Geometry 2

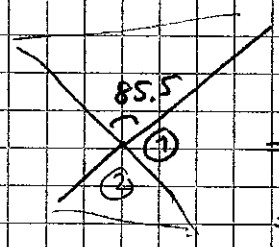
1a i) "Three sides" $\Rightarrow$ cosine rule

$$\cos C = \frac{10^2 + 12^2 - 15^2}{2 \times 10 \times 12}$$

$$\cos C = 0.0791...$$

$$C = 85.5°$$

ii)



$\Rightarrow$ ① $180 - 85.5° = 94.5$

$\Rightarrow$ ② $180 - 94.5° = \underline{\underline{85.5°}}$

1b) i) $2x + x + 85.5 = 180$

$3x + 85.5 = 180$

$3x = 180 - 85.5$

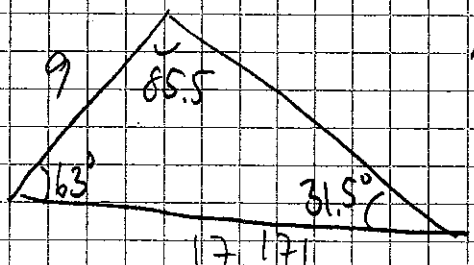
$x = 31.5°$

ii) $$\frac{DE}{\sin 85.5} = \frac{9}{\sin 31.5}$$

$$DE = \frac{9 \sin 85.5}{\sin 31.5}$$

$$DE = 17.2 \text{ km}$$

c)



$$A = \frac{ab \sin C}{2}$$

$$A = \frac{9 \times 17.171.. \times \sin 63}{2}$$

$$A = 68.9 \text{ km}^2$$

2 a) ① Use the length of the edges to find an expression for h to put into volume formula

$V = x \times 2x \times h$

$V = 2x^2 h$

(Because in $V = ax^2 - 6x^3$ you cannot find any h...)

$4 \times 2x + 4h + 4x = 72$

$8x + 4h + 4x = 72$

$12x + 4h = 72$

$4h = 72 - 12x$

$h = 18 - 3x$

② Replace h by $18-3x$ in

$V = 2x^2 h \Rightarrow$

$V = 2x^2(18-3x)$

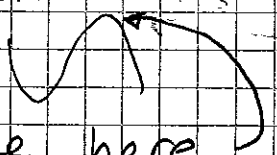
③ Multiply $2x^2$ into the bracket

$\Rightarrow V = 36x^2 - 6x^3$

④ Now I can see that $a = 36$ in $V = ax^2 - 6x^3$.

⑤ answer: $a = 36$

2b) $V = 36x^2 - 6x^3$ is a cubic function.



Max volume here (at the maximum point)

At turning points the gradient of a tangent is zero

ie $V' = 0$

① So, find the derivative

$V' = 72x - 18x^2$

② Put $V' = 0 \Rightarrow$

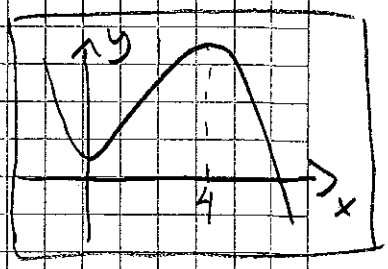
$72x - 18x^2 = 0$

③ Solve the quadratic equation either by factorising or by use APPS polySmlt ....

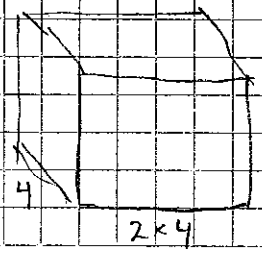
$18x(4 - x) = 0$

$(x_1 = 0)$ (min)

$x_2 = 4$

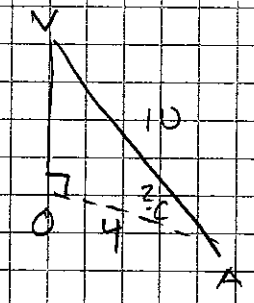


④ So, when $x = 4$ we have the maximum volume of the cuboid



5a) AO = 4 m $\left(\frac{8}{2}=4\right)$

b)



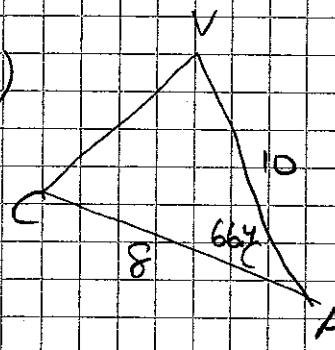
Know adj. and hyp.

Right angle at O

$\Rightarrow \cos A = \frac{4}{10}$

$A = 66.4°$

c)



$A = \frac{8 \times 10 \times \sin 66.4...}{2}$

$A = 36.7 \text{ cm}^2$

6a) $V = L \times W \times H$

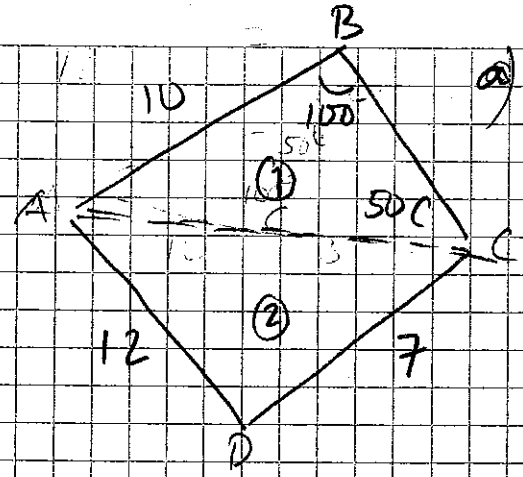
$\Rightarrow 8.7 \times 5.6 \times 3.4 = 165.648 \text{ cm}^3$

b) i) 165.6 cm^3

ii) 166 cm^3

c) 1.66×10^2

7a)



a) Triangle ①

Know "one side and two angles"

$\Rightarrow$ sine rule

$$\frac{AC}{\sin 100} = \frac{10}{\sin 50}$$

$$AC = \frac{10 \sin 100}{\sin 50}$$

$$AC = 12.9 \text{ cm}$$

b) Triangle 2

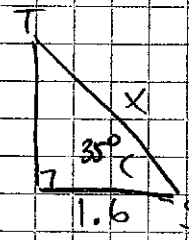
Know "three sides" $\Rightarrow$ cosine rule

$$\cos D = \frac{12^2 + 7^2 + 12.855...^2}{2 \times 12 \times 7}$$

$$\cos D = 0.165...$$

$$D = 80.5°$$

8a)

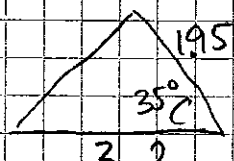


$$\cos 35 = \frac{1.6}{x}$$

$$x = \frac{1.6}{\cos 35}$$

$$x = 1.95 \text{ m}$$

b)



$$A = \frac{1.95 \times 3.2 \times \sin 35}{2}$$

$$A = 1.79 \text{ m}^2$$

8c) $4.7 \times 1.95... = 9.18$

↑ use all s.f

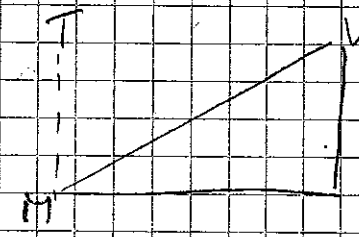
d) $2 \times 1.792... + 2 \times 9.180... + 4.7 \times 3.2$

$= 37.0\ m^2$

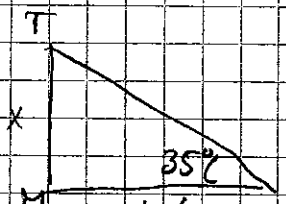
e) V = Base area (triangle) × length

$\Rightarrow V = 1.79253... \times 4.7 = 8.42\ m^3$

f)



i)

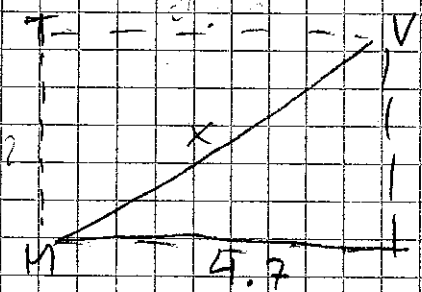


$\tan 35 = \frac{x}{1.6}$

$1.6 \times \tan 35 = x$

$x = 1.12\ m$

ii)



Pythagoras $x^2 = 4.7^2 + 1.12^2...$

$x = 4.83$

89) $\sin VH = \frac{1.12}{4.83}$

$VH = 13.4°$