Task 0

Take a few minutes and write out how you normally teach span and linear dependence/independence. What difficulties have you noticed students experience when working with these ideas?

THE CARPET RIDE PROBLEM

Name _____ Group Members _____

You are a young traveler, leaving home for the first time. Your parents want to help you on your journey, so just before your departure, they give you two gifts. Specifically, they give you two forms of transportation: a hover board and a magic carpet. Your parents inform you that both the hover board and the magic carpet have restrictions in how they operate:

We denote the restriction on the *hover board's* movement by the vector $\begin{bmatrix}3\\1\end{bmatrix}$.

By this we mean that if the hover board traveled "forward" for one hour, it would move along a "diagonal" path that would result in a displacement of 3 miles East and 1 mile North of its starting location.

We denote the restriction on the *magic carpet's* movement by the vector $\begin{bmatrix}1\\2\end{bmatrix}$.

By this we mean that if the magic carpet traveled "forward" for one hour, it would move along a "diagonal" path that would result in a displacement of 1 mile East and 2 miles North of its starting location.

SCENARIO ONE: THE MAIDEN VOYAGE

Your Uncle Cramer suggests that your first adventure should be to go visit the wise man, Old Man Gauss. Uncle Cramer tells you that Old Man Gauss lives in a cabin that is 107 miles East and 64 miles North of your home.

TASK:

Investigate whether or not you can use the hover board and the magic carpet to get to Gauss's cabin.
If so, how? If it is not possible to get to the cabin with these modes of transportation, why is that the case?

As a group, state and explain your answer(s) on the group whiteboard. Use the vector notation for each mode of transportation as part of your explanation and use a diagram or graphic to help illustrate your point(s).

THE CARPET RIDE PROBLEM: HIDE AND SEEK

Name _____ Group Members _____

You are a young traveler, leaving home for the first time. Your parents want to help you on your journey, so just before your departure, they give you two gifts. Specifically, they give you two forms of transportation: a hover board and a magic carpet. Your parents inform you that both the hover board and the magic carpet have restrictions in how they operate:

We denote the restriction on the *hover board's* movement by the vector $\begin{bmatrix}3\\1\end{bmatrix}$.

By this we mean that if the hover board traveled "forward" for one hour, it would move along a "diagonal" path that would result in a displacement of 3 units East and 1 unit North of its starting location.

We denote the restriction on the *magic carpet's* movement by the vector $\begin{bmatrix}1\\2\end{bmatrix}$.

By this we mean that if the magic carpet traveled "forward" for one hour, it would move along a "diagonal" path that would result in a displacement of 1 unit East and 2 units North of its starting location.

SCENARIO TWO: HIDE-AND-SEEK

Old Man Gauss wants to move to a cabin in a different location. You are not sure whether Gauss is just trying to test your wits at finding him or if he actually wants to hide somewhere that you can't visit him.

Are there some locations that he can hide and you cannot reach him with these two modes of transportation? Describe the places that you can reach using a combination of the hover board and the magic carpet and those you cannot. Specify these geometrically and algebraically. Include a symbolic representation using vector notation. Also, include a convincing argument supporting your answer.

Use your group's whiteboard as a space to write out our work as you work together on this problem.

THE CARPET RIDE PROBLEM: GETTING BACK HOME

Name _____ Group Members _____

Suppose you are now in a three-dimensional world for the carpet ride problem, and you have three modes of transportation: $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, $\mathbf{v}_2 = \begin{bmatrix} 6 \\ 3 \\ 8 \end{bmatrix}$, $\mathbf{v}_3 = \begin{bmatrix} 4 \\ 1 \\ 6 \end{bmatrix}$.

You are only allowed to use each mode of transportation **once** (in the forward or backward direction) for a fixed amount of time (c_1 on $\mathbf{v}_1$, c_2 on $\mathbf{v}_2$, c_3 on $\mathbf{v}_3$). Find the amounts of time on each mode of transportation (c_1, c_2, and c_3, respectively) needed to go on a journey that starts and ends at home OR explain why it is not possible to do so.

As a group, state and explain your answer(s) on the group whiteboard. Use the vector notation for each mode of transportation as part of your explanation and use a diagram or graphic to help illustrate your point(s).

After you have completed the part above, answer the questions on the back of the page:

1. Is there more than one way to make a journey that meets the requirements described above? (In other words, are there different combinations of times you can spend on the modes of transportation so that you can get back home?) If so, how?

2. Is there anywhere in this 3D world that Gauss could hide from you? If so, where? If not, why not?

3. What is $span\left\{\begin{bmatrix}1\\1\\1\end{bmatrix}, \begin{bmatrix}6\\3\\8\end{bmatrix}, \begin{bmatrix}4\\1\\6\end{bmatrix}\right\}$?

LINEAR INDEPENDENCE AND DEPENDENCE: CREATING EXAMPLES

Name _____ Group Members _____

Fill in the following chart with the requested sets of vectors. Keep track of the strategies you use to generate the examples.

	Linearly dependent set	**Linearly independent set**
A set of 2 vectors in R^2		
A set of 3 vectors in R^2		
A set of 2 vectors in R^3		
A set of 3 vectors in R^3		
A set of 4 vectors in R^3		

Write at least 2 generalizations that can be made from these examples and the strategies you used to create them.