mv 3;4

Grade 11 Paper 2 Nov 2014

Question One

a) $y = 2x + 10$

x int - let $y = 0$

$2x + 10 = 0$

$x = -5$

$P(-5; 0)$ ✓

$S(0; 10)$ ✓ (2)

b) $\frac{-5 + x_T}{2} = 0 \quad \frac{0 + y_T}{2} = 10$ ✓

$x_T = 5 \quad y_T = 20$

$T(5; 20)$ (3)

c) $PT^2 = (5 - (-5))^2 + (20 - 0)^2$

$= 100 + 400$

$PT^2 = 500$

$PT = 10\sqrt{5}$ ✓

or

$PS^2 = 25 + 100$ ✓

$PS = \sqrt{125}$

$PS = 5\sqrt{5}$ ✓

$\therefore PT = 10\sqrt{5}$ ✓ (3)

d) $y = -kx + 6$ ✓

$-k = -\frac{1}{2}$ ✓

$k = \frac{1}{2}$ ✓ (2)

Question Two

a) bisect ✓ (1)

b) $m_{AC} = \frac{8 - (-4)}{-3 - 5}$ ✓

$= \frac{12}{-8}$

$= -\frac{3}{2}$ ✓ (2)

c) $\tan B = -\frac{3}{2}$ ✓

$B \simeq 180 - 56,3°$

$B \simeq 123,7°$ ✓✓ (3)

d) $m_{AD} = m_{BC} = \frac{2 - (-4)}{6 - 5}$ ✓

$m_{AD} = 6$ ✓

$\tan\alpha = 6$

$\alpha \simeq 80,5°$ ✓

$C\hat{A}D = 123,7° - 80,5°$

$C\hat{A}B \simeq 43,2°$ ✓

$\therefore \theta = 43,2°$ ✓ (5)

Question Three

a) $\frac{\sin(x + 90)\tan(x + 180)}{\cos(90 - x)}$

$= \frac{(\cos x)(\tan x)}{\sin x}$ ✓

$= \frac{(\cos x)\left(\frac{\sin x}{\cos x}\right)}{\sin x}$

$= 1$ ✓ (4)

b) $\tan 143° = \frac{-\sin\alpha}{\sin\beta}$

$\tan 143° = -\tan 37°$ ✓

$= -\frac{\sin 37°}{\cos 37°}$ ✓

$= -\frac{\sin 37°}{\sin 53°}$ ✓

$\therefore \alpha = 37° \quad \beta = 53°$ ✓ (4)

Question Four

a) LHS: $\cos^2\theta - \tan\theta \sin\theta \cos\theta$

$= \cos^2\theta - \frac{\sin\theta}{\cos\theta} \times \sin\theta \times \cos\theta$ ✓

$= \cos^2\theta - \sin^2\theta$ ✓

$= 1 - \sin^2\theta - \sin^2\theta$

$= 1 - 2\sin^2\theta$

$=$ RHS ✓ (4)

(-1) if no LHS/RHS.

b) 1) $\tan x + 1 = 2,18$

$\tan x = 1,18$ ✓

$x = 49,7° + 180°k$ ✓

−1 if no $k \in Z$ $k \in Z$ (3)

2) $\sqrt{2}\sin(x+45) = \sin x + \cos x$

but $-\sin x - \cos x = \frac{1}{\sqrt{2}}$

$\therefore \sin x + \cos x = -\frac{1}{\sqrt{2}}$ ✓

$\sqrt{2}\sin(x+45) = -\frac{1}{\sqrt{2}}$ ✓

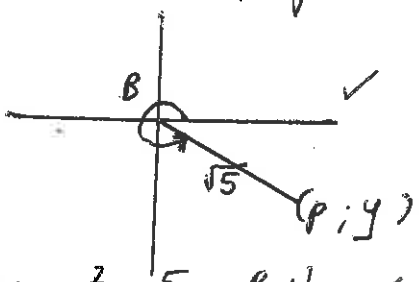
$\sin(x+45) = -\frac{1}{2}$ ✓

$x+45 = -30 + 360k$ ✓ or $x+45 = 210 + 360k$ ✓

$x = -75 + 360k$ ✓ or $x = 165 + 360k$ ✓

$k \in Z$ (7)

c) $\cos B = \frac{p}{\sqrt{5}}$; $p > 0$



✓

$p^2 + y^2 = 5$ Pythag ✓

$y^2 = 5 - p^2$

$y = \pm\sqrt{5-p^2}$ ✓

$x = p \quad y = -\sqrt{5-p^2} \quad r = \sqrt{5}$

$\therefore \tan B = \frac{-\sqrt{5-p^2}}{p}$ ✓ (4)

Wrong quad max mark = 2

Question 5

a) $y \in [-2; 2]$ ✓ (1)

b) $360°$ ✓ (1)

c) $a = \frac{1}{2}$ ✓ (1)

d) $x \in (0°; 120°)$ ✓ ✓ (2)

e) $B(240°; -\sqrt{3})$ ✓ ✓ (2)

f) $x \in [0°; 90°) \cup (270°; 360°]$ ✓ ✓ (3)

g) $h(x) = \tan 2x - 2$ ✓ (2)

Question Six

−1 if not to 1 dec pl.

1) equal (or parallel) (1)

2) $EC^2 = 7,5^2 + 9,4^2 - 2(7,5)(9,4)\cos 32°$ ✓✓

$EC^2 \simeq 25,03\ldots$

$EC \simeq 5m$ (2)

3a) $\frac{\sin D\hat{C}E}{7,5} = \frac{\sin 32°}{5}$ ✓

$\sin D\hat{C}E = \frac{7,5\sin 32°}{5}$

$D\hat{C}E = 52,6°$ ✓ (3)

b) Area $\triangle DEC = \frac{1}{2}(7,5)(9,4)\sin 32°$ ✓

$= 18,7m^2$ ✓ (2)

c) $\sin 32° = \frac{EG}{7,5}$ ✓

$EG = 7,5\sin 32°$

$EG = 4m$ ✓

$\therefore EF = 4 + 3,5 = 7,5m$ ✓ (3)

Question Seven

a) $h^2 = 6,71^2 - 3^2$ ✓ Pythag

$h^2 = 36,0241$

$h = 6m$ ✓ (2)

b) $V = \pi(3)^2(20) + \frac{1}{3}\pi(3)^2(6)$ ✓

$= 198\pi$ ✓ m^3 ✓ (3)

c) $V_{truck} = 5 \times 3 \times 1\frac{1}{2}$ ✓

$= 22,5m^3$ ✓

no load $= \frac{198\pi}{22,5}$

$= 27,6$

$= 28$ loads ✓ (3)

(or $\hat{M}_2 + \hat{M}_3 = 90$ ✓ diameter ✓
$\hat{M}_2 = 40$ proved
$K_1 + K_2 = 50$ ✓ opp ∠'s cyclic quad ✓)

(e) $\hat{P}$ (4)

$\hat{K}_1 + \hat{K}_2 = \hat{N}_1 = 50°$ ✓ ∠" opp equal sides OK = ON radii ✓

$\hat{N}_1 + \hat{N}_2 = 100$ proved above

$\therefore \hat{P} = 30°$ ✓ ∠' of ΔPKN ✓

(2) Prove that KG = GM (3)

$\hat{M}_2 + \hat{M}_3 = 90$ subtended by diameter ✓

$\therefore \hat{G}_2 = 90$ co-int ∠'s ON // LM ✓

$\therefore KG = GM$ ⊥ from centre ✓

or

$\hat{N}_2 = 50$ $\hat{N}_1 + \hat{N}_2 = 100°$ and $\hat{N}_1 = 50°$ ✓

$\hat{G}_3 = 90$ ∠' of ΔGMN ✓

$KG = GM$ ⊥ from centre ✓

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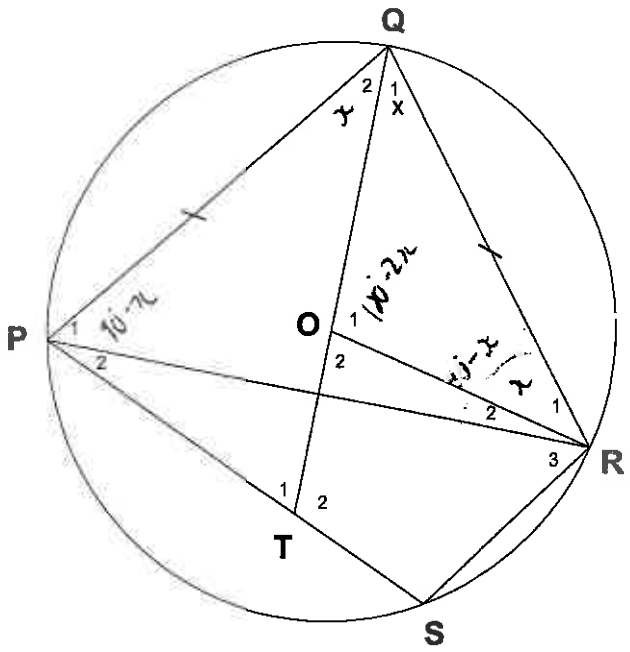
QUESTION NINE

Fill in all the blanks to complete the proof:

In the diagram below O is the centre of the circle. P,Q, R and S are points on the circumference of the circle. TOQ is a straight line such that T lies on PS. PQ = QR and $\hat{Q}_1 = x$



(a) Determine with reasons $\hat{P}_1$ in terms of x

$\hat{Q}_1 = x$ (given)

$\therefore \hat{R}_1 = x$ ($\angle$'s opp = sides OQ = OR radii)

$\therefore \hat{O}_1 = 180-2x$ ($\angle$'s of $\Delta = 180°$)

$\therefore \hat{P}_1 = 90-x$ ($\angle$ at centre) (5)

(b) Show that TQ bisects $P\hat{Q}R$

PQ = QR (given)

$\hat{R}_1 + \hat{R}_2 = 90-x$ ($\angle$'s opp = sides QP = QR)

$\therefore \hat{Q}_1 + \hat{Q}_2 = 2x$ (sum of $\angle$'s of triangle)

$\therefore \hat{Q}_2 = x$

i.e.TQ bisects $P\hat{Q}R$ (3)

(c) Show that STOR is a cyclic quadrilateral.

$\hat{S} = 180-2x$ (opposite angles of a cyclic quadrilateral are supplementary)

$\hat{O}_1 = 180-2x$ (proved)

∴ STOR is a cyclic quadrilateral

(ext ∠ = int opp ∠) (2)

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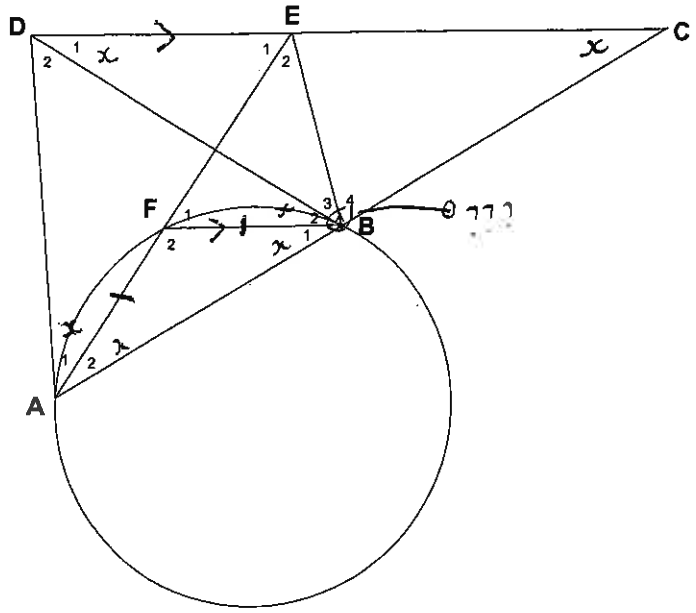
QUESTION TEN

In the sketch below DA and DB are tangents at A and B. AF = FB.
DE // FB. AB produced cuts the line through D and E at C. $\hat{A}_1 = x$.



(a) Find with reasons 5 other angles each equal to x. (7)

$\hat{B}_1 = x$ tan- chord thm

$\hat{A}_2 = x$ ∠'' opp = sides AF = FB

$\hat{C} = x$ corresp ∠'' DC // FB

$\hat{B}_2 = x$ tan- chord thm

$\hat{D}_1 = x$ alt ∠'s DC // FB

(b) Prove that ABED is a cyclic quadrilateral.

(2)

$\hat{D}_1 = \hat{A}_2$ ✓ proved above

ABED is cyclic quad line subtends equal ✓

(c)Prove that $A\hat{B}E = 3\hat{A}_1$

(3)

$\hat{B}_1 = x$ proved above

$\hat{B}_2 = x$ proved above

$\hat{B}_3 = \hat{A}_1 = x$ ✓ subtended by ED ✓

$\therefore A\hat{B}E = 3x = 3\hat{A}_1$ $\hat{A}_1 = x$ given ✓

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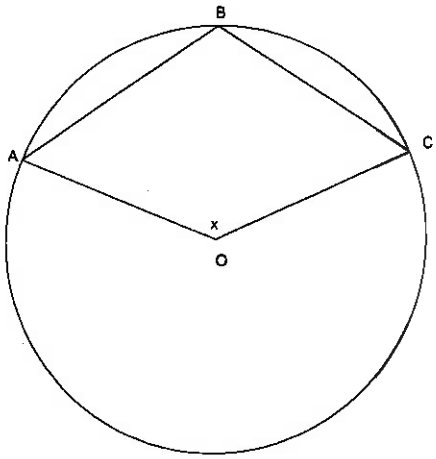
QUESTION ELEVEN

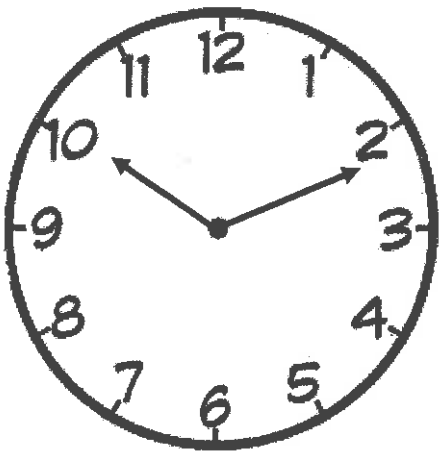


(a) Find with reasons the size of $\hat{B}$ in terms of x (3)

Reflex $A\hat{O}C = 360 - x$ ∠'s around point ✓

$B^{\circ} = 180^{\circ} - \frac{x}{2}$ ✓ ∠ at centre ✓

(b)



The time on the clock is 10:12.
What is the size of the angle between the two hands?

$60\text{min} = 360^{\circ}$

$1\text{min} = 6^{\circ}$ ✓

$22\text{min} = 132^{\circ}$ ✓ (2)