2D Momentum

Everything to this point was straight forward…
literally. Now let's break things up… literally!

When things break up in an explosion they can
go in any direction. For this class we will limit
this result to 2D physics -- but it is the same
in 3D.

Momentum must be conserved. It is the law.
∴ the center of gravity is conserved
throughout the explosion. All the momentums
of the pieces must be equal before and after
the explosion.

A 6.0 kg IED is travelling East at 4.0m/s. It explodes into 2
pieces. If the front mass of 1.5kg has a final velocity of 20m/s
what velocity and direction is the other piece?

Let's do a more complicated example.

I shoot a watermelon out of the air. The watermelon had an original momentum of 10 Ns. After I shot it, it broke into 2 pieces. One of the pieces went up at a 30° angle and had a momentum of 8 Ns. What is the momentum of the other piece?

A cat of mass 10kg runs at 5.0m/s towards a sleeping cat. The sleeping cat weighs 4.0 kg. The larger cat travels away with a velocity of 3.2 m/s at 27°. What is the velocity of the smaller cat?

A 10 kg zombie cat runs at 10 m/s [E] toward a spike, it splits into 2 parts, a 4.0 kg mass travels at 8.0 m/s at 45° S of E what is the velocity of the other piece?

A zombie head of mass 10 kg at rest is exploded into 3 pieces. A 2.5 kg piece travels off at 20 m/s at 30° N from W, a 3.0 kg mass travels due south at 12 m/s find the velocity of the 3rd piece.

A mass of a 5.0 kg is travelling due East at 20 m/s when an explosion separates it into exactly 2 pieces, a 1.5 kg mass travels at 50° N of E and the other mass travels off at 25° from the original path. Determine the speed of each piece.