ESSENTIAL MATH FORMULAS

DESIRED BODY WEIGHT (DBW)

DBW = LBW ÷ (1 – DBF%)
Step 1: 100% – Fat % = Lean body %
Step 2: Body weight x Lean body % = LBW
Step 3: 100% – Desired fat % = Desired lean %
Step 4: LBW ÷ Desired lean % = DBW

Example: 200-pound individual with 30% body fat; How much will he or she weigh at 25% body fat?

- 100% – 30% = 70%
- 200 pounds x 0.70 = 140 pounds LBW
- 100% – 25% = 75%
- 140 pounds ÷ 0.75 = 187 pounds DBW

WAIST-TO-HIP RATIO (WHR)

Waist ÷ Hip = WHR

Example: Individual with 36-inch waist and 35-inch hip circumference

36 in ÷ 35 in = 1.03

BMI METRIC FORMULA

Metric Formula: Weight (kg) ÷ Height^2 (m)
Weight conversion:
weight in pounds ÷ 2.2 = weight in kg
Height conversion:
(height in inches x 2.54) ÷ 100 = height in meters

Example: BMI for a 5' 8", 196-pound individual

(5' x 12) + 8 = 68" 196 ÷ 2.2 = 89 kg
(68" x 2.54) ÷ 100 = 1.73 m
89 kg ÷ (1.73 m x 1.73 m) = 30 (rounded up)

BMI STANDARD FORMULA

Standard Formula:

$$\frac{[\,(\text{Weight (lbs)} \times 703) \div \text{Height (inches)}\,]}{\text{Height (inches)}}$$

- Multiply weight (lbs) by 703
- Convert the height into inches: feet x 12 + inches
- Divide (weight x 703) twice by the height in inches

Example: BMI for a 5' 8", 196 pound individual

- 196 lbs x 703 = 137,788
- 137,788 ÷ 68 inches = 2026.3 (rounded up)
- 2026.3 ÷ 68 inches = 29.7 = 30 (rounded up)

SUBMAXIMAL STRENGTH ASSESSMENTS *(see Table 10-25)*

Pounds lifted ÷ % 1-RM = Predicted 1-RM

Example: Individual can perform maximum of 10 repetitions (10-RM) with 150 pounds. What is his predicted 1-RM?

10RM ÷ 0.75 = 1-RM
150 pounds ÷ 0.75 = 200 pounds

1. Estimating 1-RM using the repetition table (See Table 10-25)
   The example for option 1 is already on the sheet
2. Estimating 1-RM using prediction coefficients (see Table 10-27)
   1RM = pounds lifted x correlating coefficient

Example: A client does a bench press with 60lbs and performs 3 repetitions. What is their predicted 1RM?

3 repetitions = a coefficient of 1.08 for bench/chest press
60lbs x 1.08 = 64.8lbs is the 1RM

PREDICTED MAXIMAL HEART RATE

Fox, Naughton, Haskell: MHR = 220 - Age
Tanaka, Monahan, Seals: MHR = 208 - (0.7 x Age)
Gellish et al.: MHR = 206.9 - (0.67 x Age).
Example: Calculate the maximum heart rate for a 42-year-old client
Fox, Naughton, Haskell: 220 - 42 = 178 bpm
Tanaka, Monahan, Seals: 208 - (0.7 x 42) = 179 bpm
Gellish et al.: 206.9 - (0.67 x 42) = 179 bpm

KARVONEN FORMULA — HEART RATE RESERVE (HRR)

Target HR (THR) = (HRR x % Intensity) + RHR
Where: HRR = MHR – RHR
Next, show the example
34-year-old, resting heart rate = 62 bpm, 75% of HRR
Step 1: 220 - 34 = 186 bpm (max heart rate)
Step 2: 186 (Max HR) - 62 (resting HR) = 124 (HRR)
Step 3: 124 (HRR) X 0.75 (% HRR) + 62 (Resting HR) = 155 bpm (Target Heart Rate)

Example: 34-year-old, resting heart rate = 62 bpm, 75% of HRR

- 220 – 34 = 186 bpm
- 186 – 62 = 124
- (124 x 0.75) + 62 = 155 bpm

CALORIC (KCAL) VALUES PER GRAM (G)

Fat = 9 kcal/g	Alcohol = 7 kcal/g
Carbohydrates = 4 kcal/g	Protein = 4 kcal/g

TOTAL CALORIES AND PERCENTAGE OF CALORIES

Nutrition label values: 36g carbohydrate, 11g protein, 8g fat

Total Calories:

- Calories from carbs: 36g x 4cal/g = 144 calories
- Calories from protein: 11g x 4cal/g = 44 calories
- Calories from fat: 8g x 9 cal/g = 72 calories

Total calories = 144 + 44 + 72 = 260 calories

Percentage of Calories:

- Carb calories ÷ total calories = % of calories from carbohydrate 144 ÷ 260 = 55% (0.55) of calories from carbohydrate
- Protein calories ÷ total calories = % of calories from protein 44 ÷ 260 = 17% (0.169) of calories are from protein
- Fat calories ÷ total calories = % of calories from fat 72 ÷ 260 = 28% (0.276) of calories are from fat

DAILY CALORIC DEFICIT NEEDED TO ACHIEVE DESIRED WEIGHT LOSS IN SET TIMEFRAME

1 pound body fat = 3,500 kcal

Step 1: (Desired Weight Loss (pounds) x 3,500 kcal/pounds) ÷ # Weeks = Weekly Caloric Deficit (kcal/week)

Step 2: Weekly Caloric Deficit (kcal/week) ÷ 7 days /week = Daily Caloric Deficit

Example: Individual wants to lose 15 pounds in 20 weeks; What daily caloric deficit is required to reach this goal?

- (15 pounds x 3,500 kcal/pounds) ÷ 20 weeks = 2,625 kcal / week
- 2,625 kcal/week ÷7 days/week = 375 kcal/day

For additional information and guidance on these formulas, you can refer to your textbook, online material, or videos on www.acefitness.org/fitness-certifications/ace-answers/