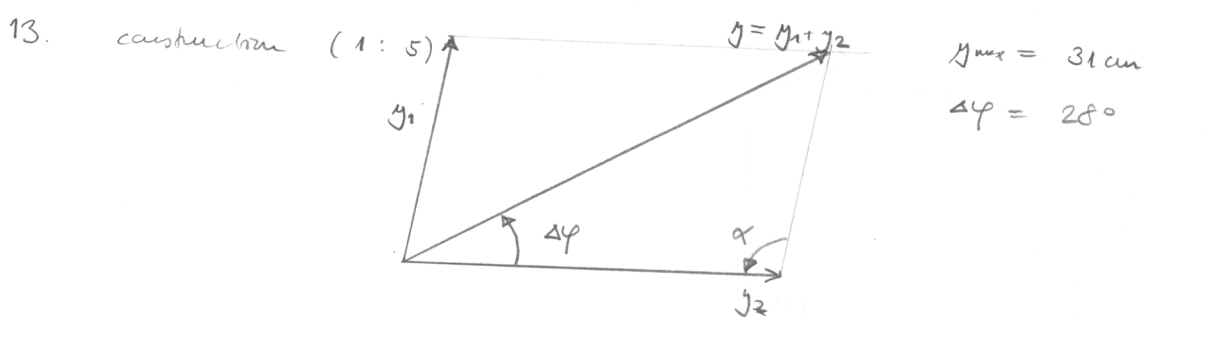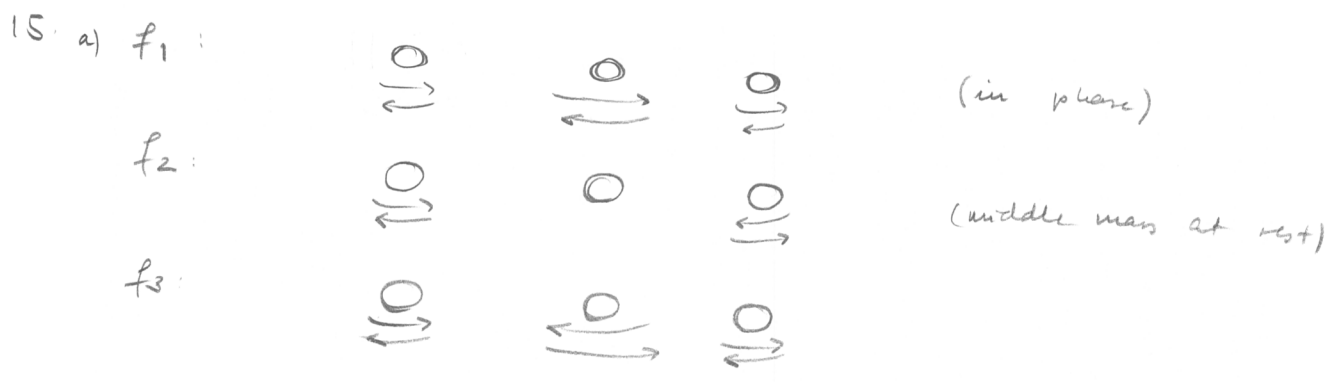# Oscillations 2

12. $[\omega] = [\omega_0] = [\Gamma] = 1s^{-1}$, $[constant] = 1\dfrac{[A]}{s}$ ← e.g. m, V, ...

Γ depends on the damping; more damping → greater Γ (see diagram)

13. construction (1 : 5)

$y = y_1 + y_2$

$y_{max} = 31\,cm$

$\Delta\varphi = 28°$

calculation: $y^2 = y_1^2 + y_2^2 - y_1 \cdot y_2 \cdot \cos\alpha$

$\rightarrow y = \sqrt{15^2 + 25^2 - 15 \cdot 25 \cdot \cos 100°}\ cm = \underline{30\,cm}$

$\dfrac{\sin \Delta\varphi}{y_1} = \dfrac{\sin \alpha}{y}$

$\rightarrow \Delta\varphi = \arcsin\left(\sin\alpha \cdot \dfrac{y_1}{y}\right) = \arcsin\left(\sin 100° \cdot \dfrac{15}{30}\right) = \underline{29°}$

14. $T' = \dfrac{9}{10} \cdot T \quad \rightarrow \quad f' = \dfrac{10}{9} \cdot f$

$\Rightarrow \Delta f = f' - f = \dfrac{1}{9} f \rightarrow f = 9 \cdot \Delta f = 45\,Hz, \quad f' = 50\,Hz$

15. a) f_1 :

(in phase)

f_2 :

(middle mass at rest)

f_3 :

b)   only first and third one

Legend:
- C = 100 s⁻¹ — $C = 100 \text{ s}^{-1}$
- C = 300 s⁻¹ — $C = 300 \text{ s}^{-1}$

Y-axis: **Amplitude**

X-axis: **Frequency** (Hz)