Vector Module Practice **NAME: __SOLUTIONS_____**

1) A vector can be written in many ways thanks to angles repeating every $360°$. Similarly a negative vector is simply the same vector pointing at $180°$ (pointing in the other direction). For example, the vector $v_1 = 25\ m\ @40°$ can also be written as:
$v_1 = 25\ m\ @400°$ or $v_1 = 25\ m\ @760°$ or $v_1 = 25\ m\ @ -320°$ or $v_1 = 25\ m\ @ -780°$
If we use negatives in front of the vector we could write the same vector as
$v_1 = -25\ m\ @220°$ or $v_1 = -25\ m\ @580°$
These are just a few of the infinite possible ways or writing a vector.

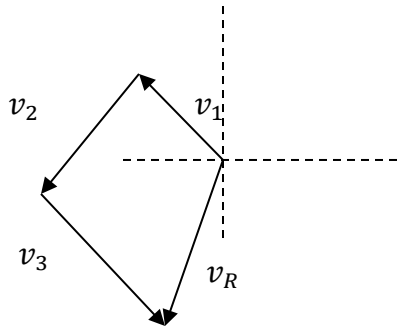
Write the following vectors in 3 other equivalent ways by changing the angle and/or negative signs.

$v_2 = 35\ km\ @55°$
i) add $360°$ $v_2 = 35\ km\ @415°$
ii) subtract $360°$ $v_2 = 35\ km\ @ -305°$
iii) make negative and add $180°$ $v_2 = -35\ km\ @235°$

$v_3 = 50\ \frac{m}{s}\ @240°$
i) add $360°$ $v_3 = 50\ \frac{m}{s}\ @600°$
ii) subtract $360°$ $v_3 = 50\ \frac{m}{s}\ @ -120°$
iii) make negative and subtract $180°$ $v_3 = -50\ \frac{m}{s}\ @60°$

2) Draw a sketch (not exactly to scale) of the following vector sum: $v_R = v_1 + v_2 + v_3$ given

$v_1 = 60\ kg\ @\ 130°$
$v_2 = 70\ kg\ @\ 240°$
$v_3 = 80\ kg\ @\ 300°$



3) Find the components of the following vector:

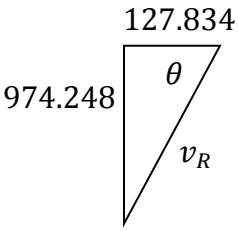
$v_1 = 75\ mi\ @\ 110°$

Vector	East or x	North or y
v_1	$75\cos(110°) = -25.6515\ mi$	$75\sin(110°) = 70.4769\ mi$

4) Find the resultant vector $v_R = v_1 + v_2 + v_3$ given the following vectors:

$v_1 = 600\ lbs\ @\ 125°$
$v_2 = 700\ lbs\ @\ 288°$
$v_3 = 800\ lbs\ @\ 270°$

Vector	East or x	North or y
v_1	$600\cos(125°)$	$600\sin(125°)$
v_2	$700\cos(288°)$	$700\sin(288°)$
v_3	$800\cos(270°)$	$800\sin(270°)$
v_R	-127.8339657	-974.2483348



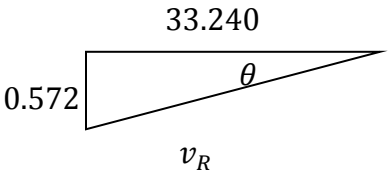
$v_R = \sqrt{(-127.8339657)^2 + (-974.2483348)^2}$, $\theta = \tan^{-1}\left(\frac{974.248}{127.834}\right)$

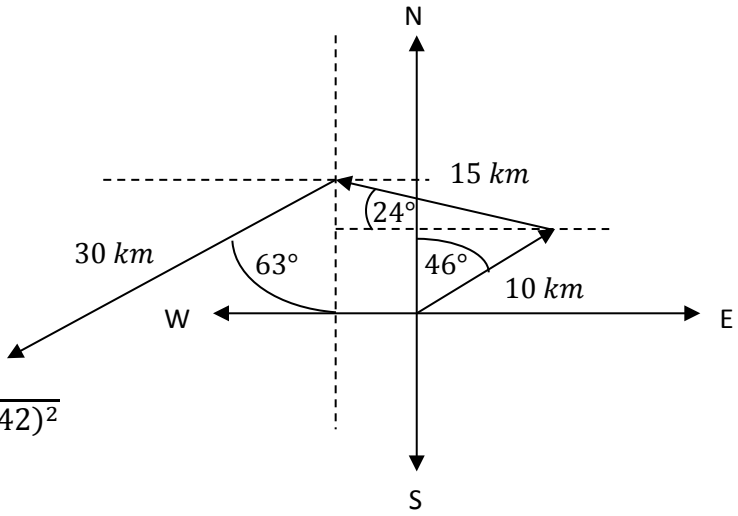
$= 982.5992778$ $= 82.52°$

$v_R = 982.60\ lbs\ @\ 262.5°$

5) Using the following diagram, draw and label the resultant vector and calculate the resultant vector, stating your answer in standard position.

Vector	East or x	North or y
v_1	$10\cos(44°)$	$10\sin(44°)$
v_2	$15\cos(156°)$	$15\sin(156°)$
v_3	$30\cos(207°)$	$30\sin(207°)$
v_R	-33.23997959	-0.572081642





$v_R = \sqrt{(-33.23997959)^2 + (-0.572081642)^2}$

$= 33.24490217$

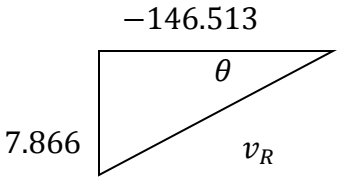
$\theta = \tan^{-1}\left(\frac{0.572}{33.240}\right) = 0.986°$

$v_R = 33.24\ km @\ 181.0°$

6) Find the resultant vector $v_R = v_1 + v_2 + v_3 - v_4$ given: (note the negative sign)

$v_1 = 25\ N\ @\ 157°$
$v_2 = 50\ N\ @\ 188°$
$v_3 = 75\ N\ @\ 272°$
$v_4 = 100\ N\ @\ 320°$

Vector	East or x	North or y
v_1	$25\cos(157°)$	$25\sin(157°)$
v_2	$50\cos(188°)$	$50\sin(188°)$
v_3	$75\cos(272°)$	$75\sin(272°)$
$-v_4$	$-100\cos(320°)$	$-100\sin(320°)$
v_R	-146.5130068	-7.865927894



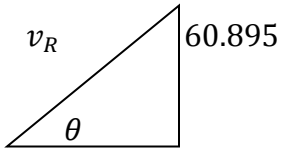
$v_R = \sqrt{(-146.5130068)^2 + (-7.865927894)^2}$, $\theta = \tan^{-1}\left(\frac{7.865927894}{146.5130068}\right)$
$= 146.7240062$ $= 3.07°$

$v_R = 146.72\ N\ @\ 183.07°$

7) Find the resultant vector $v_R = v_1 + v_2 + v_3 + v_4$ given:

$v_1 = 100\ \frac{km}{h}\ @\ 65°$
$v_2 = 250\ \frac{km}{h}\ @\ 125°$
$v_3 = 200\ \frac{km}{h}\ @ -25°$
$v_4 = 150\ \frac{km}{h}\ @\ 270°$

Vector	East or x	North or y
v_1	$100\cos(65°)$	$100\sin(65°)$
v_2	$250\cos(125°)$	$250\sin(125°)$
v_3	$200\cos(-25°)$	$200\sin(-25°)$
v_4	$150\cos(270°)$	$150\sin(270°)$
v_R	80.12927449	60.89513743



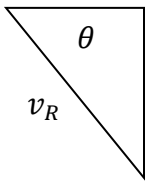
$v_R = \sqrt{(80.12927449)^2 + (60.89513743)^2}$, $\theta = \tan^{-1}\left(\frac{60.895}{80.129}\right)$
$= 100.6425278$ $= 37.23°$

$v_R = 100.643\ \frac{km}{h}\ @\ 37.2°$

8) Find the resultant vector $v_R = v_1 + v_2 - v_3 + v_4 - v_5$ (note the negatives) given:

$v_1 = 15\ \frac{kg*m}{s}\ @\ 110°$
$v_2 = 25\ \frac{kg*m}{s}\ @\ 207°$
$v_3 = 35\ \frac{kg*m}{s}\ @\ 35°$
$v_4 = 45\ \frac{kg*m}{s}\ @285°$
$v_5 = 55\ \frac{kg*m}{s}\ @\ 180°$

Vector	East or x	North or y
v_1	$15\cos(110°)$	$15\sin(110°)$
v_2	$25\cos(207°)$	$25\sin(207°)$
$-v_3$	$-35\cos(35°)$	$-35\sin(35°)$
v_4	$45\cos(285°)$	$45\sin(285°)$
$-v_5$	$-55\cos(180°)$	$-55\sin(180°)$
v_R	10.57107022	−60.79621064



$v_R = \sqrt{(10.57107022)^2 + (-60.79621064)^2}$, $\theta = \tan^{-1}\left(\frac{60.796}{10.571}\right)$
$= 61.708401$ $= 80.14°$

$v_R = 61.71\ \frac{kg*m}{s}\ @\ 279.9°$