Name: _____ **Block:** _____

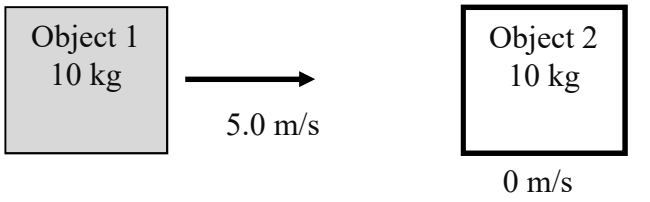
PHYSICS: ELASTIC AND INELASTIC COLLISIONS
DETERMINING MOMENTUM, KE, AND VELOCITIES OF COLLIDING OBJECTS

Elastic Collisions: Objects collide and rebound off of each other without damage and without loss of kinetic energy.

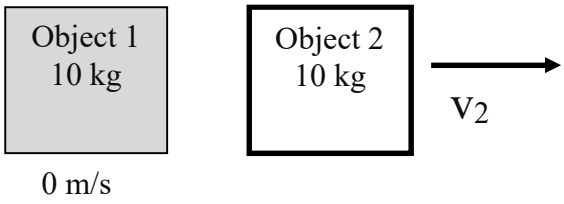
$$(p_1 + p_2)_{before} = (p_1 + p_2)_{after}$$
$$(m_1 \cdot v_1)_{before} + (m_2 \cdot v_2)_{before} = (m_1 \cdot v_1)_{after} + (m_2 \cdot v_2)_{after}$$

Collision A. Elastic Collision: Moving object impacts a stationary object. Both objects have the same mass.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION	
	Object 1	**Object 2**		**Object 1**	**Object 2**
Mass (kg)	10 kg	10 kg		10 kg	10 kg
Velocity (m/s)	5.0 m/s	0 m/s		0 m/s	
Momentum (kgm/s)	50 kg·m/s +	0 kg·m/s	=	0 kg·m/s +	
Kinetic energy (J)	125 J +	0 J	=	0 J +	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

Object _____ transferred momentum to Object _____ (look at the "after collision" evidence).

Object #1 moved _____ after the collision than it did before the collision.

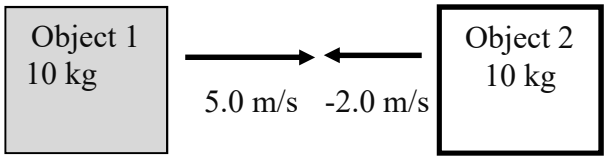
Object #2 moves _____ after the collision than it did before the collision.

What is special about this collision?

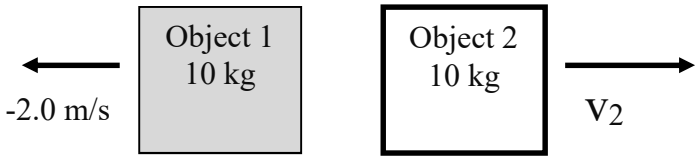
What happened to the momentums and to the velocities of the objects?

Collision B. Elastic Collision. Two objects experience a head-on collision. Both objects have the same mass.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION	
	Object 1	**Object 2**		**Object 1**	**Object 2**
Mass (kg)					
Velocity (m/s)					
Momentum (kgm/s)	+		=	+	
Kinetic energy (J)	+		=	+	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

Object _____ transferred momentum to Object _____ (look at the "after collision" evidence).

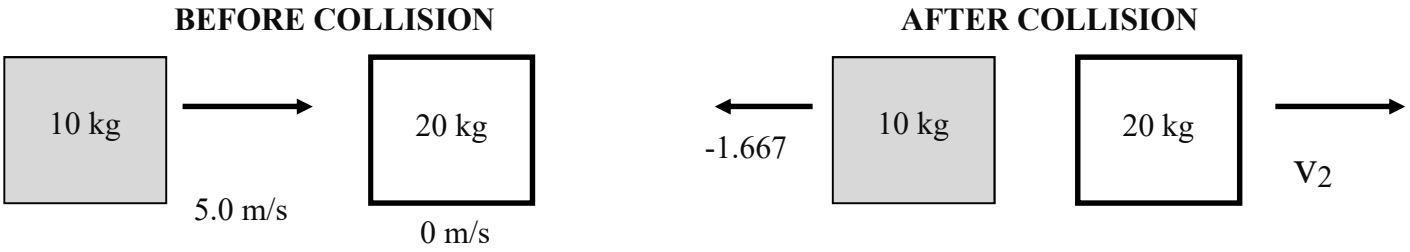
Object #1 moved _____ after the collision than it did before the collision.

Object #2 moves _____ after the collision than it did before the collision.

What is special about this collision?

What happened to the momentums and to the velocities of the objects?

Collision C. Elastic Collision. Moving object collides with stationary object. The objects have different masses.



	BEFORE COLLISION			AFTER COLLISION	
	Object 1	**Object 2**		**Object 1**	**Object 2**
Mass (kg)					
Velocity (m/s)					
Momentum (kgm/s)	+		=	+	
Kinetic energy (J)	+		=	+	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

Object _____ transferred momentum to Object _____ (look at the "after collision" evidence).

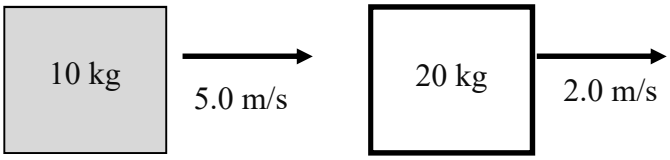
Object #1 moved _____ after the collision than it did before the collision.

Object #2 moves _____ after the collision than it did before the collision.

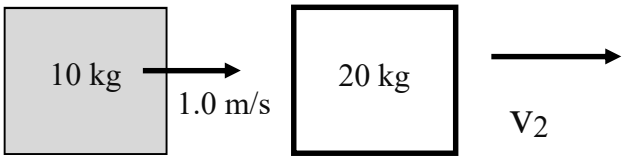
The objects did not exchange momentum and velocities in this collision because…

Collision D. Elastic Collision. Moving object collides with stationary object. The objects have different masses.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION	
	Object 1	**Object 2**		**Object 1**	**Object 2**
Mass (kg)					
Velocity (m/s)					
Momentum (kgm/s)		+	=		+
Kinetic energy (J)		+	=		+

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

Object _____ transferred momentum to Object _____ (look at the "after collision" evidence).

Object #1 moved _____ after the collision than it did before the collision.

Object #2 moves _____ after the collision than it did before the collision.

The objects did not exchange momentum and velocities in this collision because…

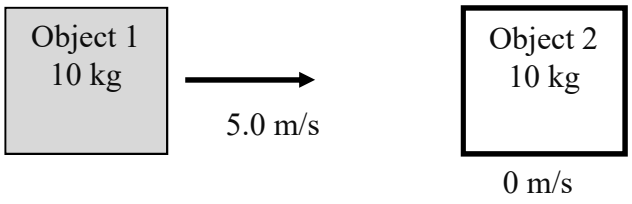
GUIDED PRACTICE: INELASTIC COLLISIONS

Inelastic Collisions: Objects collide and are damaged, fuse together, or experience energy loss through friction. Momentum is conserved, but KE is not conserved. There is a loss of KE.

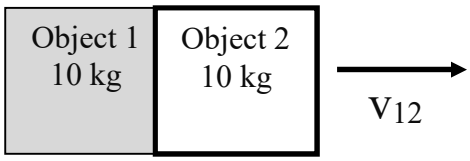
$$(p_1 + p_2)_{before} = (p_{12})_{after}$$
$$(m_1 \cdot v_1)_{before} + (m_2 \cdot v_2)_{before} = (m_{12} \cdot v_{21})_{after}$$

Collision A. Inelastic Collision: Moving object impacts a stationary object.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION
	Object 1	**Object 2**		**Object 12**
Mass (kg)	10 kg	10 kg		20 kg
Velocity (m/s)	5.0 m/s	0 m/s		
Momentum (kgm/s)	50 kg·m/s	+ 0 kg·m/s	=	
Kinetic energy (J)	125 J	+ 0 J	>	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

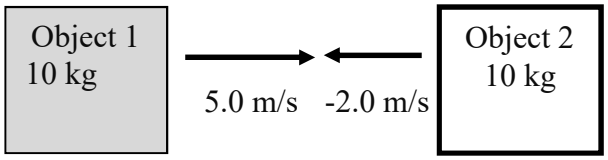
Which direction did the fused object move after the collision? _____

Why did the object move in that direction? _____

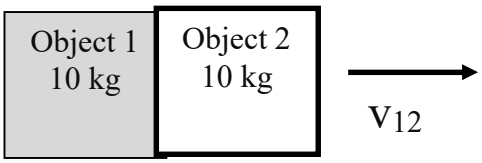
How fast was the fused object moving after the collision? Explain why it was moving at that velocity.

Collision B. Inelastic Collision. Two objects experience a head-on collision.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION
	Object 1	**Object 2**		**Object 12**
Mass (kg)				
Velocity (m/s)				
Momentum (kgm/s)		+	=	
Kinetic energy (J)		+	>	

Which object had more momentum before the collision? _____

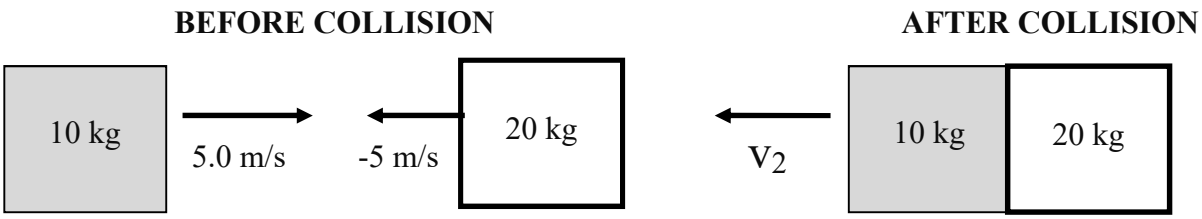
Which object had less momentum before the collision? _____

Which direction did the fused object move after the collision? _____

Why did the object move in that direction? _____

How fast was the fused object moving after the collision? Explain why it was moving at that velocity.

Collision C. Inelastic Collision. Two objects experience a head-on collision.



	BEFORE COLLISION			AFTER COLLISION
	Object 1	**Object 2**		**Object 12**
Mass (kg)				
Velocity (m/s)				
Momentum (kgm/s)		+	=	
Kinetic energy (J)		+	>	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

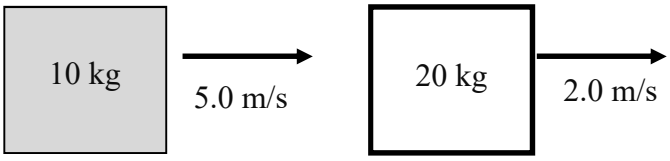
Which direction did the fused object move after the collision? _____

Why did the object move in that direction? _____

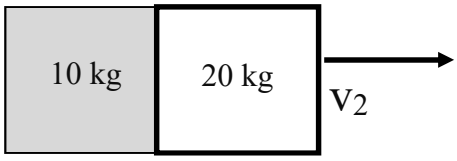
How fast was the fused object moving after the collision? Explain why it was moving at that velocity.

Collision D. Inelastic Collision. Two moving objects are moving the same direction. The faster moving object collides and merges with the slower moving object.

BEFORE COLLISION



AFTER COLLISION



	BEFORE COLLISION			AFTER COLLISION
	Object 1	**Object 2**		**Object 12**
Mass (kg)				
Velocity (m/s)				
Momentum (kgm/s)		+	=	
Kinetic energy (J)		+	>	

Which object had more momentum before the collision? _____

Which object had less momentum before the collision? _____

Which direction did the fused object move after the collision? _____

Why did the object move in that direction? _____

How fast was the fused object moving after the collision? Explain why it was moving at that velocity.