

IM2 Book 2 Selected Answers

IM2 Dream Team

March 2025

1. $P_{original} = 32 \text{ in.}$
 $A_{original} = 64 \text{ in.}^2$
 $P_{cut} = 32 \text{ in.}$
 $A_{cut} = 48 \text{ in.}^2$
2. $P = 20 \text{ m}$
3. 45-45-90: $1, \sqrt{2}$
30-60-90: $\sqrt{3}, 2$
4. (a) $w = \pi r; h = r$
(b) $A = \pi r^2$
(c) $A = \pi r^2$
5. (a) yes
(b) no
(c) no
(d) yes
6. 320 sugar cubes. $V = 320 \text{ cm}^3$
7. $BA = 80 \text{ cm}^2$
 $h = 4 \text{ cm}$
 $V = BA \cdot h$
8. (a) $V = 800 \text{ in.}^3$
(b) $V = 800 \text{ in.}^3$
(c) No
9. $P = 6x + 18$
 $A = 2x^2 + 9x + 8$
10. (a) $AC = 4, BC = 4\sqrt{3}$
(b) $\frac{16\sqrt{2}}{2}, \frac{16\sqrt{2}}{2}$
(c) $\sqrt{2}, 2\sqrt{2}$

- (d) $x = 2, y = 2\sqrt{3}, z = 2\sqrt{6}$
11. $4\sqrt{3}$
 12. $24\sqrt{3}$
 13. They all have the same area.
 14. (a) $A_{shaded} = 40\pi \text{ cm}^2$
(b) $A_{shaded} = 12\pi$
 15. –
 16. Cylinder
 17. Cereal box, Toblerone box, Pringles can
 18. (a) 32
(b) 24
 19. –
 20. Yes: 9, 8, 7, 6, 5, 4
No: 1, 2, 3
 21. $A_{shaded} = 50 \text{ m}^2$
 22. (a) 50 in.^2
(b) $75\sqrt{3} \text{ in.}^2$
 23. (a) –
(b) $A = 192\sqrt{3} + 384 = 716.6 \text{ cm}^2$
(c) $A = 192 \tan 75^\circ = 716.6 \text{ cm}^2$
 24. (a) One is a scaled version of the other.
(b) Diagonals: 2 : 1
Perimeters: 2 : 1
(c) 4 : 1
 25. –
 26. –
 27. $V = 5.91 \text{ in.}^3$. The volume doesn't change when we shift the cards.
 28. They have the same volume.
 29. 18%
 30. $V(x) = x^3$
Domain: $x \in (0, \infty)$

31. Base area and height
 $V = BA \cdot h$
32. (a) One circle is just a scaled version of the other.
 (b) Diameters: 3 : 1
 Circumferences: 3 : 1
 (c) 9 : 1
33. (a) One circle is a scaled version of the other.
 (b) 8 : 3
 (c) I'd expect it to be 8 : 3 because the ratio of corresponding 1-D measurements in similar shapes appears to be constant.
 (d) $AB = 6$, $PQ = 16$, $PQ : AB = 8 : 3$
 (e) 64 : 9
34. (a) –
 (b) 72 bars
 (c) $V_{bar} = \frac{\sqrt{3}}{2} in.^3$
 $V_{box} = 36\sqrt{3} in.^3$
35. 1280π
36. (a) $1,000 m^3$
 (b) $250\sqrt{3} cm^3$
 (c) $1,920\sqrt{3} ft^3$
37. $2,400 + 2,400\sqrt{3}$ cubic feet of grain
-
136. $\frac{12,400\pi}{3} + 800\sqrt{3} ft^2$
137. (a) 46°
 (b) 46°
138. –
139. –
140. $\frac{\pi}{4}$
141. (a) 1 : 8
 (b) 7 : 8
142. 12.5
143. (a) $2k$

(b) $2k$

(c) $-$

144. $\angle BCA = 20^\circ$, $\angle CAB = 110^\circ$, $\widehat{AC} = 100^\circ$, major arc $\widehat{BC} = 220^\circ$

145. $-$

146. $-$

147. $-$

148. $-$

149. $-$

150. (a) $\frac{1}{2}$

(b) $\frac{1}{8}$

(c) $100\pi \text{ cm}^3$

(d) $\frac{25\pi}{2} \text{ cm}^3$

151. $\angle R = 67^\circ$, $\angle P = 126^\circ$

152. $-$

153. $-$

154. $-$

155. $1 : \sqrt[3]{2}$

156. $V = \frac{485\pi}{3}$, $LA = 55\sqrt{2}$

157. 104° , 76°

158. $\frac{9}{4}$

159. $\frac{13.6}{\sin 63^\circ}$

160. $-$

161. $-$

162. $864\pi \text{ cm}^2$

163. $2\sqrt{2} \text{ in.}$

164. 90°

165. $-$

166. (a) $8:27$

(b) $2:3$

- (c) –
167. $2\pi - 3\sqrt{3}$
168. 16 cm
169. (a) 70°
(b) $180 - k^\circ$
170. (a) $\frac{12.1}{\sin 48^\circ}$
(b) $\frac{a}{\sin A}$
171. $\frac{5\sqrt{3}}{3}$
172. –
173. $144\pi\text{ cm}^2$
174. $\frac{250\pi}{3}$
175. 21, 1
176. 30
177. –
178. Minor arc length = 11.07; major arc length = 20.34; $A_1 = 17.68$; $A_2 = 60.86$
179. $\frac{2\pi r^3}{3}$
180. (a) $39\pi\text{ cm}^2$
(b) $39\pi\text{ cm}^2$
181. –
182. $V_1 = \frac{1,280\pi}{3} - 320\sqrt{3}$, $V_2 = \frac{2,560\pi}{3} + 320\sqrt{3}$
183. $15, \sqrt{505}$
184. $L = 16, A_1 = 48, A_2 = 120$
185. –
186. tangent line: $y - 12 = \frac{1}{8}(x - 6)$
187. $2\pi - 4$
188. (a) $16h\pi - h^2\pi\text{ cm}^2$
(b) $16h\pi - h^2\pi\text{ cm}^2$
(c) –
(d) –

- (e) $\frac{1,024\pi}{3} \text{ cm}^3$
 (f) $\frac{2,048\pi}{3} \text{ cm}^3$
189. $\sqrt{r^2 - d^2}$
190. $-$
191. $\frac{29}{4}$
192. 66.33
193. (a) 120
 (b) $25r$
 (c) $\frac{24}{5}$
194. (a) $-$
 (b) $-$
 (c) 1
195. 4, 9, 13, 12
196. (a) $2\pi rh - \pi h^2 \text{ cm}^2$
 (b) $2\pi rh - \pi h^2 \text{ cm}^2$
 (c) $-$
 (d) $-$
 (e) $\frac{2\pi r^3}{3} \text{ cm}^3$
 (f) $\frac{4\pi r^3}{3} \text{ cm}^3$
197. 8 in.
198. 2.21 cm
199. $-$
200. (a) $-$
 (b) $R - r$
 (c) $-$
201. $1.5 - \frac{\sqrt[3]{19}}{2} \text{ cm}$
202. (a) $\frac{1}{3}$
 (b) $\frac{2}{3}$
203. $8\sqrt{3}$
204. $12\pi + 36 \text{ in.}$

205. $V = 9\sqrt{3}\pi$, $SA = 27\pi$
206. (a) 4.52 in.^2
(b) 452 in.^2
207. $x^3 - y^3$
208. –
209. (a) $h = 8$, $V = 72\pi$
(b) $V(r) = 2\pi r^2 \sqrt{25 - r^2}$
(c) 302.30
210. (a) –
(b) $\frac{2}{3}$ (Assume the sphere is tangent to both bases and the lateral surface of the cylinder)
211. (a) –
(b) $y = -\frac{4}{3}(x - 4) + 3$
(c) $(\frac{25}{4}, 0)$
(d) $y = \frac{4}{3}(x - 4) - 3$
212. –
213. (a) $\frac{4}{3}\pi(R^3 - r^3)$
(b) –
(c) –
(d) $BA = \frac{4}{3}\pi(R^2 + Rr + r^2)$
(e) $4\pi R^2$
(f) $SA = 4\pi R^2$
214. $3,364\pi \text{ cm}^2$
215. (a) 67%
(b) $LA = 12\pi r^2$, $SA = 12\pi r^2$
216. (a) 3 : 2
(b) 9 : 4
(c) 27 : 8
217. (a) 3
(b) $r = \frac{w\sqrt{100-w^2}}{10+w}$
(c) –
218. π

219. –
220. –
221. 57.30, 6
222. $y = -\frac{5}{12}(x - 13)$ or $y = \frac{5}{12}(x - 13)$
223. 80
224. $10\pi + 4\sqrt{3}$
225. Skip
226. 125 : 343
227. –
228. –
229. (a) $2\pi r$
 (b) πr
 (c) r
230. (a) $\frac{3}{2}$
 (b) $\left(\frac{270}{\pi}\right)^\circ$
231. 15 in.
232. $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right), \left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
233. –
234. –
235. –
236. $A_{sector} = \frac{\theta r^2}{2}$, Arc length = θr
237. $\sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$, $\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$
238. $\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$, $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$
239. $\frac{\pi}{6} = 30^\circ$, $\frac{\pi}{4} = 45^\circ$, $\frac{\pi}{3} = 60^\circ$, $\frac{\pi}{2} = 90^\circ$