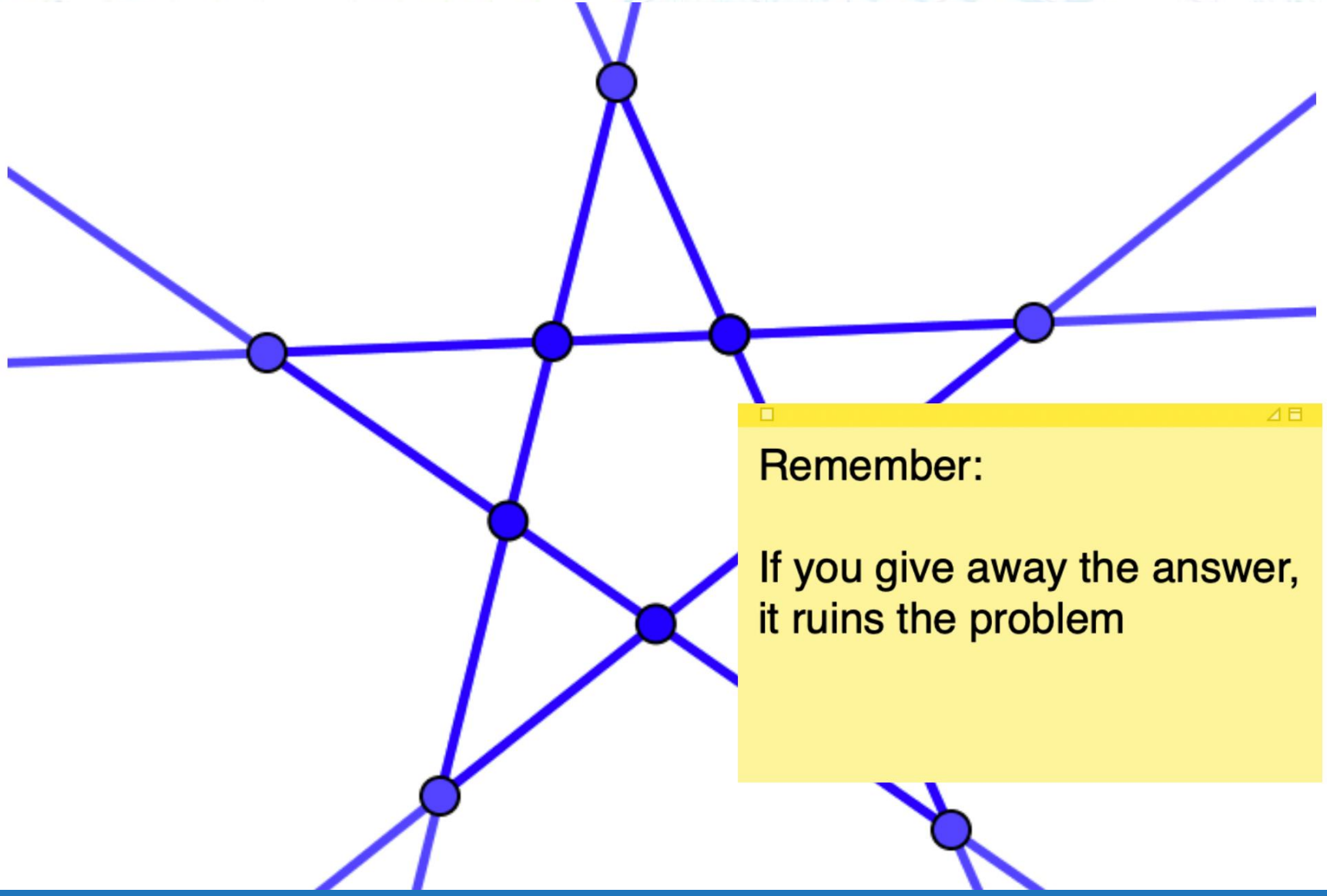
Remember:
If you give away the answer, it ruins the problem

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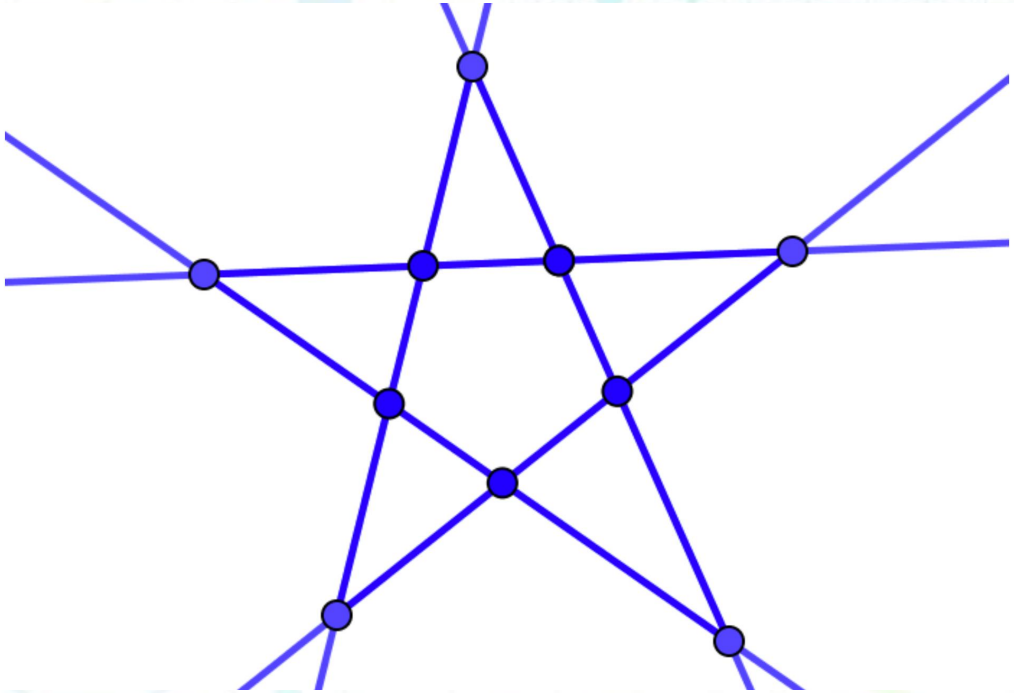
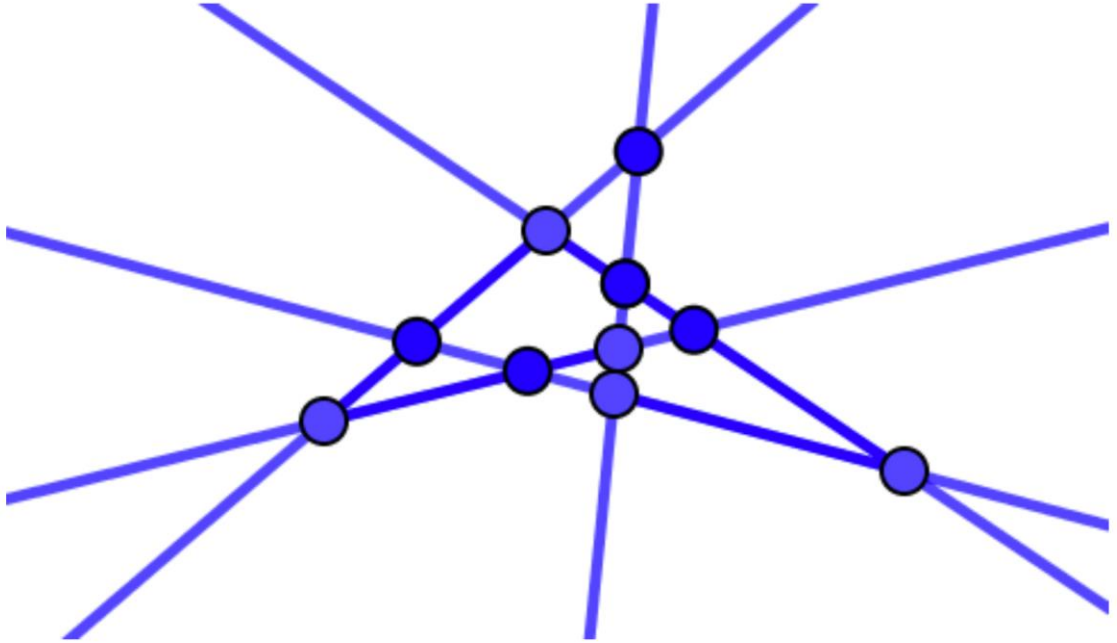
Teacher's Answer vs. Dan Finkel's Answer





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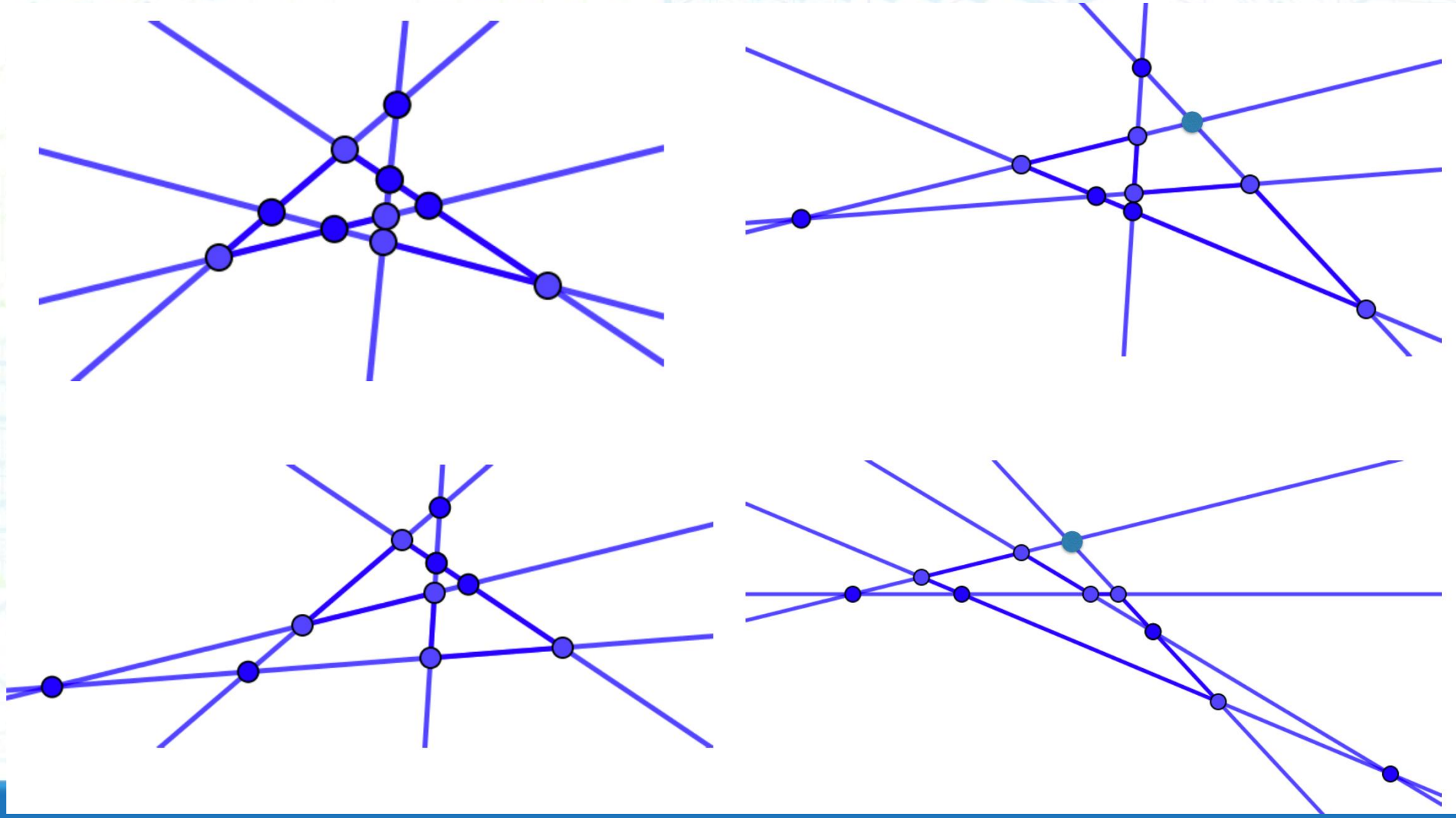
Changing your perspective
Focus on placing lines rather than points



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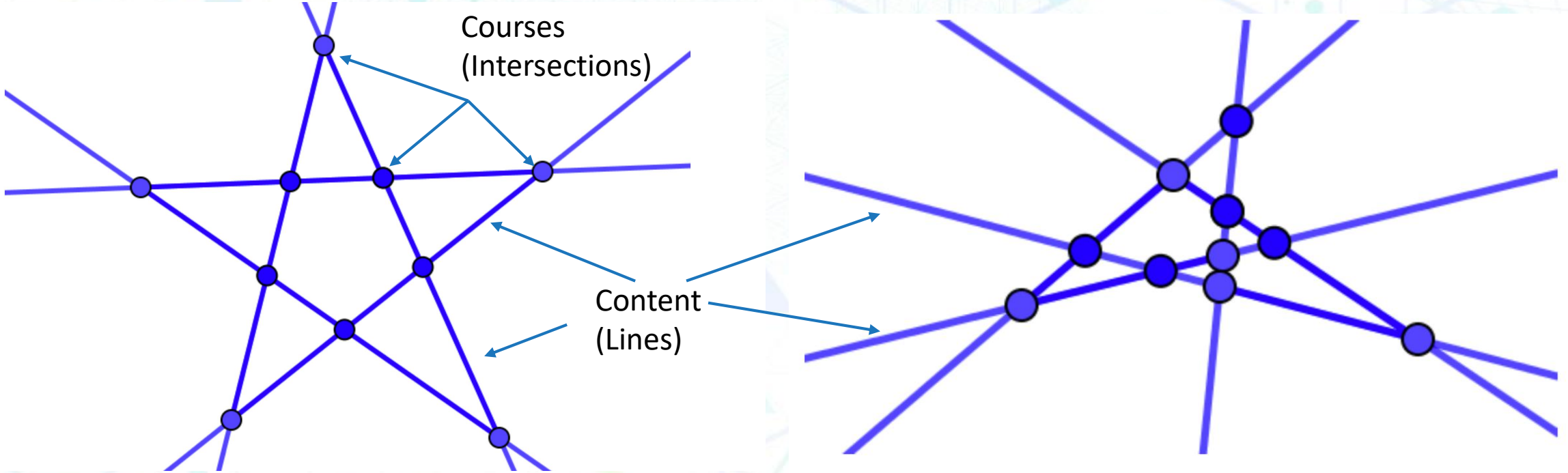
Shifting perspective from courses to content

One solution

Many solutions



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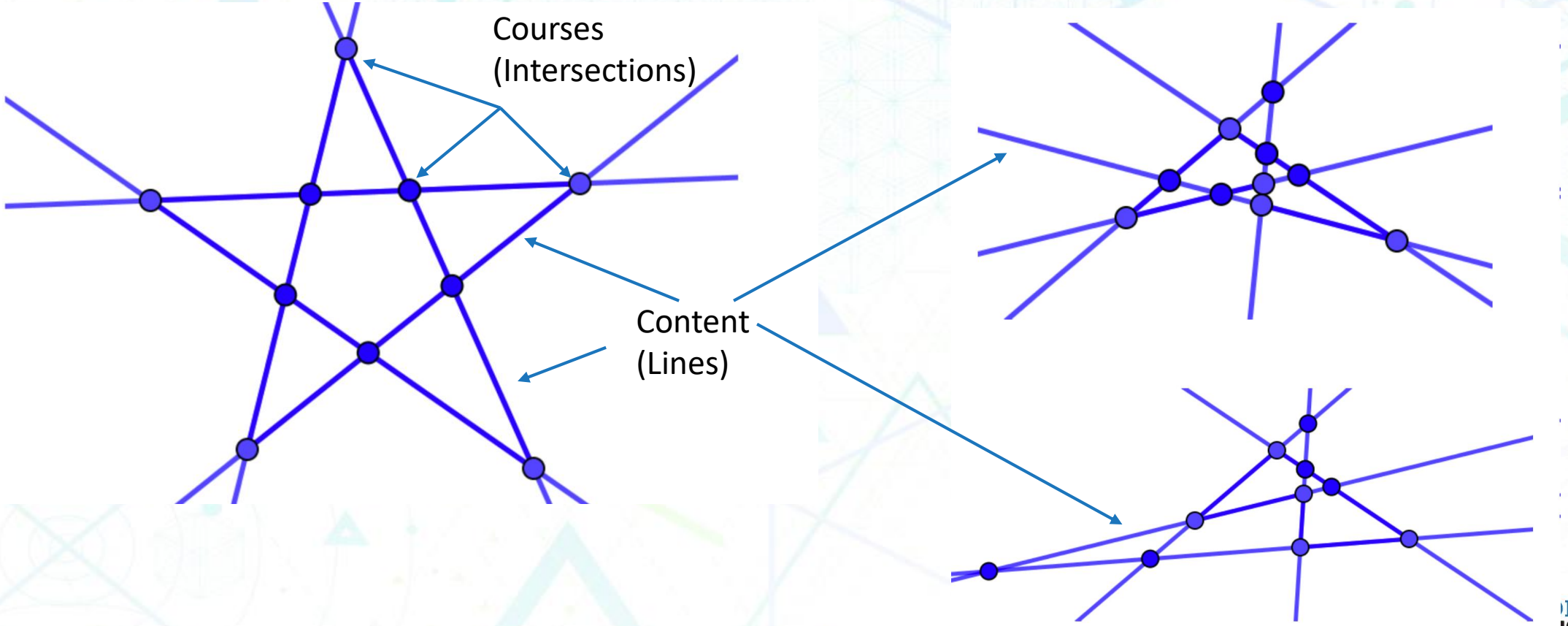
Shifting perspective from courses to content

One solution (AGA model)

Multiple solutions (2+1 model)



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The 2

- Not a specific course sequence (based on standards)
- Lesser emphasis on geometry and more on probability and statistics

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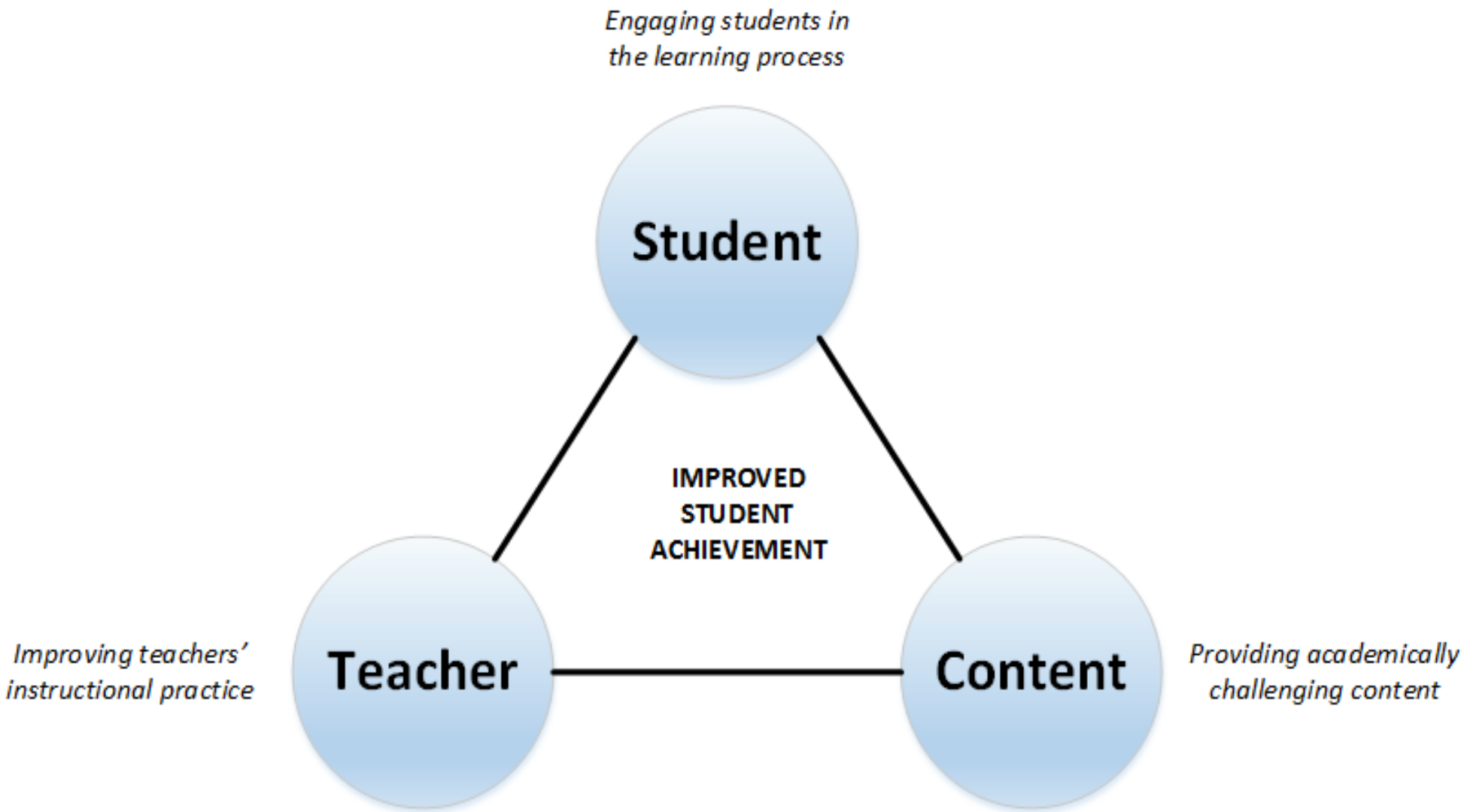
The +1



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Applied Courses Examples

- Construction Geometry
- Algebra in Manufacturing
- Bootstrap Algebra
- Introduction to Data Science

IDS
Introduction to Data Science

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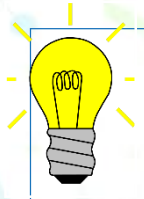
Mathways Initiative

On Track

Strong Focus



Engagement

Pathways

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Finding Focus

Issues

- Too many high school standards
- Lack of consistency as educators choose which standards to focus on.
- Recognition the role of Algebra 2 & Pre-calculus to prepare for enrollment in Calculus, but other options also could exist.
- A number of assessments students may need to take in grade 11

Moving Forward

- Identify draft conceptual framework that identifies core content for first two credits
- Bridge CCSSM-HS with NCTM Essential skills to organize content.
- Crosswalk to
- CCSS-HS content,
  - Current state assessment framework, and
  - Finding focus regional workshops

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Introduction to Lenses

- Who is at the table when content standards are written?
- Who should be at the table that may have been left out in the past?

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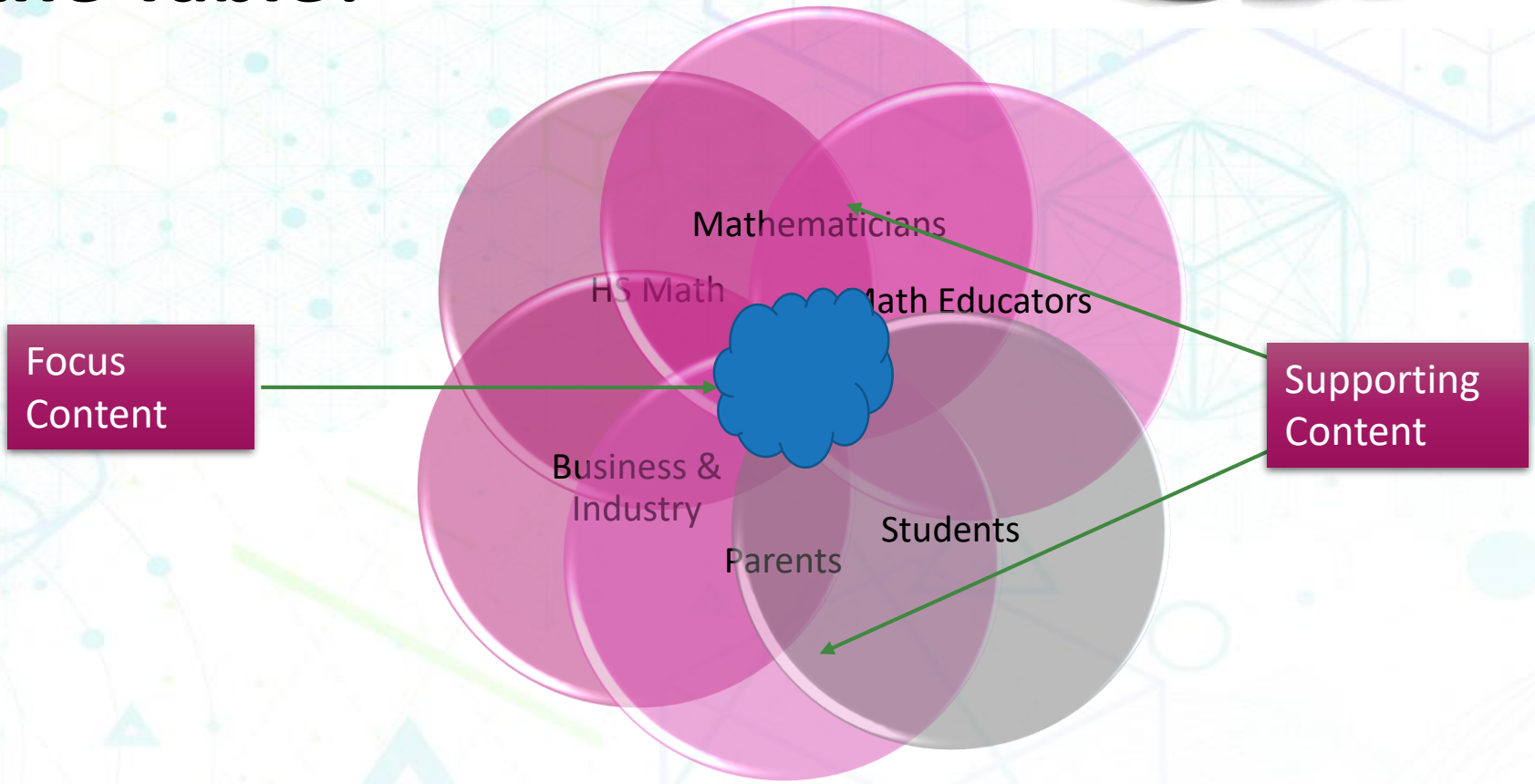
Lens to HS Math
Who is at the Table?



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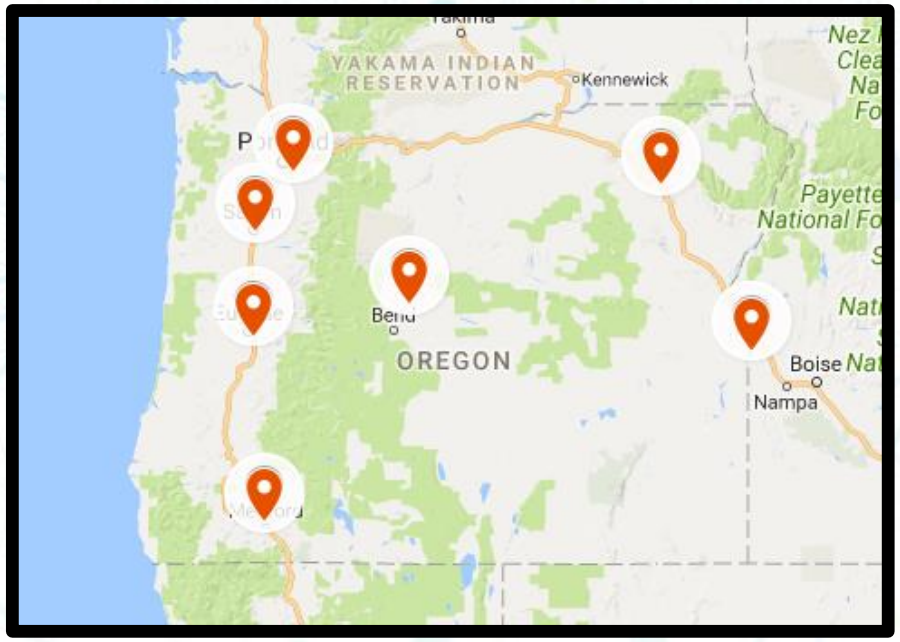
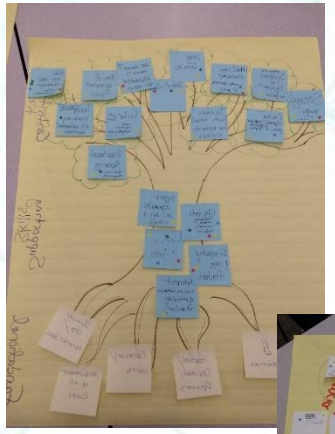
Regional Educator Meetings

Spring 2018





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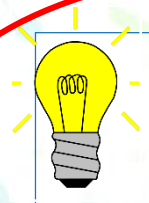
Mathways Initiative

On Track

Strong Focus



Engagement

Pathways

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Attending to Mathematical Rigor

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Math in Real Life – Highlights

- Lane County
- Central Oregon
- Portland Metro
- Oregon State University
- Southern Oregon
- Eastern Oregon

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Characteristics of Rich Context Lessons

1. The approach shown has **high potential for student engagement.**
2. The context of the lesson is **authentic** and **mirrors real-world applications.**
3. The lesson offers the opportunity to **leverage significant mathematics.**
4. The lesson demonstrates the **application of math practices using appropriate tools.**
5. The lesson portrays **math as a part of effective CTE-STEM practice**, including critical thinking, communication, and boundary-spanning problem solving.

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Linking Math and Context

- Introduce the Context
  Investigate the Math in Context
- Make the Math Explicit
- Revisit the Context
- Assess the Math in Multiple Ways

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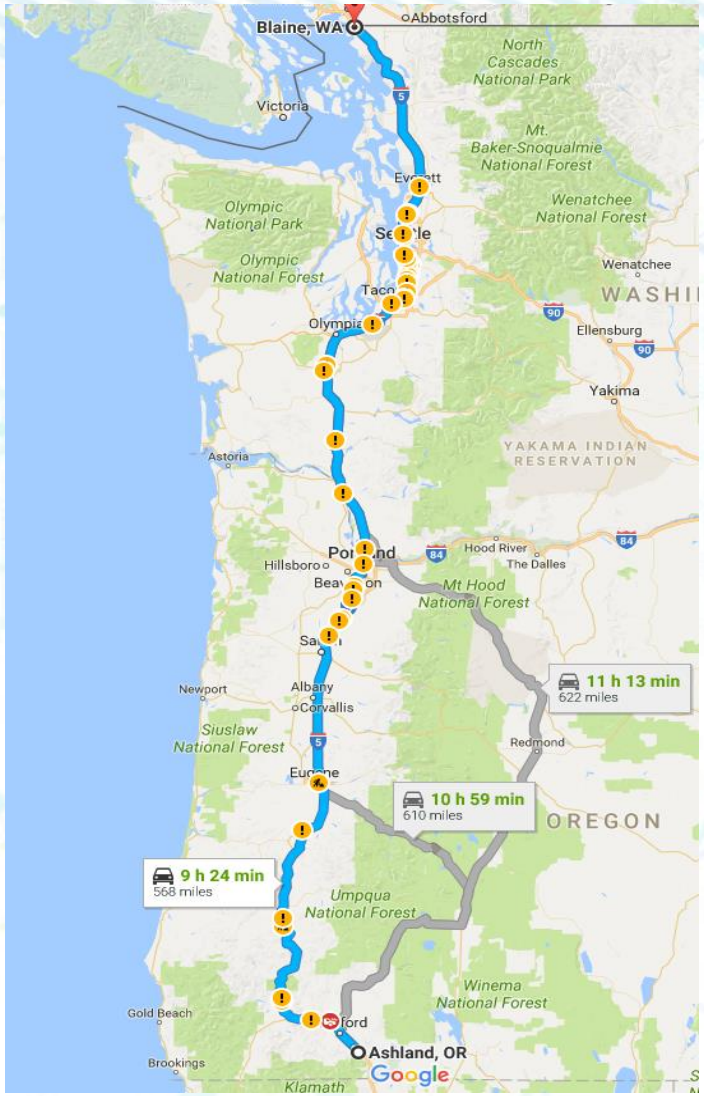

What might impact our race?

What assumptions can we make in order to simplify our strategy?

What information do we need in order to plan our race?

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If you were to add your chosen snack to your daily food intake, how many steps would you have to take to burn the equivalent number of calories?

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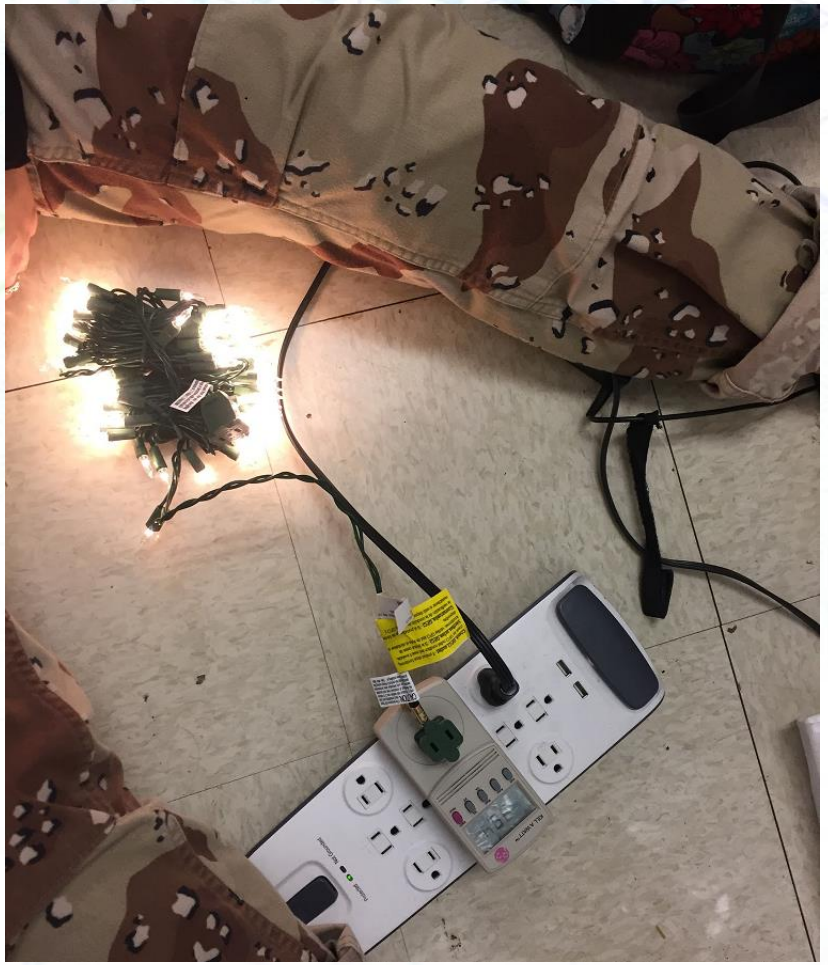
How long will it take a string of LED lights to pay for itself?

How can we use linear equations to find the breakeven point?



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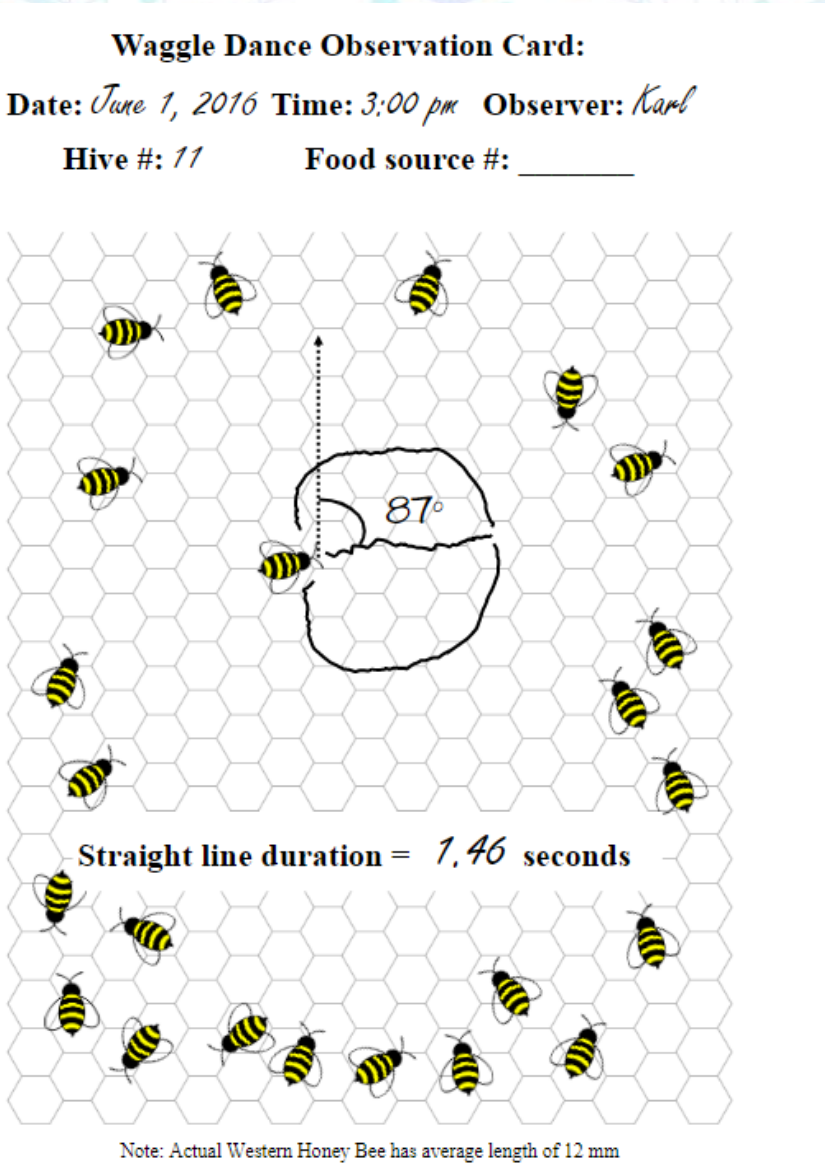
Students use proportional reasoning and angle measurement to analyze a hypothetical bee hive location and the related food sources visited by the bees.

Students decide if the distances to food sources and duration of waggle dances for the five locations are proportional.



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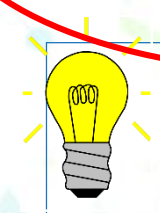
Mathways Initiative

On Track

Strong Focus



Engagement

Pathways

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Students On Track

Issues

- Students are tracked into courses with the same title but different expectations
- Students have had minimal opportunity to engage in grade level content
- Intent of the "algebra 1 and above" requirement is to raise the floor and give all students the opportunity to engage in high school content in 9th grade

Moving Forward

- Work with teachers to shift mindsets and challenge assumptions about student capabilities
- Create structures to provide additional support for student that may need assistance
  - (e.g. summer opportunities, platooning algebra with an additional course, shift pedagogy to active learning practices)

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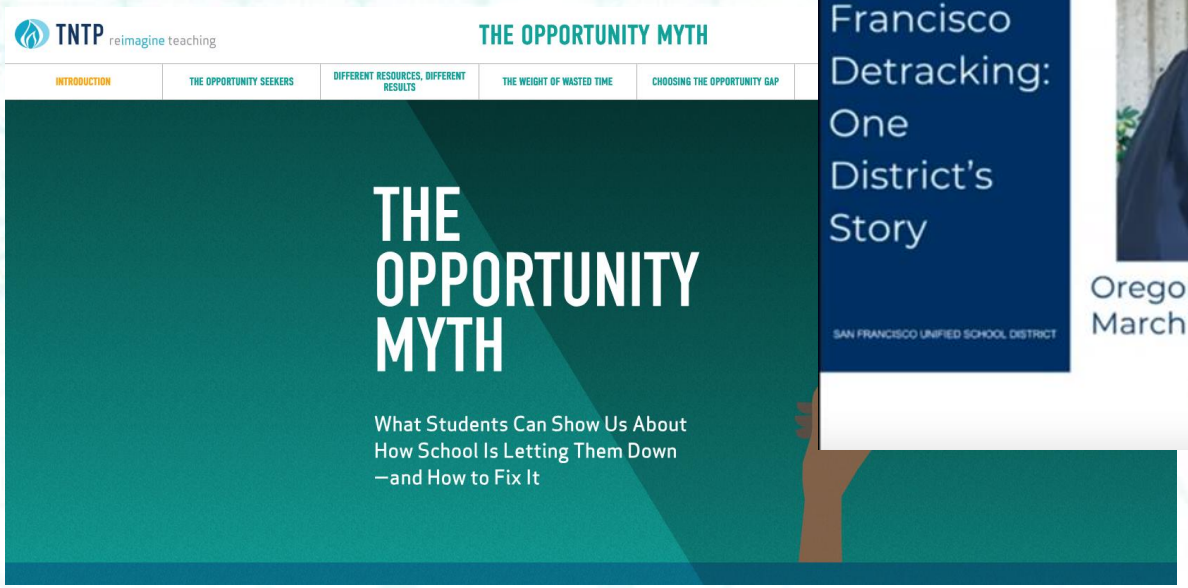
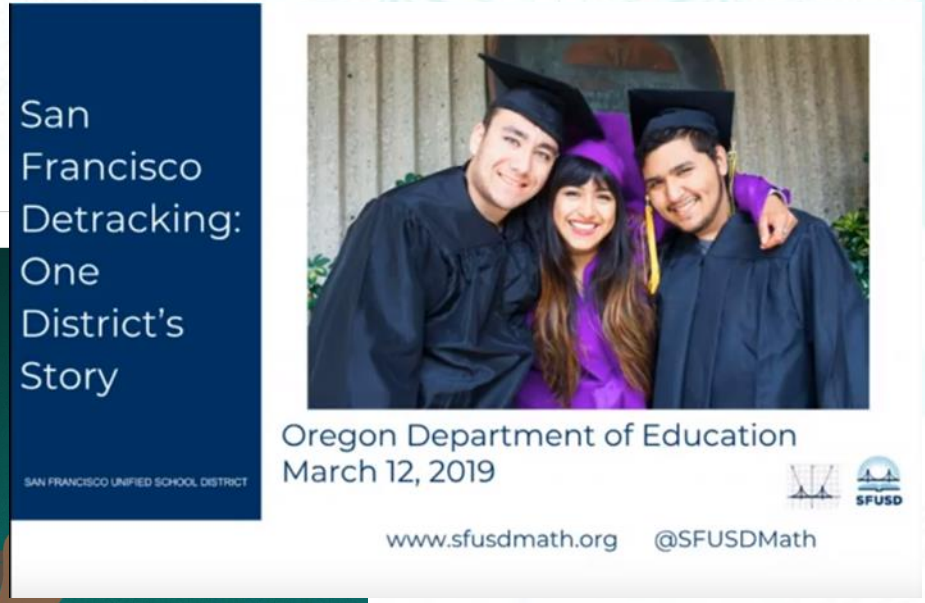
Introducing New Ideas





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Expanding and Communicating

- Policy & Research Briefs
- CBMS 11-14 Pathways
  - 25 States working on pathways, facilitated by Dana Center (UT Austin) & Achieve
  - May 2019 – October 2020 collaboration
- Oregon HS Standards review & revision
  - Drafting standards Oct 2019 – Mar 2020
  - Public Draft feedback April 2020-July 2020
  - State Board Adoption 2020-21 school year
- Ambitious Math and Science Teaching Summit

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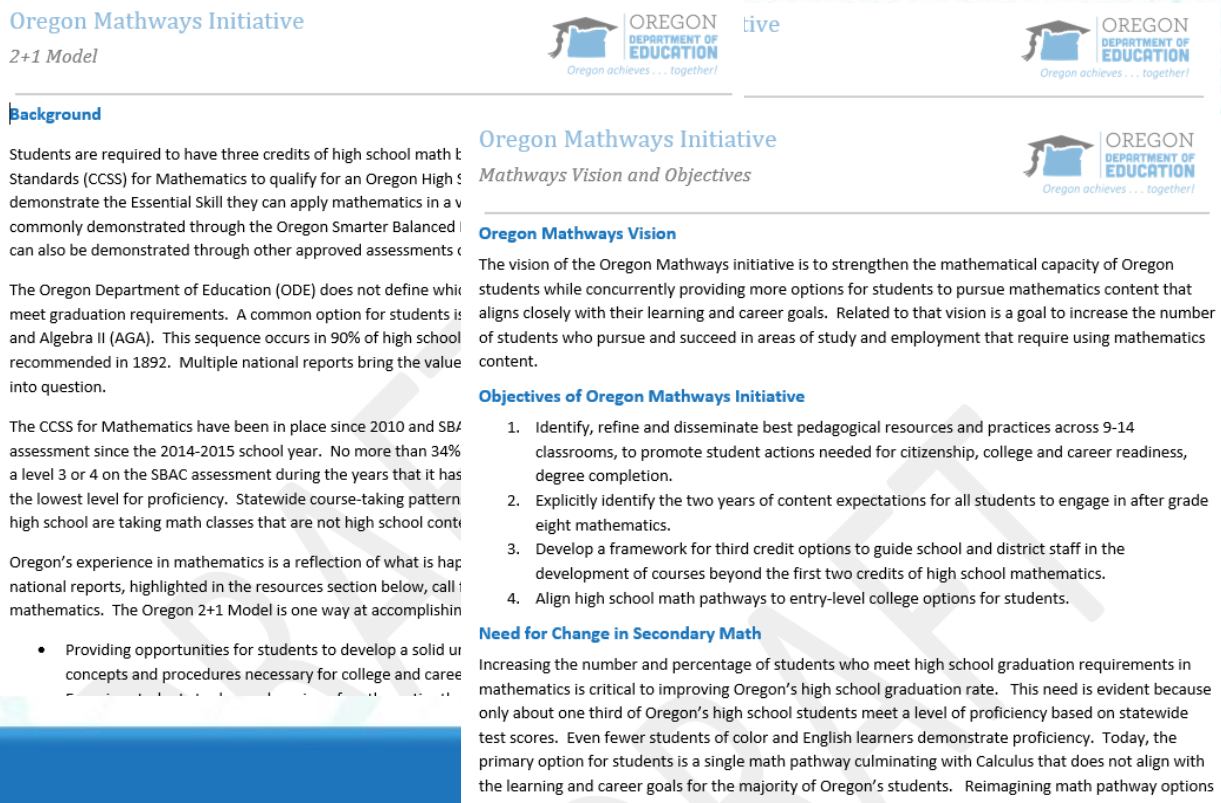
Policy Briefs

https://www.oregon.gov/ode/educator-resources/standards/mathematics/Pages/Oregon-Math-Project.aspx



Oregon Mathways Initiative

2+1 Model

Background

Students are required to have three credits of high school math b
Standards (CCSS) for Mathematics to qualify for an Oregon High S
demonstrate the Essential Skill they can apply mathematics in a v
commonly demonstrated through the Oregon Smarter Balanced
can also be demonstrated through other approved assessments

The Oregon Department of Education (ODE) does not define whi
meet graduation requirements. A common option for students is
and Algebra II (AGA). This sequence occurs in 90% of high school
recommended in 1892. Multiple national reports bring the value
into question.

The CCSS for Mathematics have been in place since 2010 and SBA
assessment since the 2014-2015 school year. No more than 34%
a level 3 or 4 on the SBAC assessment during the years that it has
the lowest level for proficiency. Statewide course-taking pattern
high school are taking math classes that are not high school conte

Oregon's experience in mathematics is a reflection of what is hap
national reports, highlighted in the resources section below, call
mathematics. The Oregon 2+1 Model is one way at accomplishin

- Providing opportunities for students to develop a solid u
concepts and procedures necessary for college and caree

tive

Oregon Mathways Initiative

Mathways Vision and Objectives

Oregon Mathways Vision

The vision of the Oregon Mathways initiative is to strengthen the mathematical capacity of Oregon students while concurrently providing more options for students to pursue mathematics content that aligns closely with their learning and career goals. Related to that vision is a goal to increase the number of students who pursue and succeed in areas of study and employment that require using mathematics content.

Objectives of Oregon Mathways Initiative

1. Identify, refine and disseminate best pedagogical resources and practices across 9-14 classrooms, to promote student actions needed for citizenship, college and career readiness, degree completion.
2. Explicitly identify the two years of content expectations for all students to engage in after grade eight mathematics.
3. Develop a framework for third credit options to guide school and district staff in the development of courses beyond the first two credits of high school mathematics.
4. Align high school math pathways to entry-level college options for students.

Need for Change in Secondary Math

Increasing the number and percentage of students who meet high school graduation requirements in mathematics is critical to improving Oregon's high school graduation rate. This need is evident because only about one third of Oregon's high school students meet a level of proficiency based on statewide test scores. Even fewer students of color and English learners demonstrate proficiency. Today, the primary option for students is a single math pathway culminating with Calculus that does not align with the learning and career goals for the majority of Oregon's students. Reimagining math pathway options

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