KEY

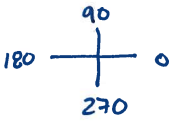
First Name:_____ Last Name:_____

L08 – FQ – Collisions in 2-Dimensions

Use the following information to answer Q1-Q2:

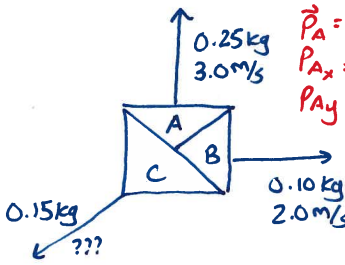
A stationary 0.50kg firework explodes into three pieces. The first piece has a mass of 0.25kg and a velocity of 3.0 m/s [90°]. The second piece has a mass of 0.10kg and a velocity of 2.0 m/s [0°].

Q1: The speed of the third fragment is ____ m/s.



*(Record your **three digit** answer in the Numerical Response boxes below)*

5	.	1	7



$\vec{P}_A = 0.75\ kg\,m/s\ [90^\circ]$
$P_{Ax} = 0$
$P_{Ay} = +0.75$

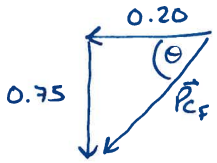
$\vec{P}_B = 0.20\ kg\,m/s\ [0^\circ]$
$P_{Bx} = +0.20$
$P_{By} = 0$

x-comp

$P_i = P_f$
$0 = P_{Af_x} + P_{Bf_x} + P_{Cf_x}$
$0 = 0 + 0.20 + P_{Cf_x}$
$P_{Cf_x} = -0.20$

y-comp

$P_i = P_f$
$0 = P_{Af_y} + P_{Bf_y} + P_{Cf_y}$
$0 = 0.75 + 0 + P_{Cf_y}$
$P_{Cf_y} = -0.75$



$|\vec{P}_{C_f}| = 0.7762\ kg\ m/s$

$|\vec{v}_{C_f}| = 5.17\ m/s$

Q2: The magnitude of the momentum of the system immediately after the explosion is

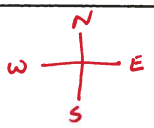
(a.) 0.00 kg*m/s
b. 0.17 kg*m/s
c. 1.73 kg*m/s
d. 5.09 kg*m/s

Initially $P_{x_i} = 0$ and $P_{y_i} = 0$
Momentum is conserved. So total $P_{x_f} = 0$ and total $P_{y_f} = 0$.

KEY

Use the following information to answer Q3:

Two balls of clay on a frictionless surface collide, sticking together.



$\vec{P}_A = 10\ kg\ m/s\ [30°\ S\ of\ E]$
$P_{A_x} = +8.66025$
$P_{A_y} = -5$

$\vec{P}_B = 9\ kg\ m/s\ [N]$
$P_{B_x} = 0$
$P_{B_y} = +9$

Q3: The velocity of the combined object immediately after the collision is ***a.b*** m/s [***ef***^{0} N of E], where ***a, b, e,*** and ***f*** are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

1	9	2	5

x-comp

$P_i = P_f$

$P_{iA_x} + P_{iB_x} = P_{f_x}$

$8.66025 + 0 = P_{f_x}$

$P_{f_x} = 8.66025\ kg\ m/s$

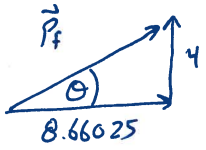
y-comp

$P_i = P_f$

$P_{iA_y} + P_{iB_y} = P_{f_y}$

$(-5) + 9 = P_{f_y}$

$P_{f_y} = +4\ kg\ m/s$



$\vec{P}_f = 9.539392014\ 16\ kg\ m/s\ [24.79°\ N\ of\ E]$

$\vec{V}_f = 1.9078...\ m/s\ [24.79°\ N\ of\ E]$

$\vec{V}_f \approx 1.9\ m/s\ [25°\ N\ of\ E]$

MARKING:

Beginning	0.0 – 1.0
Progressing	1.5 – 2.0
Competent	2.5
Exemplary	3.0