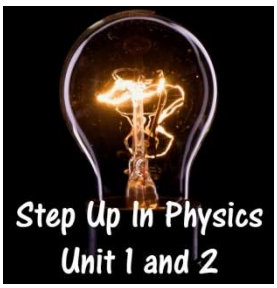
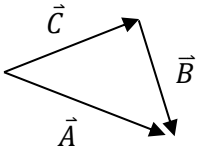
1.1 Displacement in Two Dimensions

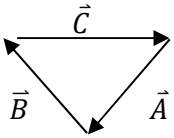
Problems Worksheet



1. A collection of vector diagrams is presented below.



1



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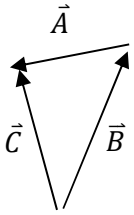

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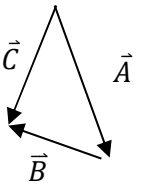

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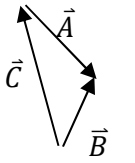

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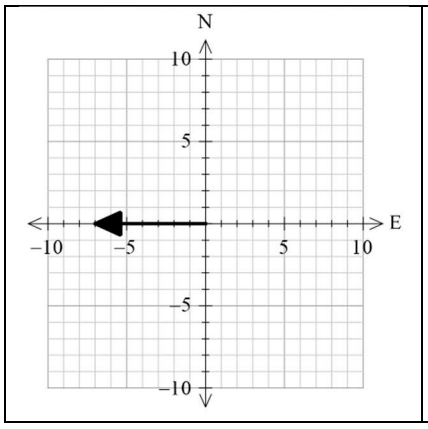
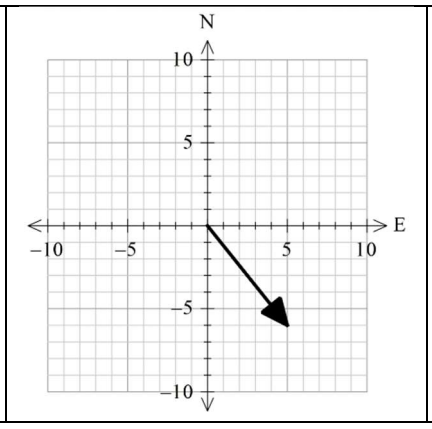
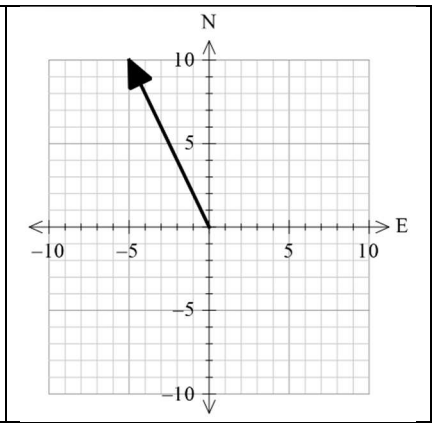
a) State which vector diagram(s) correctly shows vectors $\vec{A}$ and $\vec{B}$ being added to produce the resultant $\vec{C}$.

b) State which vector diagram(s) show three vectors being added, with a resultant of zero.

2. Determine the displacement represented by each of the following vectors, giving direction as a true bearing. All scales are in metres.







3. Determine the distance and displacements for the following routes.
   a) 60.0 m east, followed by 40.0 m west.

   b) 25.0 km east, followed by 60.0 km west.

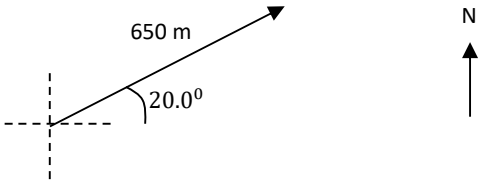
   c) 95.0 m south, followed by 110 m north, followed by 30.0 m south.

   d) 13.0 km east, followed by 25.0 km north.

   e) 85.0 m south, followed by 45.0 m east.

   f) 125 m west, followed by 35.0 m north.

4. A walker follows a straight line path, indicated by the vector below.



a) Determine how far east the walker has moved from his starting position.

b) Determine how far north the walker has moved from his starting position.

5. Katherine was solving a physics problem, and resolved a displacement into its two components. The two components are:
    - 28.5 m East
    - 82.0 m North

   Draw a vector diagram which shows the displacement resolved into its two components. Find the magnitude and direction of the displacement.

6. Two hikers head off from a cabin. Hiker A walks 8.20 km at 220^0 T while hiker B walks 5.60 km at 060^0 T. Determine which hiker has moved furthest east of the cabin.

7. Spiderman climbs 30.0 m straight up the wall of a building and then jumps 12.0 m at an angle 50.0^0 above the horizontal, away from the building to grab onto Green Goblin. Determine the displacement of Green Goblin from the base of the building.

8. A ski cross country race requires competitors to follow a long and arduous course. Koen studies a map showing the course of his next race. From the start line he must follow the route detailed below:

- Stage 1: 3.00 km due north
- Stage 2: 4.00 km S 80^0 W
- Stage 3: 6.00 km N 20^0 W

a) Draw a labelled vector diagram showing the path of the course. Include the resultant.

b) Koen makes a mistake on the day of the race and does not complete Stage 1 of the race. How far, and in what direction is the finish line after he completes the other two stages? Justify your answer.

c) After reaching the finish line Koen must head back to the start line to collect his car. Assuming he can ski back to the start in a straight line, determine how far and in what direction he must travel to reach his car.