# Quiz 02: Vector Arithmetic

1. A vector has magnitude A = 55g and direction angle θ = 120°. This vector is found in which quadrant?
   A) Quadrant I
   **B) Quadrant II**
   C) Quadrant III
   D) Quadrant IV

2. A vector has components $B_x$ = −350g and $B_y$ = −225g. This vector is located in which quadrant?
   A) Quadrant I
   B) Quadrant II
   **C) Quadrant III**
   D) Quadrant IV

3. A vector has magnitude A = 235g and direction angle θ = 120°. Express the *x-component* of the vector
$$A_x = A\cos\theta$$
$$A_x = (235\text{g})\cos 120° = -118\text{g}$$

4. A vector has magnitude B = 150g and direction angle θ = 240°. Express the *y-component* of the vector.
$$B_y = B\sin\theta$$
$$B_y = (150\text{g})\sin 240° = -130\text{g}$$

5. A vector has components $A_x$ = 145g and $A_y$ = −230g. Express the *magnitude* of this vector.
$$A = \sqrt{A_x^2 + A_y^2}$$
$$A = \sqrt{(145\text{g})^2 + (-230\text{g})^2} = 272\text{g}$$

6. A second vector has components $B_x$ = −75g and $B_y$ = −125g. Express the *direction angle* of this vector.
$$\theta = \tan^{-1}\left(\frac{B_y}{B_x}\right)$$
$$\theta = \tan^{-1}\left(\frac{-125\text{g}}{-75\text{g}}\right) = 239°$$

7. When the above vectors **A** (question 5) and **B** (question 6) are added together, the resultant vector **R** = **A** + **B** will be located in which quadrant?
   A) Quadrant I
   B) Quadrant II
   C) Quadrant III
   **D) Quadrant IV**

Vector **A** has components $A_x$ = 119g and $A_y$ = 170g. Vector **B** has components $B_x$ = −160g and $B_y$ = 40g. The vectors are added together: **A** + **B** = **R**.

8. What is the *x–component* of the resultant, $R_x$?
$$R_x = A_x + B_x = -41.0\text{g}$$

9. What is the *y–component* of the resultant, $R_y$?
$$R_y = A_y + B_y = 210\text{g}$$

10. Express he *magnitude* of the resultant vector **R** to three significant digits.
$$R = \sqrt{R_x^2 + R_y^2}$$
$$R = \sqrt{(-41\text{g})^2 + (210\text{g})^2} = 214\text{g}$$

11. Two vectors are established using the force table. Vector **A** has magnitude A = 150g, $\theta_A$ = 315°. Vector **B** has magnitude B =200g, $\theta_B$ = 45°. *To balance the table* (**A** + **B** + **C** = 0), in which quadrant must you place a third vector **C**?
   A) Quadrant I
   B) Quadrant II
   **C) Quadrant III**
   D) Quadrant IV

12. When the vectors **A** and **B** in question 11 are added together, the resultant vector **R** is located in which quadrant?
   **A) Quadrant I**
   B) Quadrant II
   C) Quadrant III
   D) Quadrant IV