Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g. *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

DETAILED LESSON PLAN: AVALANCHE RESCUE TRAINING

Where is the victim in relation to you?

The coordinate plane is the basis for many concepts in future mathematics, such as visualizing equations and scatter plots. During *Avalanche Rescue Training*, the students are part of the Ski Patrol training for avalanche rescues. The trainers explain the set-up of the coordinate grid as being part of the Beacon system worn by the patrol and used to help guide the avalanche dogs to the victim's location. The data provided is a numberless grid showing the location of the "victim."

Lesson Plan Overview

Lesson Length: 4 Days

Prerequisite Standards

- 3.NF.A.2

Vocabulary

- **Coordinate plane:** A two-dimensional number line, split into four quadrants by the *x*-axis and *y*-axis; used to plot points, lines and figures.
- **Coordinates:** Two numbers (*x, y*) that indicate the position of a point on a coordinate plane.
- ***X*-axis:** The horizontal number line running through the center of the coordinate plane.
- ***Y*-axis:** The vertical number line running through the center of the coordinate plane.
- **Origin:** The intersection of the *x* and *y*-axes on the coordinate plane; located at (0, 0).
- **Quadrants:** The four regions of a coordinate plane, as divided by the *x* and *y*-axes.
- **Ordered pair:** Two numerical coordinates (*x, y*), specifically ordered, to locate or name a point on a coordinate plane.

Vocabulary Protocols:

- In your math classroom, make a Word Wall to hang and refer to vocabulary words throughout the lesson. As a whole-class exercise, create a visual representation and definition once students have had time to use their new words throughout a lesson.
- In the *Practice Printable*, remind students that key vocabulary words are highlighted. Definitions are available at the upper right in their student account.
- In the *Student Reflection*, the rubric lists the key vocabulary words for the lesson. Students are required to use these vocabulary words to explain, in narrative form, the math experienced in this lesson. During "Gallery Walks," vocabulary can be a focus of the "I Wonder..., I Notice..." protocol.

Applying Standards for Mathematical Practice

SMP 6 **Attend to precision.***

During *Teacher Instruction*, students are prompted to describe the coordinates of points *G* and *H*, neither of which lie perfectly on the intersection of two grid lines. Students may say that *G* is close to (3, 2) and *H* is close to (6, 5). As you will see in the *Teacher Instruction,* the questioning encourages students to improve their precision.

SMP 7 **Look for and make use of structure.**

During *Resolution*, teachers prompt students with the question: *What made the coordinate plane useful when identifying the location of the victim?* This gives students the opportunity to recognize familiar structures, such as number lines, and their usefulness.

***Mathematical Practice Tip from Jo Boaler: SMP 6**

Attending to precision is as much about communication as it is the accuracy of a measurement or the correctness of a solution.

'Attending to precision' is often thought of as referring to computation of a correct answer or measuring accurately. A more inclusive idea of attending to precision involves the communication of mathematical ideas, both written and spoken. Encourage students to communicate clearly, paying attention to what words and symbols mean, and how they are modeling and labeling their work. Share with them that mathematics is a language and we can use tools, strategies and teaching approaches to make the language clearer for others.

Some teaching ideas I use are:

1. When students are presenting to others I pay attention to the clarity of their presentation – asking them to draw ideas to make them clearer, or to use bigger writing, or to stand to one side so that others can see.
2. A routine I use regularly is: I present an object, a data visualization, a graph, an image or a complex situation and ask students – *What do you notice? What do you wonder? What is going on*?
3. In conversation you can ask students to revise their descriptions to be more precise.
4. A classroom activity I love is to ask different groups to prepare a poster sharing their ideas and communicating results so that others can understand them, then I pass the poster each group has made to the next group, and ask them if they understand it, and whether they can improve it. We then display the improved posters. This leads to great classroom discussions and attention to clarity of the ideas.
5. I always encourage students to color code their mathematical work. This does not just mean coloring things differently, it means highlighting mathematical ideas using color. If you have a graph, a diagram and an equation, for example, you could show where "*x*" is represented on each by making it the same color. Color coding can be used with students of any age, to help make mathematical thinking more visible.

Communicating mathematical ideas carefully encourages good classroom discussions and serves to elevate all the other mathematical practices.

Video Highlight: A teacher presents a data talk to middle school students. (Run time: 2 min, 29 sec)
(from the online course: https://www.youcubed.org/21st-century-teaching-and-learning/)
www.youcubed.org/resources/what-do-you-notice-what-do-you-wonder/

Cluster Connection

Cluster Heading: Graph points on the coordinate plane to solve real-world and mathematical problems.

- **Direct Connection:** In *Avalanche Rescue Training*, students will use ordered pairs on a coordinate plane to understand how to locate a person buried in snow in relation to their current location.
- **Cross-Cluster Connection:** This activity connects 5.G to 6.NS, 7.RP, 8.EE, 8.G and 8.F as it provides students with the foundation necessary for future work with the coordinate plane as it relates to graphs of proportional and non-proportional relationships, functions and transformations.

Common Misconceptions

- Students often reverse the coordinates when plotting them on a coordinate plane, counting vertically first on the *y*-axis and then horizontally on the *x*-axis. Have students compare with classmates so that they will notice a difference in location of their points. Discuss the need for a common convention, which is *x* first, then *y*, and the importance of adhering to that convention.

Supporting Diverse Learners

Accommodations, Modifications and Extensions for English Learners (EL) and Special Populations

These supports may be appropriate for all students. Accommodations, modifications, and extensions are provided by curriculum component. Please consider additional supports where you find them appropriate for your students.

Note: Strategies contained in this section are appropriate for English Learners and students who are receiving services under the Federal Individuals with Disabilities Education Act (IDEA), Section 504 of the Rehabilitation Act of 1973, and state laws governing Talented and Gifted education.

Component	Accommodations/Modifications	Extensions
Test Trainer Pro	*Test Trainer Pro* automatically adapts to student ability level as students move through questions. Instruct students to work in a lower grade level or Core Skills (Grades 1-4) as needed.	*Test Trainer Pro* automatically adapts to student ability level as students move through questions. Instruct students to work in a higher grade level or Algebra I as needed.
The Math Simulator Immersion	Access Closed Caption and Spanish Subtitles within the video. Reinforce lesson vocabulary and ensure students understand the meaning and function of each word.	
The Math Simulator Data & Computation	*Provide students with an illustrated cheat sheet of the coordinate grid with key vocabulary words labeled.* *Origin* *Coordinate* *Ordered pairs* *X-axis* *Y-axis* Give students ways to remember they move horizontally first and then vertically when graphing ordered pairs. Ex: *Crawl before you walk.*	Task students to come up with another real-life situation that a coordinate grid would be helpful to do a job.
The Math Simulator Resolution	Access Closed Caption and Spanish Subtitles within the video.	Students can present their ideas of other real-life jobs that a coordinate grid would be helpful to do a job.
Simulation Trainer	Pair students to allow for peer teaching and support. Provide students with an illustrated cheat sheet of the coordinate grid with key words labeled.	Have more proficient students on this skill coach less successful students.

Component	Accommodations/Modifications	Extensions
Practice Printable	Upon completion of the first page (Procedure #1), consider following the *Exit Ticket Differentiation Plan*. Provide students with an illustrated cheat sheet of the coordinate grid with key words labeled.	Upon completion of the first page (Procedure #1), consider following the *Exit Ticket Differentiation Plan*. Introduce *6.NS.C.8 The Mark of Zero* - solving real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane.
Clicker Quiz	Have more proficient students on this skill coach less successful students. Provide students with an illustrated cheat sheet of the coordinate grid with key words labeled.	Have more proficient students on this skill coach less successful students. Task students with writing and solving their own "clicker quiz" question.
Student Reflection	Pair students to allow for peer teaching and support. Consider allowing EL students to write the narrative in their native language, then use a digital translator to help them transcribe it into English.	Have more proficient students on this skill coach less successful students.

Applying Mathematical Language Routines (MLRs)

While MLRs apply to all students, they are particularly beneficial for EL and other special populations. A full description of the MLRs is available in the Teacher Guide with a rationale for their use.

MLR 2

Collect and Display

During *Resolution*, the students are taught key vocabulary words and how they relate to the coordinate grid.

Suggestion: After students have listened to the *Resolution* video, put them in groups, and have them collaborate to make a visual vocabulary poster all about coordinate planes. Hang the posters up in the room to use as reference for the rest of the unit.

Instruction at a Glance


Gladys Graham


Kevin Simpson

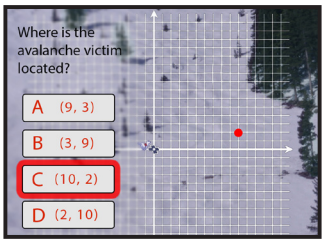

Megan LeBleu

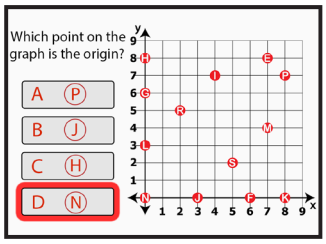
Gladys: Consider allowing students to grapple with how best to communicate the location of a point on the coordinate plane before teaching them about it. Try giving them just the major axes, with no grid lines, and ask them to communicate where a particular point is. Once there is a major need for grid lines to improve communication, then give them the additional structure. See what structure or method they use intuitively to describe the location of a point.

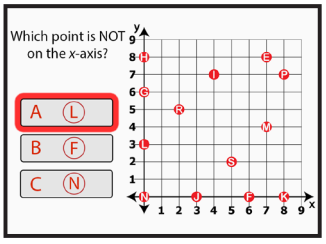
Kevin: Use the number line to help the students understand that, just as points on a number line can be located by their distance, the coordinate system can be used to locate and plot points.

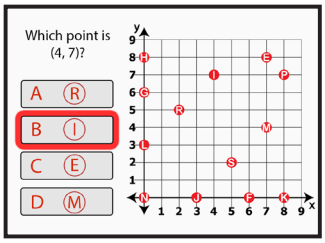
Megan: Use this standard to emphasize the importance of precision. Make sure students understand the effects of switching the order of coordinates.

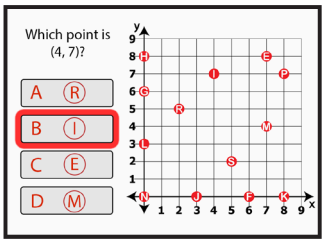
Clicker Quiz

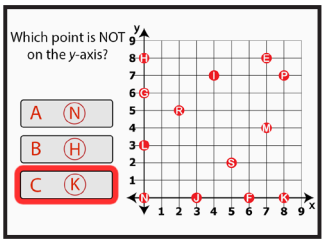












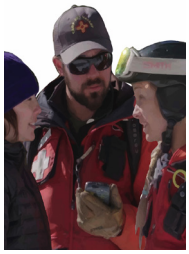
Practice Printable

Full-sized Answer Key available in printed Teacher's Guide

Name _____ Date _____ Period _____

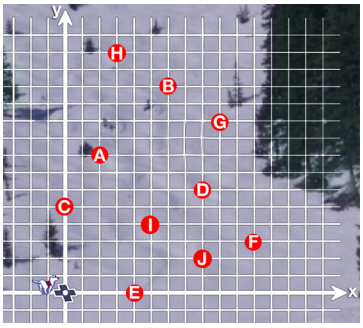
AVALANCHE RESCUE TRAINING

Where is the victim in relation to you?



The Ski Patrol is once again training for avalanche rescues. This time they have placed ten patrol members in various places as victims.

Write the coordinates of each of the ten locations so that the dog can locate and rescue them all.



5.G.A.1

About this standard

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

The victims are located at these coordinates:

A (2, 8)	B (6, 12)	C (0, 5)	D (8, 6)
E (4, 0)	F (11, 3)	G (9, 10)	H (3, 14)
I (5, 4)	J (8, 2)		

MidSchoolMath Avalanche Rescue Training 1 of 2

Name _____ Date _____ Period _____

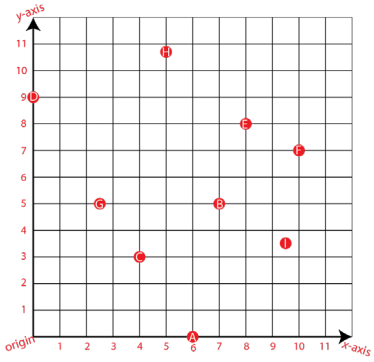
APPLYING THE STANDARD

How might this standard appear on a test?

CHECK OUT MY WORKED EXAMPLE: POINT J ON PAGE 1

Label each part of the graph.

- Origin
- *x*-axis
- *y*-axis
- Scale on the *x*-axis: 1 - 11
- Scale on the *y*-axis: 1 - 11



Plot and label each point on the graph.

- *A* (6, 0)
- *B* (7, 5)
- *C* (4, 3)
- *D* (0, 9)
- *E* (8, 8)
- *F* (10, 7)
- *G* $(2\frac{1}{2}, 5)$
- *H* $(5, 10\frac{2}{3})$
- *I* $(9\frac{1}{2}, 3\frac{1}{2})$

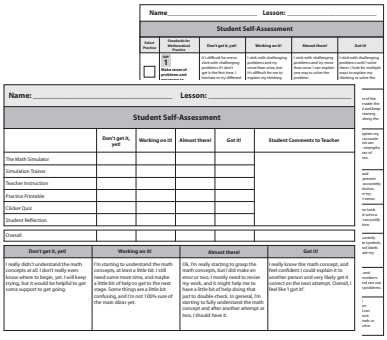
Put an X in the box next to each TRUE statement.

- [X] The *x*-axis and *y*-axis intersect at the origin.
- [ ] The *x*-axis and *y*-axis intersect at 10.
- [X] The *x*- and *y*- coordinates are used to locate points on a coordinate plane.
- [ ] The *x*- and *y*- axes are parallel number lines.
- [X] The *x*- and *y*- axes are perpendicular number lines.
- [ ] The point (3, 5) is located 3 units above the origin and 5 units to the right of the origin.
- [X] The point (5, 2) is located 5 units to the right of the origin and 2 units above the origin.
- [X] *x*- and *y*-coordinates are always written: (*x*, *y*).
- [X] The coordinates of the origin are (0, 0).

MidSchoolMath Avalanche Rescue Training 2 of 2

Student Self-Assessment

Student Self-Assessments are an excellent way for teachers to gauge student learning. In combination with qualitative and quantitative data from the assignments, teachers can form a clear picture of student needs and follow-up appropriately. These self-assessments, if completed by students throughout a lesson, not only provide the teacher with useful information, but also improve student self-monitoring of learning.


Name_____ Lesson:_____

Student Self-Assessment

Select Practice	Standards for Mathematical Practice	Don't get it, yet!	Working on it!	Almost there!	Got it!
☐	SMP 1 Make sense of problems and persevere in solving them.	It's difficult for me to work with challenging problems and I'm not sure how to get it the first time. I want to try different	I work with challenging problems and try more than one approach but it's difficult for me to explain my thinking.	I work with challenging problems and I usually find a way to solve the problem.	I work with challenging problems and I solve them with little or no difficulty. I can explain my thinking or solve the

Name:_____ Lesson:_____

Student Self-Assessment

	Don't get it, yet!	Working on it!	Almost there!	Got it!	Student Comments to Teacher
The Math Simulator					
Simulation Trainer					
Teacher Instruction					
Practice Printable					
Clicker Quiz					
Student Reflection					
Overall					

Don't get it, yet!	Working on it!	Almost there!	Got it!
I really didn't understand the math concepts at all. I don't really even know where to begin, but I will keep trying, but it would be helpful to get some support to get going.	I'm starting to understand the math concepts, at least a little bit. I still have some questions and I may need a little bit of help to get to the next stage. Some things are a little bit confusing, and I'm not 100% sure of the main ideas yet.	Ok, I'm really starting to grasp the math concepts, but I'd still like to check my work with someone else's work, and it might help me to have a little bit of help doing that just to double-check. In general, I'm starting to fully understand the math concept and after another attempt or two, I should have it.	I really know this math concept, and I feel confident I could explain it to someone else. I understand very likely get it correct on the next attempt. Overall, I feel like I 'got it!'

Materials

- *Student Self-Assessment*
- Pencil

Standards Assessed:

- 5.G.A.1
- SMP 6 (*Teacher Instruction*)
- SMP 7 (*Resolution*)

Recommendations for Use:

Mathematical Standard

1. Distribute the *Student Self-Assessment* at the beginning of the lesson and fill in Name and Lesson title.
2. After each lesson component (*The Math Simulator, Simulation Trainer, Teacher Instruction, Practice Printable, Clicker Quiz, Student Reflection, Overall*), give students the opportunity to reflect on their perceived proficiency and knowledge of the content.
3. Ask students to mark their perceived proficiency or knowledge of the content, according to the scale provided (*Don't get it, yet!, Working on it!, Almost there!, Got it!*).
4. Students may then write any additional comments about their learning in the space provided.

Standards for Mathematical Practice

1. After students have completed a component that utilizes a specified SMP (as indicated above), have students mark the column on the SMP side of the *Student Self-Assessment*, to indicate the Standards for Mathematical Practice emphasized in that component.
2. Ask students to read through the various descriptions for that particular SMP and then mark the description that best describes their degree of use of the practice.

3. Repeat for other SMPs used in other lesson components.

Recommendations for Follow-Up:

Don't get it, yet!

Students in this learning phase require personal tutoring.

Partner with a classmate who rated themselves in the **Got it!** category. Review with your partner:

5.G.A.1 Avalanche Rescue Training Math Simulator

- Watch the *Immersion* video, and explain the story and the question.
- Review the class WorkPads, and discuss strategies used to solve the problem.
- Watch the *Resolution* video, and revise your work.

Working on it!

Students in this learning phase need focus in conceptual work.

Create a personal visual glossary for lesson vocabulary.

5.G.A.1 Vocabulary Words:
Coordinate Plane
Coordinates
x-axis, y-axis
Quadrants
Ordered Pair

- Look up each word in the student glossary.
- Read the definition and think about its meaning.
- Draw a picture that illustrates the meaning.

Almost there!

Students in this learning phase need practice with procedures.

Review the *Worked Example* video in the *Practice Printable* assignment and the written *Example Problem* in the *Student Workbook*:

5.G.A.1 Avalanche Rescue Training Worked Example

Compare your thinking to the video and the written solution.

- Identify any places where you have made mistakes.
- Correct any mistakes you have made on the *Practice Printable*.

Got it!

Students in this learning phase can reinforce their learning by teaching others.

Partner with a classmate who rated themselves in the **Don't get it yet!** category. Review with your partner:

5.G.A.1 Avalanche Rescue Training Math Simulator

- Watch the *Immersion* video, and ask them to explain the story and the question.
- Review the class WorkPads, and discuss strategies used to solve the problem.
- Watch the *Resolution* video, and have your partner revise their work.

Test Trainer Pro

Allow 7 to 10 minutes

As a warm-up, tell students to log into their account and access *Test Trainer Pro*. Specify the domain in which you would like students to work (preferably a different one than the prior day) and also the length of time you wish students to work (not a number of items). It is important to remind students to work out the math using paper and pencil when necessary and to look at their feedback.

The Math Simulator™

Allow 45 minutes

1 Immersion

Materials

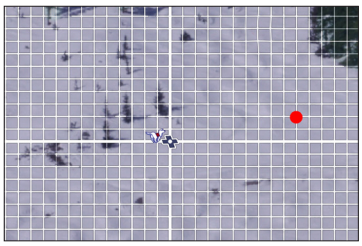
- *Avalanche Rescue Training Immersion* video
- Chart paper/Interactive whiteboard

Procedure

1. Play the *Immersion* video to the whole class.
2. Restate the question and keep it visible: *Where is the victim in relation to you?*
3. Use the **Think-Pair-Share** protocol. Ask students: *What do we need to know?*

Think-Pair-Share
Ask students to think individually about what information they need to know and make some notes (≈ 1-2 min). Tell students to pair with a partner and discuss their notes (≈ 2 min). Finally, facilitate whole-class by cold-calling on students to share their strategies on an interactive board (≈ 2 min).

2 Data & Computation



Materials

- Copies of *Avalanche Rescue Training Data Artifact*, one per student

Procedure

1. Distribute the *Data Artifact* to each student.
2. Invite students to work individually or with a partner to arrive at a solution.
3. Observe students at work. As students explain their reasoning to you and to classmates, look for opportunities to clarify their vocabulary. Allow students to 'get their idea out' using their own language but when possible, make clarifying statements using precise vocabulary to say the same thing. This allows students to hear the vocabulary in context, which is among the strongest methods for learning vocabulary. Also ask students clarifying questions to further their thinking.
    - *What information are we given? What information is missing?*
    - *Do you recognize any familiar structures on the diagram? If so, what are they?*
    - *What's helpful to you here? What's not so helpful?*
    - *What are some ways you could communicate to someone else exactly where the victim is?*
4. Identify select students to share their strategies and reasoning before the *Resolution*. Look for reasoning or strategies that highlight both misconceptions about and insights into the math, that will likely elicit discourse among students.

5. Invite selected students or groups of students to share their reasoning and strategies with the class. After each sharing session, consider facilitating a discussion by asking one or more of the following questions to:

The presenter(s)

- *How or why did you decide to use this strategy?*
- *Did you try a method that did not work? Why didn't it work?*
- *How did you test whether your solution was reasonable?*
- *What is one question you still have about this concept?*

The listeners

- *What is something you agree with? Why?*
- *What is something you disagree with? Why?*
- *What is the same or different about their strategy and your strategy?*
- *What is one question you have about their reasoning or strategy?*
- *Do you find this solution or approach reasonable? Why or why not?*
- *How might you have approached this differently?*

3 Resolution

Materials

- *Avalanche Rescue Training Resolution* video

Procedure

1. Play *Resolution* video to the whole class, and have the students compare their solutions as they watch.

Answer:
The victim is located and rescued at the point (7, 9).

2. After the video, prompt students with one or more of the following questions:
   - *What did you do that was the same? What was different?*
   - *What made the coordinate plane useful when identifying the location of the victim?*
   - *Why is it important to have a convention that everyone agrees upon for ordered pairs?*

   Students can respond to these questions aloud or in a journal.

Student Self-Assessment

- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

Test Trainer Pro

Allow 7 to 10 minutes

As a warm-up, tell students to log into their account and access *Test Trainer Pro*. Specify the domain in which you would like students to work (preferably a different one than the prior day) and also the length of time you wish students to work (not a number of items). It is important to remind students to work out the math using paper and pencil when necessary and to look at their feedback.

The Math Simulator™
Simulation Trainer

Allow 25 to 35 minutes

Materials

- *Avalanche Rescue Training Simulation Trainer*
- Student Devices
- Paper and Pencil
- Student Headphones

Procedure

1. Assign the *Simulation Trainer* to all students.
2. Tell students to navigate to the *Simulation Trainer* assignment.
3. Have students work individually to start.
4. Consider using varied protocols that include peer teaching.
5. Use *Progress Monitoring* on the *Teacher Dashboard* to determine which students are having difficulty. Provide individual help when necessary.

Student Self-Assessment

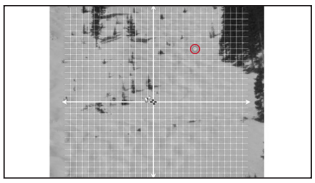
- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

Teacher Instruction

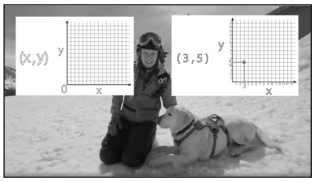
Allow 10 to 15 minutes

Consider this sample lecture to accompany the slide deck in the *Teacher Instruction* component. You may deliver the slide deck yourself, watch the video as a class, or assign the video to student devices. Alternatively, you may create and deliver your own concise, brief lecture using any method you see fit.

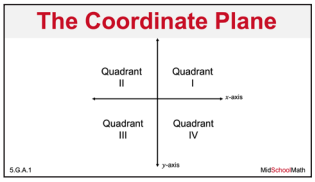
We're going to take a deeper look at the math we used in *Avalanche Rescue Training.*



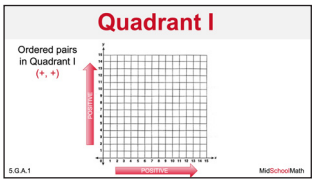
In *Avalanche Rescue Training*, students are part of the Ski Patrol, training for avalanche rescues. The trainers explain the set-up of the coordinate grid as being part of the Beacon system worn by the patrol and that it is used to help guide the avalanche dogs to the victim's location.



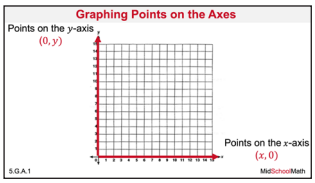
The victim can be found using a coordinate plane, which is formed when two perpendicular number lines, the *x*-axis and *y*-axis, intersect. The point at which they intersect is called the origin, located at (0, 0).
We learned that the *x*-coordinate, or the number that comes first in an ordered pair, tells us how many units to move left or right, and the *y*-coordinate, or the number that comes second in an ordered pair, tells us how many units to move up or down. In the ordered pair (3, 5), we must travel 3 units to the right and 5 units up.
The avalanche victim in the story was located at point (7, 9) on the coordinate plane, which meant that Hattie had to travel 7 units to the right of the origin and 9 units up.



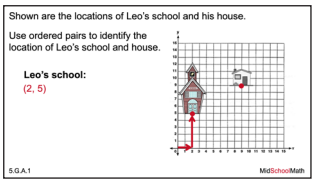
To review, the coordinate plane is made when a horizontal number line, the *x*-axis, and a vertical number line, the *y*-axis, intersect.
When they intersect, the coordinate plane is divided into four sections, quadrants one, two, three and four. These are typically labeled with Roman Numerals.
The point at which the axes intersect is called the origin, and its ordered pair is (0, 0).
Ordered pairs are written as two numbers in parentheses. The *x*-coordinate comes first, telling us how many units to move right or left. The *y*-coordinate comes second, telling us how many units to move up or down.



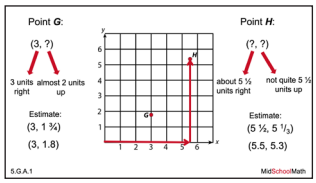
Let's focus on quadrant I. In quadrant I, both *x*-values and *y*-values are positive.
Take the point (4, 6), for example. To graph points (sometimes called plotting points), it's helpful to start at the origin (0, 0). The positive *x*-coordinate tells us to move to the right 4 units, and the positive *y*-coordinate tells us to move 6 units up. We put a dot where we end up.



Sometimes points land on the axes which can be tricky, so it's important to pay close attention to each coordinate.
Points located on the *x*-axis have an ordered pair in the form of (*x*, 0), where *x* is the location along the *x*-axis. Points located on the y-axis have an ordered pair in the form of (0, *y*), where *y* is the location along the *y*-axis.
Let's graph the point (6, 0). Start at the origin, and move 6 units to the right along the *x*-axis, then move 0 units up. The point remains on the *x*-axis.
Now let's graph the point (0, 11). Start at the origin and move 0 units to the right and 11 units up along the *y*-axis. The point is located on the *y*-axis.



On this coordinate plane, we are shown are the locations of Leo's school and his house. Use ordered pairs to identify the location of Leo's school and house.
To identify the location of Leo's school and house on the coordinate plane, we need to count the number of units we move to the left or right and the number of units we move up or down to get to the point on the grid.
It's helpful to start at the origin or (0, 0). To get to the school, we move 2 units to the right along the *x*-axis and 5 units up in the direction of the *y*-axis, so the location of Leo's school is at the point (2, 5) -- positive 2 for the *x*-coordinate and positive 5 for the *y*-coordinate.
Next, to find the location of Leo's house, we start again at the origin. We move 9 units to the right and 9 units up, so the location of Leo's house is at the point (9, 9) -- positive 9 for the *x*-coordinate and positive 9 for the *y*-coordinate .



Sometimes, points don't land on exact intersections within the coordinate plane. That can make it more challenging to identify coordinates.

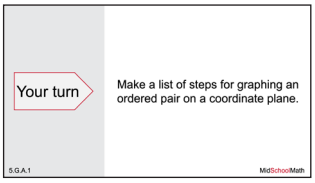
When we look at the graph we are given, we can tell that point *G* isn't located an exact intersection of grid lines. It is located 3 units to the right of the origin, so the *x*-coordinate is 3. From there, the point is located almost 2 units up, but we can't identify the exact *y*-coordinate. In this case, we would have to estimate using decimals or fractions. It's over 1 ½, so we could estimate 1 ¾ or maybe 1.8, but we don't know for sure.

For point *H*, we see that the point isn't on any grid line which means we will have to estimate both coordinates. Starting at the origin, we go right about 5 ½ units and up a little more than 5 units… but how far right and up exactly? Point *H* looks like it could be about 5 ½ units to the right and maybe 5 1/3 units up. We could write our estimates as decimals as well.

If the graph has more precise gridlines, like this, we can better identify the locations of the *x* and *y* coordinates for both points. This graph now is showing us grid lines that represent fourths.

Point *G* is located 3 units to the right and 1 ¾ units up, so its ordered pair is (3, 1 ¾).

Point *H* is located 5 ½ units to the right and 5 ¼ units up, so its ordered pair is (5 ½, 5 ¼).



Now it's your turn.

Note: Feel free to modify this part to suit your needs. You may even want to change this entirely to another activity or question.

Student Self-Assessment

- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

Test Trainer Pro

Allow 7 to 10 minutes

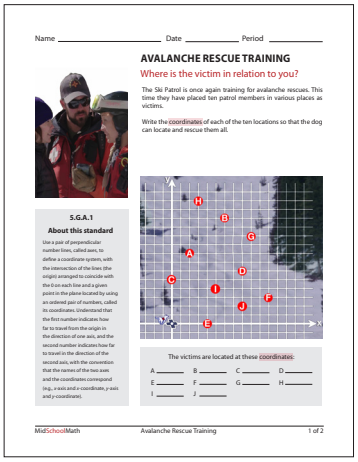
As a warm-up, tell students to log into their account and access *Test Trainer Pro*. Specify the domain in which you would like students to work (preferably a different one than the prior day) and also the length of time you wish students to work (not a number of items). It is important to remind students to work out the math using paper and pencil when necessary and to look at their feedback.

Practice Printable

Allow 35 minutes

Materials

- Copies of *Avalanche Rescue Training Practice Printable*, 1 per student


Name _____ Date _____ Period _____

AVALANCHE RESCUE TRAINING

Where is the victim in relation to you?

The Ski Patrol is once again training for avalanche rescues. This time they have placed ten patrol members in various places as victims.

Write the coordinates of each of the ten locations so that the dog can locate and rescue them all.

5.G.A.1

About this standard

The victims are located at these coordinates:

A _____ B _____ C _____ D _____

E _____ F _____ G _____ H _____

I _____ J _____

MidSchoolMath Avalanche Rescue Training 1 of 2

Procedure

1. Distribute copies of the *Practice Printable*. Have students work through the first page.
2. Self-Rating: Ask students to rate their personal understanding of the problem on a scale of 1 to 3.
   1 = I need more help
   2 = I need more time, yet mostly understand
   3 = I've got this!
   Have students put the number on their *Practice Printable*.
3. Have students sort themselves based on the student self-rating and professional teacher judgment of accuracy of the response. This sorting can be used for grouping students for differentiation of instruction.
4. Implement the **Practice Printable Differentiation Plan** (see below) as students finish the *Practice Printable*.
5. Collect completed *Practice Printable*.

DON'T FORGET TO ASSIGN MY WORKED EXAMPLE!

Student Self-Assessment

- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

Practice Printable Differentiation Plan

Remediation

Meet with students who were unsuccessful on the first problem in a small group. Consider using whiteboards to work through problems on the *Practice Printable* together.

Practice

Students who completed the first problem but need more practice should spend the class period completing the *Practice Printable*. Encourage them to confirm strategies and solutions with each other. Any additional time remaining should be spent getting started on the *Student Reflection*.

Enrichment

Students who demonstrated confident mastery on the first problem can finish the *Practice Printable* and spend the remaining time getting started on the *Student Reflection* or completing the following activity:

- Have students create a picture on a coordinate grid.
  - List the ordered pairs of the points that need to be plotted to complete the mystery picture on a separate sheet of paper.
  - Trade with a partner.

Student Reflection

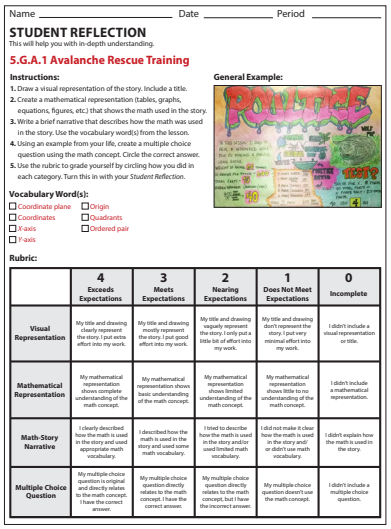
Allow 10 minutes (optional)

Materials

- Copies of *Student Reflection* rubric, 1 per student
- White Paper
- Colored Pencils

Procedure

1. Available in the *Student Reflection* lesson on Teacher Dashboard, print and distribute the rubric. Discuss requirements with students.
2. Distribute white paper and colored pencils to students.
3. Have students begin the *Student Reflection* by sketching a draft. They will have additional time the following day to complete it.



Name _____ Date _____ Period _____

STUDENT REFLECTION

This will help you with in-depth understanding.

5.G.A.1 Avalanche Rescue Training

Instructions:

1. Draw a visual representation of the story. Include a title.
2. Create a mathematical representation (tables, graphs, equations, figures, etc.) that shows the math used in the story.
3. Write a brief narrative that describes how the math was used in the story. Use the vocabulary word(s) from the lesson.
4. Using an example from your life, create a multiple choice question using the math concept. Circle the correct answer.
5. Use the rubric to grade yourself by circling how you did in each category. Turn this in with your *Student Reflection*.

General Example:

Vocabulary Word(s):

☐ Coordinate plane ☐ Origin
☐ Coordinates ☐ Quadrants
☐ X-axis ☐ Ordered pair
☐ Y-axis

Rubric:

	4 Exceeds Expectations	3 Meets Expectations	2 Nearing Expectations	1 Does Not Meet Expectations	0 Incomplete
Visual Representation	My title and drawing clearly represent the story. I put extra effort into my work.	My title and drawing mostly represent the story. I put good effort into my work.	My title and drawing vaguely represent the story. I only put a little bit of effort into my work.	My title and drawing don't represent the story. I put very minimal effort into my work.	I didn't include a visual representation or title.
Mathematical Representation	My mathematical representation shows complete understanding of the math concept.	My mathematical representation shows basic understanding of the math concept.	My mathematical representation shows limited understanding of the math concept.	My mathematical representation shows little to no understanding of the math concept.	I didn't include a mathematical representation.
Math-Story Narrative	I clearly described how the math is used in the story and used appropriate math vocabulary.	I described how the math is used in the story and used some math vocabulary.	I tried to describe how the math is used in the story and/or used limited math vocabulary.	I did not make it clear how the math is used in the story and/ or didn't use math vocabulary.	I didn't explain how the math is used in the story.
Multiple Choice Question	My multiple choice question is original and directly relates to the math concept. I have the correct answer.	My multiple choice question directly relates to the math concept. I have the correct answer.	My multiple choice question directly relates to the math concept, but I have the incorrect answer.	My multiple choice question doesn't use the math concept.	I didn't include a multiple choice question.

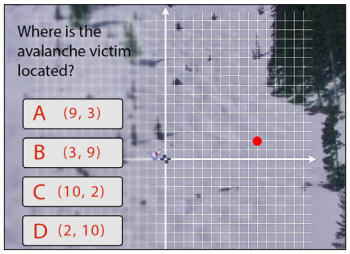
Test Trainer Pro

Allow 7 to 10 minutes

As a warm-up, tell students to log into their account and access *Test Trainer Pro*. Specify the domain in which you would like students to work (preferably a different one than the prior day) and also the length of time you wish students to work (not a number of items). It is important to remind students to work out the math using paper and pencil when necessary and to look at their feedback.

Clicker Quiz

Allow 30 minutes



Materials

- *Avalanche Rescue Training Clicker Quiz*
- Student Devices
- Paper and Pencil

Procedure

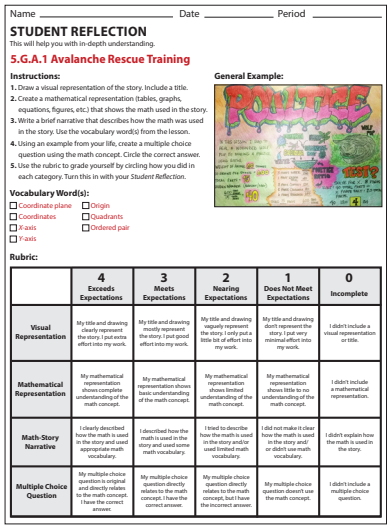
1. Ask students to log into their account and access *Virtual Clicker*.
2. Open the *Clicker Quiz*, whole class.
3. Prompt students to enter the quiz code on their device.
4. Launch quiz.
5. For each question:
    a. Show question and give students time to work. Consider using various protocols (i.e., students work individually, work with a partner, or maybe they have to agree with an entire table).
    b. Click "Vote," and students will have 10 seconds to enter a response.
    c. Analyze class distribution. Decide whether more teaching is necessary, either a mini-lesson from you or by having students share strategies.
    d. Click ">" to advance to the next question.
    e. You may either then "Skip" the question or repeat steps a through e.

Student Self-Assessment

- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

Student Reflection

Allow 20 minutes (optional)



Name _____ Date _____ Period _____

STUDENT REFLECTION

This will help you with in-depth understanding.

5.G.A.1 Avalanche Rescue Training

Instructions:

1. Draw a visual representation of the story. Include a title.
2. Create a mathematical representation (tables, graphs, equations, figures, etc.) that shows the math used in the story.
3. Write a brief narrative that describes how the math was used in the story. Use the vocabulary word(s) from the lesson.
4. Using an example from your life, create a multiple choice question using the math concept. Circle the correct answer.
5. Use the rubric to grade yourself by circling how you did in each category. Turn this in with your *Student Reflection*.

General Example:

Vocabulary Word(s):

- ☐ Coordinate plane
- ☐ Coordinates
- ☐ x-axis
- ☐ y-axis
- ☐ Origin
- ☐ Quadrants
- ☐ Ordered pair

Rubric:

	4 Exceeds Expectations	3 Meets Expectations	2 Nearing Expectations	1 Does Not Meet Expectations	0 Incomplete
Visual Representation	My title and drawing clearly represent the story. I put extra effort into my work.	My title and drawing mostly represent the story. I put good effort into my work.	My title and drawing vaguely represent the story. I only put a little bit of effort into my work.	My title and drawing don't represent the story. I put very minimal effort into my work.	I didn't include a visual representation or title.
Mathematical Representation	My mathematical representation shows complete understanding of the math concept.	My mathematical representation shows basic understanding of the math concept.	My mathematical representation shows limited understanding of the math concept.	My mathematical representation shows little to no understanding of the math concept.	I didn't include a mathematical representation.
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Multiple Choice Question	My multiple-choice question is original and directly relates to the math concept. I have the correct answer.	My multiple choice question directly relates to the math concept. I have the correct answer.	My multiple choice question directly relates to the math concept, but I have the incorrect answer.	My multiple-choice question doesn't use the math concept.	I didn't include a multiple choice question.

Materials

- *Student Reflections* from Day 3
- White Paper
- Colored Pencils
- Sticky Notes

Procedure

1. Students continue working and complete their *Student Reflections*.
2. Consider having a **Gallery Walk** when they are complete, using the **I Wonder…, I Notice…** protocol and sticky notes.

Gallery Walk (16-20 min)

Display student work (such as *Student Reflections*) on classroom walls. Assign groups with tasks focused on specific details (such as identifying different ways to solve a problem) and/or larger patterns (such as general misconceptions). Tell groups to walk around, complete their task (≈ 8-10 min), then prepare and report brief remarks to the class with their broader "a-ha" and "why" understandings (≈ 8-10 min).

I Wonder . . . , I Notice . . . (8-10 min)

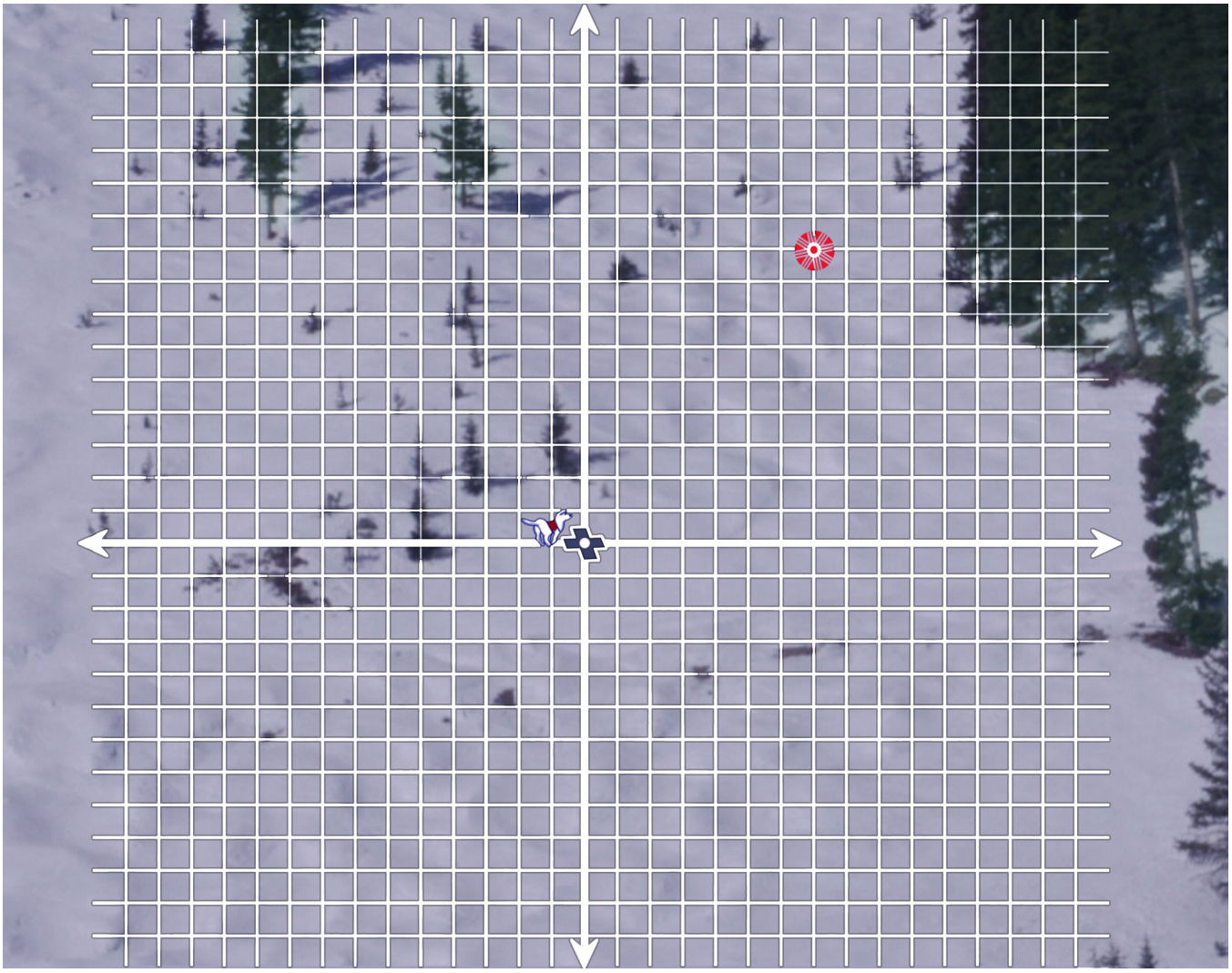
Following a completed whole-class assignment, set ground rules for peer critique, including being thoughtful, specific, helpful and joining in (≈ 1 min)! Choose a student to be "the originator" who is tasked to explain his or her approach and solution to a problem (≈ 2 min), while other students listen only. Then ask other students to ask "the originator" clarifying questions or comments that start with 'I wonder' and 'I notice' (≈ 5-6 min).

Student Self-Assessment

- Refer to the instructions for the *Studenf Self-Assessment* (on a prior page of this lesson plan).
- Allow students time to assess their level of knowledge after having completed this component.
- Collect the self-assessment from students, or have them keep it for later components.

AVALANCHE RESCUE TRAINING

Artifact 1



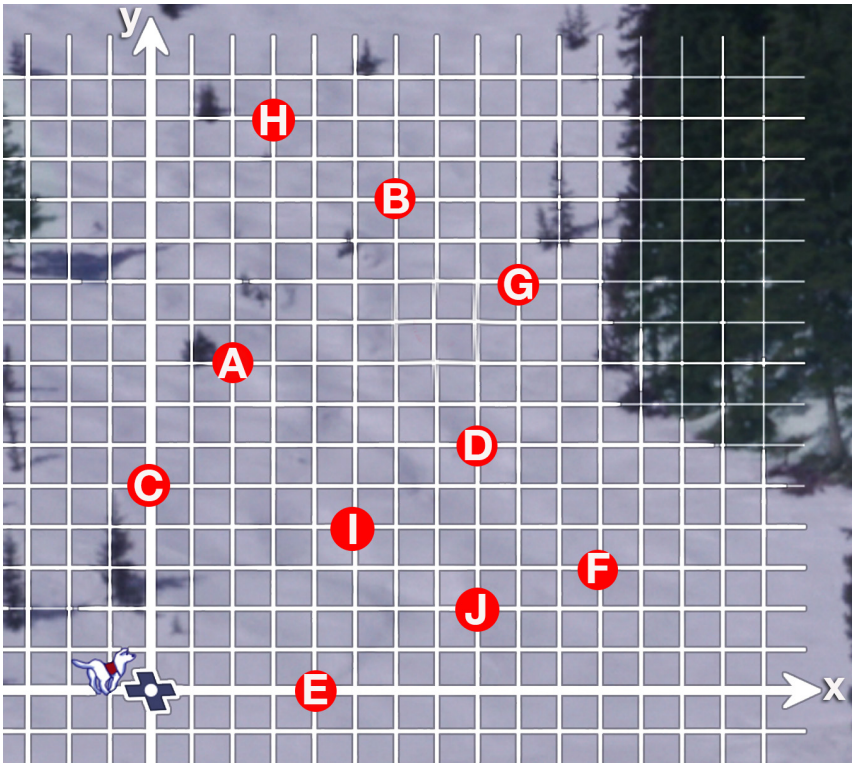
Name _____ Date _____ Period _____

AVALANCHE RESCUE TRAINING

Where is the victim in relation to you?

The Ski Patrol is once again training for avalanche rescues. This time they have placed ten patrol members in various places as victims.

Write the coordinates of each of the ten locations so that the dog can locate and rescue them all.



The victims are located at these coordinates:

A _____ B _____ C _____ D _____

E _____ F _____ G _____ H _____

I _____ J _____

5.G.A.1

About this standard

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

Name _____ Date _____ Period _____

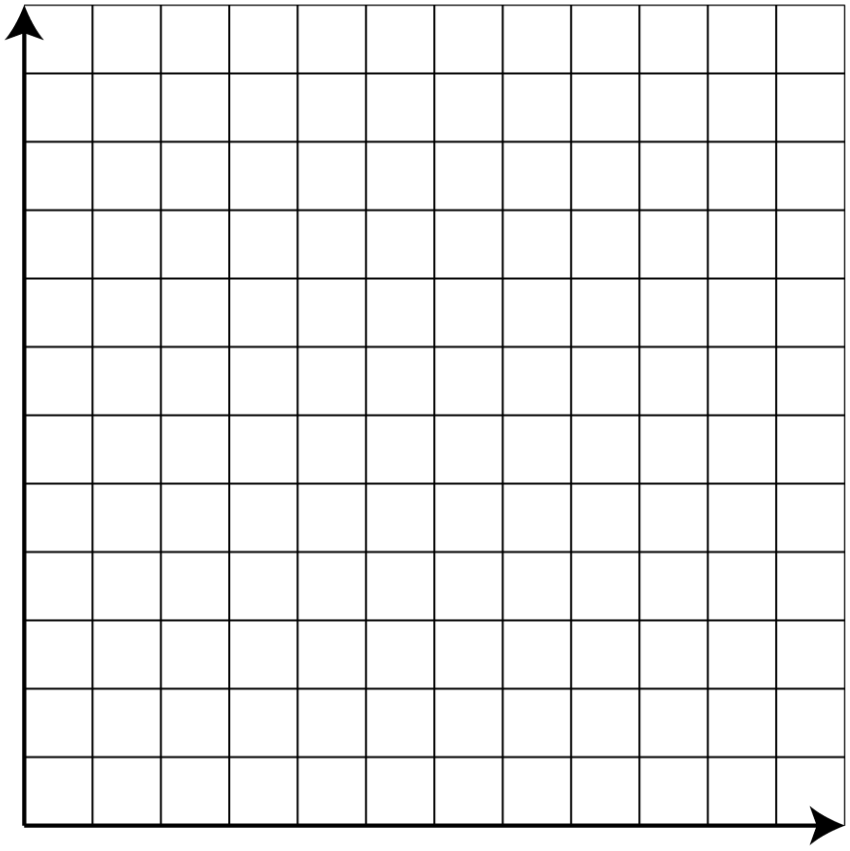
APPLYING THE STANDARD

How might this standard appear on a test?

Check out my worked example: Point J on Page 1

Label each part of the graph.

- Origin
- *x*-axis
- *y*-axis
- Scale on the *x*-axis: 1 - 11
- Scale on the *y*-axis: 1 - 11



Plot and label each point on the graph.

- *A* (6, 0)
- *B* (7, 5)
- *C* (4, 3)
- *D* (0, 9)
- *E* (8, 8)
- *F* (10, 7)
- *G* $(2\frac{1}{2}, 5)$
- *H* $(5, 10\frac{2}{3})$
- *I* $(9\frac{1}{2}, 3\frac{1}{2})$

Put an X in the box next to each TRUE statement.

- ☐ The *x*-axis and *y*-axis intersect at the origin.
- ☐ The *x*-axis and *y*-axis intersect at 10.
- ☐ The *x*- and *y*- coordinates are used to locate points on a coordinate plane.
- ☐ The *x*- and *y*- axes are parallel number lines.
- ☐ The *x*- and *y*- axes are perpendicular number lines.
- ☐ The point (3, 5) is located 3 units above the origin and 5 units to the right of the origin.
- ☐ The point (5, 2) is located 5 units to the right of the origin and 2 units above the origin.
- ☐ *x*- and *y*-coordinates are always written: (*x*, *y*).
- ☐ The coordinates of the origin are (0, 0).

Name: _____ **Lesson:** _____

Student Self-Assessment

	Don't get it, yet!	Working on it!	Almost there!	Got it!	Student Comments to Teacher
The Math Simulator					
Simulation Trainer					
Teacher Instruction					
Practice Printable					
Clicker Quiz					
Student Reflection					

Overall					

Don't get it, yet!	Working on it!	Almost there!	Got it!
I really didn't understand the math concepts at all. I don't really even know where to begin, yet. I will keep trying, but it would be helpful to get some support to get going.	I'm starting to understand the math concepts, at least a little bit. I still need some more time, and maybe a little bit of help to get to the next stage. Some things are a little bit confusing, and I'm not 100% sure of the main ideas yet.	Ok, I'm really starting to grasp the math concepts, but I did make an error or two. I mostly need to revise my work, and it might help me to have a little bit of help doing that just to double-check. In general, I'm starting to fully understand the math concept and after another attempt or two, I should have it.	I really know this math concept, and feel confident I could explain it to another person and very likely get it correct on the next attempt. Overall, I feel like 'I got it!'.

Name_____ **Lesson:** _____

Student Self-Assessment

Select Practice	Standards for Mathematical Practice	Don't get it, yet!	Working on it!	Almost there!	Got it!
☐	SMP 1 **Make sense of problems and persevere in solving them.**	It's difficult for me to stick with challenging problems if I don't get it the first time. I hesitate to try different strategies.	I stick with challenging problems and try more than once, but it's difficult for me to explain my thinking.	I stick with challenging problems and try more than once. I can explain one way to solve the problem.	I stick with challenging problems until I solve them. I look for multiple ways to explain my thinking or solve the problem.
☐	SMP 2 **Reason abstractly and quantitatively.**	It's difficult for me to create a representation of the problem. I don't know how to apply math symbols to solve problems.	I can create a representation of the problem, but I often lose track of the units or the meaning of my results along the way.	I can create a representation of the problem, but I sometimes lose track of the units or the meaning of my results along the way.	I can create a representation of the problem. I consider the units involved and keep track of the meaning of my results along the way.
☐	SMP 3 **Construct viable arguments and critique the reasoning of others.**	It's difficult for me to explain my own thinking and to understand the thinking of others.	I sometimes explain my own thinking but without accurate vocabulary, and rarely understand the solutions of others.	I often explain my thinking with accurate vocabulary, and can sometimes identify strengths and weaknesses of others' solutions.	I frequently explain my thinking with accurate vocabulary, and can often identify strengths and weaknesses of others' solutions.
☐	SMP 4 **Model with mathematics.**	It's difficult for me to represent problems and to develop a structure to solve them.	I identify important quantities in problems but have difficulty representing their relationships.	I use models and symbols to represent problem, and can explain the solution.	I use models and symbols to represent problem, can accurately explain the solution, and make sure my answer makes sense.
☐	SMP 5 **Use appropriate tools strategically.**	It's difficult for me to know when and how to use tools to help me solve a problem.	I sometimes use tools to explore and solve a problem but it's difficult to justify my choice.	I often use tools to explore and solve a problem and can justify my tool selection.	I frequently use tools to explore and solve a problem and can justify my tool selection.
☐	SMP 6 **Attend to precision.**	My calculations are often inaccurate, and it's difficult for me to communicate my thinking.	My calculations are sometimes inaccurate, and my communication is not always clear.	I calculate accurately and mostly use symbols, vocabulary, and labels to communicate my thinking.	I calculate accurately and always use symbols, vocabulary, and labels to communicate my thinking.
☐	SMP 7 **Look for and make use of structure.**	It's difficult for me to see patterns and structures in numbers and figures.	I sometimes see patterns and structures in numbers and figures, and can sometimes use them to solve problems.	I often see patterns and structures in numbers and figures, and can often use them to solve problems.	I see patterns and structures in numbers and figures, and can use them to solve problems.
☐	SMP 8 **Look for and express regularity in repeated reasoning.**	It's difficult for me to notice repeated calculations, and rarely find shortcuts.	I sometimes notice when calculations are repeated and might be able to find shortcuts to solve problems.	I notice when calculations are repeated and can often find shortcuts to solve problems.	I notice when calculations are repeated and can always find more efficient methods or shortcuts to solve problems.