1. 7° 12′: 8 grades. **2.** $\frac{4\pi}{15}, \frac{\pi}{3}, \frac{2\pi}{5}$. **4.** $\frac{3}{2}$.

5. $15\sqrt{3}=25{\cdot}98$ m. **6.** 790 m. **7.** 1·745 m.

8. $\frac{8}{17}, \frac{15}{17}$. **9.** 30°, 60°. **10.** $\frac{125}{78}$. **12.** $\frac{1-\tan^8 A}{\tan^4 A}$.

17. (1) 45°; (2) 60°. **18.** 327·2 m. **21.** 200, 183 nearly.

22. ·09375; 16·7552. **24.** $\sqrt{2}:1$. **25.** 1; tan A.

27. $-\frac{5}{31}$. **28.** 45° or 60°. **29.** 15° 12′ 45″.

30. 260·26 m. **32.** (1) 60°; (2) 60°. **33.** 6° 18′.

34. sine $=\frac{24}{25}$, cosine $=\frac{7}{25}$, tangent $=\frac{24}{7}$.

35. (1) and (3) are impossible, (2) and (4) possible.

37. $B=45°$, $b=25\sqrt{2}$, $p=25$. **39.** $-\frac{\sqrt{3}}{2}, -2, \frac{1}{\sqrt{3}}$.

40. 45°, 135°, 225°, 315°, 405°, 495°. **42.** 15°, 75°.

45. 30°, 150°, 270°. **46.** $\pm{\cdot}8$. **47.** $\frac{16}{65}$.

48. tan $2A$. **49.** $\pm\frac{1}{\sqrt{3}}$. **50.** $500\,(3+\sqrt{3})=2366$ m.

51. (1) 0; (2) -2. **53.** $\frac{a^2-b^2}{a^2+b^2}$. **55.** $-\sqrt{3}, -\frac{1}{2}, \frac{1}{\sqrt{3}}$.

56. $6\frac{4}{11}°$. **57.** $-\frac{15}{352}$. **59.** (1) cot C; (2) 2.

60. $50\sqrt{6}$ m. **66.** $50\sqrt{3}=86{\cdot}6$ m. **67.** 3·141.

70. -1. **73.** $\frac{1}{2}\sin 2\theta$. **74.** $x^{\frac{2}{3}}+y^{\frac{2}{3}}=4^{\frac{2}{3}}$.

75. $5\sqrt{3}$ m.; $5(3+\sqrt{3})$ m.; $20+5\sqrt{3}$ m. **77.** 22·5 cm.

84. 4·14 km. **89.** ·38021, 3·73239, 9·76143.

95. 27° 45′ 44″. **97.** $\sin 2A=-\frac{336}{625}$; $\tan\frac{A}{2}=-\frac{1}{7}$.

98. $2-\sqrt{3}$. **99.** $\bar{2}{\cdot}60206$, $1{\cdot}3802113$, $\bar{1}{\cdot}8239087$.

102. 45, 53; 58° 6′ 33·2″. **104.** 120°. **106.** $\frac{20}{21}$.

107. 4 cosec 2θ. **108.** 49° 28′ 32″.

110. 2·30103, $\bar{2}{\cdot}39794$, ·598626, 9·69897, 9·849485.

112. 114 yds., 57 yds. **114.** 53° 7′ 48″. **115.** ·8, 1·25.

116. ·90309, 1·10739, $\bar{8}$·52575. **117.** $\frac{1}{\sqrt{2}}$.

118. $-\tan\frac{\alpha}{2}\cot\frac{\beta}{2}$, $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}$. **120.** 13·5 m; 58°6′.

122. 1·60206, $\bar{1}$·562469. **123.** 34° 18′ 1″, 1° 41′ 59″.

127. $\pm\frac{2\sqrt{5}}{5}$. **131.** 1·3011928.

137. ·69897, ·845098, 1·113943.

138. 49° 19′ 30″, 40° 40′ 30″. **143.** ·4855934.

144. 39° 35′ 11″, 28° 20′ 49″.

146. 2·0755469, ·3853509, $\bar{1}$·9256038.

149. $100\sqrt{2}$, $50\sqrt{2}$; 71° 33′ 54″, 108° 26′ 6″.

150. $\operatorname{cosec} x-\operatorname{cosec} 3^n x$. **152.** 45°, 60°, 120°, 135°.

154. $-\frac{56}{33}$; $\frac{4}{5}$, $\frac{12}{13}$, $-\frac{33}{65}$; 120° 30′ 37″.

158. ·30103, ·477121, 1·041393. **160.** 68° 52′ 42″.

161. $\frac{\text{area of circle}}{\text{area of octagon}}=\frac{1380}{1309}$. **165.** $\frac{c\sin\beta}{\sin(\alpha+\beta)}$, $\frac{c\sin\alpha\sin\beta}{\sin(\alpha+\beta)}$

166. $-4\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$. **173.** $B=4°\ 55'\ 11''$, $C=178°\ 27'\ 25''$.

176. $B=105°$, $C=45°$, $a=\sqrt{2}$.

178. $B=81°\ 47'\ 12''$ or $98°\ 12'\ 48''$; $c=13$ or 11;
$C=68°\ 12'\ 48''$ or $51°\ 47'\ 12''$.

180. 3333·3 m. **186.** 64° 31′ 58″.

191. 2310 sq m; 55 m, 66 m, 70 m.

193. (1) $n\pi$, $\frac{n\pi}{2}\pm\frac{\pi}{16}$; (2) $n\pi\pm\frac{\pi}{6}$.

197. 134·19 m. **204.** 226·87. **206.** $\frac{4}{3}$, $-\frac{3}{8}$.

212. (1) $(2n+1)\frac{\pi}{8}$, $n\pi+(-1)^n\frac{\pi}{4}$; (2) $n\pi$, $n\pi+\frac{3\pi}{4}$.

214. 10 m. **219.** $\frac{1}{4}$ or -8. **222.** 37·27919 m.

231. $4\frac{1}{8}$ km approximately. **233.** $\pm\frac{7}{23}$.

235. (1) $\frac{n\pi}{4}$, $\frac{2n\pi}{3} \pm \frac{\pi}{9}$; (2) $n\pi + \frac{\pi}{3}$, $n\pi + \frac{3\pi}{4}$.

242. 10°. **246.** 205·4. **252.** 1224·35 m.

256. 9·65146, 20·5309. **262.** $\alpha+\beta+\gamma=(2n+1)\frac{\pi}{2}$.

264. $\sqrt{2}$ km. **266.** $\theta=n\pi$.

275. $B=70°\ 0'\ 57''$ or $109°\ 59'\ 3''$;
$C=59°\ 59'\ 3''$ or $20°\ 0'\ 57''$. **277.** θ.

279. $\cos(\alpha+\beta+\gamma+\delta)+\cos(\alpha+\beta-\gamma-\delta)+\cos(\alpha+\gamma-\beta-\delta)$
$+\cos(\alpha+\delta-\beta-\gamma)$.

281. 4. **283.** $A=45°$, $B=112\frac{1}{2}°$, $c=\sqrt{2-\sqrt{2}}$.