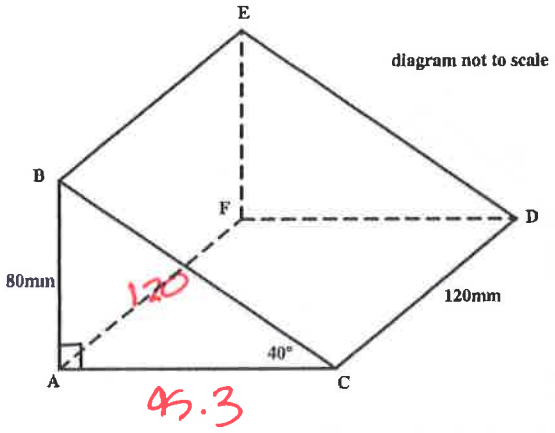
PART A

(14) * *

A gold bar is in the shape of a right triangular prism with AB = 80mm, CD = 120mm and $A\hat{C}B = 40°$.

show separate sketches and calculations on separate paper.



(a) Find the length AC. [2]

(b) Find the length BC. [2]

(c) Show that the area of triangle ABC is 3810mm^2, correct to 3 significant figures. [2]

(d) (i) Find the volume of the triangular prism. [2]

(ii) Write your answer in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in Z$. [2]

The density of gold is 0.01932 $g \cdot mm^{-3}$. Gold is \$0.02791 per gram.

(e) Find the mass of gold contained in this gold bar. [2]

(f) How much money is the gold bar worth. [2]

(g) Find total surface area of the gold bar. [3]

(17 marks)

Solutions

Name _____

Review of

Right Angled Trigonometry
Non-Right Angled Trig,
Coordinate Geometry

Attached are 14 problems from the three curriculum topics above. You should have previous exposure to all of these topics but it will be good for you to review using them.

The first 11 problems are Exam Paper 1 Type Questions where you do your work on the sheet itself. The last three questions are Exam Paper 2 Type Questions where you show all of your work on separate paper including diagrams.

Keep you IB Formula sheet handy!

Work on them in class and outside of class for the next two class periods. The packet will be due on Tuesday, October 17th. We will start the next unit, Sets/Venn Diagrams and Probability on Monday so you should be mostly finished by the weekend.

They will be turned in as a packet, not as part of the normal HW packet.

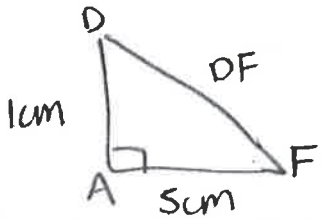
They will be graded on completion and details shown in your work, not for the correct answer. Do them with the intent of reviewing and learning, not just to get them done.

A few of these questions, or ones like them, will be on the next test.

Answers will be available to check as you go.

QUESTION 1

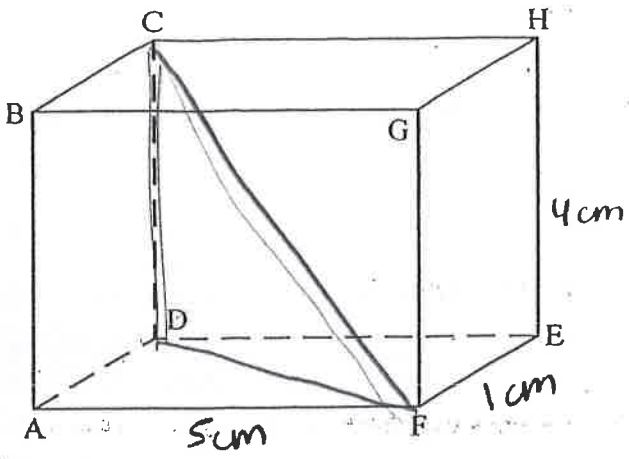
The following diagram shows the rectangular prism ABCDEFGH. The length is 5 cm, the width is 1 cm, and the height is 4 cm.



$1^2 + 5^2 = DF^2$

$26 = DF^2$

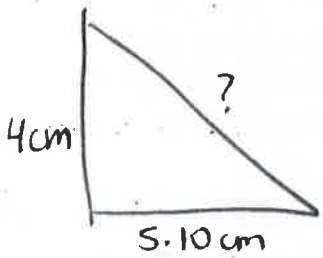
$DF = 5.099$



$4^2 + 5.10^2 = CF^2$

$42.01 = CF^2$

$CF = 6.48$



(a) Find the length of [DF]. *[2 marks]*

(b) Find the length of [CF]. *[2 marks]*

Working:

work

Final answers

Answers:

(a) 5.10 cm

(b) 6.48 cm

(2)

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Right triangle LMN has angle LMN = 60° and LN = 13.7mm.

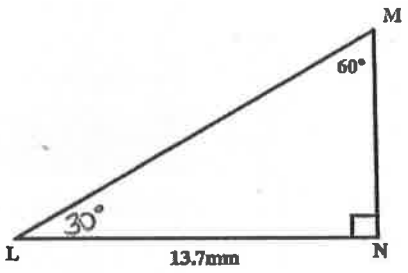


diagram not to scale

$180° - (60+90°) = 30°$

(a) Write down the the size of angle MLN. [1]

(b) i) Calculate the length MN. [2]

ii) Convert the length MN to cm. [1]

Yusaf estimated the length MN to be 0.9cm.

(c) Find the percent error of Yusaf's estimation. [2]

Working.....

$$\frac{x}{\sin(30°)} \quad \frac{13.7mm}{\sin(60°)}$$

$$\frac{\sin(60)}{\sin(60)}x = \frac{6.85}{\sin(60)}$$

$x = 7.91$

$$\varepsilon = \left|\frac{V_A - V_E}{V_E}\right| \times 100\%$$

$$\varepsilon = \left|\frac{0.9 - 0.791}{0.791}\right| \times 100\%$$

$\varepsilon = 13.78\%$

(a) 30°

(b) i) 7.91 mm

ii) 0.791 cm

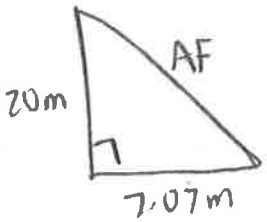
$7.91\,mm \times \frac{1}{10} = 0.791$

(c) 13.8 %

(6 marks)

3

The square-based pyramid below has sides of length 10m and a height of 20m.



$20^2 + 7.07^2 = AF^2$

$449.9849 = AF^2$

$AF = 21.2\text{m}$

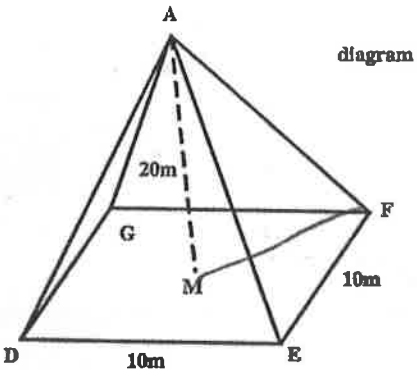


diagram not to scale

MF

$10^2 + 10^2 = DF^2$

$200 = DF^2$

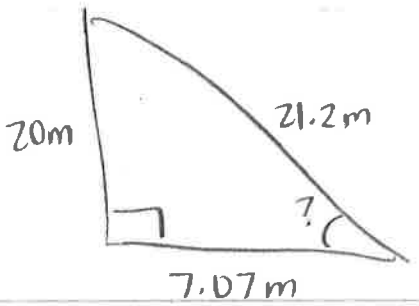
$DF = \frac{14.14}{2}$

$MF = 7.07$

(a) Find the length AF. [4]

(b) Find the measure of angle AFM. [2]

Working.....



$\frac{21.2\text{m}}{\sin(90)} = \frac{20\text{m}}{\sin(x)}$

$\sin(90) \cdot 20 = 21.2 \cdot \sin(x)$

$\frac{20}{21.2} = \frac{21.2 \cdot \sin(x)}{21.2}$

$\sin(x) = 0.943$

$\sin^{-1} \quad \sin^{-1}$

$X = 70.6°$

(a) AF = 21.2m

(b) AFM = 70.5°

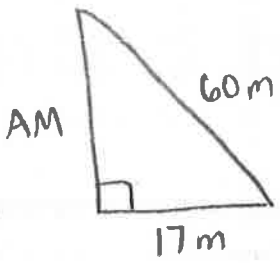
(6 marks)

4

Question

A right pyramid has apex A and rectangular base WXYZ. The vertical height of the pyramid is AM.

$AM^2 + 17^2 = 60^2$
$AM^2 + 289 = 3600$
$-289 \quad -289$
$AM^2 = 3311$
$\sqrt{\quad} \quad \sqrt{\quad}$
$AM = 57.54$



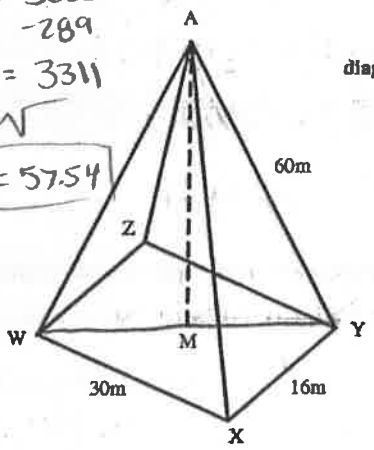


diagram not to scale

$a^2 + b^2 = MY^2$
$30^2 + 16^2 = MY^2$
$1156 = MY^2$
$\sqrt{\quad} \quad \sqrt{\quad}$
$MY = \frac{34}{2} = 17m$

(a) Calculate AM. [4]

(b) Find the volume of the pyramid. [2]

Working.....

$V = \frac{1}{3}Ah$

$V = \frac{1}{3} \cdot 480 \cdot 57.5$

$V = 9200\ m^3$

A = area of base
$A = 30m \times 16m$
$A = 480\ m$

$h = AM$
$h = 57.5m$

(a) $AM = 57.5\ m$

(b) $9200\ m^3$

(6 marks)

5

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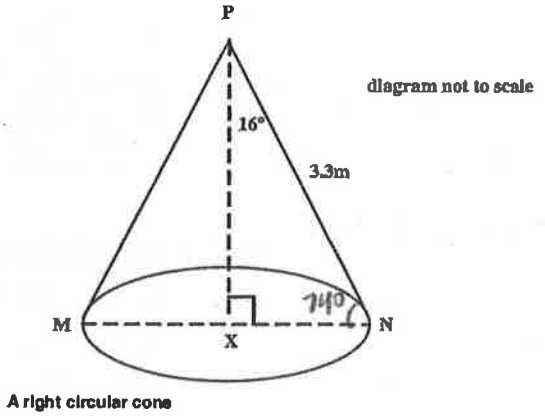
Question

Below is the diagram of a cone shaped tent. Angle NPX is 16°, the slant height of the cone is 3.3m.



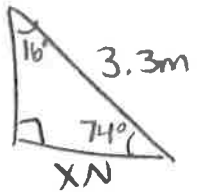
A right circular cone

(a) Find the radius of the cone. XN [2]

(b) Find the vertical height of the cone. [2]

(c) Find the volume of the cone. $V = \frac{1}{3}\pi r^2 h$ [2]

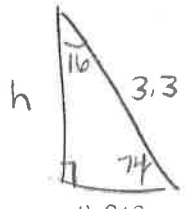
Working.....



$\frac{3.3\text{ m}}{\sin 90} \times \frac{XN}{\sin 16}$

$\frac{\sin(90)\,XN}{\sin(90)} = \frac{0.9096}{\sin(90)}$

$XN = 0.910\text{ m}$



$\frac{h}{\sin 74} = \frac{3.3}{\sin 90}$

$\frac{\sin(90)\,h}{\sin(90)} = \frac{3.1721}{\sin(90)}$

$h = 3.17$

(a) 0.910 m

(b) 3.17m

(c) 2.75 m^3

$V = \frac{1}{3}\pi (0.910)^2 (3.17)$

$V = 2.7489\ m^3$

(6 marks)

6

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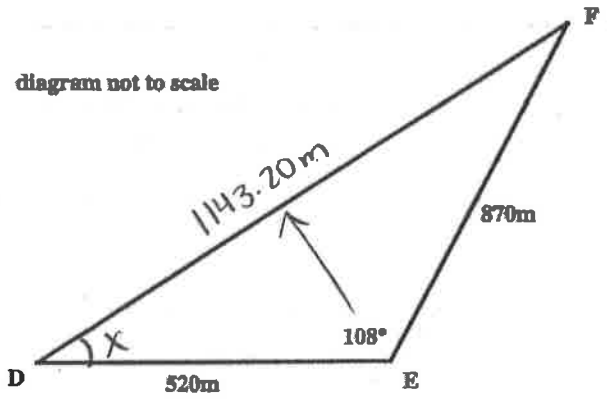
Question 1

On a map three hospitals D, E and F are located as shown below.

Hospitals D and E are 520 metres apart. Angle $D\hat{E}F$ = 108° and EF = 870m.



(a)Find the distance between hospitals D and F. [3]

(b)Find the angle $E\hat{D}F$. [3]

Working.....

a) $a^2 = b^2 + c^2 - 2abcosA$

$a^2 = 520^2 + 870^2 - 2(520)(870)(\cos 108)$

$a^2 = 1027300 + 279598.5765$

$a^2 = 1306898.577$

$a = 1143.20m$

$\frac{1143.20}{\sin 108} = \frac{870}{\sin X}$

$\frac{\sin 108 \cdot 870}{1143.20} = \frac{\sin X \cdot 1143.20}{1143.20}$

$\sin X = 0.72377$

$\sin^{-1}\ \sin^{-1}$

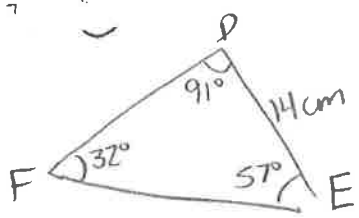
$X = 46.37°$

(a) DF = 1143.20m

(b) $D\hat{E}F = 46.37°$

(6 marks)

7



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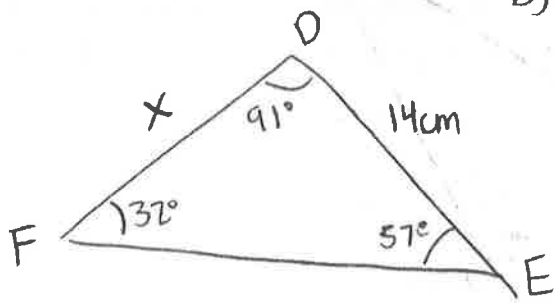
Triangle DEF is such that DE is 14cm, angle DEF is 57° and angle DFE is 32°.

(a) Sketch the triangle writing in the side length and angles. [1]

(b) Find the length of DF. [3]

(c) Find the area of triangle DEF. [2]



b) $\frac{14}{\sin 32} = \frac{X}{\sin 57}$

$\frac{14 \cdot \sin 57}{\sin 32} = \frac{X \cdot \sin 32}{\sin 32}$

$X = 22.2\text{ cm}$

c) $A = \frac{1}{2}ab\sin C$

$A = \frac{1}{2}(14)(22.2)(\sin 91)$

$A = 153.98\text{ cm}^2$

(b) DF = 22 cm

(c) $A = 153.98\text{ cm}^2$

(6 marks)

Working.....

8

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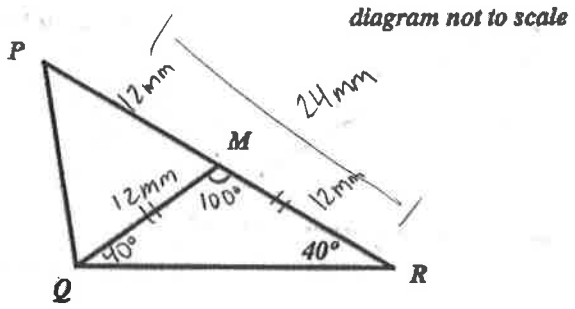
Question

The diagram shows triangle PQR with PR = 24mm, QM = MR and $P\hat{R}Q = 40°$. M is the midpoint of PR.



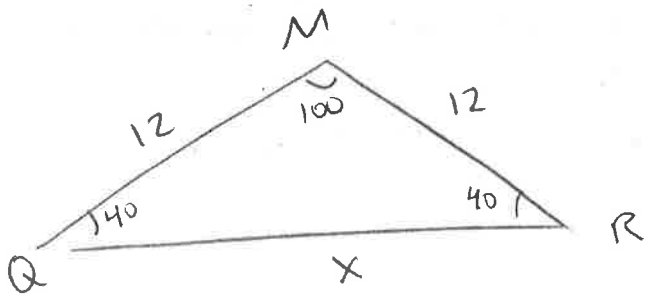
(a) Write down

(i) the size of angle QMR;

(ii) the length of RM;

(ii) the length of QM. [3]

(b) Calculate the length QR. [3]



$\frac{x}{\sin 100} \times \frac{12}{\sin 40}$

$\frac{\sin 100 \cdot 12}{\sin 40} = \frac{\sin 40 \cdot x}{\sin 40}$

$x = 18.39\text{ mm}$

(a) (i) 100°

(ii) 12mm

(iii) 12mm

(b) QR = 18.39mm

(6 marks)

9

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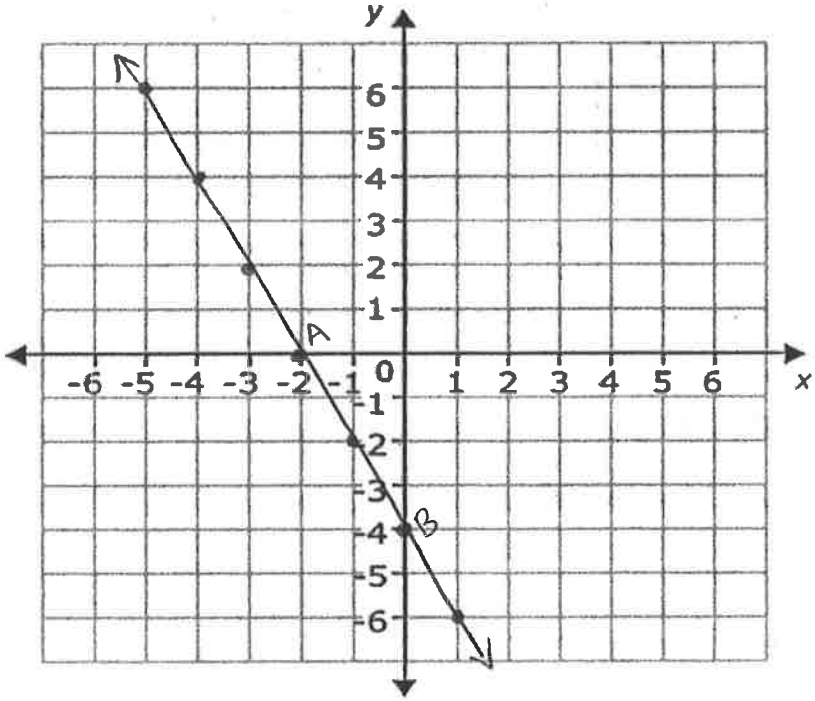
Question

$y = -2x - 4$

a) Graph the line $y+2x+4 = 0$, that cuts the x-axis at A and the y-axis at B.

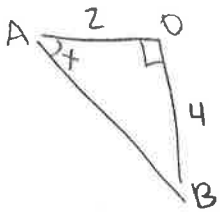
b) Find the area of the triangle AOB

c) Find the angle $\angle OAB$ (to 3 s.f.)



Write answers here

Working.....



$A = \frac{1}{2} \cdot bh$

$A = \frac{1}{2} \cdot 2 \cdot 4$

$A = 4$

$\tan(x) = \frac{o}{a} = \frac{4}{2}$

$x = \tan^{-1}\left(\frac{4}{2}\right)$

$x = 63.4°$

a) *graphed*

b) $A = 4 \text{ units}^2$

c) $x = 63.4°$

(6marks)

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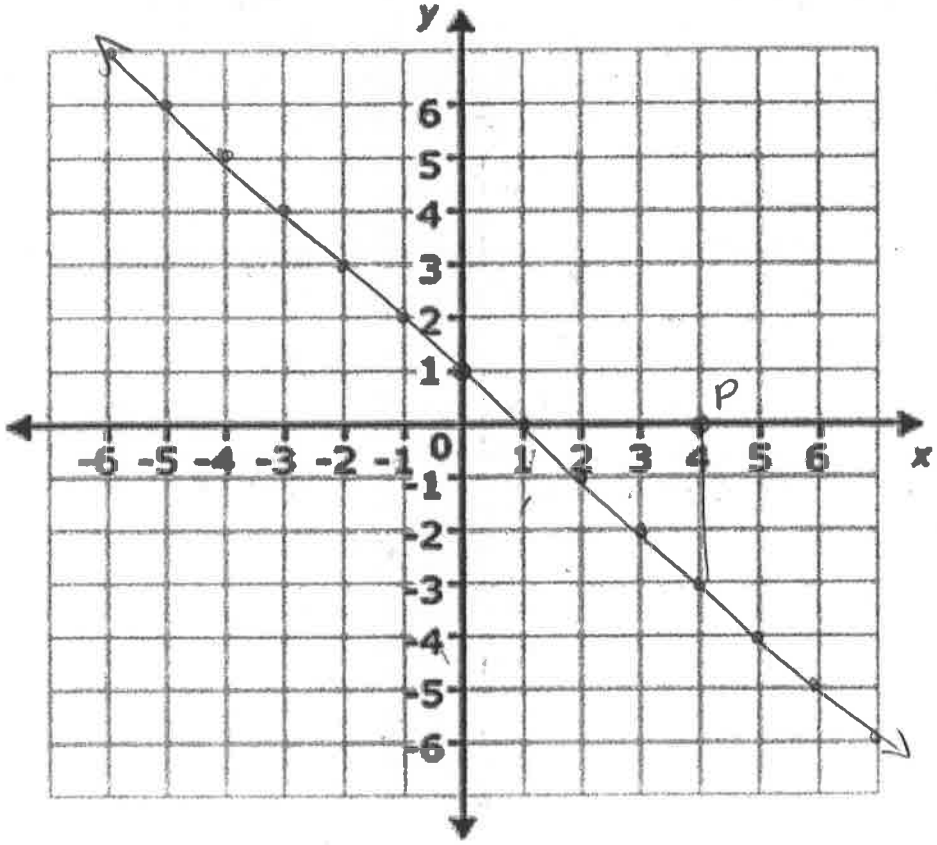
10

Question

$y = -x+1$

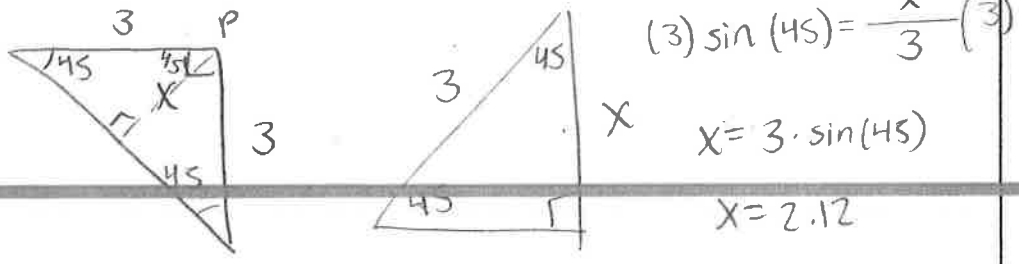
a) Graph the line D : y+x-1=0 in an x-y coordinate plane.

b) Find the distance between the point P(4,0) and the line y+x-1=0



Write answers here

Working.....



(a) *graphed*

(b) 2.12 units

(6marks)

11

Question

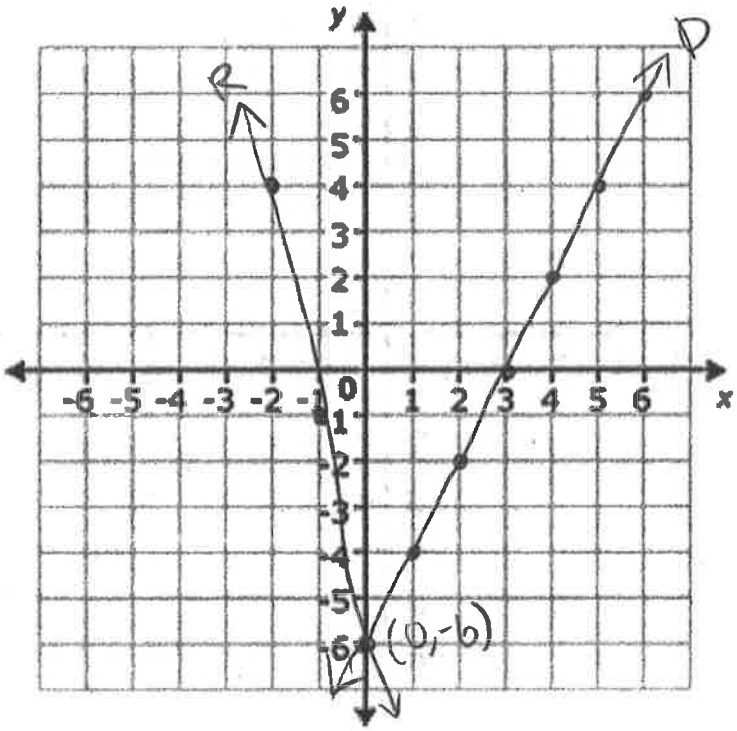
Find the point of intersection of the given 2 lines:

Line D : $2y-4x+12=0$ $y=2x-6$

Line R : $y+5x+6=0$ $y=-5x-6$

i) Using the GDC

ii) Graphically



Write answers here

i. (0,-6)

ii. (0,-6)

(6marks)

12

Line D: $\frac{y-3x}{2} = x+y-3$

i. $y-3x = 2x+2y-6$
$-y \quad +3x \quad +3x \quad -y$

$\boxed{0 = 5x+y-6}$

ii. x-int, when $y=0$

$0 = 5x+0-6$

$0 = 5x-6$

$6 = 5x \rightarrow x = \frac{6}{5}$

$\boxed{(\frac{6}{5}, 0)}$

iii. y-int, when $x=0$

$0 = 5(0)+y-6$

$0 = y-6$

$y = 6$

$\boxed{(0,6)}$

iv. $0 = 5x+y-6$
$-5x+6 \quad -5x \quad +6$

$y = -5x+6$

$\boxed{\text{slope} = -5}$

v. parallel = same slope

Line H: $y = mx+b$

$5 = -5(3)+b$

$5 = -15+b$
$+15 \quad +15$

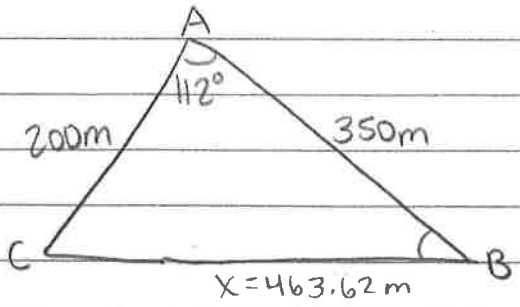
$b = 20$

$y = -5(x)+20$
$-y \quad -y$

$\boxed{0 = -5x-y+20}$

13

Part B - Question 8



a. $x^2 = b^2 + c^2 - 2ab\cos A$

$x^2 = 200^2 + 350^2 - 2(200)(350)(\cos 112)$

$x^2 = 162{,}500 + 52444.92308$

$x^2 = 214944.9231$

$\sqrt{\quad}$ $\sqrt{\quad}$

$x = 463.62\text{m}$

$P = 200\text{m} + 350\text{m} + 463.62\text{m}$

$\boxed{P = 1013.62\text{m}}$

tickets = 78,000

max = 2.5 people/m^2

b. $A = \frac{1}{2}ab\sin C$

$A = \frac{1}{2}(200)(350)(\sin 112)$

$\boxed{A = 32451.43\ m^2}$

c. $\frac{78{,}000 \text{ people}}{32{,}451.43\ m^2} = \boxed{2.4 \text{ people}/m^2}$

No this doesn't break the regulations

d. Angle ABC

$\frac{200}{\sin x} \times \frac{463.62}{\sin 112}$

$\sin x \cdot 463.62 = \sin 112 \cdot 200$

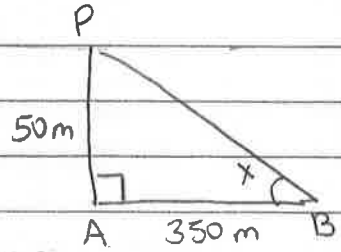
$\frac{\sin x \cdot 463.62}{463.62} = \frac{\sin 112 \cdot 200}{463.62}$

$\sin x = 0.3999$

$x = \sin^{-1}(0.399)$

$\boxed{x = 23.58°}$

e.



$a^2 + b^2 = c^2$

$50^2 + 350^2 = c^2$

$125{,}000 = c^2$

$\sqrt{\quad}$ $\sqrt{\quad}$

$\boxed{PB = 353.55\text{m}}$

f. $\angle ABP$

$\tan(x) = \frac{o}{a}$

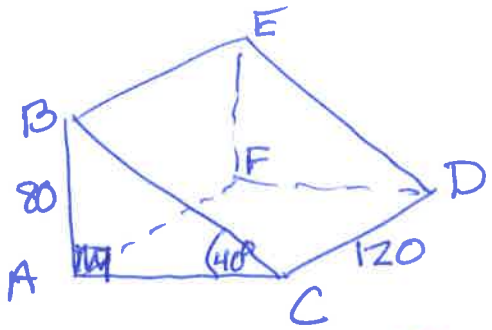
$\tan(x) = \frac{50}{350}$

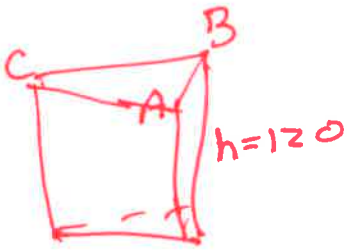
$\tan^{-1}$ $\tan^{-1}$

$x = \tan^{-1}\left(\frac{50}{350}\right)$

$\boxed{x = 8.13°}$

14





(a) SohCahToa

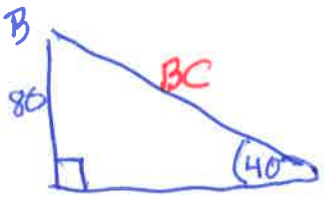
$\tan(C) = \frac{80}{AC}$

$AC = \frac{80}{\tan(40)}$

$AC = 95.340$

AC = 95.3 mm

(b)



can also use Soh-Cah-Toa

$\sin(40^\circ) = \frac{80}{BC}$

$BC = \frac{80}{\sin(40)}$

BC = 124.45....

BC = 124 mm

(c)

$A = \frac{1}{2}bh \cdot \sin C$

$= \frac{1}{2}(80)(95.340)\sin(40)$

$= 2451.33$

2450 mm²

(d) Volume of any Prism

= area of base · height

↑ from part (b) ↑ 120

$= (124.45)(120)$

$= 14934$ ...

$= 14900\ mm^3$

(e) MASS

$14934\ mm^3 \cdot 0.01932\ \frac{g}{mm^3}$

$= 288.524...$

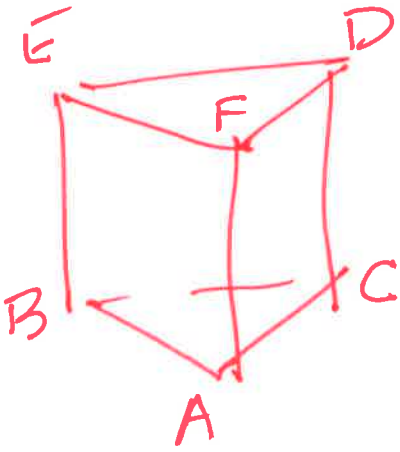
$= 289\ g$ 3 s.f.

(f) $(288.524\ g)\left(\frac{\$0.02\ 791}{g}\right)$

$= 8.0527... = \$8.05$

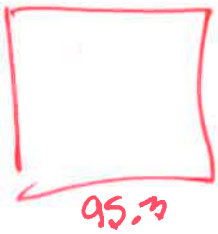
(g)

(g) surface area of this prism is the sum of the 5 surfaces



2 Bases 124.45 mm^2 top
+ 124.45 bottom

FDCA

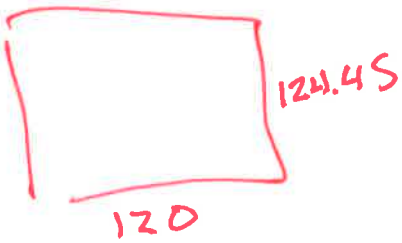


+ 11436 mm^2

ABEF

+ 9600 mm^2

CBED



+ 14934

TOTAL 36218.9 mm^2

36200 mm^2