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$$145. (4) \text{与式} = \sqrt{\frac{1 - \frac{\sqrt{3}}{2}}{1 + \frac{\sqrt{3}}{2}}} = \sqrt{\frac{2 - \sqrt{3}}{2 + \sqrt{3}}} = \sqrt{\frac{(2 - \sqrt{3})^2}{(2 + \sqrt{3})(2 - \sqrt{3})}} = \sqrt{\frac{(2 - \sqrt{3})^2}{4 - 3}} = \sqrt{(2 - \sqrt{3})^2} = 2 - \sqrt{3}.$$

$$147. BD = AB = \sqrt{3}, \quad AC = 2 + \sqrt{3}, \quad AD^2 = AC^2 + CD^2 = (2 + \sqrt{3})^2 + 1 = 8 + 4\sqrt{3}.$$

$$\text{よって } AD = \sqrt{8 + 4\sqrt{3}} = 2\sqrt{2 + \sqrt{3}}. \text{ よって } \sin 15^\circ = \frac{1}{2\sqrt{2 + \sqrt{3}}},$$

$$\cos 15^\circ = \frac{2 + \sqrt{3}}{2\sqrt{2 + \sqrt{3}}} = \frac{(2 + \sqrt{3})\sqrt{2 + \sqrt{3}}}{2\sqrt{2 + \sqrt{3}}\sqrt{2 + \sqrt{3}}} = \frac{(2 + \sqrt{3})\sqrt{2 + \sqrt{3}}}{2(2 + \sqrt{3})} = \frac{\sqrt{2 + \sqrt{3}}}{2},$$

$$\tan 15^\circ = \frac{1}{2 + \sqrt{3}} = \frac{2 - \sqrt{3}}{(2 + \sqrt{3})(2 - \sqrt{3})} = \frac{2 - \sqrt{3}}{4 - 3} = 2 - \sqrt{3}$$

$$148. \text{巻末解答参照} \quad \text{条件より } AB = 100(\text{cm}), OH = 90(\text{cm}) \text{ よって } AH = 50\sqrt{2},$$

$$\tan \alpha = \frac{OH}{AH} = \frac{90}{50\sqrt{2}} = \frac{9\sqrt{2}}{10} = 1.2728 \text{ よって } \alpha = 52^\circ. \quad MH = 50. \text{ よって } \tan \beta = \frac{90}{50} = 1.8 \text{ よって } \beta = 61^\circ.$$

$$OM^2 = OH^2 + MH^2 = 90^2 + 50^2 = 10600. \therefore OM = 10\sqrt{106}. \text{ よって } \tan \frac{\gamma}{2} = \frac{BM}{OM} = \frac{50}{10\sqrt{106}} = 0.4856.$$

$$\text{よって } \frac{\gamma}{2} = 26^\circ \therefore \gamma = 52^\circ$$

$$149. (1) \cos A = \frac{b^2 + c^2 - a^2}{2bc} = \frac{\sqrt{6}^2 + (\sqrt{3} + 1)^2 - 2^2}{2\sqrt{6}(\sqrt{3} + 1)} = \frac{6 + 3 + 2\sqrt{3} + 1 - 4}{2\sqrt{6}(\sqrt{3} + 1)}$$

$$= \frac{6 + 2\sqrt{3}}{2\sqrt{6}(\sqrt{3} + 1)} = \frac{2(3 + \sqrt{3})}{2\sqrt{2}(3 + \sqrt{3})} = \frac{1}{\sqrt{2}} \text{ よって } A = 45^\circ$$

$$\cos B = \frac{c^2 + a^2 - b^2}{2ab} = \frac{2^2 + (\sqrt{3} + 1)^2 - \sqrt{6}^2}{2(\sqrt{3} + 1)2} = \frac{2 + 2\sqrt{3}}{4(\sqrt{3} + 1)} = \frac{2(1 + \sqrt{3})}{4(\sqrt{3} + 1)} = \frac{1}{2} \text{ よって } B = 60^\circ$$

$$C = 180^\circ - (A + B) = 180^\circ - (45^\circ + 60^\circ) = 75^\circ$$

$$(2) \cos A = \frac{(3\sqrt{2})^2 + (3 - \sqrt{3})^2 - (2\sqrt{3})^2}{2 \cdot 3\sqrt{2}(3 - \sqrt{3})} = \frac{18 - 6\sqrt{3}}{6\sqrt{2}(3 - \sqrt{3})} = \frac{6(3 - \sqrt{3})}{6\sqrt{2}(3 - \sqrt{3})} = \frac{1}{\sqrt{2}} \text{ よって } A = 45^\circ$$

$$\cos B = \frac{(3 - \sqrt{3})^2 + (2\sqrt{3})^2 - (3\sqrt{2})^2}{2(3 - \sqrt{3})2\sqrt{3}} = \frac{6 - 6\sqrt{3}}{4\sqrt{3}(3 - \sqrt{3})} = \frac{6(1 - \sqrt{3})}{12(\sqrt{3} - 1)} = -\frac{1}{2} \text{ よって } B = 120^\circ$$

$$C = 180^\circ - (A + B) = 180^\circ - (45^\circ + 120^\circ) = 15^\circ$$

$$150. \text{巻末解答と別の方法} : \cos A = \frac{b^2 + c^2 - a^2}{2bc} = \frac{5^2 + 7^2 - 8^2}{2 \cdot 5 \cdot 7} = \frac{1}{7}.$$

$$\text{よって } \sin A = \sqrt{1 - \cos^2 A} = \sqrt{1 - \left(\frac{1}{7}\right)^2} = \frac{4\sqrt{3}}{7}.$$

$$2R = \frac{a}{\sin A} = 8 \cdot \frac{7}{4\sqrt{3}} = \frac{14\sqrt{3}}{3} \therefore R = \frac{7\sqrt{3}}{3}.$$

151. 巻末解答参照

$$153 \text{ 正弦定理より } \sin A = \frac{a}{2R}, \sin B = \frac{b}{2R}, \sin C = \frac{c}{2R}. \text{ 余弦定理より } \cos A = \frac{b^2 + c^2 - a^2}{2bc}, \cos B = \dots \text{ を}$$

(2), (3) は左辺に代入して右辺を導く, (1), (4) は右辺, 左辺 それぞれに代入して別々に整理する.

$$154. (3) \text{条件式より } b \tan A = a \tan B, \therefore \frac{b \sin A}{\cos A} = \frac{a \sin B}{\cos B}. \sin A = \frac{a}{2R}, \sin B = \frac{b}{2R} \text{ より}$$

$$\frac{ab}{2R \cos A} = \frac{ab}{2R \cos B} \therefore \cos A = \cos B \therefore A = B.$$