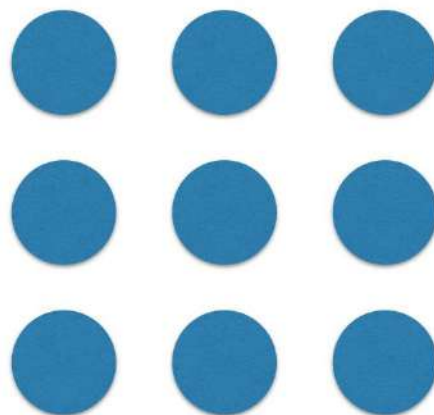


Warm-up Problem

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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MATH PROJECT

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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Meaningful Math for Every Student



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Presentation Outline

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



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

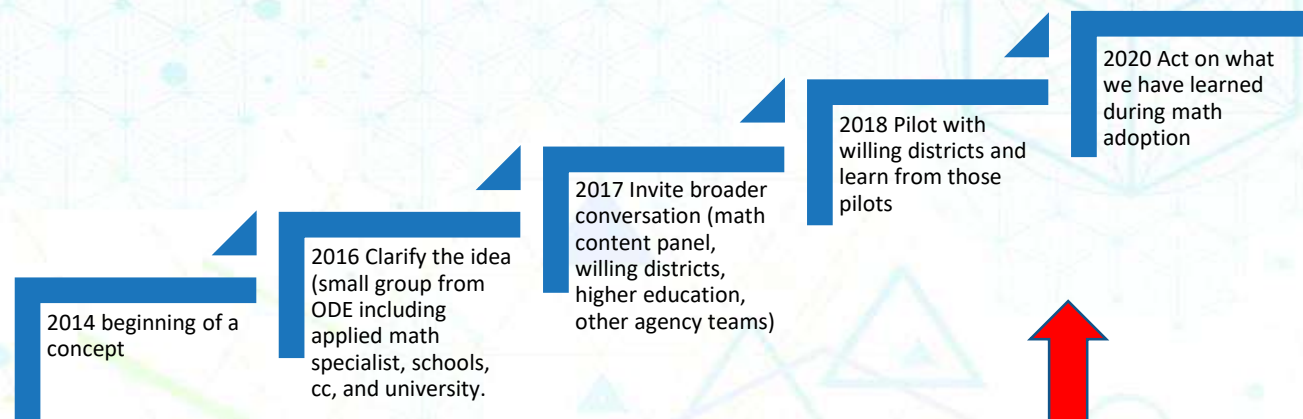
- Reducing Chronic Absenteeism
 - Identify content necessary and meaningful to all students
 - Engage students with authentic applications
- Increase Graduation Rate
 - Create multiple pathways for mathematics
 - Meet diverse student needs as well as college and career goals
- Freshmen On-Track
 - Open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



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Participatory Leadership: Personal to Systemic





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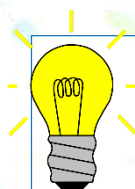
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On Track



Strong Focus



Engagement



Pathways



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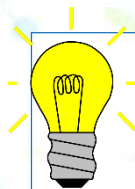
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On Track



Strong Focus



Engagement



Pathways



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Current Pathway Model:

Engineered for Success in Calculus

Elementary

Middle

High School

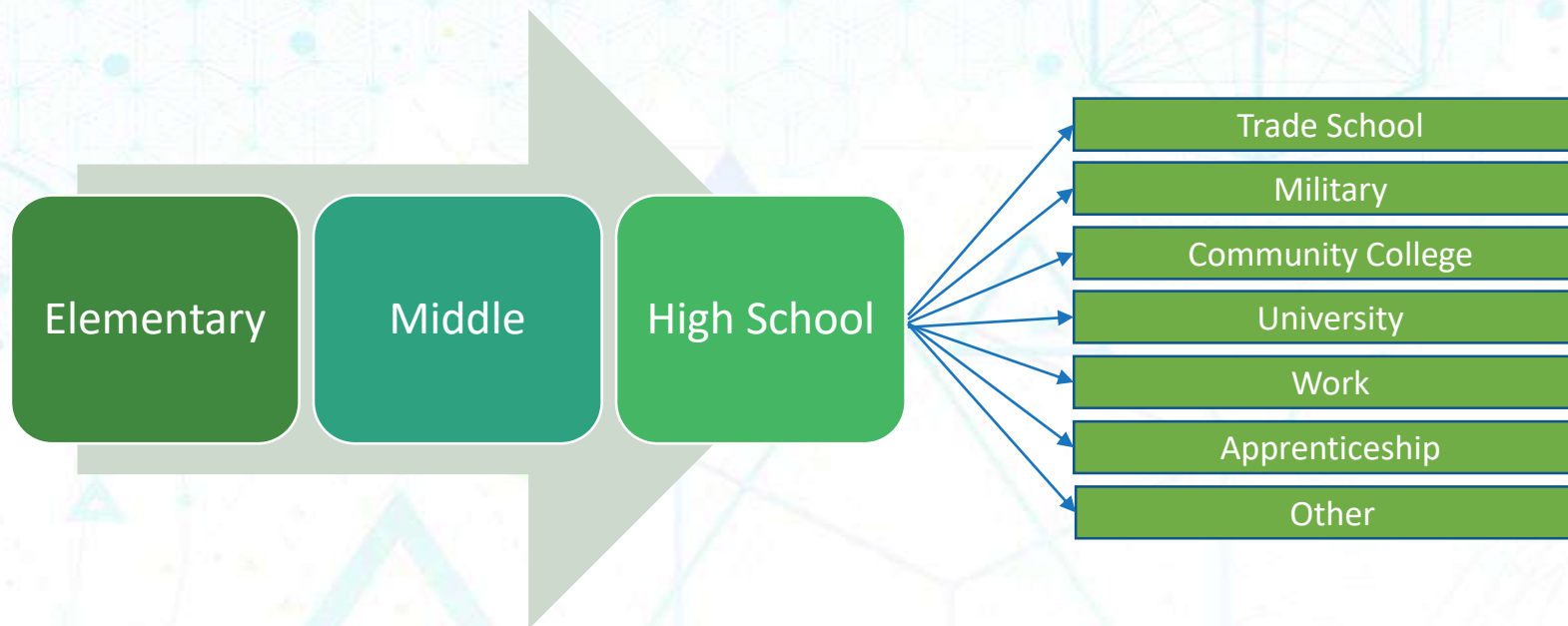
University
(Calculus)



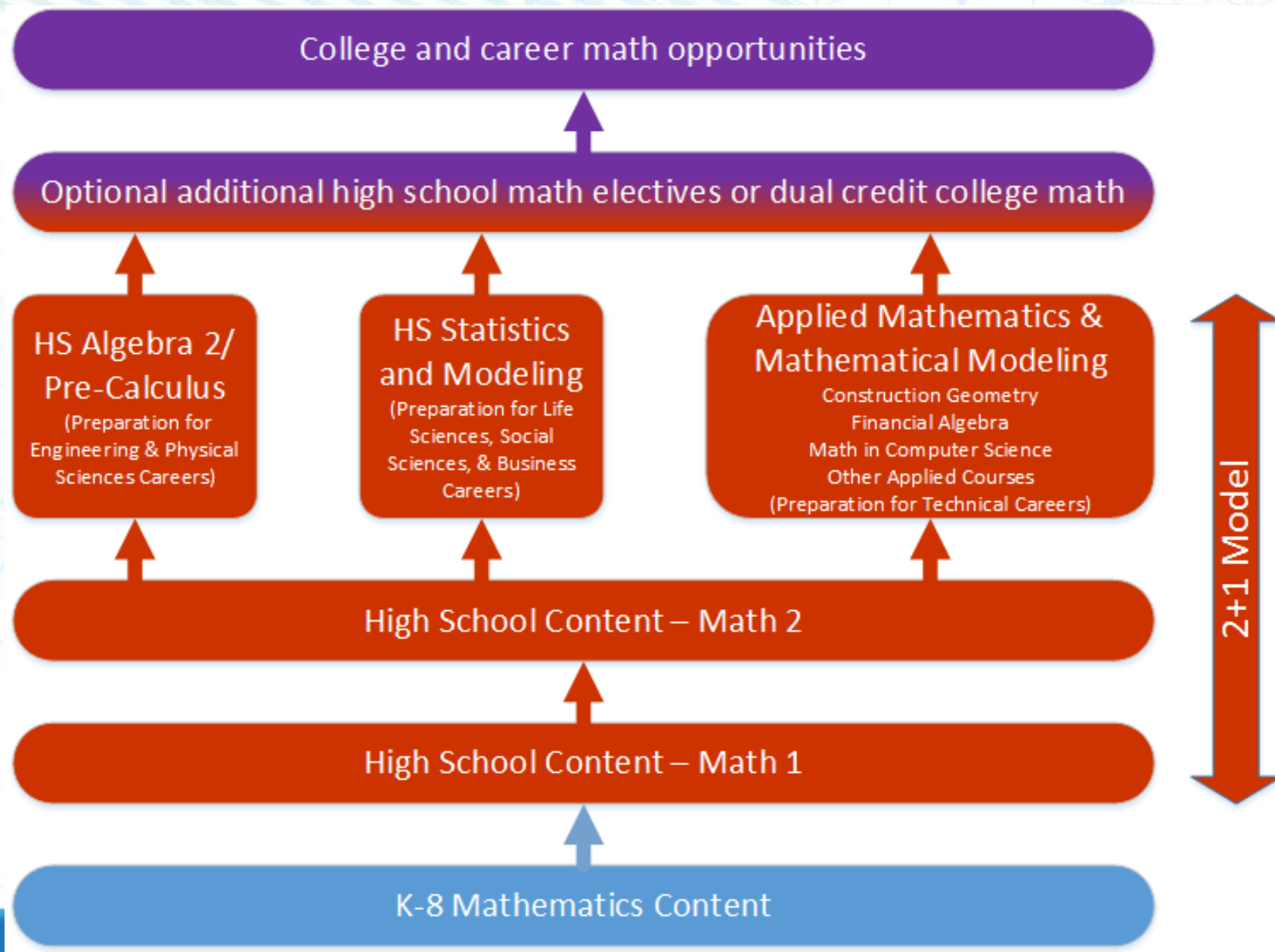
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Pathways Model: *Student Math Reality*

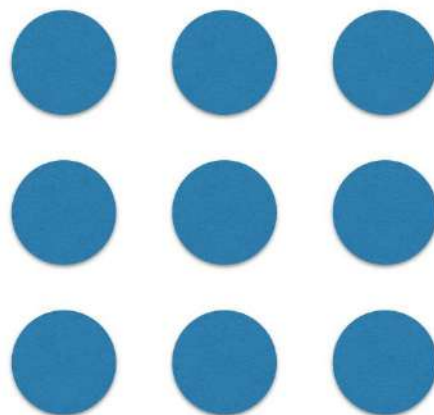


Proposed 2+1 Model



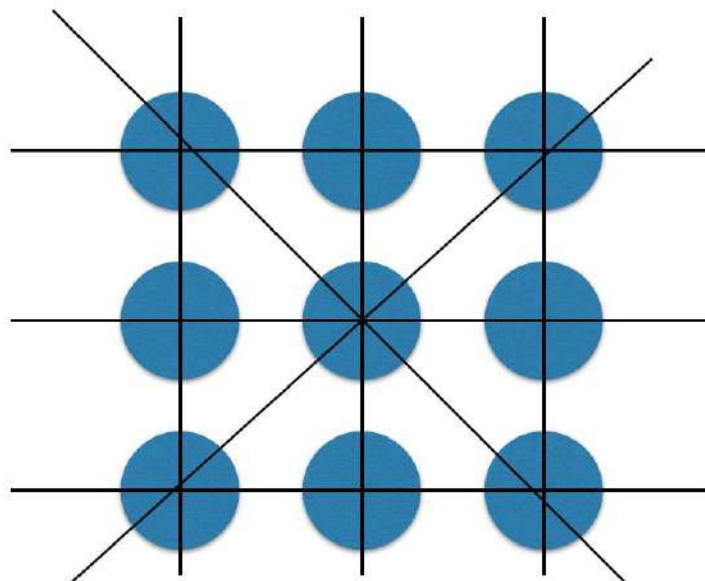
Warm-up Problem

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



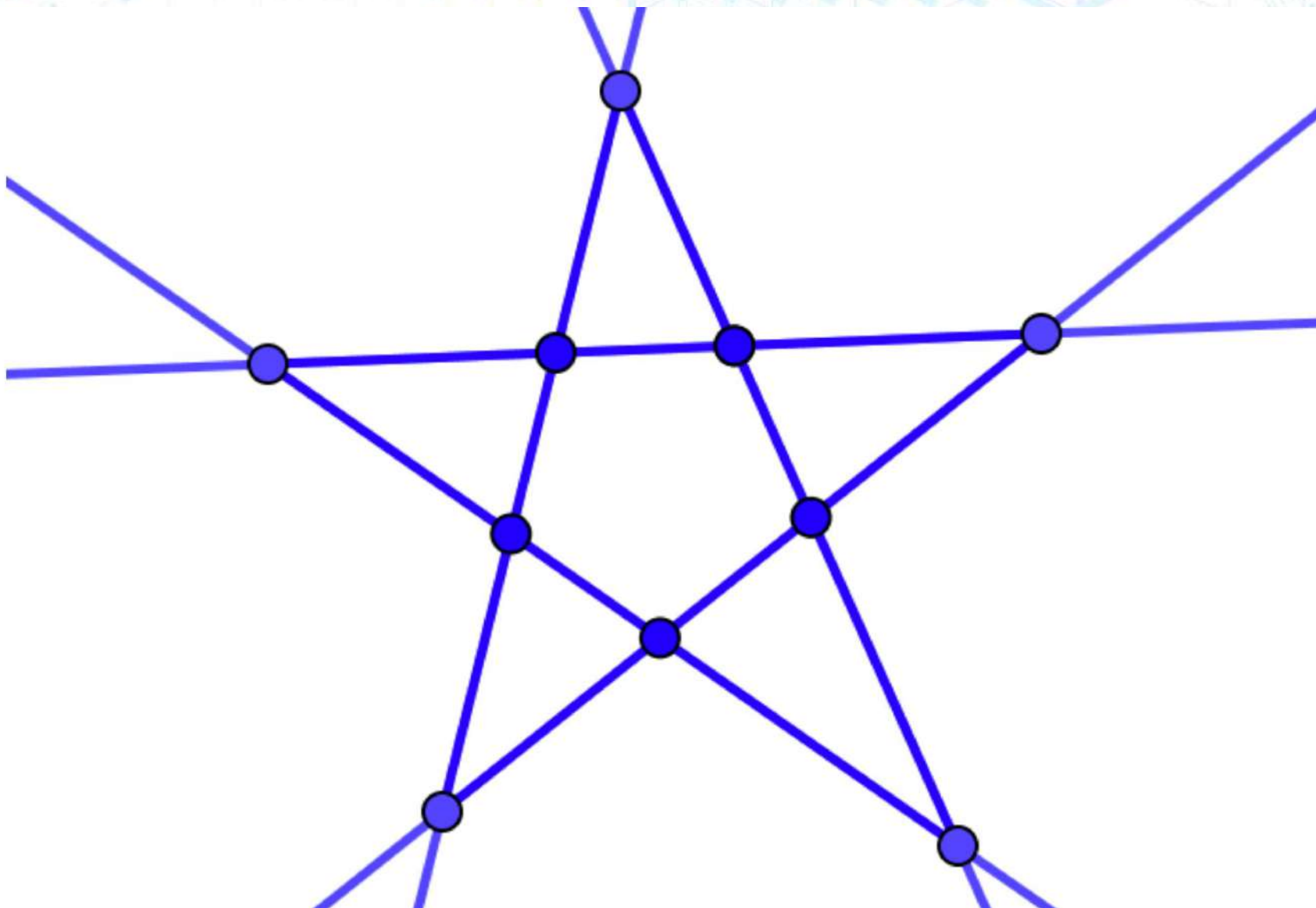
Example: 9 trees creating 8 lines with 3 trees on each line

Plant 10 trees to make five rows of four.



9 dots in 8 rows of 3

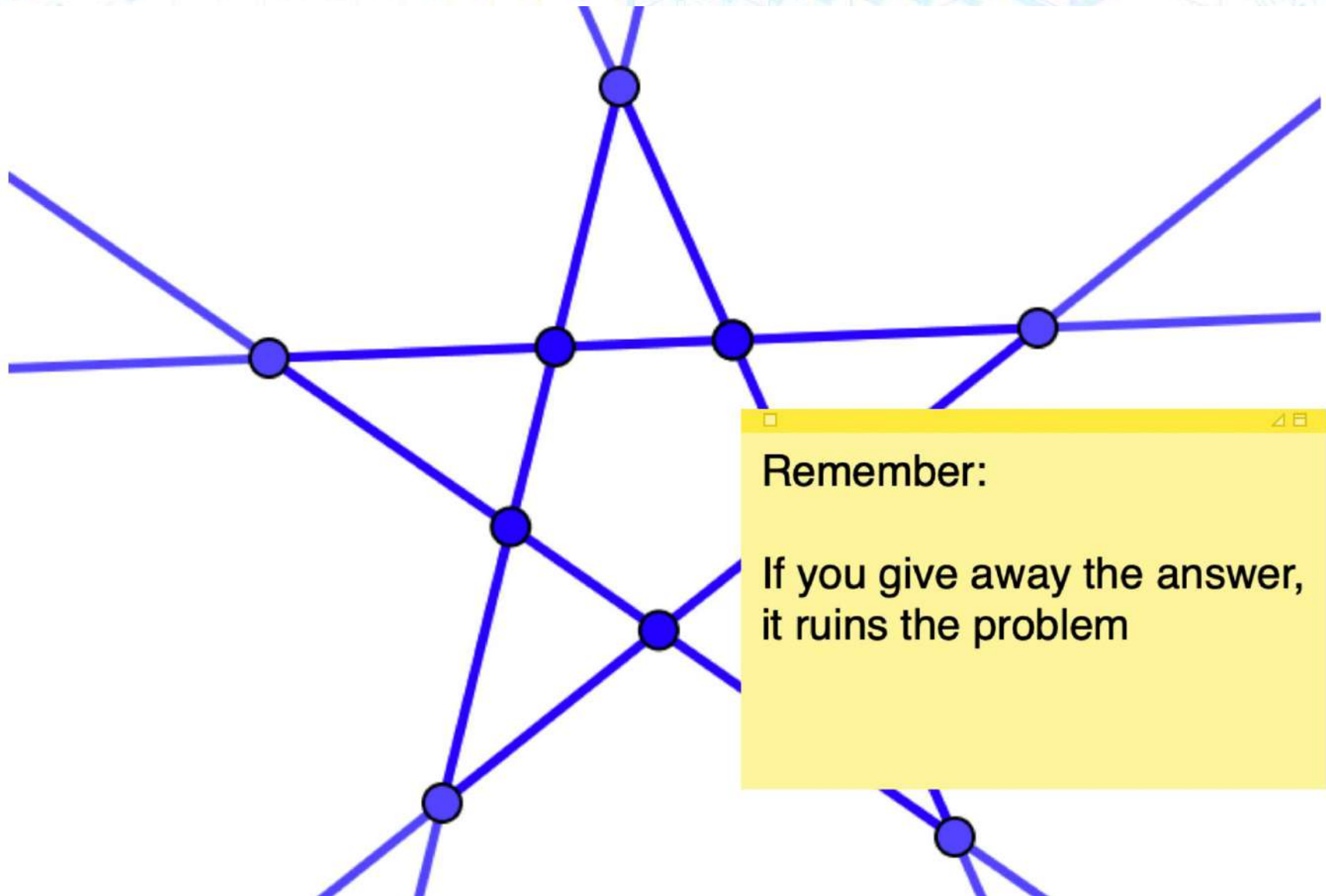
The “Answer”??





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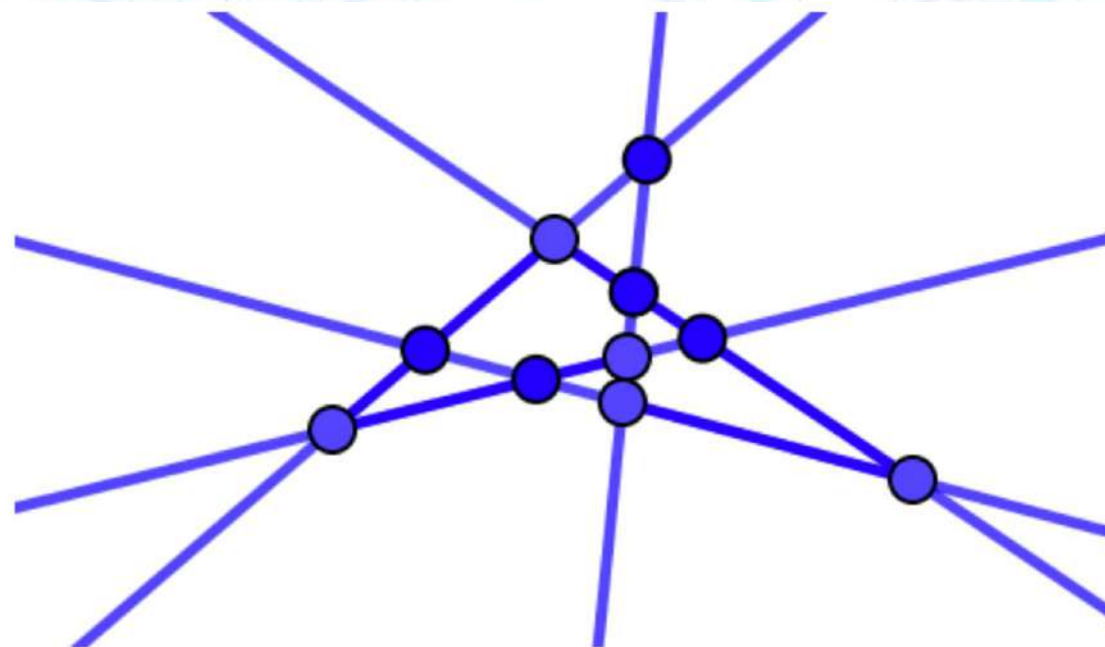
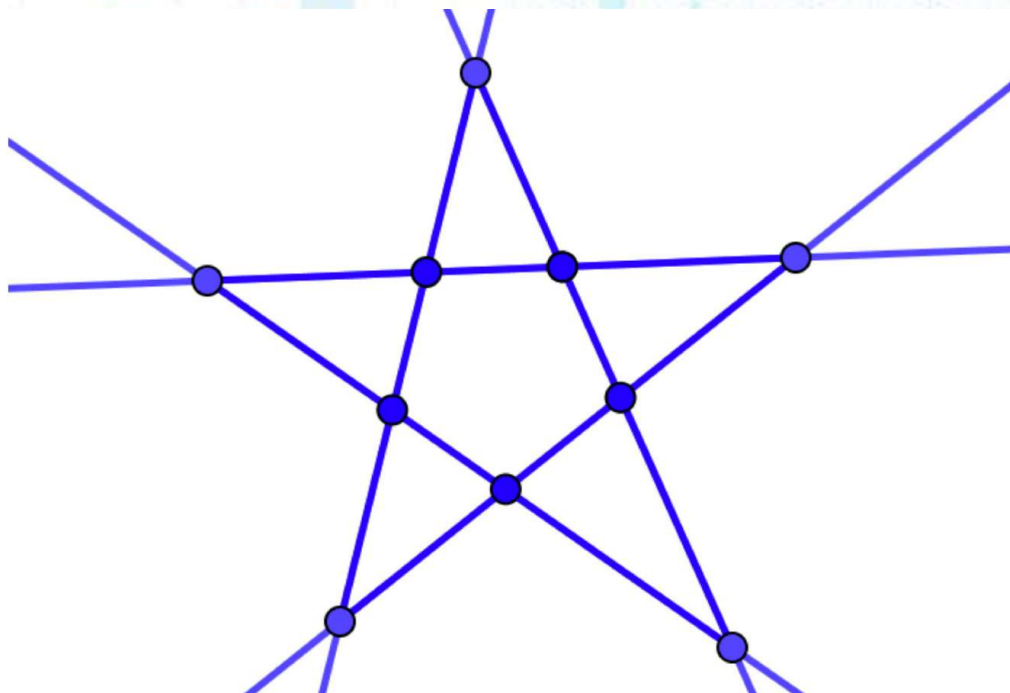
Remember:

If you give away the answer,
it ruins the problem

Teacher's Answer

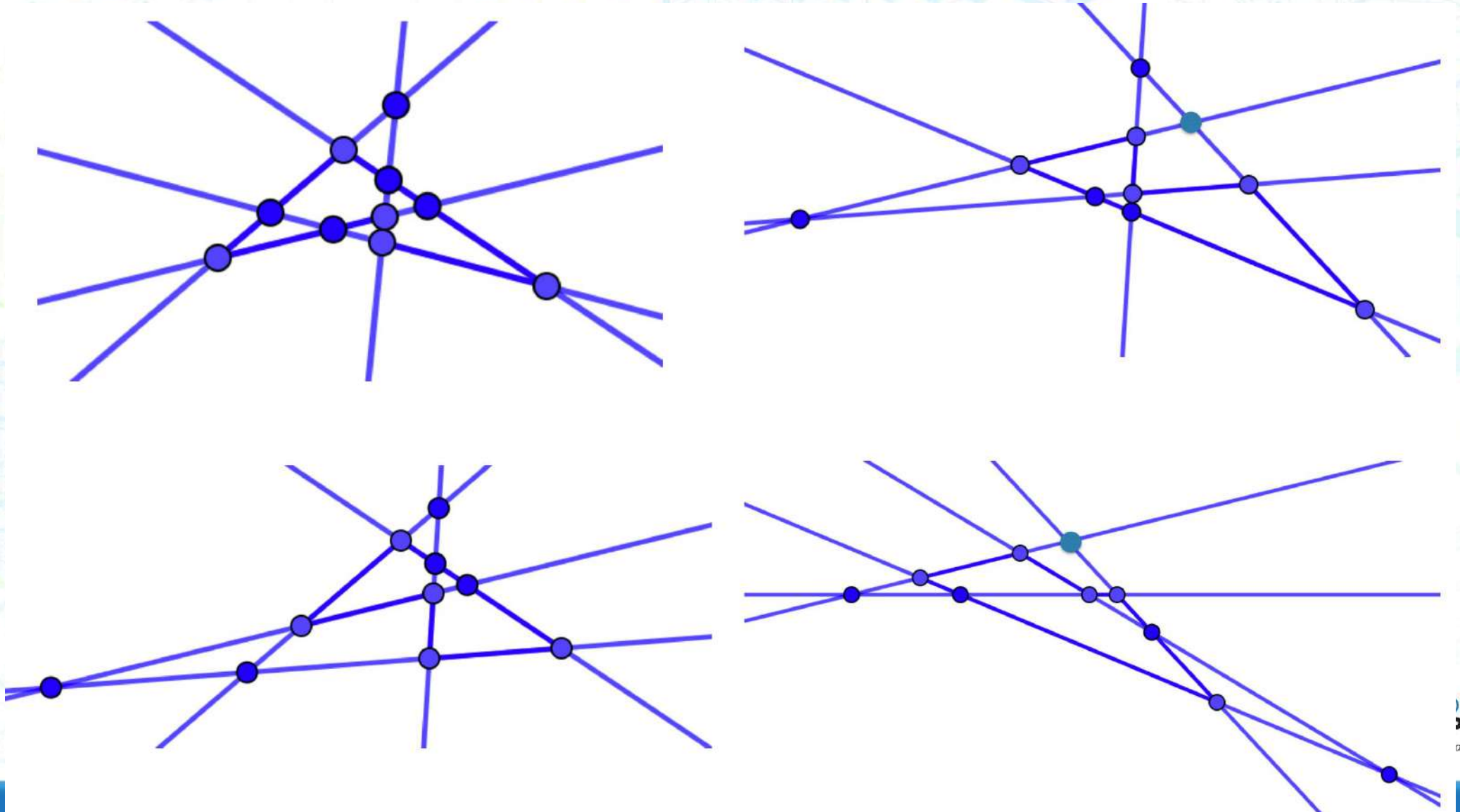
vs.

Dan Finkel's Answer



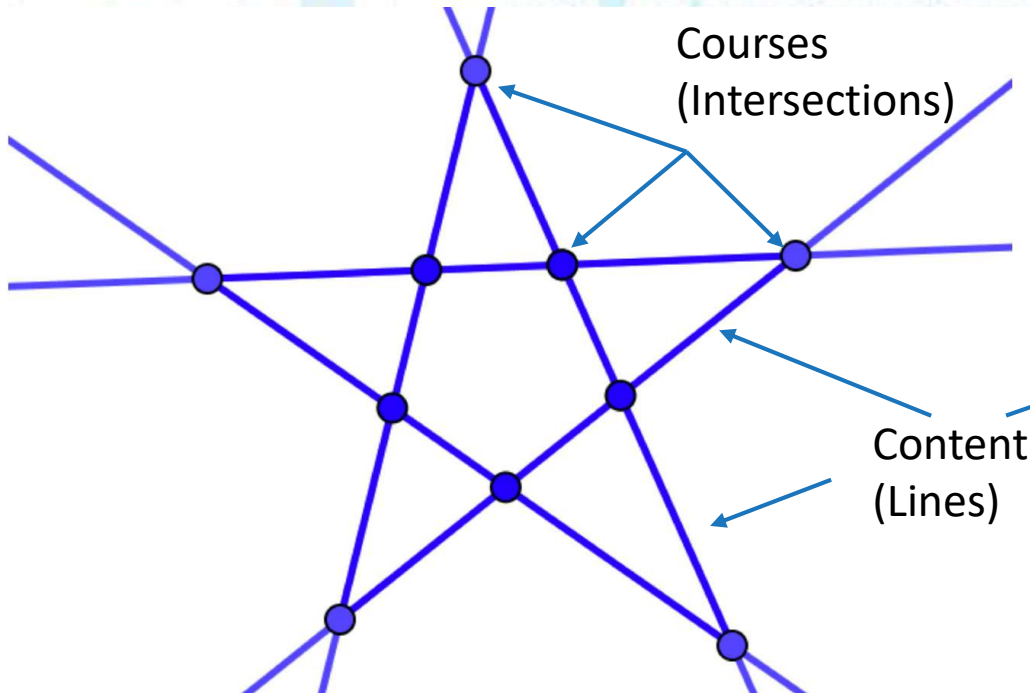
Changing your perspective

Focus on placing lines rather than points

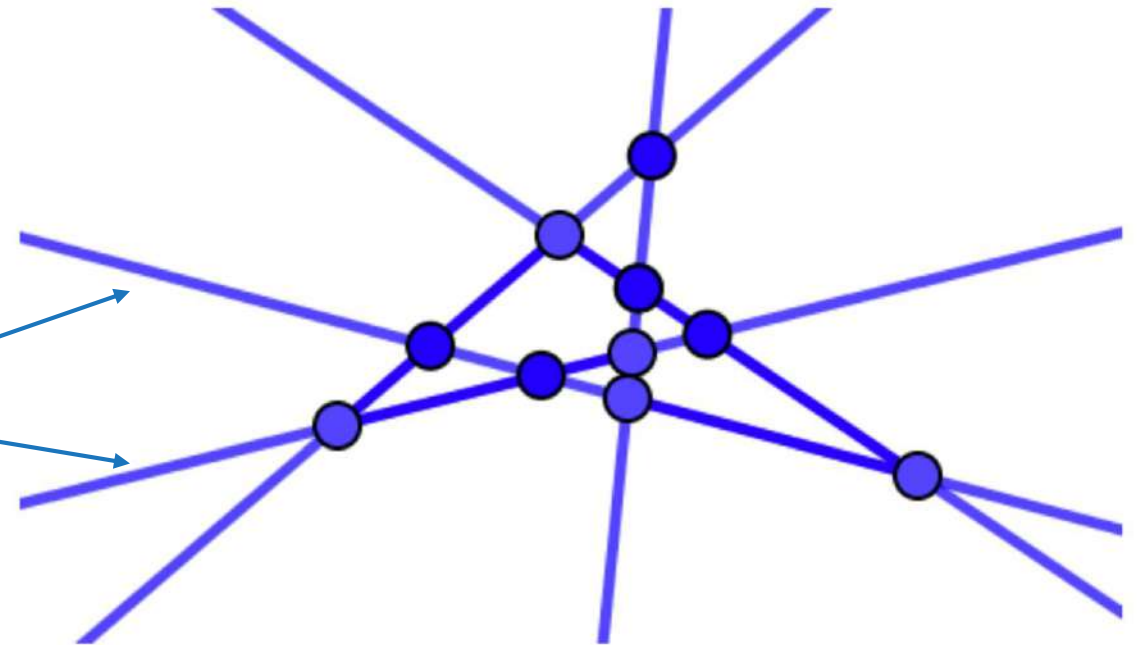


Shifting perspective from courses to content

One solution



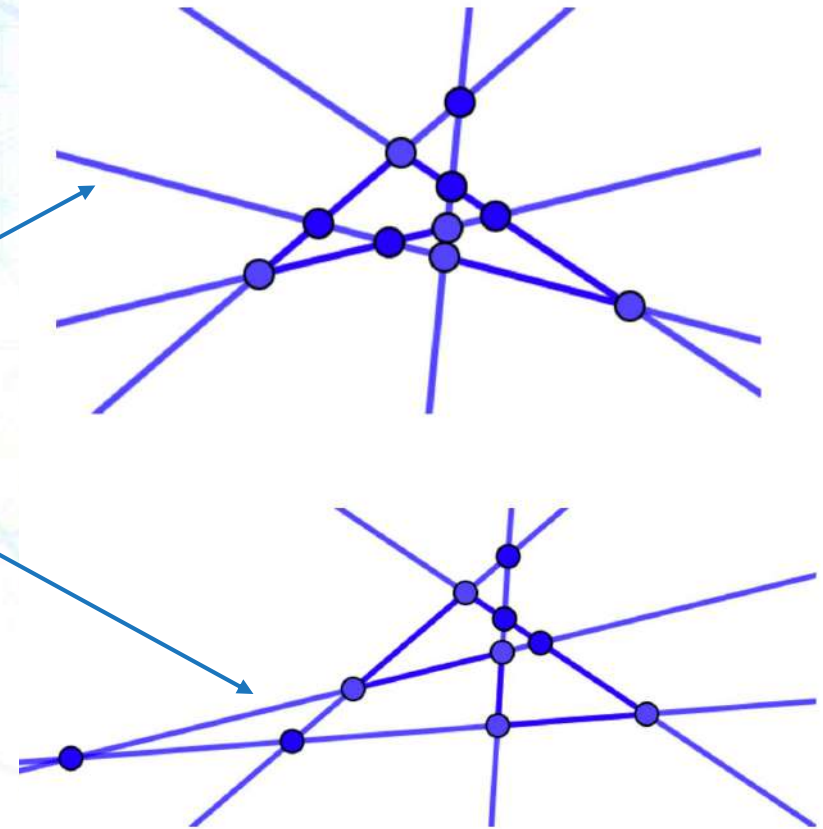
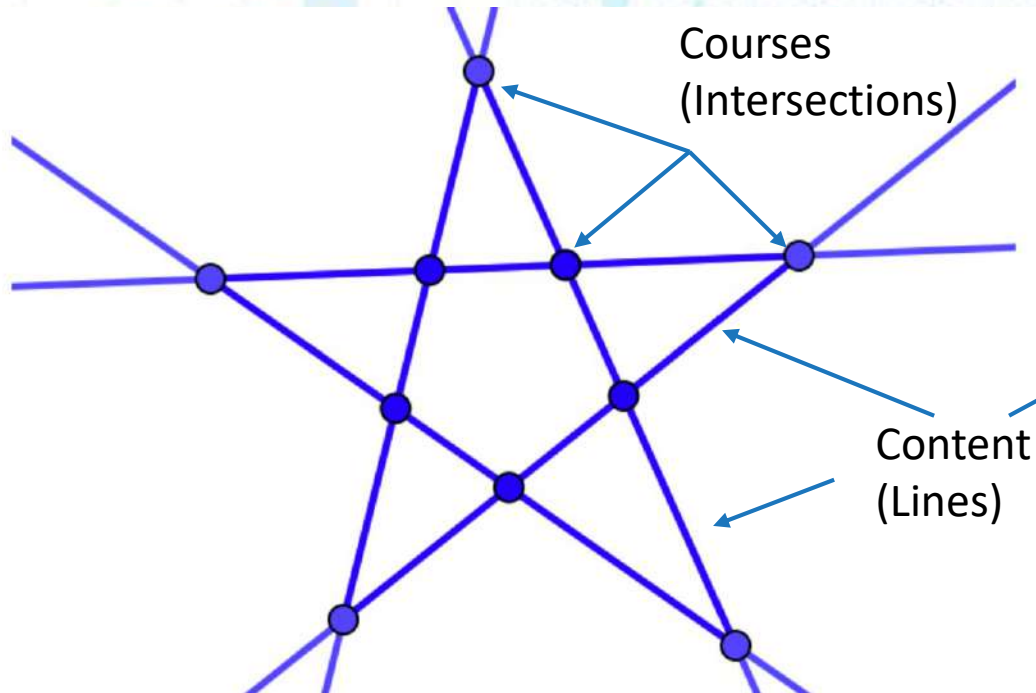
Many solutions



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

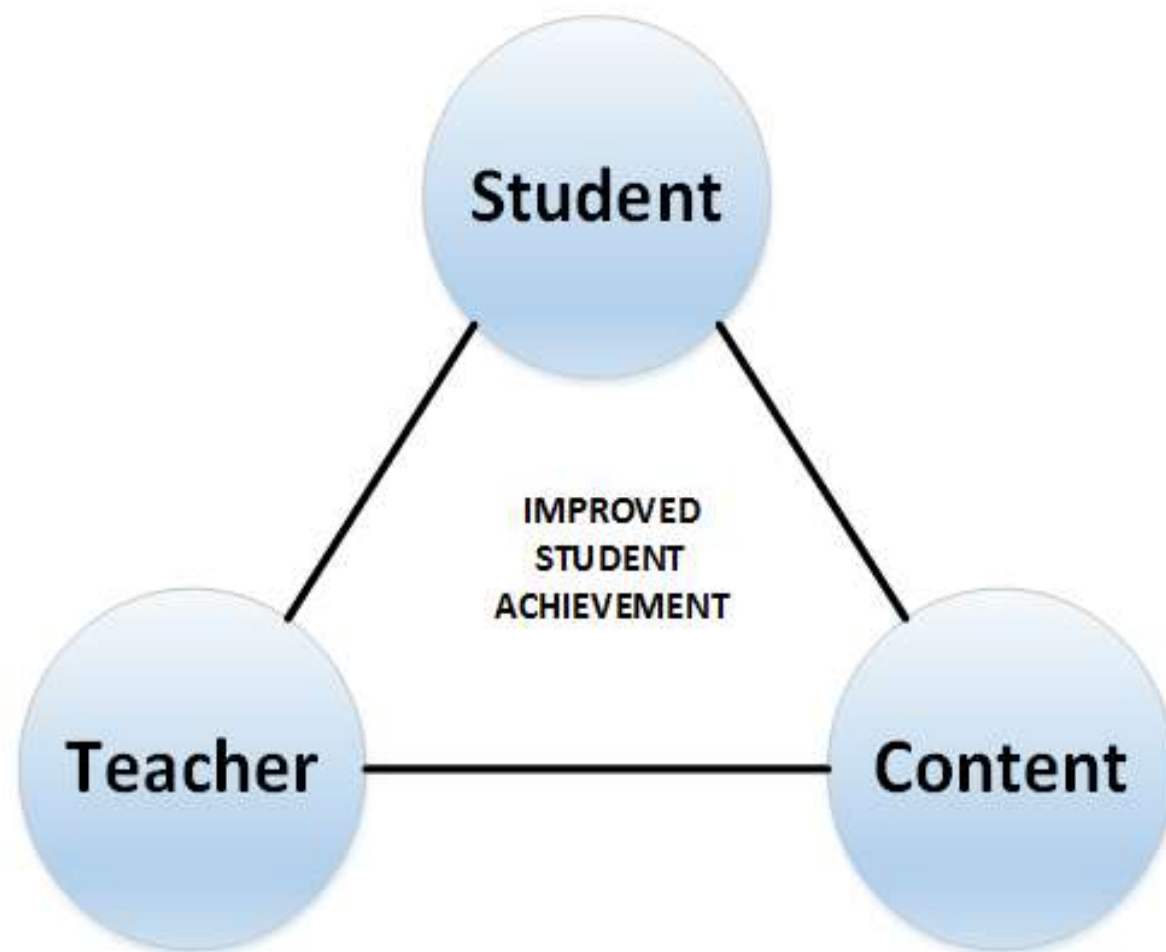


Oregon

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*Engaging students in
the learning process*

The +1



*Improving teachers'
instructional practice*

*Providing academically
challenging content*

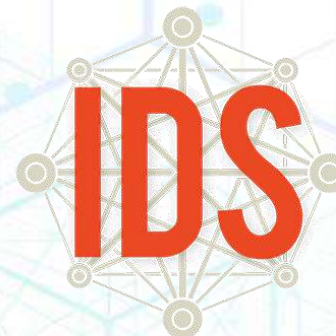


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Applied Courses Examples

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



Introduction to Data Science





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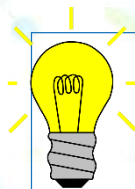
Mathways Initiative



On Track



Strong Focus



Engagement



Pathways



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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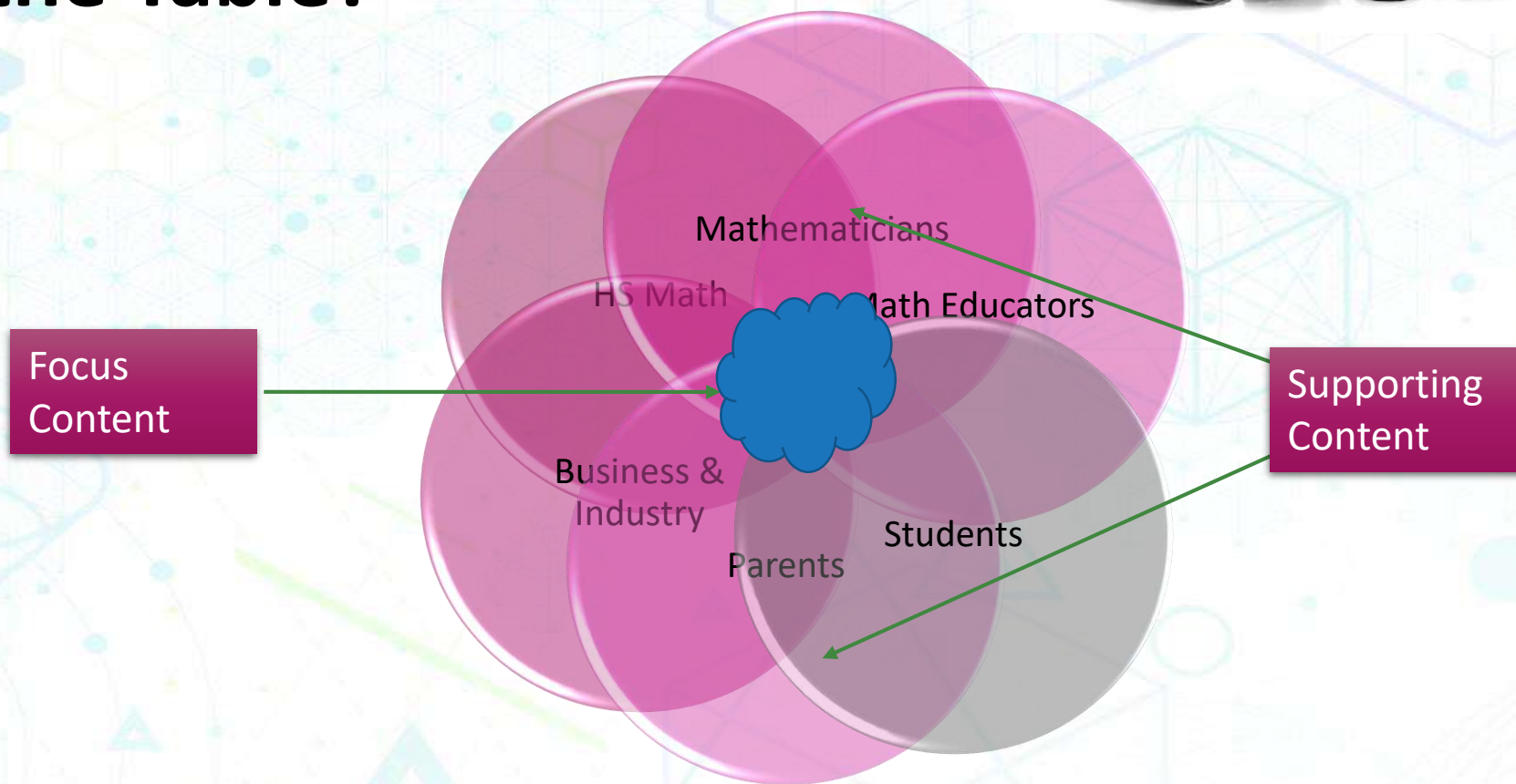
Introduction to Lenses



- 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?

Lens to HS Math

Who is at the Table?



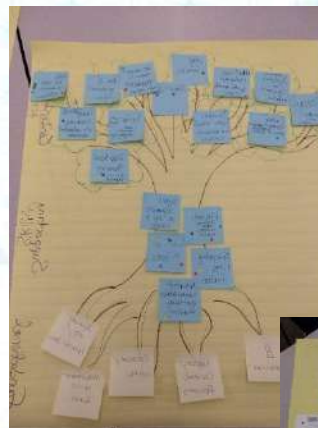
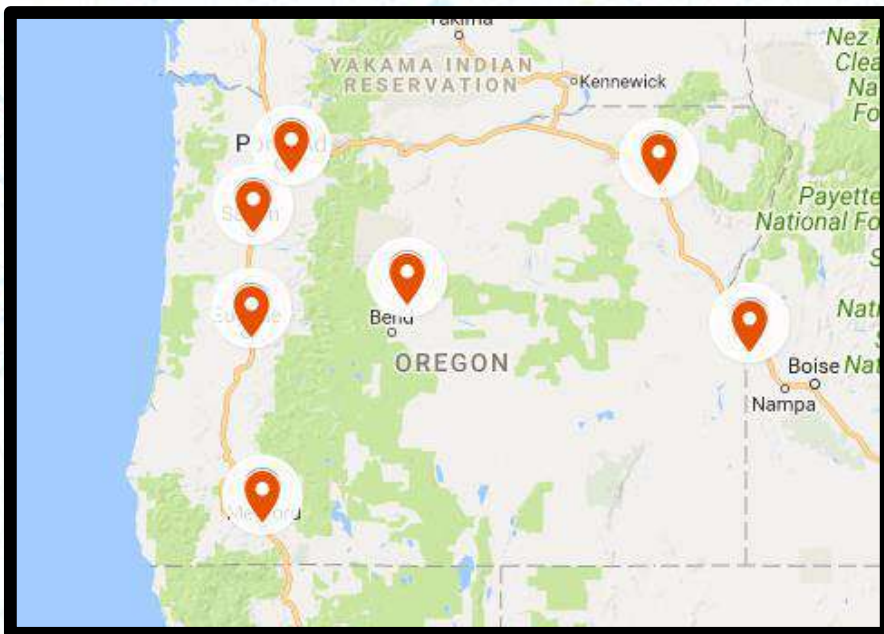


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Regional Educator Meetings

Spring 2018





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Mathways Initiative



On Track



Strong Focus



Engagement



Pathways

Attending to Mathematical Rigor

Conceptual
Understanding



Procedural Skill
and Fluency

Application



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Math in Real Life – Highlights

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



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**



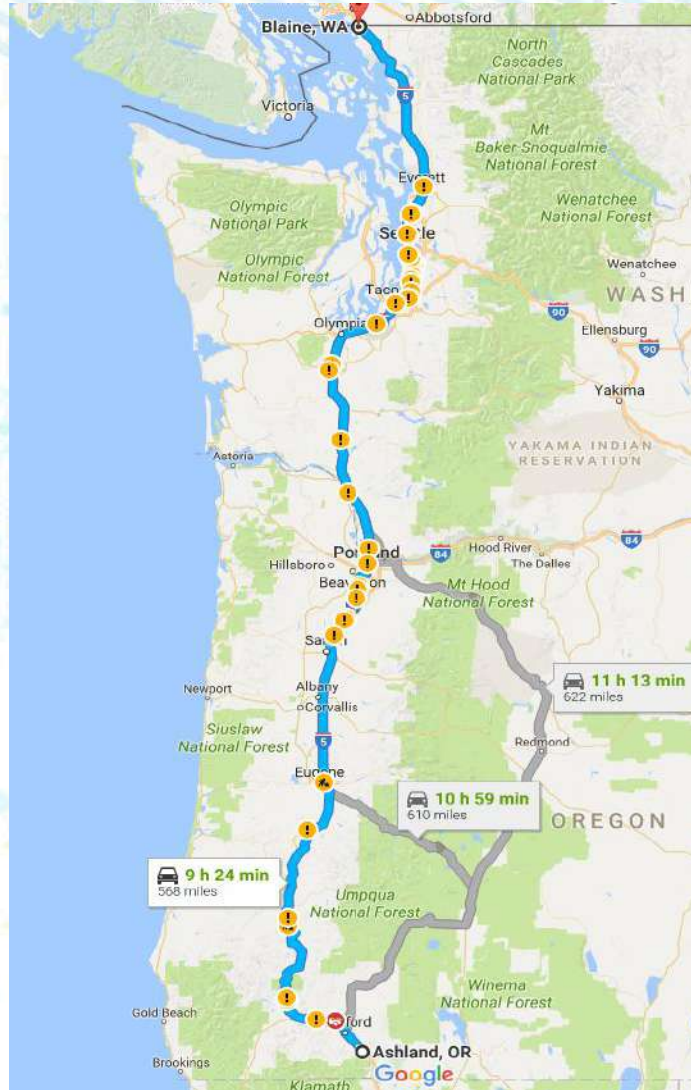
Make the Math Explicit



Revisit the Context



Assess the Math in Multiple Ways



What might
impact our race?

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

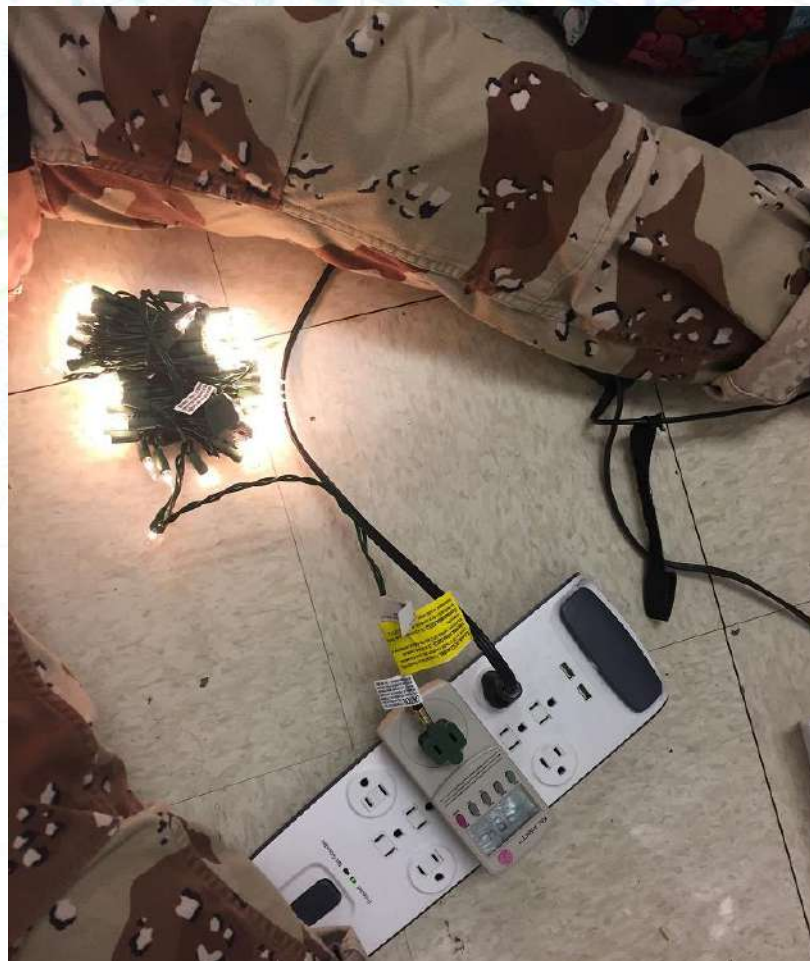
What information do
we need in order to
plan our race?

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?



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?



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

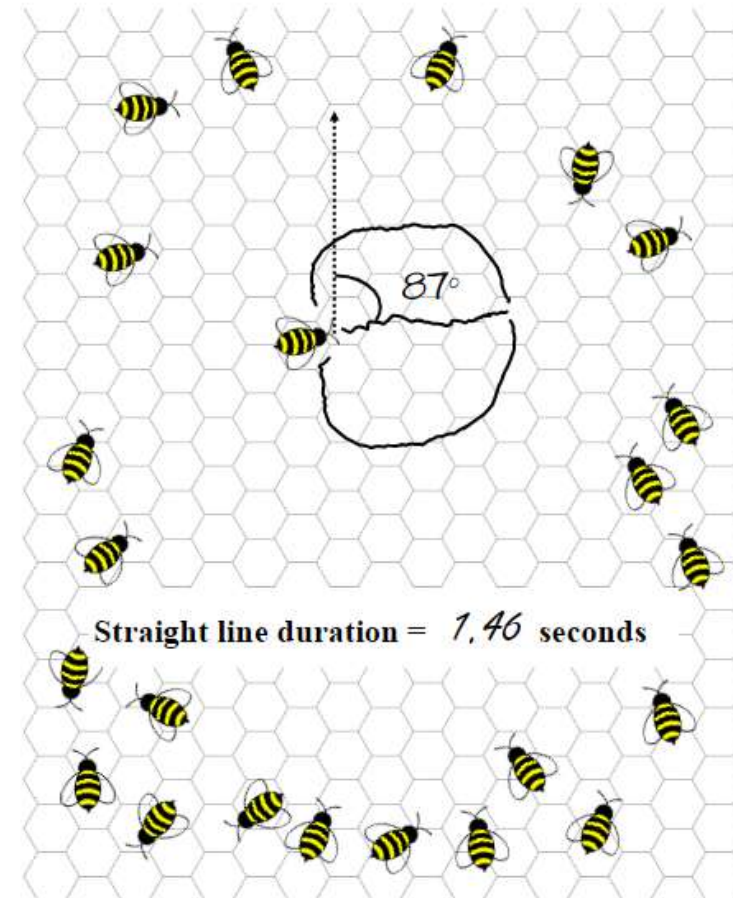
Students decide if the distances to food sources and duration of waggle dances for the five locations are proportional.

Waggle Dance Observation Card:

Date: *June 1, 2016* Time: *3:00 pm* Observer: *Karl*

Hive #: *11*

Food source #: _____



Note: Actual Western Honey Bee has average length of 12 mm



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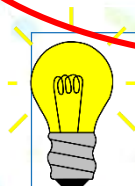
Mathways Initiative



On Track



Strong Focus



Engagement



Pathways



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



THE OPPORTUNITY MYTH

INTRODUCTION

THE OPPORTUNITY SEEKERS

DIFFERENT RESOURCES, DIFFERENT RESULTS

THE WEIGHT OF WAISTED TIME

CHOOSING THE OPPORTUNITY GAP

THE OPPORTUNITY MYTH

What Students Can Show Us About
How School Is Letting Them Down
—and How to Fix It

San
Francisco
Detracking:
One
District's
Story

SAN FRANCISCO UNIFIED SCHOOL DISTRICT



Oregon Department of Education
March 12, 2019



www.sfusdmath.org @SFUSDMath



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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



tive



Background

Students are required to have three credits of high school mathematics (CCSS) for Mathematics to qualify for an Oregon High School diploma. Students can demonstrate the Essential Skill they can apply mathematics in a variety of ways. This can be commonly demonstrated through the Oregon Smarter Balanced Assessment Consortium (OSBAC) or can also be demonstrated through other approved assessments (e.g., AP, IB, etc.).

The Oregon Department of Education (ODE) does not define which sequence of courses students must take to meet graduation requirements. A common option for students is to take Algebra I (AI) and Algebra II (AGA). This sequence occurs in 90% of high schools recommended in 1892. Multiple national reports bring the value of mathematics into question.

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

Oregon's experience in mathematics is a reflection of what is happening nationally. National reports, highlighted in the resources section below, call for a reimagining of mathematics. The Oregon 2+1 Model is one way to accomplish this.

- Providing opportunities for students to develop a solid understanding of mathematical concepts and procedures necessary for college and career readiness.

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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