

Phys12 Vectors : Worksheet - 20

1) Given : $\mathbf{A} = [4.0 , 1.0]$, $\mathbf{B} = [-2.0 , 3.0]$

a)i) $\mathbf{A} + \mathbf{B} =$

ii) $-\mathbf{B} =$

iii) $\mathbf{A} - \mathbf{B} =$

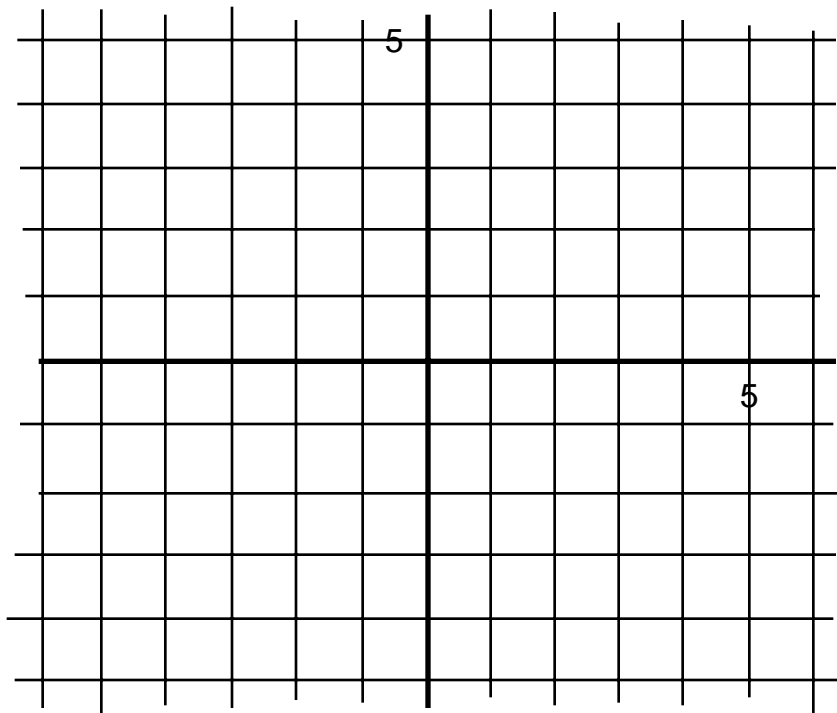
iv) $\mathbf{B} - \mathbf{A} =$

b) Write the \mathbf{A} and \mathbf{B} vectors referenced to an X-Y grid. (give magnitude and a direction angle relative to the X-axis)

$\mathbf{A} =$

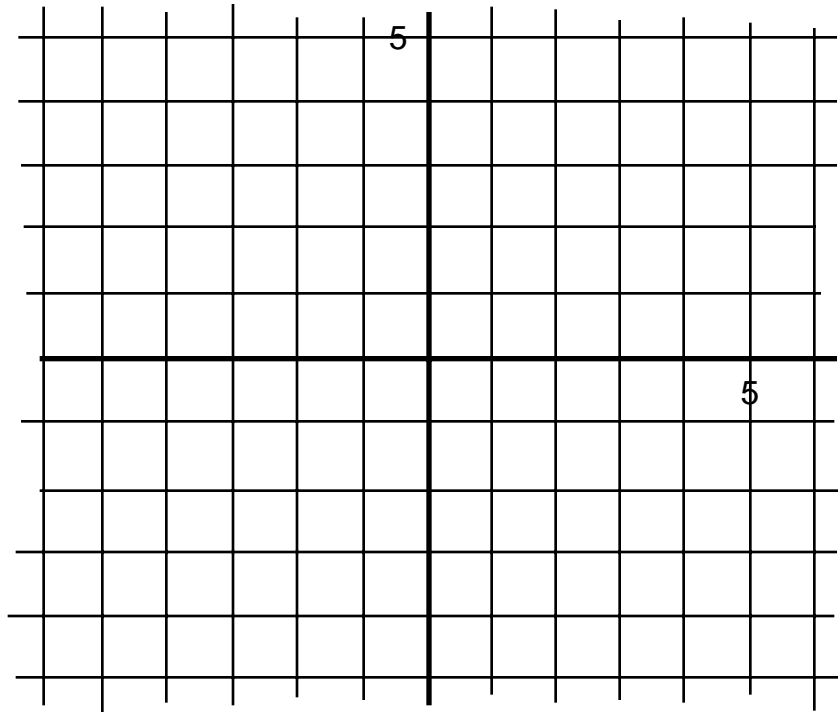
$\mathbf{B} =$

c) Draw all of the above vectors on the grid below.



2) Find $|\mathbf{A}|$ _____ , and $|\mathbf{A} - \mathbf{B}|$ _____

3) When a body is at equilibrium, the sum of all forces acting on it equals the zero vector $[0.0 , 0.0]$. If three forces \mathbf{A} , \mathbf{B} , (both given above) and \mathbf{C} act on a body that is at equilibrium, find vector \mathbf{C} . $\mathbf{C} = [\quad , \quad]$. Find the magnitude of \mathbf{C} . _____. Draw the three vectors on the grid below head to tail. (use a ruler).



4) Two forces 30. N and 40. N with an angle of $60.^\circ$ between them act on a body. Give the magnitude and direction of the resultant. Draw a diagram. (hint: let the 40. N force vector lie on the positive x-axis)

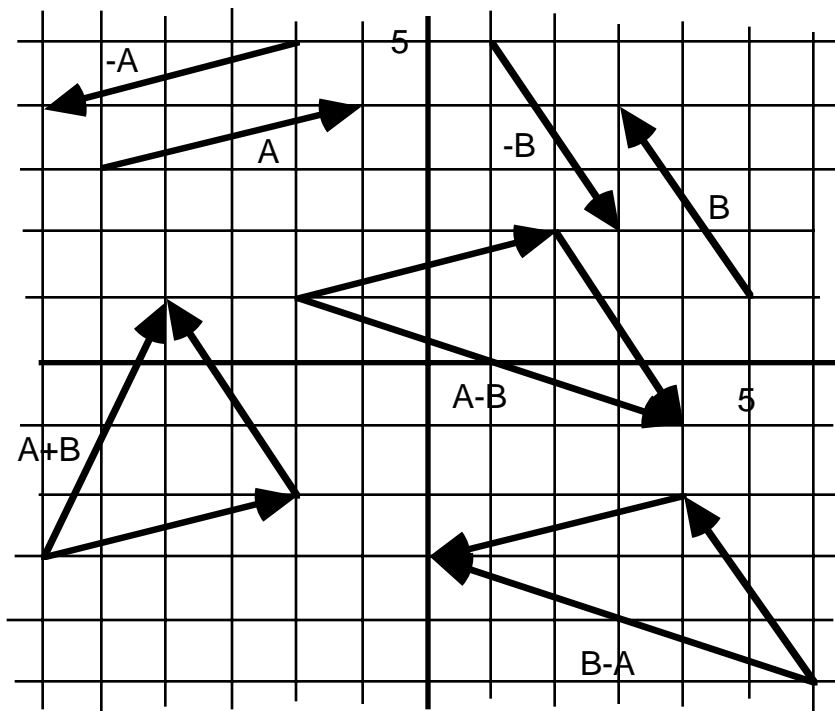
5) A man walks 3.0 km North. Then he walks 5.0 km East. He finally walks 7.0 km South. Find the final displacement.

6) A plane heads due East. The airspeed (speed with no wind) of the plane is 150. km/hr. But a wind blows toward the North-East at 30. km/hr (45° N of E). The wind blows the plane off course. Give the true velocity and direction (relative to the ground).

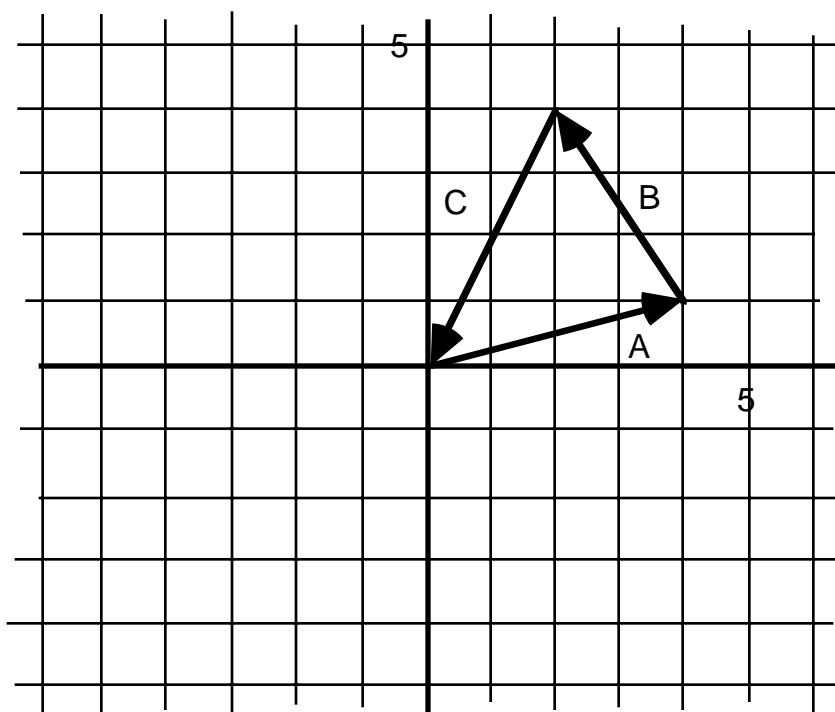
7) Find the resultant displacement $\mathbf{R} = \mathbf{A} + \mathbf{B} + \mathbf{C} + \mathbf{D}$. Given $\mathbf{A} = 85.0$ km north east, $\mathbf{B} = 72.0$ km west, $\mathbf{C} = 94.0$ km at 30.0° south of west, $\mathbf{D} = 78.0$ km at 20.0° east of south. Use the ordered pair method. $\mathbf{R} = [\quad , \quad]$

8) A body is at equilibrium. There are three horizontal forces acting on it. Two of the forces are : $[6.0 , -5.0]$ and $[-2.0 , -7.0]$. Find the third force. $\mathbf{F} = [\quad , \quad]$

Answers : a)i) [2.0 , 4.0], ii) [2.0 , -3.0], iii) [6.0 , -2.0], iv) [-6.0 , 2.0], b) $\mathbf{A} = 4.1$ [14° N of E], $\mathbf{B} = 3.6$ [56° N of W], c)



2) 4.1, 6.3, 3) $\mathbf{C} = [-2.0, -4.0]$, $|\mathbf{C}| = 4.5$,



4) 61 N, Resultant is 35° from the 30. N vector. (or [55,26] N), 5) [0.0, 3.0] + [5.0, 0.0] + [0.0, -7.0] = [5.0, -4.0] km or 6.4 [39° S of E], 6) [150, 0] + [21.2, 21.2] = [171.2, 21.2] = 173 km/hr [7.1° N of E], 7) [60.1, 60.1] + [-72, 0.0] + [-81.4, -47] + [26.7, -73.3] = **R**, **R** = [-66.6 , -60.2] km, 8) [-4.0 , 12.0]