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| **Activity 2.1.4 Calculating Force Vectors** |

Introduction

If guy wires are used to stabilize a tower, what is the minimum number of wires necessary? Imagine what would happen if you only used one or two wires. The guy wires work together so that the tower does not fall in any direction. As long as there are no external forces and the wires are equally spaced, each of the wires should be experiencing an equal amount of tension. The tension in each guy wire can be expressed as a vector force. It is important that values are given for each force so that engineers can make informed decisions about the necessary strength of guy wires and their support mechanisms.

Equipment

* Calculator

Procedure

In this activity you will calculate force vectors.

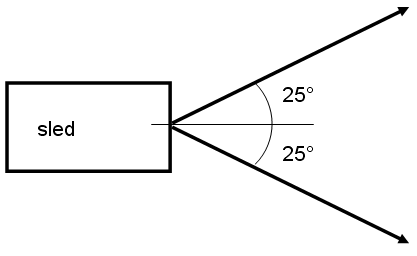
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| 1. What is the magnitude of vector A? | 2-1-4 image1 |
| 1. What is the direction of vector A relative to the negative y-axis? |
| 1. What is the sense of vector A? |
| 1. Draw a free body diagram illustrating the x and y components of vector A. *(Solve for component forces with a precision of 0.0)* | |

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| 1. What is the magnitude of vector B? | 2-1-4 image2 |
| 1. What is the direction of vector B relative to the negative y-axis? |
| 1. What is the sense of vector B? |
| 1. Draw a free body diagram illustrating the x and y components of vector B. *(Solve for component forces with a precision of 0.0)* | |

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| A picture is hung from a nail with wire. The nail supports two forces A = 5N and B = 5N. | |
| 2-1-4 image3 | |
| 1. Draw a free body diagram illustrating the x and y components of vector A and B. *(Solve for component forces with a precision of 0.0)* | |
| 1. Calculate the resultant force (R) by summing the x and y components of vectors A and B.   Fx = FAx + FBx  Fy = FAy +FBy | |
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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | An eye screw is experiencing two tension forces G=100N and H=50N. | | | | 2-1-4 image4 | | 1. Draw a free body diagram illustrating the x and y components of vector G. *(Solve for component forces with a precision of 0.0)* | | | | |  |  | | | | 1. Draw a free body diagram illustrating the x and y components of vector H. *(Solve for component forces with a precision of 0.0)* | | | | | |  | |  | | | | 1. Calculate the resultant force (R) by summing the x and y components of vectors G and H. *(precision of 0.0)* | | | | | | Fx = FGx + FHx | | | Fy = FGy + FHy | | | 1. If you know the components of a vector, what mathematical principle can be used to find the magnitude of the vector? | | | | | | 1. Sketch the resultant force (R) and calculate the magnitude and angle of the vector. (precision 0.0) | | | | | |

Conclusion

1. If you and someone else are pulling an object and both of you are 25° from the X axis (see top view below), how could you reduce the amount of force each of you must exert?



1. You and someone else are pulling on an object with forces of 50N and 75N respectively. If you are allowed to pull in any direction, what is the range of values for the magnitude of the resultant force?