The Addition of Vectors Practice

Adding vectors requires a bit more thought than adding scalars, but it is still quite simple in concept. Consider the following sets of instructions:

1. Go 3.0m left, then 4.0m up, then 6.0m left, then 9.0m down, then 1.0m right, then 2.0m down.

 Can you tell me where you are compared to where you began?

* Horizontally I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Right/Left)
* Vertically I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Up/Down)

 Would the order in which you made the above moves change the overall result?

2. Go 12m right, 6.0m down, 4.0m left, 3.0m up, 9.0m right, 4.0m up.

 Can you tell me where you are compared to where you began?

* Horizontally I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Right/Left)
* Vertically I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Up/Down)

 Would the order in which you made the above moves change the overall result?

3. Go 32m up, 49m left, 18m right, 26m up, 12m up, 14m left, 19m left, 16m down.

 Can you tell me where you are compared to where you began?

* Horizontally I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Right/Left)
* Vertically I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Up/Down)

 Would the order in which you made the above moves change the overall result?

4. Now what if the numbers are a bit tougher? Go 7.61cm R, 12.06cm D, 9.33cm R, 4.28cm U, 2.55cm L, 1.88cm U.

 Can you tell me the result of this addition?

* Horizontally I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Right/Left)
* Vertically I am \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (Up/Down)

 Would the order in which you added the above vectors change the overall result?

5. Let’s change up the code a bit. Put the following together: 7.0m/s $\hat{x}$ + -6.0m/s $\hat{y}$ + 12.0m/s $\hat{x}$+ 4.0m/s $\hat{y}$+ -18.0m/s $\hat{x}$ + -8.0m/s $\hat{y}$

 Can you tell me the result of this addition?

* Horizontally \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/s (Right/Left)
* Vertically \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/s (Up/Down)

 Would the order in which you added the above vectors change the overall result?

***If you could answer the above questions you already know how to add vectors in 2-dimensions!***

***KEY CONCEPTS:***

***1. Order of Addition is Not Important!***

***2. We Can (and should) Separate the Horizontal and Vertical Components.***

More practice:

6. 14.0m/s $\hat{x}$ + 11.0m/s $\hat{y}$ + -2.0m/s $\hat{x}$+ -9.0m/s $\hat{y}$+ -13.0m/s $\hat{x}$ + -15.0m/s $\hat{y}$

7. 24m/s $\hat{y}$ + -62m/s $\hat{y}$ + 42.0m/s $\hat{x}$+ -88m/s $\hat{y}$+ -37.0m/s $\hat{x}$ + 14m/s $\hat{x}$

8. 43km East + 16km South + 11km North + 14km South + 23km West

9. -3.6m/s2 $\hat{x}$ + 1.9m/s2 $\hat{y}$ + 0.6m/s2 $\hat{x}$ + 2.1m/s2 $\hat{y}$

10. 640m left + 0.65km down + 1.00km right + 280m up

11. 25m $\hat{y}$ + 16m/s $\hat{x}$ + 94N $\hat{y}$

The Addition of Vectors KEY

Adding vectors requires a bit more thought than adding scalars, but it is still quite simple in concept. Consider the following sets of instructions:

1. Go 3.0m left, then 4.0m up, then 6.0m left, then 9.0m down, then 1.0m right, then 2.0m down.

 Can you tell me where you are compared to where you began?

* Horizontally I am 8.0 m (Right/Left)
* Vertically I am 7.0 m (Up/Down)

 Would the order in which you made the above moves change the overall result? NO

2. Go 12m right, 6.0m down, 4.0m left, 3.0m up, 9.0m right, 4.0m up.

 Can you tell me where you are compared to where you began?

* Horizontally I am 17 m (Right/Left)
* Vertically I am 1.0 m (Up/Down)

 Would the order in which you made the above moves change the overall result? NO

3. Go 32m up, 49m left, 18m right, 26m up, 12m up, 14m left, 19m left, 16m down.

 Can you tell me where you are compared to where you began?

* Horizontally I am 64m (Right/Left)
* Vertically I am 54m (Up/Down)

 Would the order in which you made the above moves change the overall result? NO

4. Now what if the numbers are a bit tougher? Go 7.61cm R, 12.06cm D, 9.33cm R, 4.28cm U, 2.55cm L, 1.88cm U.

 Can you tell me the result of this addition?

* Horizontally I am 0.1439 m (Right/Left)
* Vertically I am 0.0590 m (Up/Down)

 Would the order in which you added the above vectors change the overall result? NO

5. Let’s change up the code a bit. Put the following together: 7.0m/s $\hat{x}$ + -6.0m/s $\hat{y}$ + 12.0m/s $\hat{x}$+ 4.0m/s $\hat{y}$+ -18.0m/s $\hat{x}$ + -8.0m/s $\hat{y}$

 Can you tell me the result of this addition?

* Horizontally 1.0 m/s (Right/Left)
* Vertically 10.0 m/s (Up/Down)

 Would the order in which you added the above vectors change the overall result? NO

***If you could answer the above questions you already know how to add vectors in 2-dimensions!***

***KEY CONCEPTS:***

***1. Order of Addition is Not Important!***

***2. We Can (and should) Separate the Horizontal and Vertical Components.***

More practice:

6. 14.0m/s $\hat{x}$ + 11.0m/s $\hat{y}$ + -2.0m/s $\hat{x}$+ -9.0m/s $\hat{y}$+ -13.0m/s $\hat{x}$ + -15.0m/s $\hat{y}$

-1.0m/s $\hat{x}$

-13.0m/s $\hat{y}$

7. 24m/s $\hat{y}$ + -62m/s $\hat{y}$ + 42.0m/s $\hat{x}$+ -88m/s $\hat{y}$+ -37.0m/s $\hat{x}$ + 14m/s $\hat{x}$

19 m/s $\hat{x}$

-126 m/s $\hat{y}$

8. 43km East + 16km South + 11km North + 14km South + 23km West

2.0x10km East (20 with correct sig figs)

19km South

9. -3.6m/s2 $\hat{x}$ + 1.9m/s2 $\hat{y}$ + 0.6m/s2 $\hat{x}$ + 2.1m/s2 $\hat{y}$

-3.0m/s2 $\hat{x}$

4.0m/s2 $\hat{y}$

10. 640m left + 0.65km down + 1.00km right + 280m up

360m right or 0.36km right

370m down or 0.37km down

11. 25m $\hat{y}$ + 16m/s $\hat{x}$ + 94N $\hat{y}$

CANNOT BE ADDED AS THESE QUANTITIES HAVE DIFFERENT DIMENSION