REVIEW: ANSWERS

1. **A** - AS THE ROCK FALLS, IT HAS A CONSTANT ACCELERATION — THE ROCK GAINS AN EQUAL AMOUNT OF VELOCITY EVERY SECOND (NOT EVERY METER). BECAUSE IT GAINS AN EQUAL AMOUNT OF VELOCITY EACH SECOND, IT GAINS AN EQUAL AMOUNT OF MOMENTUM, NOT ENERGY

$P = MV \qquad K = \frac{1}{2}MV^2$

2. **A** - CONVERT WEIGHT TO MASS (USING $g = 9.8\ m/s^2$).

$P = MV.$

3. **E** - $\Delta P = M\Delta V$ $\qquad V_0 = -12\ m/s \downarrow$ $\qquad \Delta V = 24\ m/s \uparrow$

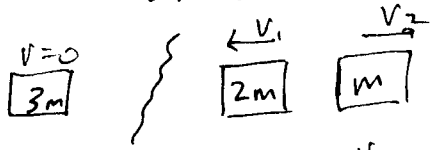
$V = +12\ m/s \uparrow$

$\Delta p = 1(24) = 24\ kgm/s \uparrow$

4. **E** - A-D ARE EXPLOSIONS / COLLISIONS IN THE ABSENCE OF AN OUTSIDE FORCE

E - GRAVITY (AN EXTERNAL FORCE) PULLS THE LIMB TO THE GROUND AND CHANGES THE MOMENTUM.

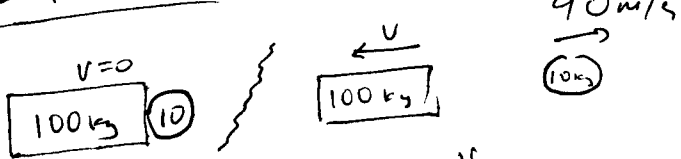
5. **C**



$0 = 2mV_1 + mV_2$

$\boxed{2V_1 = V_2}$

6. **B**



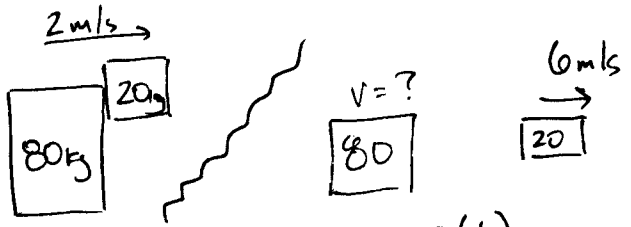
$(M+m)V = m_1V_1 + m_2V_2$

$0 = 100V + 900\ kgm/s$

$-900\ kgm/s = 100V$

$\boxed{-9\ m/s = V}$

7. [A]



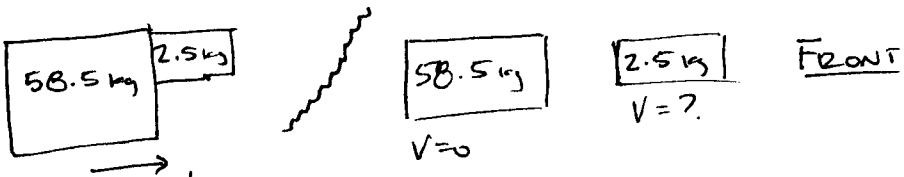
$(80+20)(2) = 80V + 20(6)$

$200 = 80V + 120$

$80 = 80V$

$1 = V$ ← SINCE IT'S (+), IT WILL MOVE TOWARD THE SHIP.

8. [C]



$(M_1+M_2)V = M_1(0) + M_2V_F$

$60(.15) = 0 + 2.5V$

$3.6\ m/s = V$ → TOWARD FRONT BECAUSE VELOCITY IS (+).

9. [A] HOW (OR IF) KINETIC ENERGY IS LOST IS A WAY TO CLASSIFY COLLISIONS. MOMENTUM IS CONSERVED ALWAYS (IN A COLLISION).

$\Delta K = 0$ → ELASTIC

ΔK LOST → INELASTIC

MORE ΔK LOST → COMPLETELY INELASTIC.

10. [D] IN A ~~[illegible]~~ COLLISION, MOMENTUM IS CONSERVED. TOTAL ENERGY IS ALWAYS CONSERVED KINETIC ENERGY IS LOST IN COMPLETELY INELASTIC COLLISIONS

~~[illegible]~~ $\Delta P = J$

11. [D] ACCORDING TO NEWTON'S ~~[illegible]~~ 2ND LAW, THE VELOCITY (OF THE CENTER OF MASS) OF A SYSTEM IS CONSTANT (IE MOMENTUM IS CONSERVED) WHEN THE NET EXTERNAL FORCE IS EQUAL TO ZERO.

12. [B] $V_0 = 20\ m/s$

$V = -29\ m/s$

$\Delta V = -49\ m/s$

$J = \Delta P = M\Delta V$

$= 0.11\ kg\ (-49\ m/s)$

$\boxed{J = 5.4\ kg\ m/s}$

13. [E]

$V_0 = 27 m/s$

$V = -40 m/s$

$\Delta V = -67 m/s$

$t = 3ms = 0.003s$

$$F = \frac{J}{t} = \frac{\Delta P}{t} = \frac{m\Delta V}{t}$$

$$F = \frac{0.11(67)}{.003}$$

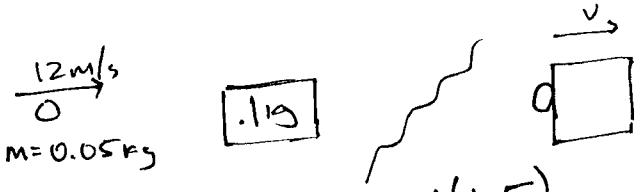
$F = 2456 N$

$\boxed{2.5 kN}$

14. [A]

Ball 1	Ball 2
$V_0 = V$	$V_0 = V$
$V = -V$	$V = 0$
$J = m(-2V)$	$J = m(-V)$
$J = -2mV$	$J = mV$

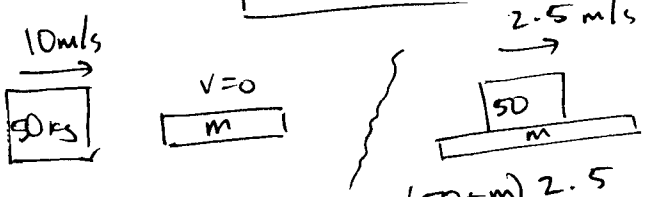
15. [B]



$12(.05) = V(.1.5)$

$\boxed{4 m/s = V}$

16. [A]



$50(10) = (50+m)\,2.5$

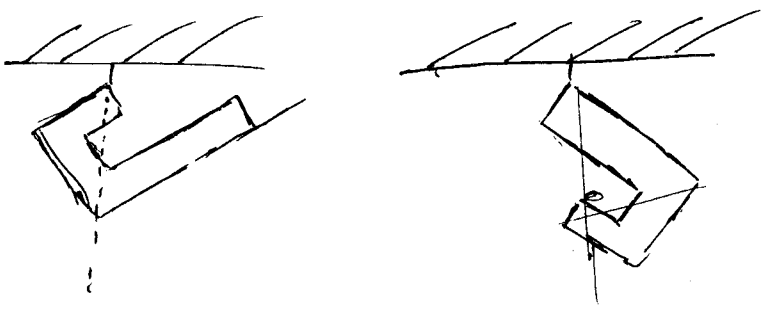
$\frac{500}{2.5} = 50+m$

$200 - 50 = m$

$\boxed{150 kg = m}$

17. IGNORE

18. [D] DRAWING A LINE STRAIGHT DOWN FROM THE PIVOT ON BOTH PICTURES WILL LOCATE THE CENTER OF MASS



19. **B** (1.5, 1)

$$X_{cm} = \frac{7kg(0) + 3kg(2) + 1kg(3) + 3kg(4)}{14kg}$$

$$X_{cm} = 1.5$$

$$Y_{cm} = \frac{7kg(0) + 3kg(3) + 1kg(2) + 3kg(1)}{14kg}$$

$$Y_{cm} = 1m$$

20. **E** MOMENTUM AND IMPULSE ARE THE SAME THING. SO, YES, THEY ARE MEASURED IN THE SAME UNITS.

21. **D**

$$7.3(6) = 7.3(5.4) + 1.6V$$

$$\frac{7.3(6) - 7.3(5.4)}{1.6} = V$$

$$2.7m/s = V$$

THIS WOULD NOT HAPPEN IN REAL LIFE. THE PIN WOULD MOVE MUCH FASTER THAN THE BALL.

22. **D**

$V_0 = 0$

$V = 21 m/s$

$t = 0.05s$

$M = 0.41kg$

$$F = \frac{M\Delta V}{t} = \frac{.41(21)}{.05}$$

$$F = 170N$$

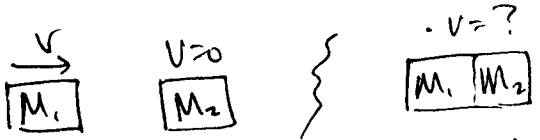
23. **A**

$$F = \frac{m\Delta V}{t} = \frac{0.05kg(+30m/s)}{.1s}$$

$$F = +15N$$

24. **E** - MOMENTUM IS CONSERVED IN EACH SITUATION.

25. **D**



$$M_1V = (M_1 + M_2)V_f$$

$$\frac{M_1V}{M_1 + M_2} = V_f$$