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△ABC において, 次の値を求めよ。

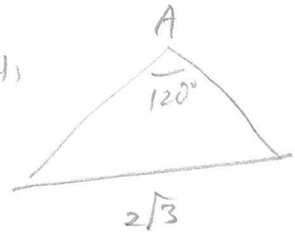
(1) $a = 2\sqrt{3}$, $\angle A = 120^\circ$ のとき, 外接円の半径 R

(2) $a = \sqrt{2}$, $\angle A = 45^\circ$, $\angle B = 60^\circ$ のとき, b の長さ

(3) $b = 6$, $c = 4$, $\angle A = 120^\circ$ のとき, a の長さ

(4) $a = 1 + \sqrt{3}$, $b = \sqrt{2}$, $c = 2$ のとき, $\angle C$ の大きさ

(1)

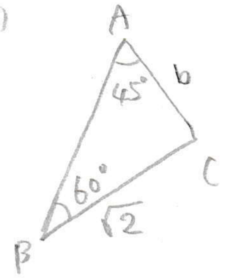


$\dfrac{2\sqrt{3}}{\sin 120} = 2R$ (∵ Rは外接円の半径)

$2\sqrt{3} \div \dfrac{\sqrt{3}}{2} = 2R$

$2R = 4$ $\underline{R = 2}$

(2)



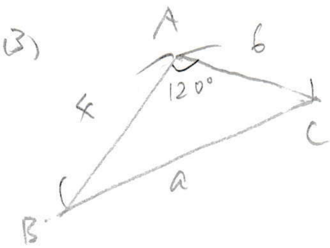
正弦定理より

$\dfrac{\sqrt{2}}{\sin 45} = \dfrac{b}{\sin 60}$

$b \sin 45^\circ = \sqrt{2} \sin 60^\circ$

$\dfrac{1}{\sqrt{2}} b = \dfrac{\sqrt{6}}{2}$ $\underline{b = \sqrt{3}}$

(3)



余弦定理より

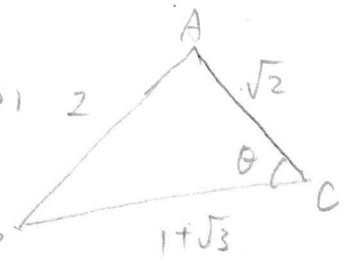
$a^2 = 16 + 36 - 2 \cdot 4 \cdot 6 \underbrace{\cos 120^\circ}_{-\frac{1}{2}}$

$= 52 + 24$

$= 76$ $\underline{a = 2\sqrt{19}}$

4) $\dfrac{76}{19}$

(3)



余弦定理より ∠C=θとすると

$4 = (\sqrt{2})^2 + (1+\sqrt{3})^2 - 2 \cdot \sqrt{2} \cdot (1+\sqrt{3}) \cos\theta$

$\cancel{4} = 2 + \cancel{4} + 2\sqrt{3} - 2\sqrt{2}(1+\sqrt{3}) \cos\theta$

$2\sqrt{2}(1+\sqrt{3}) \cos\theta = 2(1+\sqrt{3})$ $0^\circ < \theta < 180^\circ$

$\cos\theta = \dfrac{2(1+\sqrt{3})}{2\sqrt{2}(1+\sqrt{3})} = \dfrac{1}{\sqrt{2}}$ より $\underline{\theta = 45^\circ}$