

Practice 6.1 - Rocket Science!!!!

1. a. A 35.0 N unbalanced force is exerted on a 7.10 Kg mass for 36.0 seconds. What is the change of **velocity** of the mass? (177 m/s)
 - b. A 0.145 Kg baseball going 41.0 m/s, strikes a bat, and heads straight **back** to the outfield at 31.0 m/s. If the bat exerted a force of 2530 N, for what **time** was it in contact with the bat? (0.00413 s)
 - c. A rocket burns 42.4 kg in 6.50 s with an exhaust velocity of 720. m/s. What is the thrust of the engine? (4697 N)
 - d. A rocket engine burns fuel at a rate of 4.10 grams per second, and develops a force of 12.2 N. What must be the exhaust **velocity**? (1000 grams = 1 kg) (2976 m/s)
 - e. A 114 kg rocket (total mass of fuel and rocket), burns 95.0 kg of fuel at a rate of 3.50 kg/s with an exhaust velocity of 790. m/s. What are its initial and final acceleration as it takes off from earth? (14.5 m/s/s, 136 m/s/s)
2. a. A 62.0 N unbalanced force is exerted on an object for 4.5 seconds. The mass changes velocity from rest to 47 m/s. What is the **mass** of the object? (5.94 kg)
 - b. A 0.138 Kg baseball going 37.0 m/s, strikes a bat, and heads straight **back** to the outfield at 45.0 m/s. If the collision lasted for .0121 seconds, what **force** did the bat exert on the baseball? (935 N)
 - c. A rocket engine develops 1240 N of thrust burning 56.2 kg of fuel in 21.5 s. What is the exhaust velocity? (474 m/s)
 - d. A rocket engine burns fuel at a rate of 1.40 grams per second, and has an exhaust velocity of 890. m/s. What **thrust** does it develop? (1000 grams = 1 kg) (1.25 N)
 - e. A 324 kg rocket, 292 kg of which is fuel, burns all of its fuel in 38.0 seconds with an exhaust velocity of 880. m/s. What are its initial and final acceleration as it takes off from earth? (11.1 m/s/s, 202 m/s/s)
3. a. A force is exerted on a 23 Kg mass for 15 seconds. The mass changes velocity from rest to 45 m/s. What was the **force**? (69.0 N)
 - b. A ball going 27.0 m/s, strikes a bat, and heads straight **back** to the outfield at 41.0 m/s. If the bat exerted a force of 312 N for 0.0230 seconds, what is the **mass** of the ball? (0.106 kg)
 - c. A rocket burns 35.1 kg of fuel generating 450. N of thrust with an exhaust velocity of 790. m/s. What time do the engines burn? (61.6 s)
 - d. A rocket develops a thrust of 14.2 N, with an exhaust velocity of 910. m/s. What **mass** in fuel does the engine burn every second? (0.0156 kg/s or 15.6 g/s)
 - e. A 67.0 kg rocket (total mass of fuel and rocket), burns 52.0 kg of fuel at a rate of 2.70 kg/s with an exhaust velocity of 642 m/s. What are its initial and final acceleration as it takes off from earth? (16.1 m/s/s, 106 m/s/s)
4. a. A 68 N unbalanced force is exerted on a 12 Kg mass. The mass changes velocity from rest to 35 m/s. What **time** did the force act? (6.18 s)
 - b. A 0.141 Kg baseball going 34.0 m/s, strikes a bat, and heads straight **back** to the outfield at 58.0 m/s. If the bat exerted a force of 1830 N, for what **time** was it in contact with the bat? (0.00709 s)
 - c. A rocket engine produces 360. N of thrust for 45.0 s with an exhaust velocity of 770. m/s. What mass of fuel does it burn in this time? (21.0 kg)
 - d. A rocket engine burns fuel at a rate of 14.0 grams per second, and develops a force of 31.7 N. What must be the exhaust **velocity**? (1000 grams = 1 kg) (2264 m/s)
 - e. A 19.0 kg rocket, 14.0 kg of which is fuel, burns its fuel at a rate of 0.420 kg/s with an exhaust velocity of 650. m/s. What are its initial and final acceleration as it takes off from earth? (4.57 m/s/s, 44.8 m/s/s)
5. a. A 23 N unbalanced force is exerted on a 46 Kg mass for 18 seconds. What is the change of **velocity** of the mass? (9.00 m/s)
 - b. A 0.143 Kg baseball going 36.0 m/s, strikes a bat, and heads straight **back** to the outfield at 86.0 m/s. If the collision lasted for 0.0120 seconds, what **force** did the bat exert on the baseball? (1454 N)
 - c. A rocket engine burns 2.20 kg of fuel generating 89.0 N of thrust with an exhaust velocity of 710. m/s. What time does the engine burn? (17.6 s)
 - d. A rocket engine burns fuel at a rate of 11.0 grams per second, and has an exhaust velocity of 752 m/s. What **thrust** does it develop? (1000 grams = 1 kg) (8.27 N)
 - e. A 5.70 kg rocket, 4.60 kg of which is fuel, burns all of its fuel in 10.3 seconds with an exhaust velocity of 610. m/s. What are its initial and final acceleration as it takes off from earth? (38.0 m/s/s, 238 m/s/s)