

Conversions:

Distance: $1 \text{ NM} = 6075.1 \text{ ft} = 1.852 \text{ km}$

Speed:

$$90 \text{ kn} = \frac{90 \text{ NM}}{1 \text{ hr}} = \frac{90 \text{ NM}}{60 \text{ min}} = 1.5 \frac{\text{NM}}{\text{min}} = 1.5 \cdot \frac{6076.1 \text{ feet}}{60 \text{ sec}} = 152 \text{ ft/s}$$

$$90 \text{ kn} = \frac{90 \text{ NM}}{1 \text{ hr}} = \frac{90 \cdot 1.852 \text{ km}}{1 \text{ hr}} = 167 \frac{\text{km}}{\text{hr}} = 46 \text{ m/s}$$

Map scale is 1 : 250 000. Then 1 cm on map is in real life:

$$\begin{aligned} 1 \text{ cm} \cdot 250,000 &= 2,500 \cdot 100 \text{ cm} = 2,500 \text{ m} \\ &= 2.5 \cdot 1000 \text{ m} = 2.5 \text{ km} \\ &= \frac{2.5 \text{ km}}{1.852 \text{ km/NM}} = 1.35 \text{ NM} \end{aligned}$$

Coordinates (degrees, minutes, seconds)

$$1^\circ = 60' = 3600''$$

$$\begin{aligned} 10^\circ 20' 30.5'' &= 10^\circ (20 + 30.5/60)' = 10^\circ 20.5083' \\ &= \left(10 + \frac{20.5083}{60}\right)^\circ = 10.34181^\circ \end{aligned}$$

Time:

12 hour	24 hr (for am add 12hrs, except for 12 am)	
12:00 am (12 midnight)	00:00 or 24:00	0000
12:03 am	00:03	0003
1:00 am	01:00	0100
11:59 am	11:59	1159
12:00 pm (12 noon)	12:00	1200
1:00 pm	13:00	1300
11:59 pm	23:59	2359

NZST (winter) = UTC + 12

NZDT (summer) = UTC + 13

i.e.: 1600utc = 0400nzst = 0500nzdt

Rule of three:

We fly at a ground speed of 90 kn. How many minutes does it take to go 137 nautical miles?

90 *NM* correspond to 60 *minutes*

$$\begin{aligned} 90 \text{ NM} &\cong 60 \text{ min} \\ 137 \text{ NM} &\cong ? \end{aligned}$$

$$\frac{90 \text{ NM}}{137 \text{ NM}} = \frac{60 \text{ min}}{x}$$

$$x = 60 \text{ min} * \frac{137 \text{ NM}}{90 \text{ NM}} = 91.3 \text{ min}$$

Our fuel consumption is 18.6 litres per hour. We fly for 73 minutes. How much fuel did we use?

$$73 \text{ min} = 73 \text{ min} \cdot \frac{1 \text{ hr}}{60 \text{ min}} = 1.217 \text{ hr}$$

18.6 *L* correspond to 1 *hr*

$$\begin{aligned} 18.6 \text{ L} &\cong 1 \text{ hr} \\ ? &\cong 1.217 \text{ hr} \end{aligned}$$

$$\frac{18.6 \text{ L}}{x} = \frac{1 \text{ hr}}{1.217 \text{ hr}}$$

$$x = 18.6 \text{ L} * \frac{1.217 \text{ hr}}{1 \text{ hr}} = 22.6 \text{ L}$$

Avgas volume is 75 litres. What is its weight?

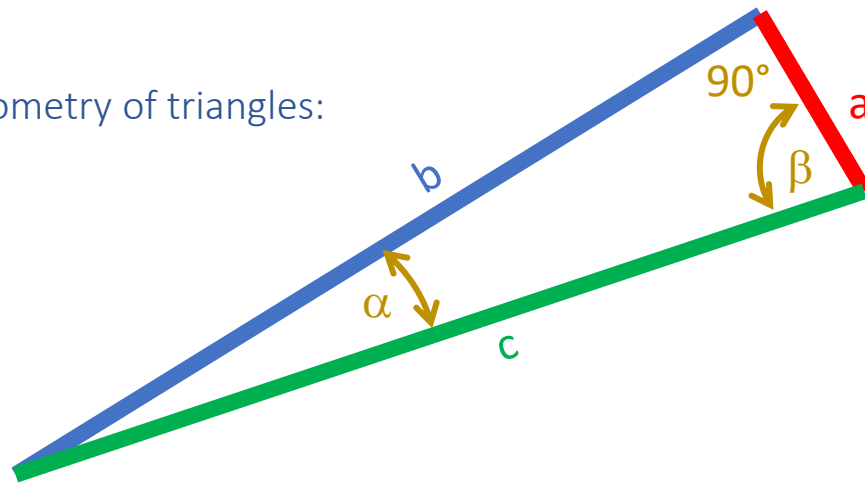
1 *L* correspond to 0.72 *kg*

$$\begin{aligned} 1 \text{ L} &\cong 0.72 \text{ kg} \\ 75 \text{ L} &\cong x \end{aligned}$$

$$\frac{1 \text{ L}}{75 \text{ L}} = \frac{0.72 \text{ kg}}{x}$$

$$x = 0.72 \text{ kg} * \frac{75 \text{ L}}{1 \text{ L}} = 54 \text{ kg}$$

Some trigonometry of triangles:



a,b,c are the lengths of the sides of the triangle as indicated. α , β , γ are the angles as indicated.

$$\sin(\alpha) = \frac{a}{c}, \quad \cos(\alpha) = \frac{b}{c}, \quad \tan(\alpha) = \frac{a}{b}$$

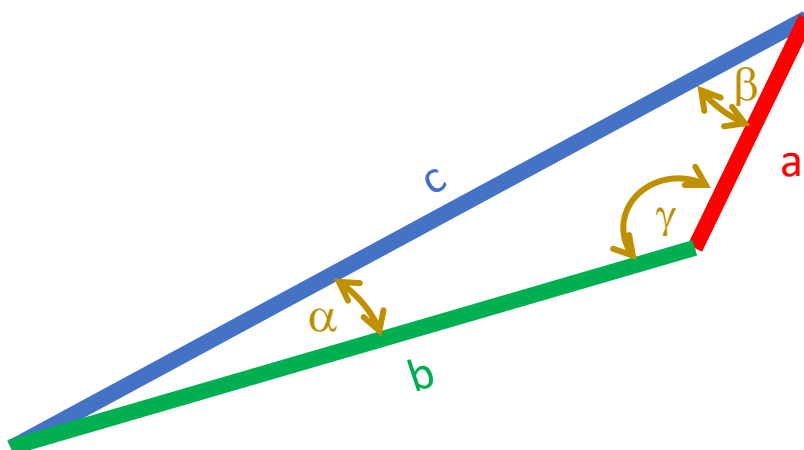
$$\alpha = \arcsin\left(\frac{a}{c}\right) = \sin^{-1}\left(\left(\frac{a}{c}\right)\right)$$

$$360^\circ = 2 * \pi \text{ radians} \approx 6.28 \text{ rad}$$

for example, a=1 and c=2: $\alpha = \arcsin\left(\frac{1}{2}\right) = 0.524 \text{ rad} = 30^\circ$

for example, a=1 and c=60:

$$\alpha = \arcsin\left(\frac{1}{60}\right) = \arcsin(0.01667) = 0.01667 \text{ rad} = 0.955^\circ \approx 1^\circ$$



$$\frac{a}{\sin(\alpha)} = \frac{b}{\sin(\beta)} = \frac{c}{\sin(\gamma)}$$

$$\alpha + \beta + \gamma = 180^\circ$$