



**FIGURE 12-2**

Balanced forces—unbalanced moment

\*†12-5 A system of three noncoplanar weights is arranged on a shaft generally as shown in Figure 12-3 (p. 615). For the dimensions from the row(s) assigned in Table P12-2, find the shaking forces and shaking moment when run unbalanced at 100 rpm and specify the  $mR$  product and angle of the counterweights in correction planes  $A$  and  $B$  needed to dynamically balance the system. The correction planes are 20 units apart. Work in any consistent units system you prefer.

\* Answers in Appendix F.

† These problems are suited to solution using *Mathcad*, *Matlab*, or *TKSolver* equation solver programs.

**TABLE P12-2 Data for Problem 12-5**

Row	$m_1$	$m_2$	$m_3$	$l_1$	$l_2$	$l_3$	$R_1$	$R_2$	$R_3$
a.	0.20	0.40	1.24	2	8	17	1.25 @ 30°	2.25 @ 120°	5.50 @ -30°
b.	2.00	4.36	3.56	5	7	16	3.00 @ 45°	9.00 @ 320°	6.25 @ 220°
c.	3.50	2.64	8.75	4	9	11	2.65 @ 100°	5.20 @ -60°	1.25 @ 30°
d.	5.20	8.60	4.77	7	12	16	7.25 @ 150°	6.25 @ 220°	9.00 @ 320°
e.	0.96	3.25	0.92	1	3	18	5.50 @ 30°	3.55 @ 120°	2.65 @ 100°