

# IM2 Book 2 Selected Answers

IM2 Dream Team

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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)  $50 \text{ in.}^2$   
(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)  $V_{bar} = \frac{\sqrt{3}}{2} \text{ in.}^3$   
 $V_{box} = 36\sqrt{3} \text{ in.}^3$
35.  $1280\pi$
36. (a)  $1,000 \text{ m}^3$   
(b)  $250\sqrt{3} \text{ cm}^3$   
(c)  $1,920\sqrt{3} \text{ ft}^3$
37.  $2,400 + 2,400\sqrt{3}$  cubic feet of grain
38. The midpoint is closest to the center.
39. 64 m
40. 9 : 25
41.  $r^2 : 1$
42. 14 prisms  
 $V = 56\sqrt{77}$
43.  $V = 90\pi$
44.  $A = \frac{s^2\sqrt{3}}{4}$
45. (a) Rectangular prism  
(b) Hexagonal prism  
(c) Cylinder

46.  $108\pi$  in.
47. –
48.  $SA = 88$  in.<sup>2</sup>
49. (a)  $SA = 132$  ft<sup>2</sup>  
(b)  $SA = 144 + 48\sqrt{3}$  ft<sup>2</sup>
50.  $20\sqrt{2} - 20$
51. (a) 120 ft<sup>2</sup>  
(b) 144 ft<sup>2</sup>
52. (a) All cubes are similar. They have congruent angles and their side lengths are proportional.  
(b) 2 : 1  
(c) 4 : 1  
(d) 8 : 1
53.  $r^3$
54. (a) True  
(b) True
55. (a)  $\sqrt{157}$   
(b)  $4\sqrt{5}$   
(c)  $6\sqrt{2}$
56.  $24\pi$  in<sup>2</sup>
57. First, calculate the circumference of the base. Second, multiply the circumference by the height.
58. (a) 700 m<sup>2</sup>  
(b)  $300 + 50\sqrt{3}$  cm<sup>2</sup>
59.  $4\sqrt{3}$  cm
60.  $P = 125.5$  cm  
 $A \approx 1250$  cm<sup>2</sup>
61.  $V = 384\pi$  ft<sup>3</sup>  
 $SA = 224\pi$  ft<sup>2</sup>
62. 3 : 1
63. (a)  $SA = 156\pi$   
 $V = 360\pi$

(b)  $SA = 1,260 \text{ m}^2$   
 $V = 2,040 \text{ m}^3$

64.  $V = 320$   
 $SA = 64 + 160\sqrt{2}$

65.  $r = \frac{1}{2} \text{ in.}$   
 $V = \frac{3\sqrt{3}}{2} \text{ in.}^3$

66. –

67.  $8.125 \text{ in.}$

68.  $243\pi$

69. (a) Answers may vary.

(b)  $SA = 2s^2 + \frac{6,000}{s}$

(c)  $s \approx 11.45 \text{ in.}$   
 $SA \approx 786.22 \text{ in.}$

(d) –

70. (a)  $2.939$

(b)  $3.090$

(c)  $A(n) = n \sin\left(\frac{180}{n}\right) \cos\left(\frac{180}{n}\right)$

71. If you don't actually draw these shapes, I'm going to throw a temper tantrum.

72. Cone

73. (a)  $28\pi \text{ mi.}^2$

(b) –

(c)  $14\pi \text{ mi.}$

(d) –

74. (a)  $y = \frac{3}{2}x$

(b) Yes

(c) –

75. First cube:  $12.910 \text{ cm}$

Second cube:  $6.455 \text{ cm}$

76. –

77. (a) –

(b) –

78. –

79. (a) Height:  $\sqrt{7}$   
Slant height: 4

(b) No

80. (a)  $\sqrt{119}$

(b)  $\sqrt{\frac{611}{3}}$

(c)  $\sqrt{351}$

81. (a) Thickness =  $R - r$   
Area =  $\pi(R^2 - r^2)$

(b) Width =  $\pi(R + r)$

(c) Circumference  $\approx \pi(R + r) \rightarrow 2\pi R$

82. (a)  $(x - 2)^2 + (y + 4)^2 = 50$

(b) Inside

83. (a) Triangular pyramid

(b) Square pyramid

(c) Cone

84. –

85.  $843 \text{ cm}^2$

86. (a)  $18\pi$

(b)  $9\pi$

(c)  $12\pi$

87. (a)  $6\pi$

(b)  $3\pi$

(c)  $4\pi$

88.  $\frac{64}{3}$

89. (a)  $\frac{1}{3}$

(b)  $V_{pyramid} = \frac{1}{3}BA \cdot h$

(c) No

90. –

Yes	Yes	Yes	No
No	No	Yes	Yes
Yes	Yes	No	Yes

92.  $324 + 108\sqrt{5} \text{ cm}^2$

93. (a) Center:  $(-3, 5)$   
Radius:  $2\sqrt{11}$   
(b) Center:  $(-1, 4)$   
Radius: 3
94.  $\frac{2}{3}\pi$
95.  $\frac{2}{n}\pi$
96. Yes
97.  $\frac{400}{3} \text{ in.}^3$
98. (a)  $(x - 2)^2 + (y - 3)^2 = 65$   
(b) No
99. (a)  $12\pi \text{ cm}^3$   
(b)  $5 \text{ cm}$
100. (a)  $8\pi - 16$   
(b)  $16\sqrt{3} - 8\pi$
101. (a)  $8\pi - 16$   
(b)  $16\sqrt{3} - 8\pi$
102. Fraction:  $\frac{s}{2\pi r}$   
Area:  $\frac{sr}{2}$
103. (a)  $\frac{64}{3}\pi \text{ cm}^2$   
(b) 8 cm  
(c)  $\frac{8}{3} \text{ cm}$
104. (a) Cone  
(b)  $32\pi$
105. 64
106. 134,136
107.  $100 + 100\sqrt{3} \text{ m}^2$
108. –
109. (a) Radius: 12 cm  
Arc Length:  $10\pi \text{ cm}$   
(b)  $\frac{5}{12}$   
(c)  $60\pi \text{ cm}^2$

110. (a) Center:  $(2, 0)$   
Radius:  $\sqrt{14}$

(b) Center:  $(3, -\frac{1}{2})$   
Radius:  $\frac{7}{2}$

111.  $18\sqrt{2}$

112.  $V = \frac{x^3\sqrt{2}}{12}$   
Domain:  $x \in (0, \infty)$

113. (a) Cylinder, circle  
(b) Cone, circle  
(c) Sphere, circle

114. (a) Circle  
(b) Triangle

115. (a) –  
(b)  $\frac{r}{l}$   
(c)  $\pi r l$

116.  $V = \frac{578\pi\sqrt{38}}{3} \text{ cm}^3$   
 $SA = 646 \text{ cm}^2$

117.  $4,021 \text{ ft}^2$

118. (a)  $72^\circ$   
(b)  $72^\circ$   
(c)  $288^\circ$

119.  $3\pi$

120. Angular size:  $106.3^\circ$   
Arc length: 18.5 in.

121.  $\frac{64\pi\sqrt{3}}{3}$

122.  $48\pi$

123.  $AB : AC = 3 : 7$   
 $BC : AC = 4 : 7$

128. (a)  $r = 30 \text{ cm}$   
 $\theta = 216^\circ$   
(b) –  
(c) 37.70 cm  
(d) 35.27 cm

129.  $AB : BC = 3 : 7$   
 $BC : AC = 7 : 10$

130.  $\angle ABC = 90^\circ$

131. (a)  $135^\circ$   
(b)  $270^\circ$   
(c) The measure of the arc is twice the measure of the interior angle.  
(d) Answers may vary.

132.

$$\text{Area} = \frac{\theta}{360}\pi r^2$$
$$\text{Arc Length} = \frac{\theta\pi r}{180}$$
$$\text{Perimeter} = \frac{\theta\pi r}{180} + 2r$$

133.  $r_1 = 3$   
 $r_2 = 8$   
 $r_3 = 5$

134.  $\frac{10\sqrt{3}}{3}$

135. (a)  $4 : 25$   
(b)  $4 : 21$

136.  $\frac{12,400\pi}{3} + 800\sqrt{3} ft^2$

137. (a)  $46^\circ$   
(b)  $46^\circ$

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.  $104^\circ$ ,  $76^\circ$

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.  $90^\circ$

165. –

166. (a) 8:27  
(b) 2:3  
(c) –

167.  $2\pi - 3\sqrt{3}$

168. 16 cm

169. (a)  $70^\circ$   
 (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)  $4.52 \text{ in.}^2$

(b)  $452 \text{ in.}^2$

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.  $3,364\pi cm^2$

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.  $\pi$

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)  $\pi r$   
 (c)  $r$
230. (a)  $\frac{3}{2}$   
 (b)  $(\frac{270}{\pi})^\circ$
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 =  $\theta r$
237.  $\sin(\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$ ,  $\cos(\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$
238.  $\sin(\frac{\pi}{6}) = \frac{1}{2}$ ,  $\cos(\frac{\pi}{6}) = \frac{\sqrt{3}}{2}$
239.  $\frac{\pi}{6} = 30^\circ$ ,  $\frac{\pi}{4} = 45^\circ$ ,  $\frac{\pi}{3} = 60^\circ$ ,  $\frac{\pi}{2} = 90^\circ$