yohandi - assignment 3

9 $A \to B$

$V_x = \frac{\Delta x}{\Delta t} = \frac{x_B - x_A}{t_B - t_A} = \frac{30-15}{5 \cdot 60}$ m/s $= \frac{1}{20}$ m/s $\approx 0,05$ m/s

$V_y = \frac{\Delta y}{\Delta t} = \frac{y_B - y_A}{t_B - t_A} = \frac{-45+15}{5 \cdot 60}$ m/s $= -\frac{1}{10}$ m/s $\approx 0,1$ m/s

$V = \sqrt{V_x^2 + V_y^2} = \frac{1}{20}\sqrt{5}$ m/s $\approx \boxed{0,112 \text{ m/s}}$

$\theta = \arctan\left(\frac{V_y}{V_x}\right) \approx -1,107$ radian or $\boxed{-63,435°}$

$A \to C$

$V_x = \frac{\Delta x}{\Delta t} = \frac{x_C - x_A}{t_C - t_A} = \frac{20-15}{10 \cdot 60}$ m/s $= \frac{1}{120}$ m/s $\approx 0,0083$ m/s

$V_y = \frac{\Delta y}{\Delta t} = \frac{y_C - y_A}{t_C - t_A} = \frac{-15+15}{10 \cdot 60}$ m/s $= 0$ m/s

$V = \sqrt{V_x^2 + V_y^2} = \frac{1}{120}$ m/s $\approx \boxed{0,0083 \text{ m/s}}$

$\theta = \arctan\left(\frac{V_y}{V_x}\right) = 0$ radian or $\boxed{0°}$

$A \to D$

$V_x = \frac{\Delta x}{\Delta t} = \frac{45-15}{15 \cdot 60} = \frac{1}{30}$ m/s $\approx 0,0333$ m/s

$V_y = \frac{\Delta y}{\Delta t} = \frac{45+15}{15 \cdot 60} = \frac{1}{15}$ m/s $\approx 0,0666$ m/s

$V = \sqrt{V_x^2 + V_y^2} = \frac{1}{30}\sqrt{5}$ m/s $\approx \boxed{0,0745 \text{ m/s}}$

$\theta = \arctan\left(\frac{V_y}{V_x}\right) \approx 1,107$ radian or $\boxed{63,435°}$

(a) $\boxed{V_{AC} \approx 0,0083 \text{ m/s}}$

(b) $\boxed{\theta_{AC} = 0°}$

(c) $\boxed{V_{AB} \approx 0,112 \text{ m/s}}$

(d) $\boxed{\theta_{AB} \approx -63,435°}$

32. the time taken for the ball to hit the wall : $t = \frac{d}{V_{0x}} = \frac{22,0}{25,0\cos(40°)}$ s $\approx 1,15$ s

a. $y = y_0 + V_{0y} t - \frac{1}{2} g t^2$

$y = y_0 + \left[25,0 \cdot \sin(40°) \cdot 1.15 - \frac{1}{2} \cdot 9.81 \cdot (1,15)^2 \text{ m}\right]$

$\boxed{y \approx y_0 + 12,0 \text{ m} \text{ (12m above the horizontal)}}$

b. $V_{tx} = V_{0x}$ (since V_x constant)

$= 25,0 \cdot \cos(40°)$

$\approx \boxed{19,2 \text{ m/s}}$

c. $V_{ty} = V_{0y} - gt$

$= 25,0 \cdot \sin(40°) - 9,81 \cdot 1,15$

$\approx \boxed{4,79 \text{ m/s}}$

d. Highest point when $V_y = 0 = 25,0 \sin(40°) - 9.81\, t$, we have $t_H \approx 1,64$ s. Since $1,15 < 1,64$, the ball has not passed its highest throughout the trajectory

50. $f = 1100$ rpm $= \frac{1100}{60}$ Hz $= \frac{110}{6}$ Hz

$R = 0,15$ m

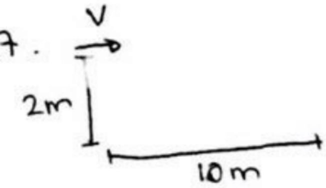
(a) perimeter $= 2\pi R \approx \boxed{0,942 \text{ m}}$

(b) $v = \omega \cdot R = 2\pi f \cdot R \approx \boxed{17,3 \text{ m/s}}$

(c) $a = \frac{v^2}{R} = \omega^2 R = (2\pi f)^2 \cdot R \approx \boxed{2,00 \cdot 10^3 \text{ m/s}^2}$

(d) $T = \frac{1}{f} = \frac{6}{110}$ s $\approx \boxed{0,055 \text{ s}}$

67.



time taken to land:

$0 = 2 + 0 - \frac{1}{2} \cdot 9,8\, t^2$

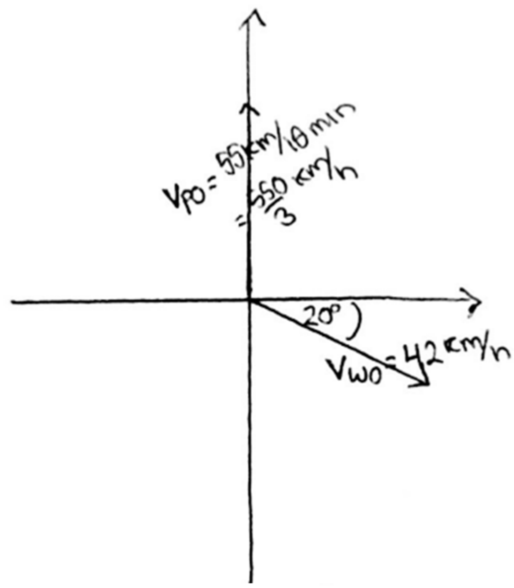
$t \approx 0,64$ s

$V_x \approx \frac{10}{0,64} = 15,625$ m/s

$a_s = \frac{V_x^2}{R} = \frac{(15,625)^2}{1,5}$ m/s² $\approx 162,76$ m/s

$\approx \boxed{160 \text{ m/s}}$ (2 s.f)

74.



$V_{pw\,x} = V_{po\,x} - V_{wo\,x}$

$= 0 - 42\cos 20°$ km/h

$= -39,47$ km/h

$V_{pw\,y} = V_{po\,y} - V_{wo\,y}$

$= 550/3 + 42 \sin 20°$ km/h

$= 197,70$ km/h

$V_{pw} = \sqrt{V_{pw_x}^2 + V_{pw_y}^2}$

$= \boxed{201,60 \text{ km/h}}$