Name Date Class

SECTION 3 Enrichment

$F = ma$ and Football

Coach Rogers had six positions to fill on his powder puff football team. In order to be considered for a particular position, the players had to meet certain physical criteria, Table 1. Coach Rogers obtained data on each player to use in assigning positions, Table 2. Determine each player's mass from her weight. Assume $a = 9.8\ m/s^2$. Use your knowledge of Newton's laws to assign the players to the positions for which they are best suited.

Table 1

Position	Description/Criteria
Line	Stops other players from crossing the scrimmage line. Requires great strength in a short distance.
Back	Runs with a football. Requires speed and agility.
End	May block as a lineman or act as a pass receiver. Requires both speed and strength.

Table 2

Player	Weight	Mass	Time/36–m dash	Speed at finish line
Kiran	833 N		4.51 s	9.3 m/s
Monique	735 N		4.40 s	9.5 m/s
Tracey	911 N		4.82 s	8.0 m/s
Chandra	825 N		4.71 s	8.1 m/s
Alexis	1010 N		4.90 s	7.6 m/s
Sophia	931 N		4.60 s	8.3 m/s

Assuming mass indicates strength, select two players for each position. Assign each player to a position. Explain your selection in terms of Newton's laws.

Table 3

Position	Player	Reasoning

Assuming their accelerations remained the same, how many kilograms would Chandra have to gain to exert the same force at the finish line as Kiran? (Hint: Determine a for each girl using $v = v_0 + at$, where $v_0 = 0$ because the players started from a rest position. Then use $F = ma$ to solve for m.)

Name _____ Date _____

CONCEPTUAL **Physical Science** PRACTICE SHEET

Chapter 2: Newton's Laws
2nd Law

Bronco skydives and parachutes from a stationary helicopter. Various stages of fall are shown in positions *a* through *f*. Using Newton's 2nd law,

$$a = \frac{F_{NET}}{m} = \frac{W-R}{m}$$

find Bronco's acceleration at each position (answer in the blanks to the right). You need to know that Bronco's mass *m* is 100 kg so his weight is a constant 1000 N. Air resistance *R* varies with speed and cross-sectional area as shown.

Circle the correct answers.

1. When Bronco's speed is least, his acceleration is

   (least) (most).

2. In which position(s) does Bronco experience a downward acceleration?

   (a) (b) (c) (d) (e) (f)

3. In which position(s) does Bronco experience an upward acceleration?

   (a) (b) (c) (d) (e) (f)

4. When Bronco experiences an upward acceleration, his velocity is

   (still downward) (upward also).

5. In which position(s) is Bronco's velocity constant?

   (a) (b) (c) (d) (e) (f)

6. In which position(s) does Bronco experience terminal velocity?

   (a) (b) (c) (d) (e) (f)

7. In which position(s) is terminal velocity greatest?

   (a) (b) (c) (d) (e) (f)

8. If Bronco were heavier, his terminal velocity would be

   (greater) (less) (the same).