Important Conversions
Fitness Assessments

To Convert	Into	Then Do
inches	centimeters	inches **x** 2.54
inches	meters	inches **x** .0254
pounds	kilograms	pounds **/** 2.2 **or** pounds **x** .454
kilograms	pounds	kilograms **x** 2.2
$ml \cdot kg^{-1} \cdot min^{-1}$	$ml \cdot min^{-1}$	$ml \cdot kg^{-1} \cdot min^{-1}$ **x** kg
$ml \cdot min^{-1}$	$ml \cdot kg^{-1} min^{-1}$	$ml \cdot min^{-1}$ / kg
$miles \cdot hour^{-1}$	$meters \cdot min^{-1}$	$miles \cdot hour^{-1}$ **x** 26.8
$meters \cdot min^{-1}$	$miles \cdot hour^{-1}$	$meters \cdot min^{-1}$ **/** 26.8
$miles \cdot hour^{-1}$	$min \cdot mile^{-1}$	60 **/** $miles \cdot hour^{-1}$
$min \cdot mile^{-1}$	$miles \cdot hour^{-1}$	60 **/** $min \cdot mile^{-1}$
METS	$ml \cdot kg^{-1} min^{-1}$	METS **x** 3.5
WATTS	$kgm \cdot min^{-1}$	WATTS **x** 6
$kgm \cdot min^{-1}$	WATTS	$kgm \cdot min^{-1}$ / 6

Fitness Assessment
Metabolic Calculations

General Directions: When solving the problems below, carry pounds and kilograms to one decimal place, L-min^{-1} to three decimal places, ml-min^{-1} to the nearest whole number and ml-kg^{-1}-min^{-1} to one decimal place.

1. In the table below, fill in the missing values (indicated with the letters) in order to complete each row of values.

Weight (pounds)	Weight (kilograms)	VO_2 (L min^{-1})	VO_2 (ml min^{-1})	VO_2 (ml kg^{-1} min^{-1})	METS
120	A	2.560	B	C	D
200	E	4.500	F	G	H
I	50	J	K	50	L
180	M	N	4750	O	P
Q	R	S	3500	50	T
U	70	V	W	X	15
155	Y	Z	5560	AA	BB
110	CC	DD	EE	FF	10
GG	90	HH	JJ	45	KK

2. Consider three individuals. Individual A has a low body weight (100 lbs), individual B has a medium body weight (150 lbs) and individual C has a high body weight (250 lbs). For each of these individuals, determine the following:
   a. The VO_{2max} in ml·kg^{-1}·min^{-1} if their VO_{2max} in ml·min^{-1} = 3500.
   b. The VO_{2max} in ml·min^{-1} if their VO_{2max} in ml·kg^{-1}· min^{-1} = 55.

3. On a mechanically braked bicycle ergometer, the total power output in kgm·min^{-1} is dependent on the kilograms of resistance, the pedaling rate, and how far the flywheel travels in each pedal revolution (kgm·min^{-1} = kg x rpm x flywheel travel). On the two most popular types of mechanically braked bicycle erometers (Monark and Bodyguard), the flywheels travel 6 meters per pedal revolution. For the table below, determine the missing values (indicated by the letters).

Power Output (kgm·min^{-1})	**Resistance (kg)**	**RPM**	**Flywheel Travel (m/pedal revolution)**
600	2	A	6
900	B	50	6
C	3	70	6
300	D	50	6
E	3	60	6

4. Fill in the missing values (indicated by the letters) in the table below.

Speed m min^{-1}	**Speed (mph)**	**Speed (min mile^{-1})**
A	3	B
C	7	D
E	10	F
G	H	4
I	J	7
K	L	10
M	N	15
50	O	P
75	Q	R
150	S	T
250	U	V

5. A. If you run at 6 mph, how many miles can you run in 30 min? In 60 min?
   B. If you walk at 3.5 mph, how long will it take you to walk 5 miles?
   C. If you want tot run 3 miles in 30 min, how fast in m min^{-1} will you have to run?
   D. If a marathoner runs a marathon (26.2 miles) in 5 min mile^{-1} pace, how long will it take to complete the marathon?
   E. World class runners can run a mile in 4 min 50 sec. How fast in mph are they running?
   F. How long will it take you to run 8 miles if you run at 175 m min^{-1}?

6. Fill in the missing values (indicated by the letters) in the table below.

Mode	Weight (kg)	VO_2 (ml·min^{-1})	VO_2 (ml·kg^{-1} min^{-1})	Speed m·min^{-1}	Speed (mph)	Speed (min·mile^{-1})	Grade (%)
Walking	75	A	15	B	C	D	0
Walking	50	E	20	F	G	H	0
Walking	75	I	J	K	4.0	L	5
Walking	55	800	M	N	O	P	0
Walking	100	Q	R	S	3.5	T	10
Walking	70	U	50	V	W	X	0
Walking	80	Y	Z	AA	BB	6	0
Walking	75	CC	DD	250	EE	FF	0
Walking	50	GG	35	HH	JJ	KK	5
Walking	90	LL	MM	NN	10	OO	10
Walking	10	PP	50	QQ	RR	SS	10

7. Fill in the missing values (indicated by the letters) in the table below. The mode of exercise is a mechanically braked bicycle ergometer using either the legs or the arms with a flywheel travel of 6 meters per pedal revolution.

Mode	Weight (kg)	VO_2 ($ml \cdot min^{-1}$)	VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$)	Power Output ($kgm \cdot min^{-1}$)	Resistance (kg)	RPM
Leg	50	2000	A	B	2	C
Leg	100	4000	D	E	5	F
Leg	75	G	50	H	I	50
Leg	50	J	K	600	L	50
Leg	100	M	N	1500	O	80
Arm	70	P	40	Q	2	R
Arm	80	1500	S	T	U	50
Arm	55	V	W	X	3	70
Arm	75	Y	Z	1200	3	AA
Arm	100	BB	60	CC	DD	60

8. Fill in the missing values (indicated by the letters) in the table below. The mode of exercise is stepping either up and down, just up, or just down.

Mode	Weight (kg)	VO_2 ($ml \cdot min^{-1}$)	VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$)	Step Height (m)	Step Height (inches)	Step Rate (step/min)
up & down	50	A	45	B	10	C
up & down	100	D	E	F	10	25
up & down	75	G	H	I	16	25
up & down	55	3000	J	0.254	K	L
up only	100	M	50	N	10	O
up only	75	P	Q	R	10	40
down only	75	S	T	U	10	40
down only	50	V	20	W	X	30

9. For each of the VO_2 values in the first column of the table below, compute the workload necessary for the three modes of exercise (running, bicycling, stepping) to produce that VO_2 for a 75 kg individual.

VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$)	Level Running	Grade Running		Bicycling (legs)	Stepping (Up & Down)	
	Speed ($m \cdot min^{-1}$)	Speed ($m \cdot min^{-1}$)	Grade (%)	($kgm \cdot min^{-1}$)	Height (inches)	Rate (spm)
30	A	B	5	C	D	25
45	E	F	5	G	H	25
60	I	J	5	K	L	25
80	M	268	N	O	P	25

10. A female weighing 120 lbs walks 5 miles/day on a flat track. It takes her 75 min. How many days would she have to do this to expend 3500 kilocalories?

11. Assume a runner weighing 70 kg is able to run at 75% of their VO_{2max} for an entire 10,000 meter run. If they ran the 10,000 meters in 32 minutes, what would their VO_{2max} be? How many kilocalories would they expend during this effort?

12. A male weighing 200 lbs wants to loose 10 lbs of fat by running. How many total miles would he have to run if he ran at a 10 $min \cdot mile^{-1}$ pace?

13. A female weighing 55 kg normally jogs at a 6 mph pace. However, she injured her ankle and can no longer jog. If she switched to riding a bicycle ergometer, what total workload ($kgm \cdot min^{-1}$) would she have to ride at to work at the same VO_2 as she was jogging?

14. The steps in the UNI DOME are 8 inches tall and there are 30 steps in one flight. How fast would a 100 kg person have to ascend and descend (steps per minute) in order to expend 500 kilocalories in 30 minutes?

15. An obese male weighing 300 lbs wants to loose weight by a combination of dieting and exercise. If he reduces his caloric intake by 500 kcals/day and he walks 5 miles/day at 3.5 mph, how many pounds will he loose in 90 days if he diets and exercises everyday? (note: assume there is no effect of weight lost on the caloric cost of the walking. In reality, you would have to know his new weight every so often to most accurately calculate the total weight lost)

16. Which of the following would expend the most calories for a 75 kg person?
    A. Walking 5 miles at 3 mph on the level
    B. Walking 5 miles at 4 mph on the level
    C. Running 5 miles at 6 mph on the level
    D. Running 5 miles at 10 mph on the level