TABLE D-2. Approximate Energy Requirements in METs for Horizontal and Grade Walking

	mph	1.7	2.0	2.5	3.0	3.4	3.75
% Grade	$m \cdot min^{-1}$	45.6	53.6	67.0	80.4	91.2	100.5
0		2.3	2.5	2.9	3.3	3.6	3.9
2.5		2.9	3.2	3.8	4.3	4.8	5.2
5.0		3.5	3.9	4.6	5.4	5.9	6.5
7.5		4.1	4.6	5.5	6.4	7.1	7.8
10.0		4.6	5.3	6.3	7.4	8.3	9.1
12.5		5.2	6.0	7.2	8.5	9.5	10.4
15.0		5.8	6.6	8.1	9.5	10.6	11.7
17.5		6.4	7.3	8.9	10.5	11.8	12.9
20.0		7.0	8.0	9.8	11.6	13.0	14.2
22.5		7.6	8.7	10.6	12.6	14.2	15.5
25.0		8.2	9.4	11.5	13.6	15.3	16.8

TABLE D-3. Approximate Energy Requirements in METs for Horizontal and Grade Jogging/Running

	mph	5	6	7	7.5	8	9	10
% Grade	$m \cdot min^{-1}$	134	161	188	201	214	241	268
0		8.6	10.2	11.7	12.5	13.3	14.8	16.3
2.5		9.5	11.2	12.9	13.8	14.7	16.3	18.0
5.0		10.3	12.3	14.1	15.1	16.1	17.9	19.7
7.5		11.2	13.3	15.3	16.4	17.4	19.4	
10.0		12.0	14.3	16.5	17.7	18.8		
12.5		12.9	15.4	17.7	19.0			
15.0		13.8	16.4	18.9				

TABLE D-4. Approximate Energy Requirements in METs During Leg Cycle Ergometry

Body Wt.		Power Output ($kg \cdot m \cdot min^{-1}$ and W)						
kg	lb	300 50	450 75	600 100	750 125	900 150	1,050 175	1,200 ($kg \cdot m \cdot min^{-1}$) 200 (W)
50	110	5.1	6.6	8.2	9.7	11.3	12.8	14.3
60	132	4.6	5.9	7.1	8.4	9.7	11.0	12.3
70	154	4.2	5.3	6.4	7.5	8.6	9.7	10.8
80	176	3.9	4.9	5.9	6.8	7.8	8.8	9.7
90	198	3.7	4.6	5.4	6.3	7.1	8.0	8.9
100	220	3.5	4.3	5.1	5.9	6.6	7.4	8.2

TABLE D-5. Approximate Energy Requirements in METs During Arm Ergometry

Body Wt.		Power Output ($kg \cdot m \cdot min^{-1}$ and W)					
kg	lb	150 25	300 50	450 75	600 100	750 125	900 ($kg \cdot m \cdot min^{-1}$) 150 (W)
50	110	3.6	6.1	8.7	11.3	13.9	16.4
60	132	3.1	5.3	7.4	9.6	11.7	13.9
70	154	2.8	4.7	6.5	8.3	10.2	12.0
80	176	2.6	4.2	5.8	7.4	9.0	10.6
90	198	2.4	3.9	5.3	6.7	8.1	9.6
100	220	2.3	3.6	4.9	6.1	7.4	8.7

ment of the task is eight times that of rest. Metabolic equivalents (METS) are calculated as METs = $\dot{V}O_2$ ($mL \cdot kg^{-1} \cdot min^{-1}$)/3.5].

For purposes of prescribing exercise, another utility of the metabolic equations is to estimate a *target* work rate that will elicit a desired level of oxygen uptake or energy expenditure. The equations are solved for the unknown variable on the workload side of the equation. In the case of treadmill exercise, when there are two unknown variables (i.e., speed and fractional grade), it is best to select an appropriate speed based on the ability and comfort of the client, and then solve for the fractional grade.

If knowledge of the caloric cost of exercise is desired, the $\dot{V}O_2$ should first be expressed in *net* terms (gross $\dot{V}O_2$ minus resting $\dot{V}O_2$). Once the net $\dot{V}O_2$ is determined, convert the value to caloric expenditure per minute using either of the following methods.

Method #1:

1. Convert $\dot{V}O_2$ ($mL \cdot kg^{-1} \cdot min^{-1}$ or METs) into the absolute unit of $L \cdot min^{-1}$
2. If starting from $mL \cdot kg^{-1} \cdot min^{-1}$:
   a. Multiply the $mL \cdot kg^{-1} \cdot min^{-1}$ by the kg body mass and divide by 1,000
   b. $mL \cdot kg^{-1} \cdot min^{-1}$ kg body mass/1,000 *(i.e., 1,000 mL per Liter)*.

TABLE D-6. Approximate Energy Requirements in METs During Stair Stepping

Step Height		Stepping Rate per Minute					
in	m	20	22	24	26	28	30
4	0.102	3.5	3.8	4.0	4.3	4.5	4.8
6	0.152	4.2	4.6	4.9	5.2	5.5	5.8
8	0.203	4.9	5.3	5.7	6.1	6.5	6.9
10	0.254	5.6	6.1	6.5	7.0	7.5	7.9
12	0.305	6.3	6.8	7.4	7.9	8.4	9.0
14	0.356	7.0	7.6	8.2	8.8	9.4	10.0
16	0.406	7.7	8.4	9.0	9.7	10.4	11.1
18	0.457	8.4	9.1	9.9	10.6	11.4	12.1