

# Helping All Students Develop Mathematical Habits of Mind

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*Grand Island Senior High*

*Grand Island Public Schools*

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*Omaha Public Schools*

# Why us?

- *Danielle*

- *Yes, I am a high school teacher not a high school student.*

- *NOYCE Master Teaching Fellow*

- *Grand Island Senior High*

- *24% receive ELL services*

- *49% free/reduced lunch*

- *40% 'minority' student population*

# Why us?

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- *Connie- NOYCE Master Teaching Fellow*
  - *20 years working with high needs middle-school students*
- *McMillan Magnet Center*
  - *74% free/reduced lunch*
  - *Diverse population: 37% African American, 34% Caucasian, 15% Hispanic, 15% Other*

# Targets for Today

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- *Share tips and strategies for developing mathematical “Habits of Mind”*
- *Want to give particular attention to the ‘struggling learner’*
- *Provide specific content examples*

# The “Intangibles”

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- *Much of what helps struggling learners is not math related*
- *Parts of teaching that no one teaches you to do*

# The “Intangibles”

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## *Build Relationships*

- *Motivation, motivation, motivation*

# The “Intangibles”

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## *Set High Expectations*

- *If you don't expect much, students won't do much*

# The “Intangibles”

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## *Hold Students Accountable*

- *Don't have high expectations without holding students to them*
- *Provide appropriate support to meet the high expectations*



# Strategies in the Math Classroom

## *Use Graphic Organizers Effectively*

### *Combination Note Making*

<i>Procedures/Examples</i>	<i>Graphic Representations</i>
<i>Summary</i>	

# Strategies in the Math Classroom

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## *Vocabulary!*

- *Many students struggle because they don't understand our math terminology...not necessarily because they can't 'do the math.'*
- *Do short vocabulary games or activities several times per week.*

# Strategies in the Math Classroom

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## *Make Learning & Teaching Conversational*

- *Interaction!*
- *Teachers need to give students opportunities to talk about math!*

# Strategies in the Math Classroom

## *Provide Structure & Manipulatives*

- *Struggling learners can think deeply about mathematics (“the why’s”)*
- *Teachers need to provide structure to do this...you can’t just ‘set them loose.’*

# Strategies in the Math Classroom

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## *Make Content Relevant*

- *Motivation!*
- *Do WE like to learn things we don't find relevant to our lives?*

# What do good problems look like?

- *2 examples of “rich” problems that develop the Common Core Mathematical Practice Standards*
- *Think about how these problems could be used with all learners*
- *We won't have time to work through all parts of the problems today. We simply want to discuss how they fit with Common Core.*

# For each of the two problems:

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- *With the people you are sitting next to, explore the problem and discuss which Practice Standards are addressed and how they are used in the problem*

# School Spirit Wear

*Scenario: The PTSA is planning to sell school spirit wear next year as a fundraiser to raise money for student field trips. They have investigated several companies to verify product quality and reliable business practice. They have narrowed the choice of suppliers to two vendors, but need your help in making the final decision. Use what you have learned about writing and graphing linear equations to help you decide which supplier to choose. Questions have been provided to help guide your decision.*



# Help students organize their thinking

*The Shirt Shack charges a \$50 set-up fee to cover the artwork for an order and \$8 per t-shirt.*

*Shirt's Plus charges a \$100 set-up fee to cover the artwork for an order and \$6 per t-shirt.*

*How much would it cost just to have the artwork completed without placing an order?*

*How much would it cost to order 10, 20, 30, ... shirts?*

*When is the cost from The Shirt Shack equal to the cost from Shirt's Plus?*

*Who is the least expensive vendor in the beginning?*

*When (if ever) does the least expensive vendor become more expensive?*



# The Practice Standards

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1. *Make sense of problems & persevere in solving them.*
2. *Reason abstractly and quantitatively.*
3. *Construct viable arguments & critique reasoning of others.*
4. *Model with Mathematics*
5. *Use appropriate tools strategically.*
6. *Attend to precision.*
7. *Look for & make use of structure.*
8. *Look for & express regularity in repeated reasoning.*

# How to use “what you’ve got”

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- *Many problems from our curriculum are okay, but they need more structure so that struggling learners can be successful with them*

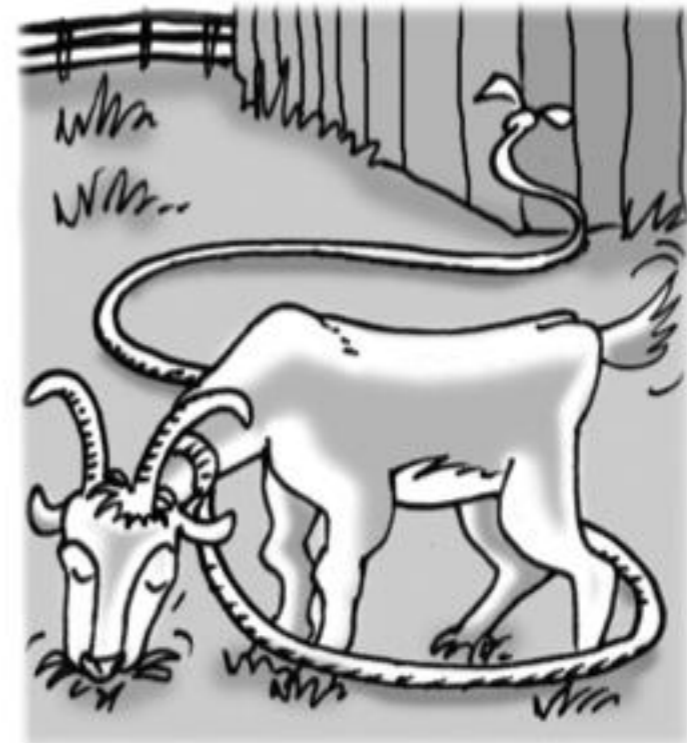
# College Preparatory Mathematics

## Geometry Connections

### 8-104. THE GRAZING GOAT

Zoe the goat is tied by a rope to one corner of a 15 meter-by-25 meter rectangular barn in the middle of a large, grassy field. Over what area of the field can Zoe graze if the rope is:  
[ a:  $\approx 235.62 \text{ m}^2$ , b:  $\approx 962.11 \text{ m}^2$ , c:  $\approx 2160 \text{ m}^2$ , d:  $x \geq 13.03$  feet, or 13 feet ]

- 10 meters long?
- 20 meters long?
- 30 meters long?
- Zoe is happiest when she has at least  $400 \text{ m}^2$  to graze. What possible lengths of rope could be used?



# Gabe the Puppy...

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- ***Scenario:** Gabe the puppy is tied by a rope to a 15 meter by 25 meter rectangular garage. Your task is to determine where it would be best to tie the rope so that Gabe has the maximum playing area.*

# Things to consider with struggling learners...

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- *Force them to draw pictures of each situation!*
- *Ask them to explain verbally and in writing.*
- *Have a manipulative available to help visualize the situation*

# Questions for kids to discuss...

- *If Gabe is tied to the **corner** of the 15 meter by 25 meter garage, determine the total area Gabe will be able to play while tied up given rope lengths of 10 m, 20m, and 30m. For each part, you need to draw an accurate picture of Gabe's play area **first**.*
- *What if you attached a 30 meter rope to the **middle** of the 25 meter side of the garage (as opposed to the corner)?*
  - *Do you think Gabe will have more area? Why or why not? Calculate it and find out*
  - *Do you think Gabe would have had more area to play in if you had attached the rope to the middle of the 15 meter side instead? How do you know? Justify your answer.*
  - *Do you think Gabe would have more playing area if the rope were attached to a different part of the garage? Explain and justify your answer.*
- *Gabe is given 25 meters of rope. Based on what you already know, where should you tie that rope so that Gabe is given the most area to play in? Explain.*
- ***Extension:** Gabe is happiest when he has at least 600 sq. meters to play. What possible rope lengths could be used?*



# How I modified it...

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- *Similarities? Differences?*
- *How does this problem address the practice standards?*

# The Practice Standards

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# Closing Thoughts

<i>Exit Slip</i>	
<i>3</i>	<i>Important ideas you would like to remember</i>
<i>2</i>	<i>Ideas you'd like to know more about</i>
<i>1</i>	<i>Question that you still have</i>

# Questions?

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- *You have them...we made you write one down.*

# Contact Us

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