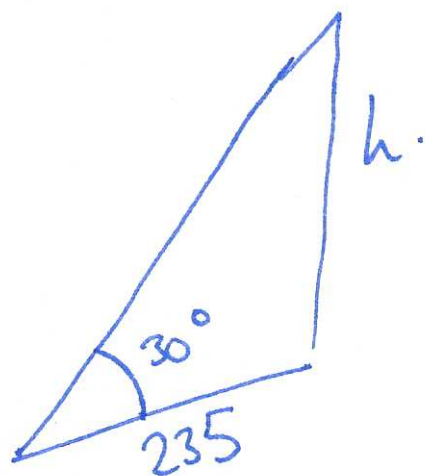
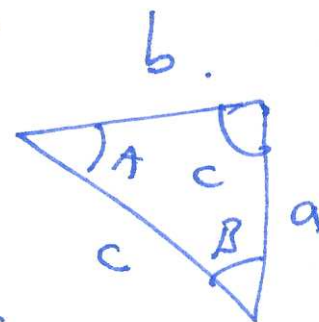
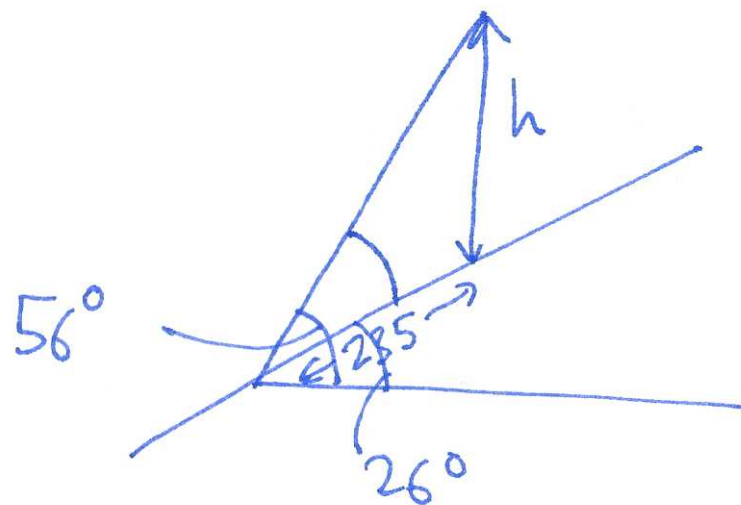
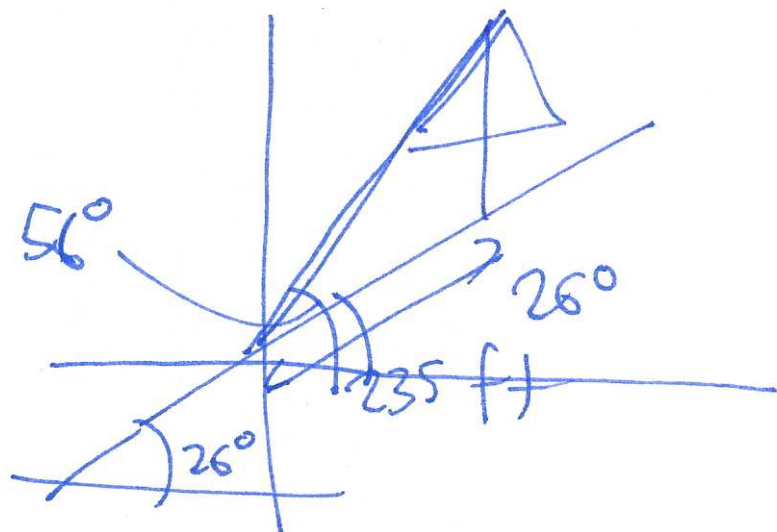


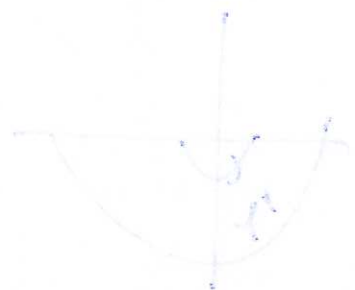
①



$$56 - 26 = 30$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$a^2 + b^2 = c^2 - 2ab \cos C$$

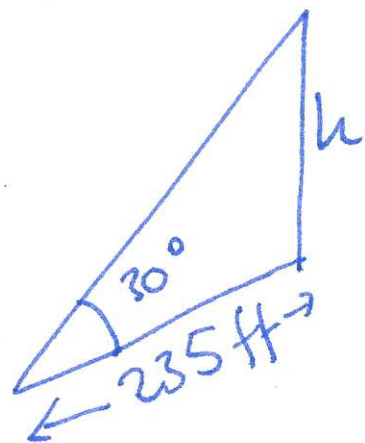


7.4

$$\frac{5}{5 \sin 1} = 1$$

$$1 + 51.5 + \frac{5}{(51.5)} + \frac{3}{(51.5)} + \dots$$

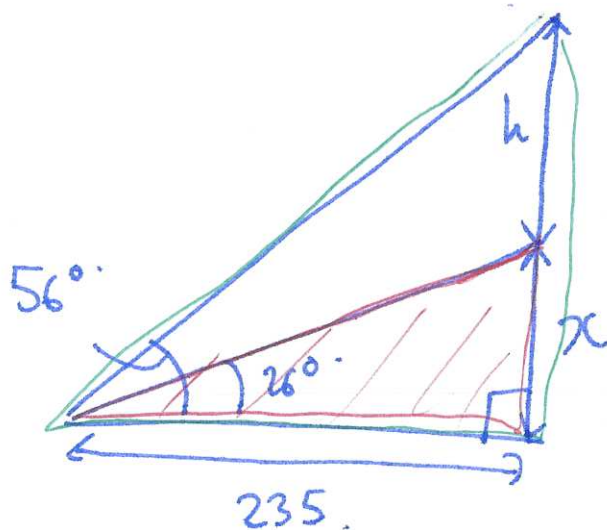
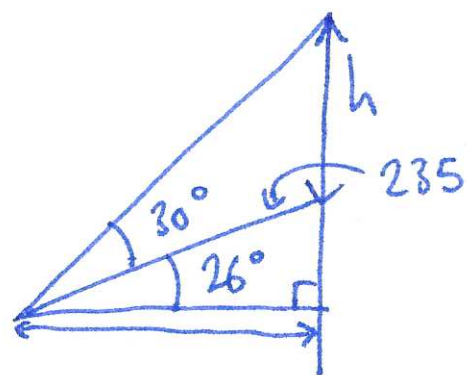
(2)



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$a^2 + b^2 = c^2 - 2ab \cos C$$

$$\frac{\text{opp}}{\text{adj}} = \tan \theta$$



$$\frac{x}{235} = \tan 26^\circ$$

$$\textcircled{1} \quad x = 235 \tan 26^\circ$$

$$\textcircled{2} \quad x + h = 235 \tan 56^\circ$$

$\textcircled{2} - \textcircled{1}$:

$$h = 235 \tan 56^\circ - 235 \tan 26^\circ$$

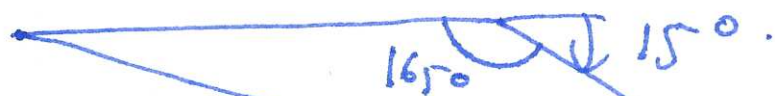
$$h = 834 \text{ ft.}$$

$$\frac{x+h}{235} = \tan 56^\circ$$

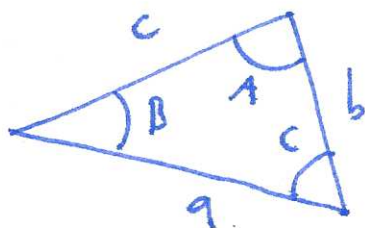
speed = 775 mph

(3)

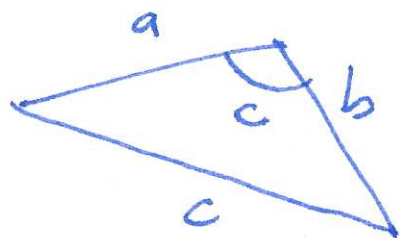
$$1430 \text{ m} = 1.5 \times 775 = 1162.5 \text{ m}.$$



$$2h \sim 2 \times 775 \text{ m} = 1550 \text{ m}.$$



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



$$\begin{matrix} \nearrow & \uparrow & & \uparrow \\ a^2 & + & b^2 & = & c^2 & + & 2ab \cos C \\ 1162.5 & & 1550 & & & & 165^\circ \end{matrix}$$

$$a^2 + b^2 = c^2 + 2ab \cos C$$

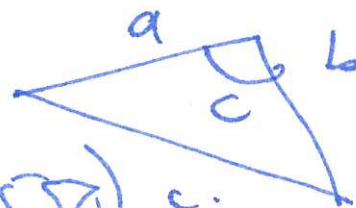
$$C = 165^\circ$$

$$a = 1162.5$$

$$b = 1550$$

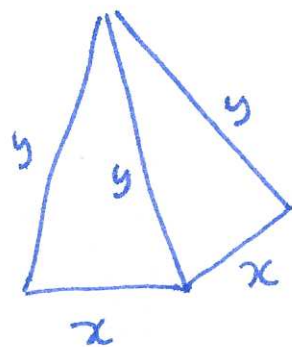
$$\Leftrightarrow c^2 = a^2 + b^2 - 2ab \cos C$$

$$= (1162.5)^2 + (1550)^2 - 2(1162.5)(1550) \times \cos(165^\circ)$$



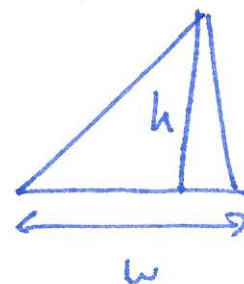
$$c = \sqrt{\dots}$$

$$c = 2690 \text{ m.}$$

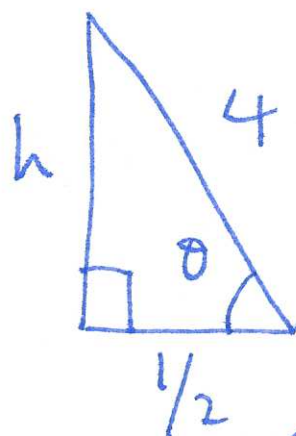
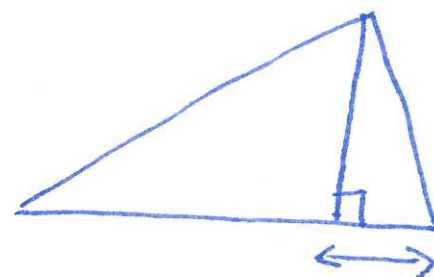
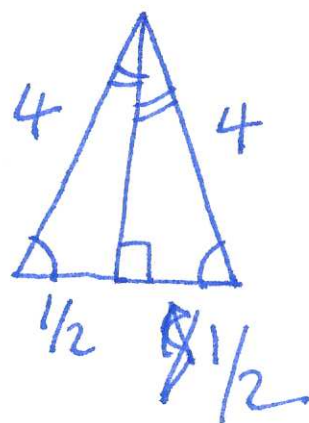
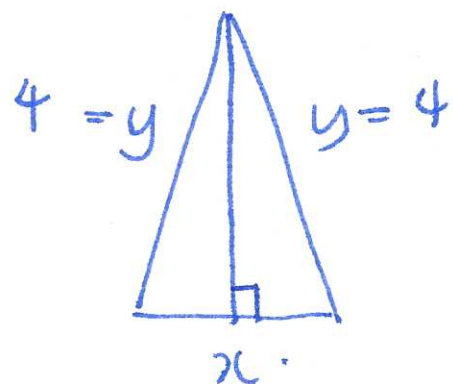


$$x = 1$$

$$y = 4$$



$$\text{area} = \frac{1}{2}wh$$



$$4^2 = h^2 + \left(\frac{1}{2}\right)^2$$

$$h = \sqrt{15.75}$$

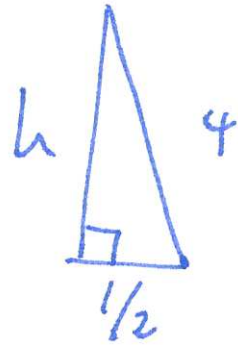
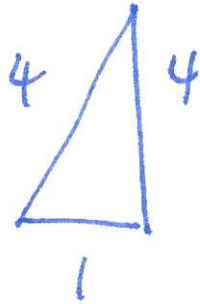
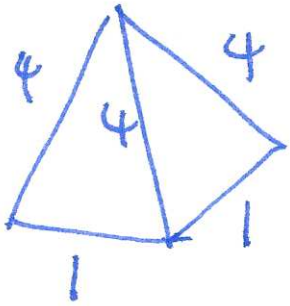
$$16 = h^2 + \frac{1}{4}$$

$$h^2 = 15\frac{3}{4}$$

$$\cos \theta = \frac{1}{8}$$

~~h = 0~~

(6)



$$h = \sqrt{15.75}$$

$$\sqrt{15.75}$$

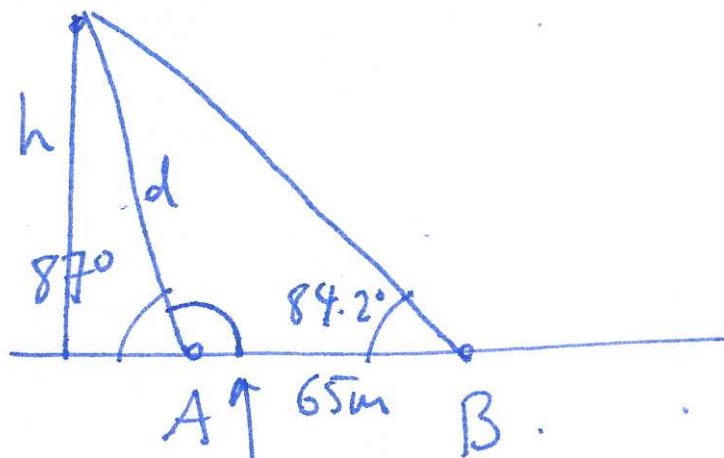
area.

$$\frac{1}{2} \sqrt{15.75}$$

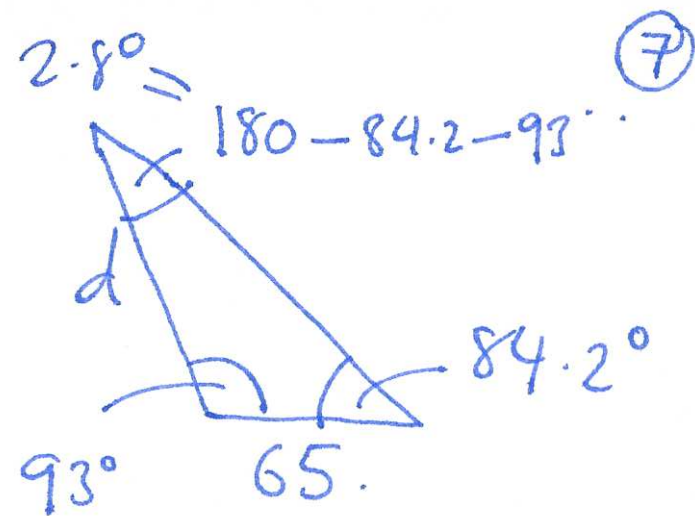
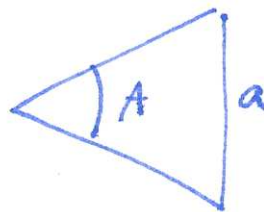
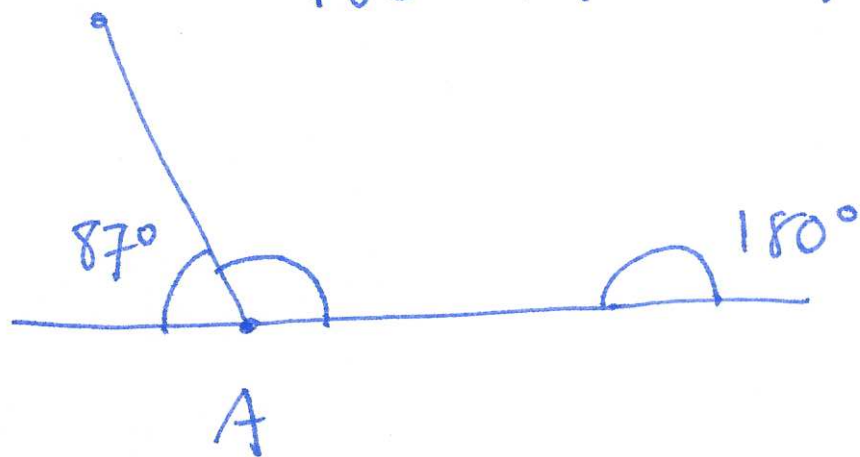
area

$$\text{area} = \frac{1}{2} \frac{1}{2} \sqrt{15.75}$$

$$3.97$$



$$180 - 87 = 93^\circ$$



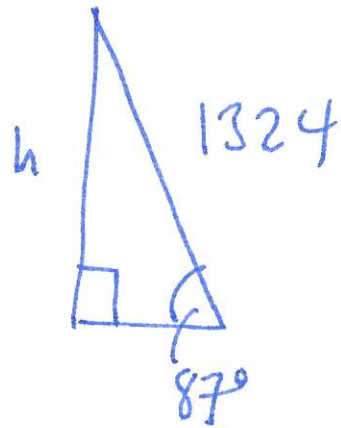
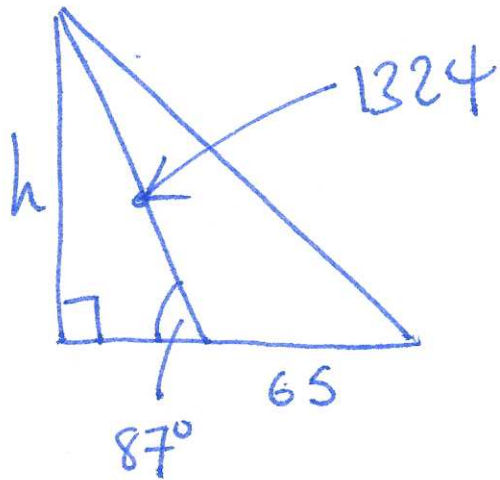
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin 84.2^\circ}{d} = \frac{\sin 2.8^\circ}{65}$$

$$65 \sin 84.2 = d \sin 2.8$$

$$d = \frac{65 \sin 84.2}{\sin 2.8} = 1324m$$

(8)



$$\frac{\text{opp}}{\text{hyp.}} = \sin \theta$$

$$\frac{h}{1324} = \sin 87^\circ$$

$$h = 1324 \times \sin 87 \approx 1322 \text{ m.}$$

Q5 a) i)

$$f(x) = (2x+1)^2$$

⑦

$$y = (2x+1)^2$$

← try and re-arrange to get $x = f^{-1}(y)$.

$$\pm\sqrt{y} = 2x+1$$

$$f(f^{-1}(x)) = x$$

$$f^{-1}(f(x)) = x$$

$$\frac{\sqrt{y} - 1}{2} = \frac{2x}{2}$$

$$x = \frac{\sqrt{y} - 1}{2}$$

$$f^{-1}(x) = \frac{\sqrt{x} - 1}{2}$$

$$f(x) = e^{3x-2} - 6$$

find the inverse.

$$y = e^{3x-2} - 6$$

+6

$$y+6 = e^{3x-2}$$

$$\ln(y+6) = \ln(e^{3x-2})$$

$$\ln(y+6) = 3x - 2$$

+2

$$\frac{\ln(y+6) + 2}{3} = \frac{3x}{3}$$

$$\sqrt{x^2} = x$$

$$\ln(e^x) = x$$

$$e^{\ln(x)} = x$$

$$x = \frac{\ln(y+6) + 2}{3}$$

$$f^{-1}(x) = \frac{\ln(x+6) + 2}{3}$$

inverse.

$$f(x) = \sin 2x$$

$$g(x) = 3^{x-1}$$

(11)

find $f \circ g(x) = f(g(x))$

composition

$$= f(3^{x-1})$$

$$\Rightarrow f \circ g(x) = \sin(2(3^{x-1}))$$

$$f(x) = \sin 2x$$

$$g(x) = 3^{x-1}$$

(12)

$$g \circ f(x) = g(f(x))$$

$$= g(\sin(2x))$$

$$g \circ f(x) = 3^{\sin(2x)-1}$$

$$f(x) = \cancel{x^2} x^2 - x + 1 \quad g(x) = \cos(\sqrt{x^1 - x^2}) \quad (13)$$

$$f \circ g(x) = f(g(x)) = f(\cos(\sqrt{x^1 - x^2})).$$

$$\nabla \quad f(\boxed{\cdot}) = \boxed{\cdot}^2 - \boxed{\cdot} + 1.$$

$$f(\cos(\sqrt{x^1 - x^2})) = (\cos(\sqrt{x^1 - x^2}))^2 - (\cos(\sqrt{x^1 - x^2})) + 1$$

$$f(x) = x^2 - x + 1 \quad f(y) = y^2 - y + 1.$$

$$f(x+y) = (x+y)^2 - (x+y) + 1.$$

$$f(x) = x^2 - x + 1$$

$$g(\boxed{x}) = \cos(\sqrt{\boxed{x}} - \boxed{x}^2)$$

14

$$g \circ f(x) = g(f(x)) = g(\boxed{x^2 - x + 1}) .$$

$$= \cos\left(\sqrt{x^2 - x + 1} - (x^2 - x + 1)^2\right) .$$

Q6 a) i)

$$\log_3 \left(\frac{1}{27} \right) \leftarrow \text{what} \\ = -3.$$

$$\log_3 \left(\frac{1}{3^3} \right).$$

$$\log_3 (3^{-3}) = -3.$$

$$27 = 3^3.$$

power of 3 is $\frac{1}{27}$?

$$3^p = \frac{1}{27}.$$

$$3^3 = \cancel{27} \cdot 27.$$

$$3^{1/3} = \sqrt[3]{3}.$$

$$3^{-3} = \frac{1}{27}.$$

(15)

$$\log_5 7 = \frac{\ln(7)}{\ln(5)}$$

$$\approx \frac{2.81}{1.21}$$

$$\log_b(a) = \frac{\log_c(a)}{\log_c(b)}$$

↑

~~base~~

base conversion rule.

$$2^{\log_2(3-2x)} = 2^3$$

$$3-2x = 2^3 = 8$$

$$\quad \quad \quad +2x \quad \quad \quad +2x$$

$$3 = 8 + 2x$$

$$-8 \quad -8$$

$$2^{\log_2(y)} = y$$

$$-5 = 2x$$

$$x = -\frac{5}{2}$$

$$e^{5x} - 9 = 0$$

$$+9 \quad +9$$

$$e^{5x} = 9$$

$$\ln(e^{5x}) = \ln(9)$$

$$5x = \ln(9)$$

$$x = \frac{\ln(9)}{5} \approx 0.44.$$

\$18,000

interest rate 5% / $\frac{\text{per year}}{\text{time} \leftarrow \text{yr. years}}$

18

$$A(t) = \underbrace{P}_{18000} e^{\underbrace{rt}_{0.05t}}$$

18000

$$A(\cancel{5})_6 = 18000 \times e^{0.05 \times \cancel{5}^6} = \cancel{\$23,112.46} \\ \$24,297.46$$

$$A(t) = \$36,000 = 18000 e^{0.05t}$$

$$2 = e^{0.05t}$$

$$t = \frac{\ln(2)}{0.05} = \frac{\ln(e^{0.05t})}{0.05} = \frac{0.05t}{0.05}$$

$\approx 13.9 \text{ years}$

i) ~~$t=0$~~ : 80g how much left in 2025?
 $t=0$ $t=15$.

$t=0 \Leftrightarrow 2010 \quad n_0 = 80$

$$n(t) = 80 e^{-0.0231 \times t} = 80 \times e^{-0.0231 \times 15}$$
$$= 56.6 \text{ g}$$

ii) find the half life.

$$\frac{40}{80} = \frac{80 e^{-0.0231 t}}{80}$$

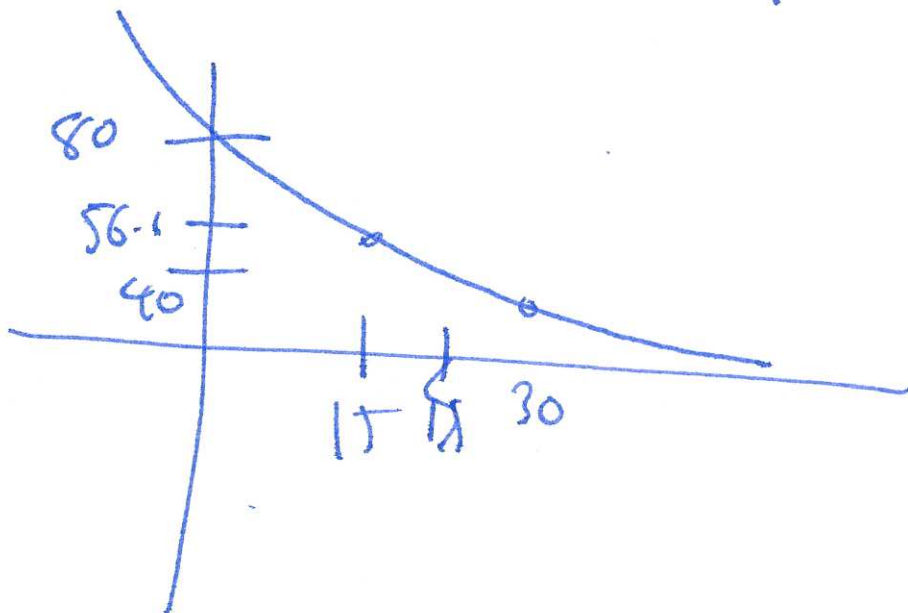
$$\frac{1}{2} = e^{-0.0231t}$$

$$\frac{1}{2} = e^{-0.0231 t}$$

$$\frac{\ln(\frac{1}{2})}{-0.0231} = \frac{\ln(e^{-0.0231 t})}{-0.0231} = \frac{-0.0231 t}{-0.0231}$$

$$t = \frac{\ln(\frac{1}{2})}{-0.0231} \approx 30 \text{ years.}$$

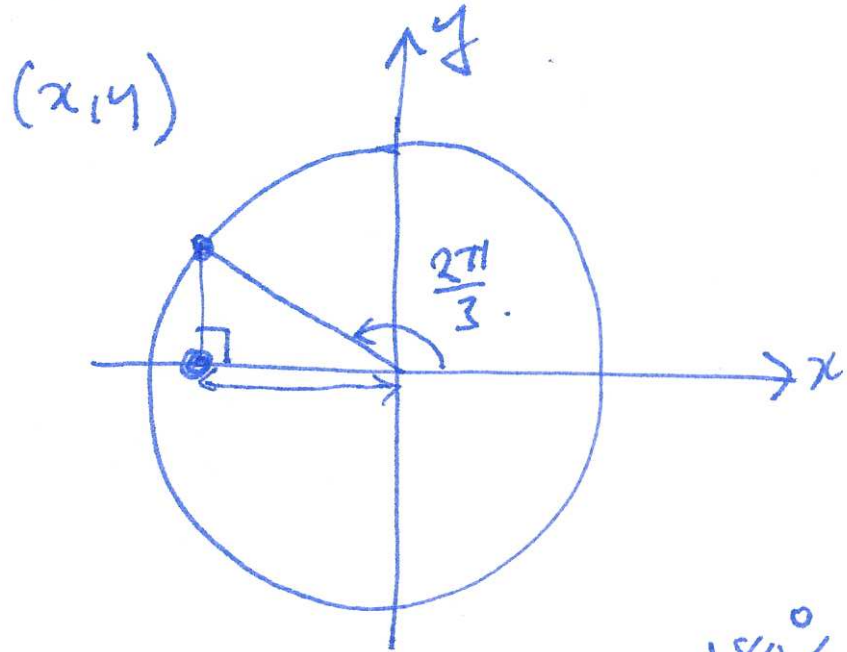
half life.



θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin \theta$	0	$\frac{\sqrt{0}}{2}$	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
$\cos \theta$	1	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	0
$\tan \theta$	0	$\frac{1/2}{\sqrt{3}/2}$	$\frac{\sqrt{2}/2}{\sqrt{2}/2}$	$\frac{\sqrt{3}/2}{1/2}$	undefined
$= \frac{\sin \theta}{\cos \theta}$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined

exact value of $\cos(120^\circ)$.

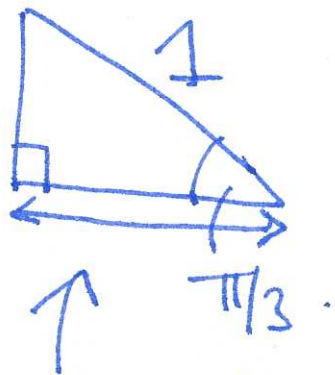
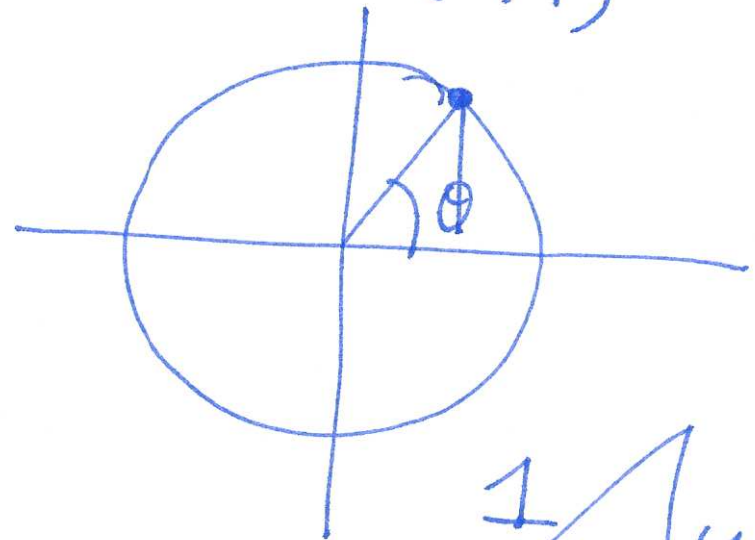
$$\frac{120^\circ \times \pi}{180} = \frac{2\pi}{3} \quad (22)$$



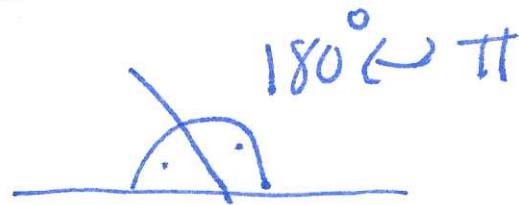
$120^\circ \leftrightarrow \frac{2\pi}{3}$

$(\cos\theta, \sin\theta)$

(x, y)

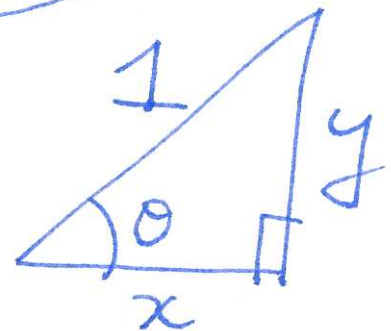


$$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$

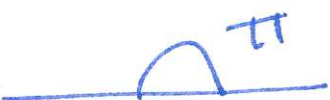


$$\pi - \frac{2\pi}{3} = \frac{\pi}{3}$$

$$\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$$



$$\tan\left(\frac{5\pi}{4}\right) = \frac{\sin(5\pi/4)}{\cos(5\pi/4)}$$

$$\frac{5\pi}{4} - \pi$$


$$\tan\left(\frac{5\pi}{4}\right) = \frac{-\sqrt{2}/2}{-\sqrt{2}/2}$$

$$= 1$$

