Dynamics Worksheet #2
Answers

1. m = 45 kg, a = 0.85 m/s^2, F = ?
   F = ma
   F = (45)(0.85) = <u>38.25 N</u>

2. m =1650 kg, a = 4.0 m/s^2, F =?
   F=ma
   F = 1650(4.0) = <u>6600N</u>

3. m = 68 kg, F = 59 N, a =?
   F = ma
   59 = 68a
   a = <u>0.87 m/s^2</u>

4. a = 0.08 m/s^2, F =47 N, m = ?
   F = ma
   47 = m(0.08)
   m = <u>587.5 kg</u>

5. F = (3)425N = 1275 N
   a = 0.85 m/s^2, m =?
   F=ma
   1275=m(0.85 m/s^2)
   m = <u>1500 kg</u>

6. m=0.314 kg, a = 164 m/s^2, F = ?
   F =ma
   F = (0.314)(164) = <u>51.50 N</u>

7. m = 8.18 kg, a = 88.2 m/s^2, F =?
   F=ma
   F = 8.18(88.3) = <u>721.5 N</u>

8. v_f = 68.2 m/s, v_i = 0, t = 2 s, m = 29 545 kg
   $v_f=v_i + at$
   68.2 = 0 +a(2)
   a =34.1 m/s^2
   F = ma
   F = (29 545)34.1 = <u>$1x10^6$ N</u>

9. $v_i = 0$, $v_f = 27$ m/s, t = 6.3 s, F = 4106 N, m=?
   $v_f = v_i + at$
   $27 = 0 + a(6.3)$
   $a = 4.2857$ m/s^2
   $F = ma$
   $4106 = m(4.2857)$
   <u>m= 958.07 kg</u>

10. v_i = ?, $v_f = 0$, d = 15 m, t = 23 s, m =52.5 kg
    $v_f = v_i + at$
    $0 = v_i + a(23)$
    $a = 0.0567$ m/s^2
    $F = ma$
    $F = 52.5(0.0567) =$ <u>2.98 N in the opposite direction of the motion</u>

11. F = 10 000 N, m = 1267 kg,
    (a) $F = ma$
        $10\,000 = 1267a$
        $a =$ <u>7.89 m/s^2</u>
    (b) $v_i = 0$, d = 394.6 m, t = 15s
        $d = v_i t + \frac{1}{2}at^2$
        $394.6 = \frac{1}{2}a(15)^2$
        $a =$ <u>3.51 m/s^2</u>
    (c) $7.89 - 3.51 =$ <u>4.38 m/s^2</u>
    (d) <u>friction</u>
    (e) $F = ma$
        $F = (1267)(4.38) =$ <u>5549 N in the direction opposite the motion</u>

12. The new acceleration is 5.6 times bigger than the old acceleration of 1.00 m/s^2. Therefore, the new force will be 5.6 times bigger.
    $5.6(45) =$ <u>252 N</u>

13. Four engines give four times the force with the same mass resulting in four times the acceleration.
    $4(8.9) =$ <u>35.6 m/s^2</u>

14. Since force stays the same
    $F = m_1a_1 = m_2a_2$
    $m_2 = 3.81m_1$
    $m_1a_1 = 3.81m_1a_2$
    $a_2/a_1 = 0.26$
    <u>The new acceleration is 0.26 times the old acceleration.</u>

15. The mass of the rocket remains constant
F_{new}/F_{old} = 46 458/12 482 = 3.72
a_{new}/a_{old} = 3.72
a_{new} = 3.72(9.8) = <u>36.48 m/s^2</u>

16. m = 40 kg
(a) F =30 N
F = ma
30 = (40)a
a = <u>0.75 m/s^2</u>
(b) v_f = 0, t =10 s, d = 15 m
d = (v_i + v_f)(t/2)
15 = vi(10/2)
v_i = 3 m/s
v_f = v_i + at
0 = 3 + a(10)
a = -0.3 m/s^2
F = ma
F= 40(0.3) = <u>12 N in the direction opposite the motion</u>

17. a = 0.524 m/s^2, m = 842 kg, F = ?
F =ma
F = 0.542(842) = <u>441.2</u> N

18. m = 989 kg, F =342 N, v_i = 0
(a) t = 12 s, d = ?
F = ma
342 = 989a
a = 0.346 m/s^2,
d = v_it + ½at^2
d = ½(0.346)(12)^2 = <u>24.9 m</u>
(b) If the pushing force is doubled, then the acceleration is doubled
a = 2(0.346) = 0.692 m/s2
The new distance is therefore
d = v_it + ½at^2
d = ½(0.692)(12)^2 = <u>49.8 m</u>

19. v_i = 5.4 m/s, v_f = 16.3 m/s, d = 107 m, m = 1201 kg
v_f^2 = v_i^2 + 2ad
(16.3)^2 = (5.4)^2 + 2a(107)
a = 1.105 m/s^2
F = ma
F = (1201)(1.105) = <u>1327 N</u>

20. Part 1

$m = 1027$ kg, $v_i = 0$, $F = 1528$ N, $t = 22$ s

$F = ma$

$1528 = 1027a$

$a = 1.488$ m/s^2

$d = v_it + \frac{1}{2}at^2$

$d = \frac{1}{2}(1.488)(22)^2 = 360.1$ m

Part 2

$v_f = v_i + at$

$v_f = (1.488)(22) = 32.74$ m/s

$d = vt$

$d = (32.74)(10) = 327.4$ m

Part 3

$F = 4056$ m

$F = ma$

$4056 = 1027a$

$a = -3.95$ m/s2

$v_f^2 = v_i^2 + 2ad$

$0 = (32.74)^2 + 2(-3.95)d$

$d = 135.7$ m

Total distance traveled = 360.1 + 327.4 + 135.7 = <u>823.2 m</u>