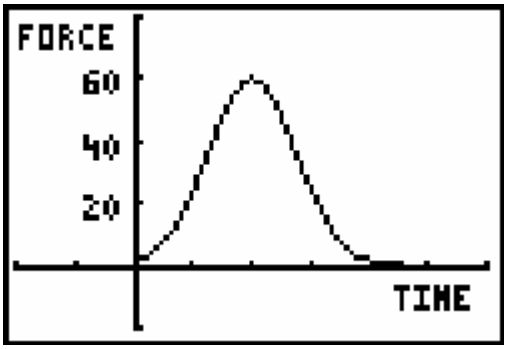
Problem I

A 300 gram ball is thrown normal to a wall. The ball approaches the wall at a speed of 20 m/s. The ball remains in contact with the wall for 0.06 seconds before rebounding at 12 m/s.

1. The change in momentum for the ball due to the wall is ____ N*sec.
2. The average force acting on the ball due to the wall is ___ N.
3. The kinetic energy lost by the ball due to a collision with the wall is ____ J.

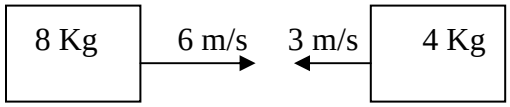
Problem II

A 0.4 Kg object at rest experiences the following impulse as a function of time where F is measured in Newtons and t is in time. **$F = 60e^{(-90(0.2-t)^2)}$** for $0 \le t \le 0.4$ seconds.



4. The maximum force occurs at t=___s.
5. The maximum force is ____ N.
6. The maximum acceleration is ___m/s^2.
7. The change in momentum for the object is ___ N*s.
8. The final speed of the object is ___m/s.

Problem III



The two objects in the above figure experience as head-on totally inelastic collision that takes places in 0.4 seconds.

9. The final velocity of the combined masses is ___ m/s.
10. The momentum transferred from one block to the other is ___ N*sec.
11. The average force experienced by either block during collision is ___N.
12. The kinetic energy that was lost to heat is ___ J.

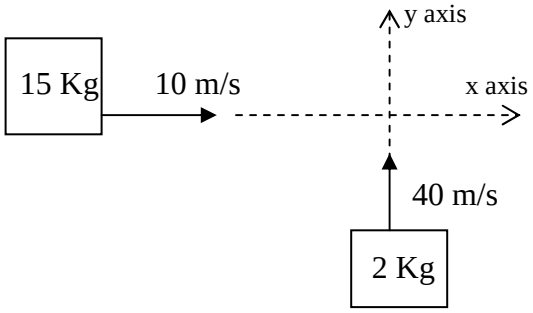
Problem IV

Consider what would happen if the blocks from the previous problem collide under perfectly elastic conditions.

13. The 8 Kg block has a final velocity of ___ m/s.
14. The 4 Kg block has a final velocity of ___ m/s.
15. The momentum transferred from one block to the other is ___ N*sec.
16. The kinetic energy transferred from one block to the other is ___ J.
17. The heat generated during the collision is ___ J.

Problem V

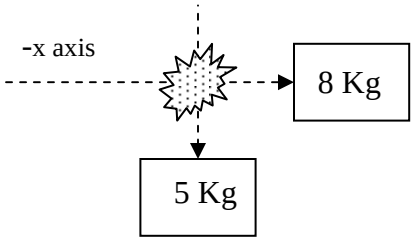
The two objects in the figure below experience a two-dimensional totally inelastic collision.



18. The final heading of the combined masses will be ___° above x axis.
19. The final speed of the combined masses will be ____ m/s.
20. The kinetic energy lost during the collision is ___ Joules.

Problem VI

A 33 Kg object at rest explodes into three parts. An 8 Kg part is blown to the right at 10 m/s. A 5 Kg part is blown down the page at 12 m/s.



21. The heading of the third part is ___° above the negative x axis.
22. The mass of the third part is ___Kg.
23. The final speed of the third part is ___m/s.
24. The energy released in the explosion is ___ J.
25. Conservation of momentum comes directly from Newton's ____ Law of Motion.

Answers:

1. – 9.6 N*s
2. –160 N
3. 38.4 Joules
4. 0.2 seconds
5. 60 N
6. 150 m/s^2
7. 11.13 N*sec
8. 27.82 m/s
9. 3 m/s
10. 24 N*sec
11. ± 60 N
12. 108 Joules
13. 0 m/s
14. +9 m/s
15. 48 N*sec
16. 144 Joules
17. 0 Joules
18. 28.1°
19. 10 m/s
20. 1500 J
21. 36.9°
22. 20 Kg
23. 5 m/s
24. 1010 Joules
25. 3rd Law of Motion

Also be responsible for a ballistic pendulum type problem.