Часть 1

Олимпиада: **Математика, 11 класс (1 часть)**

Шифр: **21100479**

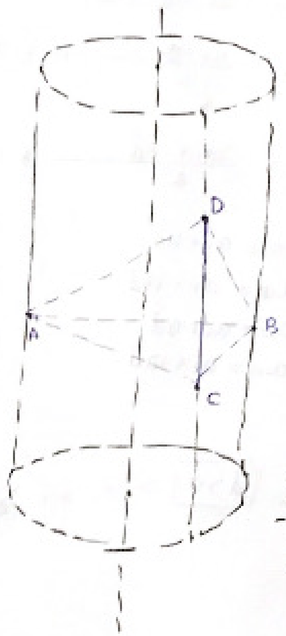
ID профиля: **138487**

Вариант 24

$AB=4$

$AC=CB=7$

$AD=DB=8$



$$\begin{array}{r}64\\-49\\\hline 15\end{array}$$

$$DB^2=(x+y)^2+KB^2$$

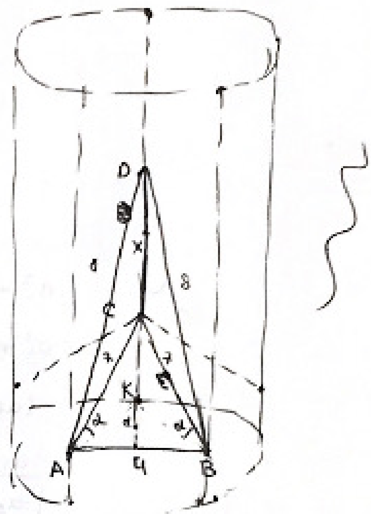
$$CB^2=y^2+KB^2$$

$$DB^2=(x+y)^2+CB^2-y^2$$

$$64=x^2+2xy+\cancel{y^2}+49-\cancel{y^2}$$

$$x^2+2xy=15$$

$$\boxed{y=\frac{15-x^2}{2x}}=CK$$



$$KB=CB^2-CK^2=$$

$$=49-\frac{(15-x^2)}{(2x)^2}=$$

$$=\sqrt{49-\left(\frac{15}{2x}-\frac{x}{2}\right)^2}$$

$$h=\sqrt{KB^2-4}$$

$$S=\frac{1}{2}\cdot h\cdot \cancel{AB}=\frac{\cancel{abc}}{4}=\frac{\cancel{AB}\cdot AK\cdot KB}{4R}$$

$$2R\cdot h=AK\cdot KB=KB^2$$

$$R=\frac{KB^2}{2h}=\frac{49-\left(\frac{15-x^2}{2x}\right)^2}{2\cdot\sqrt{49-\left(\frac{15-x^2}{2x}\right)^2-4}}$$

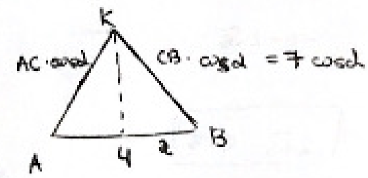
Пусть $\frac{15-x^2}{2x}=m$

$$R=\frac{49-m^2}{2\sqrt{\cancel{49}\ 45-m}}$$

$$R=\frac{49-m}{2\sqrt{45-m}}$$

$$R'=\frac{2(49-m)'\sqrt{45-m}-\left(2\sqrt{45-m}\right)'\cdot(49-m)}{4(45-m)}=$$

$$=\frac{2(-1)\sqrt{45-m}+(49-m)\cdot\frac{1}{\sqrt{45-m}}}{4(45-m)}=0$$



$$\boxed{S=\frac{abc}{4R}}$$

~~S= AC·cosα~~

$$h=\sqrt{CB^2\cdot\cos^2\alpha-4}$$

$$S=\frac{\cancel{AB}\cdot AK\cdot KB}{\cancel{4}R}=\frac{1}{\cancel{2}}\cdot h\cdot\cancel{AB}$$

$$AK\cdot KB=2R\cdot h$$

$$AK^2\cdot\cos^2\alpha=2\cdot R\cdot\sqrt{AK^2\cdot\cos^2\alpha-4}$$

$$\left(2\sqrt{45-m}\right)'=2\left(\sqrt{45-m}\right)'=2\cdot\frac{1}{2\sqrt{45-m}}\cdot(45-m)'=$$

$$=\frac{1}{\sqrt{45-m}}\cdot(-1)$$

$$\sqrt{a}'=\left(a^{\frac{1}{2}}\right)'=\frac{1}{2}\cdot a^{-\frac{1}{2}}=$$

$$=\frac{1}{2\sqrt{a}}$$

$\times\frac{17}{4}$ 68

$a_n = a_1 + d(n-1)$

$S_n = \frac{a_n + a_1}{2} \cdot n = \frac{2a_1 + d(n-1)}{2} \cdot n$

$\times\frac{12}{9}$ 108

$S_9 = \frac{2a_1 + 8d}{2} \cdot 9 = 9(a_1 + 4d)$

$a_5 = a_1 + 4d$

$a_{18} = a_1 + 17d$

$a_{10} = a_1 + 9d$

$a_{13} = a_1 + 12d$

$-\frac{108}{68}$ 40

$-\frac{68}{36}$ 32

$-\frac{108}{96}$ 12

$\boxed{d > 0}$

$a_5 \cdot a_{18} > S - 4$

$(a_1+4d)(a_1+17d) > 9(a_1+4d) - 4$

$a_1^2 + 4a_1d + 17a_1d + 68d^2 > 9a_1 + 36d - 4$

$\underbrace{a_1^2 + 21a_1d + 68d^2 - 9a_1 - 36d + 4}_{>0} > 0$

$a_{10} \cdot a_{13} < S + 60$

$(a_1+9d)(a_1+12d) < 9(a_1+4d) + 60$

$a_1^2 + 12a_1d + 9a_1d + 108d^2 < 9a_1 + 36d + 60$

$\cancel{a_1^2 + 12a_1d +}$

$a_1^2 + 21a_1d + 108d^2 - 9a_1 - 36d - 60 < 0$

$-a_1^2 - 21a_1d - 108d^2 + 9a_1 + 36d + 60 > 0$

$\cancel{a_1^2} + \cancel{21a_1d} + 68d^2 - \cancel{9a_1} - \cancel{36d} + 4 - \cancel{a_1^2} - \cancel{21a_1d} - 108d^2 + \cancel{9a_1} + \cancel{36d} + 60 > 0$

$-40d^2 + 64 > 0$

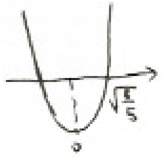
$40d^2 - 64 < 0$ $\qquad \frac{64}{40} = \frac{8}{5}$

$40d^2 < 64$

$d^2 < \frac{64}{40}$

$d^2 < \frac{8}{5}$ $\qquad$ d - целое число $\quad d > 0$

$\left.\begin{array}{l} d \in (0; \sqrt{\frac{8}{5}}) \\ d \in \mathbb{Z} \end{array}\right\} d = 1$



$a_1^2 + 21a_1 + 68 - 9a_1 - 36 + 4 > 0$

$a_1^2 + 12a_1 + 36 > 0$

$(a_1+6)^2 > 0$

$a_1 + 6 \neq 0$

$\boxed{a_1 \neq -6}$

$a_1^2 + 21a_1 + 108 - 9a_1 - 36 - 60 < 0$

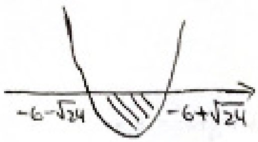
$a_1^2 + 12a_1 + 12 < 0$

$\cancel{D = 36 - 12}$

$\cancel{D = 144 - 4 \cdot 12 =}$

$D_1 = 36 - 12 = 24$

$\left[\begin{array}{l} a_1 = -6 + \sqrt{24} \\ a_1 = -6 - \sqrt{24} \end{array}\right.$



$-6 - 2\sqrt{6}$

$\boxed{2\sqrt{6} < 5}$

$24 \cdot 6 \quad 25$

$24 \quad 25$

$2\sqrt{6} > 4$

$4 \cdot 6 \quad 16$

$24 \quad 16$

$-6 + 2\sqrt{6}$

$4, \ldots$

$-6 + 4, \ldots$

$-6 - 4, \ldots$

$1, \ldots$

$-10, \ldots$

$-10 > -6 - 2\sqrt{6}$

$-4 \quad -2\sqrt{6}$

$4 \quad 2\sqrt{6}$

$2 \quad \sqrt{6}$

$4 < 6$

$\times\frac{3,5}{3,5}$ 175 105 $12,25$

$-6 + 2\sqrt{6} < 0$

$2\sqrt{6} \quad 6$

$\sqrt{6} \quad 3$

$6 < 9$

$-11 < -6 - 2\sqrt{6}$

$-5 \quad -2\sqrt{6}$

$5 \quad 2\sqrt{6}$

$25 \quad 4 \cdot 6$

$25 > 24$

$-6 + 2\sqrt{6} < 1$

$2\sqrt{6} \quad 7$

$24 < 49$

$\sqrt{6} \quad 3,5$

$-\frac{41}{15}$ 26

$-6 + 2\sqrt{6} < -1$

$2\sqrt{6} \quad 5$

$24 < 25$

$-6 + 2\sqrt{6} > -2$

$2\sqrt{6} \quad 4$

$24 > 16$

Обратная замена

$m = \left(\frac{15-x^2}{2x}\right)^2$

$$\left[\begin{array}{l} \frac{15-x^2}{2x} = \sqrt{41} \\ \frac{15-x^2}{2x} = -\sqrt{41} \end{array}\right.$$

$$\left[\begin{array}{l} \frac{15-x^2-2x\sqrt{41}}{2x} = 0 \\ \frac{15-x^2+2x\sqrt{41}}{2x} = 0 \end{array}\right.$$

$$\begin{cases} \left[\begin{array}{l} -x^2-2x\sqrt{41}+15=0 \\ -x^2+2x\sqrt{41}+15=0 \end{array}\right. \\ x \neq 0 \end{cases}$$

$$\begin{cases} \left[\begin{array}{l} x=\sqrt{56}-\sqrt{41} \\ x=\sqrt{41}+\sqrt{56} \end{array}\right. \\ x \neq 0 \end{cases}$$

$$\left[\begin{array}{l} x=\sqrt{56}-\sqrt{41} \\ x=\sqrt{56}+\sqrt{41} \end{array}\right.$$

$x^2+2x\sqrt{41}-15=0$

$D_1 = 41+15 = 56$

$$\left[\begin{array}{l} x=-\sqrt{41}+\sqrt{56} \\ x=-\sqrt{41}-\sqrt{56} \text{ — не уд. т.к. } x>0 \end{array}\right.$$

$x^2-2x\sqrt{41}-15=0$

$D_1 = 41+15 = 56$

$$\left[\begin{array}{l} x=\sqrt{41}+\sqrt{56} \\ x=\sqrt{41}-\sqrt{56} \text{ — не уд. т.к. } x>0 \end{array}\right.$$

Ответ: ~~[illegible]~~ $x \in \{(\sqrt{56}-\sqrt{41}); (\sqrt{56}+\sqrt{41})\}$

① Дано:

$S_9 = S$

$a_5 \cdot a_{18} > S-4$

$a_{10} \cdot a_{13} < S+60$

Найти: a_1

Решение:

$$\begin{cases} S_n = \dfrac{2a_1+d(n-1)}{2}\cdot n \\ a_n = a_1+d(n-1) \end{cases} \Rightarrow \begin{cases} S_9 = 9(a_1+4d) \\ a_5 = a_1+4d \\ a_{18} = a_1+17d \\ a_{10} = a_1+9d \\ a_{13} = a_1+12d \end{cases}$$

$a_5 \cdot a_{18} > S-4$

$(a_1+4d)(a_1+17d) > 9(a_1+4d)-4$

$a_1^2+21a_1d+68d^2-9a_1-36d+4>0$ (1)

$a_{10} \cdot a_{13} < S+60$

$(a_1+9d)(a_1+12d) < 9(a_1+4d)+60$

$a_1^2+21a_1d+108d^2-9a_1-36d-60<0$ (2)

Выражени в левой части неравенства (1) больше нуля, а неравенства (2) – меньше нуля. Если мы от положительного значения отнимем отрицательное, ~~то~~ то получившееся выражение будет положительно.

Из (1) и (2):

$a_1^2+21a_1d+68d^2-9a_1-36d+4-a_1^2-21a_1d-108d^2+9a_1+36d+60>0$

$-40d^2+64>0$

$40d^2-64<0$

$d^2 < \frac{64}{40}$

$d^2 < \frac{8}{5}$

• Прогрессия возрастающ. $\Rightarrow d>0$

• все члены прогрес. – целые числа $\Rightarrow d \in \mathbb{Z}$

$$\left.\begin{matrix} d \in \left(0; \sqrt{\frac{8}{5}}\right) \\ d \in \mathbb{Z} \end{matrix}\right\} \Rightarrow \boxed{d=1} \quad (3)$$

Перепишем выражение (1) и (2), учитывая (3)

$a_1^2+21a_1+68-9a_1-36+4>0$

$a_1^2+12a_1+36>0$

$(a_1+6)^2>0$

$a_1 \neq -6$

↑ условие 1

$a_1^2+21a_1+108-9a_1-36-60<0$

$a_1^2+12a_1+12<0$

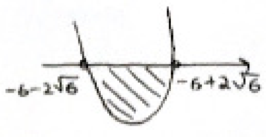
Введем функцию

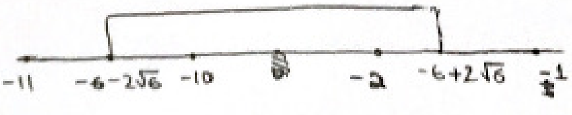
$y(a) = a_1^2+12a_1+12$

$a_1^2+12a_1+12=0$

$D_1 = 36-12 = 24$

$$\left[\begin{matrix} a_1 = -6+\sqrt{24} \\ a_1 = -6-\sqrt{24} \end{matrix}\right. \qquad \left[\begin{matrix} a_1 = -6+2\sqrt{6} \\ a_1 = -6-2\sqrt{6} \end{matrix}\right.$$





$$\left.\begin{matrix} a_1 \in \mathbb{Z} \\ a_1 \in (-6-2\sqrt{6}; -6+2\sqrt{6}) \end{matrix}\right\} \Rightarrow \begin{cases} a \in [-10; -2] \\ a \in \mathbb{Z} \end{cases}$$

↖ условие 2

Учитывая условие 1 и 2:

$a \in \{-10; -9; -8; -7; -5; -4; -3; -2\}$

Ответ: $a \in \{-10; -9; -8; -7; -5; -4; -3; -2\}$

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② Дано:

$AB = 4$

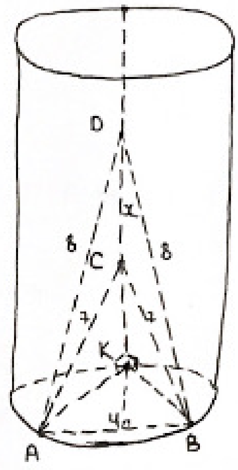
$AC = CB = 7$

$AD = DB = 8$

R_{min}

$CD - ?$

Решение:



1) Пусть $CD = x$.

(AKB) – плоскость основания цилиндра.

Тогда KB – проекция CB на (AKB), KA – проекц. AC на (AKB)

т.к. $\triangle ADC = \triangle BDC$ (по ~~пр~~ ССС), ~~так AK = KB~~, то $\angle ADK = \angle BDK \Rightarrow$

$\Rightarrow \triangle ADK = \triangle BDK$ (по СУС: $AD = DB$, KD – общ, $\angle ADK = \angle BDK$) $\Rightarrow$

$\Rightarrow AK = KB$

2) т.к. $\triangle BKB$ – прямоуг.

По т-ме Пифагора:

$$DB^2 = (DC + CK)^2 + KB^2 \quad (1)$$

$$CB^2 = (CK)^2 + (KB)^2 \quad (2)$$

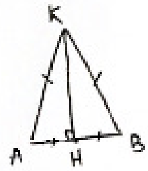
Вычтем из (1) выражение (2)

$$DB^2 - CB^2 = DC^2 + 2 \cdot DC \cdot CK + CK^2 + KB^2 - CK^2 - KB^2$$

$$64 - 49 = x^2 + 2x \cdot CK$$

$$15 = x^2 + 2x \cdot CK$$

$$CK = \frac{15 - x^2}{2x}$$



3) ~~AB~~ Из теорем. Пифагора

$$KB = \sqrt{CB^2 - CK^2} = \sqrt{49 - \left(\frac{15 - x^2}{2x}\right)^2}$$

Пусть KH – высота $\triangle AKB$

Из т-мы Пифагора:

$$KH = \sqrt{KB^2 - HB^2} = \sqrt{KB^2 - \left(\frac{AB}{2}\right)^2} = \sqrt{49 - \left(\frac{15 - x^2}{2x}\right)^2 - 4} =$$

$$= \sqrt{45 - \left(\frac{15 - x^2}{2x}\right)^2}$$

4) $\left.\begin{aligned} S_{AKB} &= \frac{1}{2} \cdot AB \cdot KH \\ S_{AKB} &= \frac{AK \cdot KB \cdot AB}{4R} \end{aligned}\right\}$ $\frac{1}{2} AB \cdot KH = \frac{AK \cdot KB \cdot AB}{4R} \Rightarrow R = \frac{AK \cdot KB}{2 \cdot KH} = \frac{KB^2}{2 \cdot KH}$

$$R = \frac{49 - \left(\frac{15 - x^2}{2x}\right)^2}{2 \cdot \sqrt{45 - \left(\frac{15 - x^2}{2x}\right)^2}}$$

Пусть $\left(\frac{15 - x^2}{2x}\right)^2 = m$, тогда $R = \frac{49 - m}{2\sqrt{45 - m}}$

$$R' = \frac{2(49 - m)' \cdot \sqrt{45 - m} - 2(49 - m)\left(\sqrt{45 - m}\right)'}{4(45 - m)} = \frac{-2\sqrt{45 - m} - 2 \cdot (49 - m) \cdot \frac{1}{2\sqrt{45 - m}} \cdot (-1)}{4(45 - m)} =$$

$$= \frac{-2\sqrt{45 - m} + \frac{49 - m}{2\sqrt{45 - m}}}{4(45 - m)}$$

в экстремуме функц. $R(m)$ $R' = 0$. $\Rightarrow$

$$\Rightarrow \frac{\frac{-2(45 - m) + 49 - m}{\sqrt{45 - m}}}{4(45 - m)} = 0$$

$$\frac{-90 + 2m + 49 - m}{4(45 - m)^{\frac{3}{2}}} = 0$$

$$m = 41$$

$\Rightarrow m = 41 \leftarrow$ точка минимума

R_{min} при $m = 41$

Черновик

$$\begin{array}{r} 90 \\ -49 \\ \hline 41 \end{array}$$

$$-2\sqrt{45-m} + \frac{49-m}{\sqrt{45-m}} = 0$$

$$\frac{-2(45-m)+49-m}{\sqrt{45-m}} = 0$$

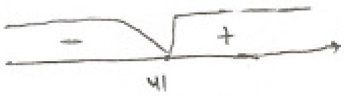
$$\frac{-90+2m+49-m}{\sqrt{45-m}} = 0$$

$$\frac{m-41}{\sqrt{45-m}} = 0 \Rightarrow m = 41$$

$45-m>0$

$45>m$

$\boxed{m<45}$



При $m=41$
R_{min}

$$m_{min}=41 \Rightarrow \left(\frac{15-x^2}{2x}\right)_{\cancel{min}} = 41$$

82

41

$$\frac{15-x^2}{2x} = 41$$

$$\frac{15-x^2-82x}{2x} = 0$$

$$-x^2-82x+15=0$$

$$x^2+82x-15=0$$

$$D=41^2 \cancel{\ } +15$$

Часть 2

Олимпиада: **Математика, 11 класс (2 часть)**

Шифр: **21100479**

ID профиля: **138487**

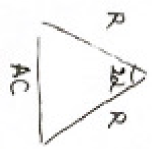
Вариант 24

$\log_{a^2} \frac{1}{2} \cdot b$

$\log_{c^2} a$

$\log_b \frac{t}{2} - c$

Черновик



I $\log_{a^2} \frac{1}{2} \cdot b = \log_{c^2} a$

$\frac{1}{2} \log_a b = \frac{1}{\log_a c^2}$

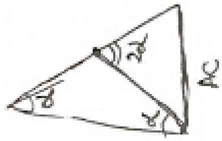
$\frac{1}{2} \log_a b \cdot \log_a c^2 = 1$

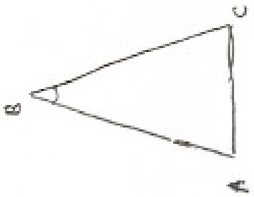
$\log_b -c \quad -1 = \log_{a^2} \frac{1}{2} \cdot b$

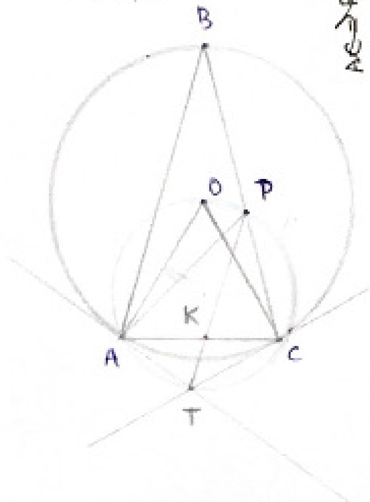
$t \log_b -c - \log_{a^2} \frac{1}{2} b = 1$

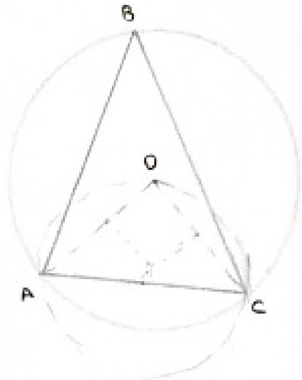
$\log_{a^2} \frac{1}{2} b$ $\quad x+1 \geq 0$

$x > -1$









$S_{APK} = 16$

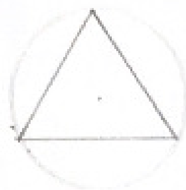
$S_{CPK} = 14$

3·11

НОК

3·11

$3^{19} \cdot 11^{15}$

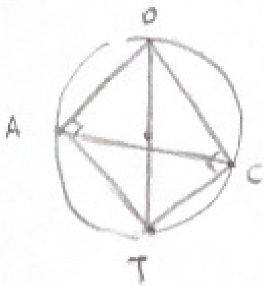


$S = \frac{abc}{4R}$

$S = \frac{1}{2} \cdot a \cdot b \cdot \sin\alpha$

$S = \frac{1}{2} \cdot ah$

$S =$



$S =$

$tg(\alpha+\beta) =$

$tg(\alpha+\beta) = \frac{tg\alpha + tg\beta}{1 - tg\alpha \cdot tg\beta}$

$\begin{array}{r} +225 \\ 64 \\ \hline 289 \end{array} = R^2$

$tg(2\alpha) = \frac{2 tg\alpha}{1 - tg^2\alpha}$

tg

$tg(60) = \frac{2 tg 30}{1 - (tg 30)^2} = \frac{2 \cdot \frac{\sqrt{3}}{3}}{1 - \frac{1}{3}} = \frac{2 \cdot \frac{\sqrt{3}}{3}}{\frac{2}{3}} = \frac{2 \cdot \sqrt{3}}{2} = \sqrt{3}$

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$1 + ctg^2\alpha = \frac{1}{\sin^2\alpha}$

$1 + \frac{64}{225} = \frac{1}{\sin^2\alpha}$ $\quad \frac{289}{225} \Rightarrow \sin\alpha = \sqrt{\frac{225}{64}} = \frac{17}{8}$

Дано:

$S_{APK} = 16$

$S_{CPK} = 14$

S_{ABC} – ?

AC – ?

$\angle ABC = \operatorname{arctg}\frac{3}{5}$

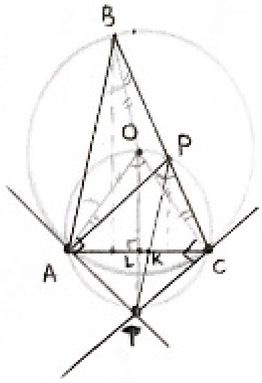
Решение:

1) AT и TC – касательн. к ω ⇒ AT и TC перпендикул. радиусам окружности, провед. в т. касания.

$\left.\begin{matrix} OA \perp AT \\ OC \perp TC \end{matrix}\right\} \Rightarrow \angle OCT + \angle OAT = 180^\circ \Rightarrow$

$\Rightarrow \angle AOC + \angle ATC = 360 - 180 = 180^\circ \Rightarrow$

⇒ точки A, O, C, T лежат на одн. окружн.



2) △APK и △CPK имеют одинаков. высоту, провед. из т. P ⇒

$\Rightarrow \frac{S_{APK}}{S_{CPK}} = \frac{AK}{KC} = \frac{16}{14} = \frac{8}{7}$

3) AO = OC (радиусы окр. ω) ⇒ △AOC – р/б ⇒

OT ∩ AC = L, ~~OL будет~~ OL ⊥ AC, AL = LC

$KC = \frac{7}{15} AC$, $AK = \frac{8}{15}$

$LK = \frac{15}{30} AC - \frac{14}{30} AC = \frac{1}{30} AC$

4) $\angle ABC = \angle AOC \cdot \frac{1}{2}$ (т.к. вписан. и центр. углы)

$\angle ABC = \operatorname{arctg}\frac{3}{5} \Rightarrow \operatorname{tg}\angle ABC = \frac{3}{5}$

$\operatorname{tg}\angle AOC = \operatorname{tg}(2\angle ABC) = \frac{2\cdot\frac{3}{5}}{1-\frac{9}{25}} = \frac{\frac{6}{5}}{\frac{16}{25}} = \frac{30}{16} = \frac{15}{8} \Rightarrow$

$\Rightarrow \sin\angle AOC = \frac{17}{8}$

5) ∠PCO = ∠PBO (т.к. △BOC – р/б, т.к. BO = OC = R)

Аналогично, ∠OBA = ∠BAO.

∠PCO = ∠OAP (опир. на одну дугу)

∠ABC = ∠ABO + ∠OBP = ∠BAO + ∠OAP = ∠BAP ⇒ △ABP – р/б ⇒ AP = BP

6) △ABC и △APC имеют общ. высоту, пров. из вершины A ⇒ $\frac{S_{ABC}}{S_{APC}} = \frac{BC}{PC} = \frac{BP+PC}{PC} =$

$= \frac{BP}{PC} + 1 = \frac{AP}{PC} + 1$

7) т.к. △AOC – р/б, то OL – биссектрисса ⇒ ∠AOL = ∠LOC

$\left.\begin{matrix} \angle AOT = \angle APT \text{ (опир. на одну дугу)} \Rightarrow \angle APT = \angle AOL = \frac{\angle AOC}{2} \\ \angle TPC = \angle TOC \text{ (опир. на одну дугу)} \Rightarrow \angle TPC = \angle LOC = \frac{\angle AOC}{2} \end{matrix}\right\} \Rightarrow$ PT – биссектрисса ∠APC

По с-ву биссектрисы:

$\frac{AK}{AP} = \frac{KC}{PC} \Rightarrow \frac{AP}{PC} = \frac{AK}{KC}$, но по доказан. в пункте 2, $\frac{AK}{KC} = \frac{7}{8} \Rightarrow \frac{AP}{PC} = \frac{8}{7}$

По доказан. в пункте 6, $\frac{S_{ABC}}{S_{APC}} = \frac{AP}{PC} + 1 = \frac{8}{7} + 1 = \frac{15}{7} \Rightarrow$

$\Rightarrow \boxed{S_{ABC} = \frac{15}{7} \cdot S_{APC} = \frac{15}{7}(S_{APK} + S_{KPC}) = \frac{15}{7}(16+14) = \frac{15}{7}\cdot 30 = \frac{550}{7}}$

8) $AC = 2 \cdot R \cdot \sin\alpha$

$S_{AOC} = \frac{1}{2} \cdot R \cdot R \cdot \sin 2\alpha = \frac{1}{2} \cdot OL \cdot AC$, $OL = R \cdot \cos\alpha$

$\frac{1}{2} \cdot R \cdot R \cdot \sin 2\alpha = \frac{1}{2} \cdot R \cdot \cos\alpha$

Ответ: 1) $S_{ABC} = \frac{550}{7}$

2)

⑤ $\log_{\sqrt{29-x}}\left(\frac{x}{7}+7\right)$

$\log_{(x+1)^2}(29-x)$

$\log_{\frac{x}{7}+7}(-x-1)$

ОДЗ: $\frac{x}{7}+7>0 \Rightarrow x>-49$

$\sqrt{29-x}>0 \Rightarrow x\neq 29$

$\sqrt{29-x}\neq 1 \Rightarrow x\neq 28$

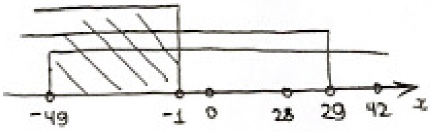
$29-x>0 \Rightarrow x<29$

$(x+1)^2>0 \Rightarrow x\neq -1$

$(x+1)^2\neq 1 \Rightarrow x\neq 0$

$\frac{x}{7}+7\neq 1 \Rightarrow x\neq -42$

$-x-1>0 \Rightarrow x<-1$



$x\in(-49;-1)$

I $\log_{\sqrt{29-x}}\left(\frac{x}{7}+7\right)=\log_{(x+1)^2}(29-x)$

$\log_{(29-x)^{\frac{1}{2}}}\left(\frac{x}{7}+7\right)=\frac{1}{\log_{(29-x)}(x+1)^2}$

$2\log_{(29-x)}\left(\frac{x}{7}+7\right)=\frac{1}{\log_{(29-x)}(x+1)^2}$

$2\log_{(29-x)}\left(\frac{x}{7}+7\right)\cdot\log_{(29-x)}(x+1)^2=1$

$\log_{\left(\frac{x}{7}+7\right)}(-x-1)-1=\log_{\sqrt{29-x}}\left(\frac{x}{7}+7\right)$

$\log_{\left(\frac{x}{7}+7\right)}(-x-1)-\log_{\sqrt{29-x}}\left(\frac{x}{7}+7\right)=1$

$\log_{(29-x)^{\frac{1}{2}}}\left(\frac{x}{7}+7\right)\cdot\log_{(29-x)}(x+1)^2=\log_{\left(\frac{x}{7}+7\right)}(-x-1)-\log_{(29-x)^{\frac{1}{2}}}\left(\frac{x}{7}+7\right)$

$\log_{(29-x)}\left(\frac{x}{7}+7\right)^2\cdot\log_{(29-x)}(x+1)^2=\log_{\left(\frac{x}{7}+7\right)}(-x-1)-\log_{(29-x)}\left(\frac{x}{7}+7\right)^2$

$\log_{(29-x)}\left(\frac{x}{7}+7\right)^2\left(\log_{(29-x)}(x+1)^2+1\right)=\log_{\left(\frac{x}{7}+7\right)}(-x-1)$

$\log_{(29-x)}\left(\frac{x}{7}+7\right)^2\left(\log_{(29-x)}\left((x+1)^2\cdot(29-x)\right)\right)$

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