CARLINGFORD HIGH SCHOOL

Year 11 Mathematics

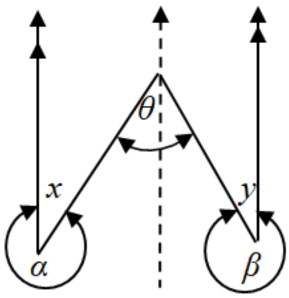
Preliminary Assessment Task 2 Term 2 2018

Solutions

QUESTION 1 (14 marks)

a). Now $x = 360^o - \alpha$ (angles at a point)
and $y = 360^o - \beta$ (angles at a point)

But $\theta = x + y$ (sum of alternate angles on parallel lines)
i.e. $\theta = 360^o - \alpha + 360^o - \beta$
$\therefore$ $\theta = 720^o - \alpha - \beta$



[3]

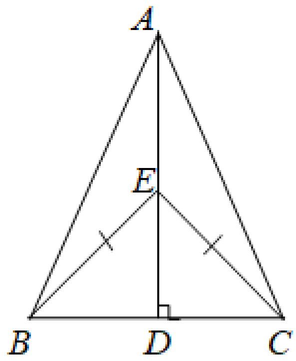
b). **i).** In ΔEBD & ΔECD

$\angle EDB = \angle EDC = 90^o$ (given)
$EB = EC$ (given)
$ED = ED$ (common side)
So $\Delta EBD \equiv \Delta ECD$ (RHS)
$\therefore$ $BD = CD$ (corresponding sides of congruent Δs)

[3]

ii). In ΔABD & ΔACD

$AD = AD$ (common side)
$\angle ADB = \angle ADC = 90^o$ (given)
$BD = CD$ (proved)
So $\Delta ABD \equiv \Delta ACD$ (SAS)
$\therefore$ $AB = AC$ (corresponding sides of congruent Δs)



[3]

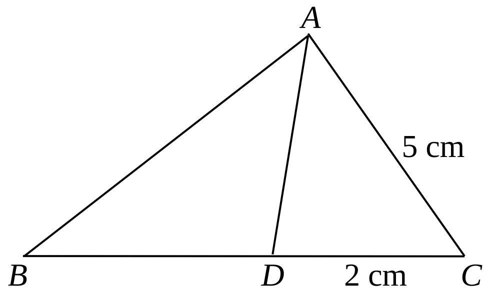
c). Now $\dfrac{AB}{AD} = \dfrac{AC}{DC} = \dfrac{BC}{AC}$ (Three pairs of matching sides in proportion)

So $\dfrac{5}{2} = \dfrac{BC}{5}$

$BC = \dfrac{25}{2}$

Thus $BD = \dfrac{25}{2} - 2$

$= \dfrac{21}{2}$ cm



[2]

d). Now $\Delta BPQ \ ||| \ \Delta BCA$ (Three pairs of matching angles equal)

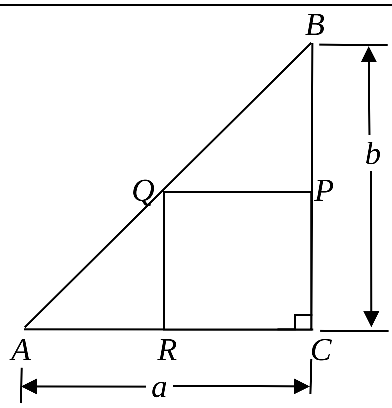
So $\dfrac{BP}{BC} = \dfrac{PQ}{CA}$

i.e. $\dfrac{b - PC}{b} = \dfrac{PC}{a}$

$ab - aPC = bPC$

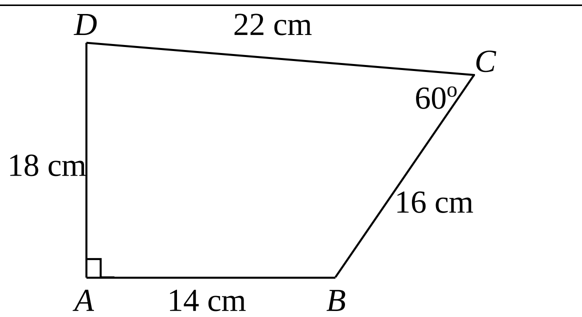
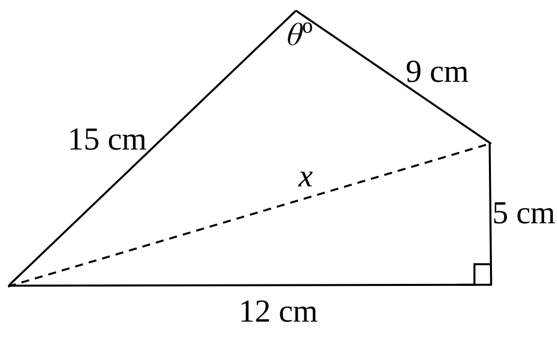
$ab = (a+b)PC$

$\therefore$ $PC = \dfrac{ab}{a+b}$



[3]

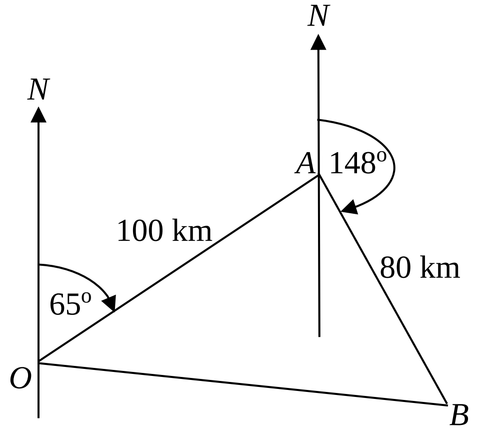
QUESTION 2 (17 marks)

a).	Now $\cot 300^o = \dfrac{1}{\tan 300^o}$ $= 1 \div \left(-\dfrac{\sqrt{3}}{1} \right)$ $= -\dfrac{1}{\sqrt{3}}$	**[2]**
b).	In quadrant I & III	**[2]**
c).	LHS = $(\sec^2 \theta - 1)\cos^2 \theta$ $= \left(\dfrac{1}{\cos^2 \theta} - 1 \right) \cos^2 \theta$ $= 1 - \cos^2 \theta$ $= \sin^2 \theta$ $=$ RHS	**[2]**
d).	Now $\sin x = \cos x$ then $\tan x = 1$ $\therefore \quad x = 45^o$ or 225^o	**[2]**
e).	Area = Area of ΔBCD + Area of ΔBAD $= \dfrac{1}{2} \times 22 \times 16 \times \sin 60^o + \dfrac{1}{2} \times 14 \times 18$ $\approx 278.4 \text{ cm}^2$  	**[2]**
f).	**i).** Now $x^2 = 5^2 + 12^2$ then $x = \sqrt{5^2 + 12^2}$ $= 13$ cm  **ii).** Now $\cos \theta^o = \dfrac{15^2 + 9^2 - 13^2}{2 \times 15 \times 9}$ $= \dfrac{137}{270}$ $\therefore \quad \theta \approx 59.51^o$	**[1]** **[2]**

g). **i).** Now $\angle OAB = 65^o + (180^o - 148^o)$
$= 65^o + 32^o$
$= 97^o$

So $OB^2 = 100^2 + 80^2 - 2 \times 100 \times 80 \times \cos 97^o$
$\therefore \quad OB \approx 135.5$ km

[2]



ii). Now $\dfrac{\sin \angle AOB}{80} = \dfrac{\sin 97^o}{135.5}$

$\sin \angle AOB = \dfrac{80 \times \sin 97^o}{135.5}$

$\therefore \quad \angle AOB = 35.9^o$

[2]

Thus the bearing of B from $O = 65^o + 35.9^o$
$\approx 100.9^o$

QUESTION 3 (19 marks)

a). **i).** Now centre $= \left(\dfrac{-2+6}{2}, \ \dfrac{4-2}{2} \right)$
$= (2, \ 1)$

[2]

ii). Now radius $= \sqrt{(-2-2)^2 + (4-1)^2} = 5$ units

[2]

b). **i).** Now equation of BC: $\dfrac{y-1}{x-2} = \dfrac{2-1}{1-2}$

$\therefore$ the equation in general form is $x + y - 3 = 0$

[2]

ii). Now the perpendicular distance of A from $BC = \left| \dfrac{-1+(-1)-3}{\sqrt{1^2+1^2}} \right| = \dfrac{5}{\sqrt{2}}$ units

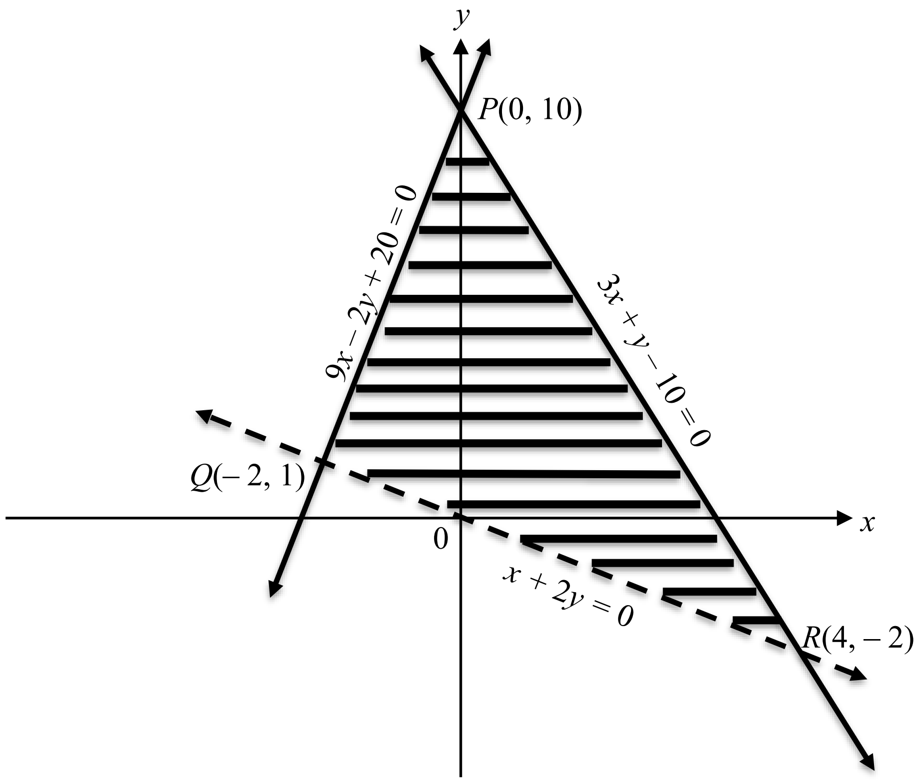
[2]

iii). Now the area of $\Delta ABC = \dfrac{1}{2} \times \sqrt{(2-1)^2 + (1-2)^2} \times \dfrac{5}{\sqrt{2}} = \dfrac{5}{2}$ units^2

[2]

c). Now the equation of the line is $(2x + y - 5) + k(x - y + 2) = 0$
$2x + y - 5 + kx - ky + 2k = 0$
$(2 + k)x + (1 - k)y + (2k - 5) = 0$ as required

[2]

d). **i).** Let $9x - 2y + 20 = 0$ ………… [1] and $3x + y - 10 = 0$ ………….. [2] From [2] × 2 give $6x + 2y - 20 = 0$ ………… [3] Now from [1] + [3] get $15x = 0$ $\therefore \quad x = 0$ Thus substitute $x = 0$ in [2] get $3(0) + y - 10 = 0$ $\therefore \quad y = 10$ Hence the point P has coordinates (0, 10) which is on the y–axis.	**[2]**
ii). Now the equation of QR is $\dfrac{y-1}{x-(-2)} = \dfrac{-2-1}{4-(-2)}$ $6(y-1) = -3(x+2)$ $6y - 6 = -3x - 6$ $3x + 2y = 0$ $\therefore \quad x + 2y = 0$	**[2]**
iii). Now sketch the region defined by the 3 inequalities $9x - 2y + 20 \geq 0$, $3x + y - 10 \leq 0$ and $x + 2y > 0$.  	**[3]**

END OF SOLUTIONS