

# Workshop: Imperial Units and Calculating Body Indices

UEA LEARNING ENANCEMENT TEAM – MATHEMATICS & STATISTICS

## Imperial and Metric Units for Volumes

For this section you should use:

$$1 \text{ pint} \approx 500 \text{ ml}$$

$$1 \text{ gallon} = 8 \text{ pints}$$

1. Convert the following volumes into ml:

a. 3 pints

$$3 \times 500 = 1500 \text{ ml}$$

b. 0.5 pints

$$0.5 \times 500 = 250 \text{ ml}$$

c. 3 gallons

$$3 \times 8 = 24 \text{ pints}$$

$$24 \times 500 = 12000 \text{ ml}$$

2. Convert the following volumes into pints:

a. 2000 ml

$$2000 \div 500 = 4 \text{ pints}$$

b. 3.5 l

$$3500 \div 500 = 7 \text{ pints}$$

c. 4 gallons

$$4 \times 8 = 32 \text{ pints}$$

d. 125 ml

$$125 \div 500 = 0.25 \text{ pints}$$

## Imperial and Metric Units for Mass

For this section you should use:

$$1 \text{ kg} \approx 2 \text{ lbs (pounds)}$$

$$1 \text{ lb} = 16 \text{ oz (ounces)}$$

$$1 \text{ stone} = 14 \text{ lbs}$$

3. Convert the following masses into lbs (pounds):

a. 5 kg

$$5 \times 2 = 10 \text{ lbs}$$

b. 500 g

$$0.5 \times 2 = 1 \text{ lbs}$$

c. 3500 g

$$3.5 \times 2 = 7 \text{ lbs}$$

d. 32 oz

$$32 \div 16 = 2 \text{ lbs}$$

e. 8 oz

$$8 \div 16 = 0.5 \text{ lbs}$$

f. 2 stone

$$2 \times 14 = 28 \text{ lbs}$$

g. 10 stone 4 lbs

$$10 \times 14 + 4 = 140 + 4 = 144 \text{ lbs}$$

h. 12 stone 12 lbs

$$12 \times 14 + 12 = 180 \text{ lbs}$$

4. Convert the following into stone:

a. 280 lbs

$$280 \div 14 = 20 \text{ stone}$$

b. 84 lbs

$$84 \div 14 = 6 \text{ stone}$$

c. 70 kg

$$70 \times 2 = 140 \text{ lbs}$$

$$140 \div 14 = 10 \text{ stone}$$

5. Convert the following masses into stone and lbs (e.g. 12 stone 5 lbs):

a. 150 lbs

$$150 \div 14 = 10 \text{ r } 10 = 10 \text{ stone } 10 \text{ lbs}$$

b. 200 lbs

$$200 \div 14 = 14 \text{ r } 4 = 14 \text{ stone } 4 \text{ lbs}$$

c. 55 kg

$$55 \times 2 = 110 \text{ lbs}$$

$$110 \div 14 = 7 \text{ r } 12 = 7 \text{ stone } 12 \text{ lbs}$$

d. 82 kg

$$82 \times 2 = 164 \text{ lbs}$$

$$164 \div 14 = 11 \text{ stone } 10 \text{ lbs}$$

## Imperial and Metric Units for Length

For this section you should use:

$$1 \text{ inch} \approx 2.5 \text{ cm}$$

$$1 \text{ ft (foot)} = 12 \text{ inches}$$

6. Convert the following lengths into cm:

a. 10 inches

$$10 \times 2.5 = 25 \text{ cm}$$

b. 1 ft

$$1 \times 12 = 12 \text{ inches}$$

$$12 \times 2.5 = 30 \text{ cm}$$

c. 5 ft 3 inches

$$5 \times 12 + 3 = 63 \text{ inches}$$

$$63 \times 2.5 = 157.5 \text{ cm}$$

d. 6 ft 6 inches

$$6 \times 12 + 6 = 78 \text{ inches}$$

$$78 \times 2.5 = 195 \text{ cm}$$

7. Convert the following lengths into ft and inches (e.g. 5 ft 8 inches):

a. 240 inches

$$240 \div 12 = 20 \text{ ft}$$

b. 100 inches

$$100 \div 12 = 8 \text{ r } 4 = 8 \text{ ft } 4 \text{ inches}$$

c. 75 inches

$$75 \div 12 = 6 \text{ r } 3 = 6 \text{ ft } 3 \text{ inches}$$

d. 50 cm

$$50 \div 2.5 = 20 \text{ inches}$$

$$20 \div 12 = 1 \text{ r } 8 = 1 \text{ ft } 8 \text{ inches}$$

e. 2 m

$$200 \div 2.5 = 80 \text{ inches}$$

$$80 \div 12 = 6 \text{ r } 8 = 6 \text{ feet } 8 \text{ inches}$$

## Body Mass Index

The formula for body mass index (BMI):

$$\text{BMI} = \frac{\text{Mass (kg)}}{(\text{Height (m)})^2}$$

8. What are the units of the BMI measurement?

$$kg/m^2$$

9. Find the BMI of the following people:

a. Mass = 90 kg, Height = 2 m

$$\frac{90}{2^2} = \frac{90}{4} = 22.5 \text{ kg/m}^2$$

b. Mass = 64 kg, Height = 1.6 m

$$\frac{64}{1.6^2} = \frac{64}{2.56} = \frac{6400}{256} = 25 \text{ kg/m}^2$$

c. Mass = 64.8 kg, Height = 180 cm

$$\frac{64.8}{1.8^2} = \frac{64.8}{3.24} = \frac{6480}{324} = 20 \text{ kg/m}^2$$

## Body Surface Area

The formula for body surface area (BSA):

$$\text{BSA (m}^2\text{)} = \sqrt{\frac{\text{Height (cm)} \times \text{Mass (Kg)}}{3600}}$$

The following information may be useful:

$$\sqrt{2} \approx 1.41 \quad \sqrt{3} \approx 1.73 \quad \sqrt{5} \approx 2.24 \quad \sqrt{6} \approx 2.45$$

10. Find the BSA of the following people:

a. Height = 180 cm, Mass = 60 kg

$$BSA = \sqrt{\frac{180 \times 60}{3600}} = \sqrt{\frac{18 \times 6}{36}} = \sqrt{\frac{1 \times 6}{2}} = \sqrt{3} \approx 1.73 \text{ m}^2$$

b. Height = 144 cm, Mass = 50 kg

$$BSA = \sqrt{\frac{144 \times 50}{3600}} = \sqrt{\frac{144 \times 5}{360}} = \sqrt{\frac{144 \times 1}{72}} = \sqrt{2} \approx 1.41 \text{ m}^2$$

c. Height = 1.92 m, Mass = 112.5 kg

$$BSA = \sqrt{\frac{192 \times 112.5}{3600}} = \sqrt{\frac{4 \times 112.5}{75}} = \sqrt{\frac{450}{75}} = \sqrt{6} \approx 2.45 \text{ m}^2$$

### Ideal Body Weight (IBW)

The formula for IBW is:

$$\text{Female: IBW (kg)} = \text{Height (cm)} \times 0.9 - 92$$

$$\text{Male: IBW (kg)} = \text{Height (cm)} \times 0.9 - 88$$

11. What is the IBW for the following:

a. Male, Height = 1.7 m

$$IBW = 170 \times 0.9 - 88 = 153 - 88 = 65 \text{ kg}$$

b. Female, Height = 1.8 m

$$IBW = 180 \times 0.9 - 92 = 162 - 92 = 70 \text{ kg}$$

## Mixed Question

12. For a person who is:

Male; Height = 6 ft; Mass = 14 stone 4 lbs

Find:

a. BSA

b. IBW

$$\begin{aligned}\text{Height} &= 6 \times 12 = 72 \text{ inches} \\ 72 \times 2.5 &= 180 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Mass} &= 14 \times 14 + 4 = 200 \text{ lbs} \\ 200 \div 2 &= 100 \text{ kg}\end{aligned}$$

$$\text{a. } BSA = \sqrt{\frac{180 \times 100}{3600}} = \sqrt{\frac{180 \times 1}{36}} = \sqrt{5} \approx 2.24 \text{ m}^2$$

$$\text{b. } IBW = 180 \times 0.8 - 88 = 74 \text{ kg}$$