

# IM1H Book 1 Selected Answers

IM1H Dream Team

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1. (a)  $A_{ABCD} = 25$ ,  $A_{BCEF} = 9$   
(b) –  
(c) –  
(d)  $A = 34$   
(e)  $l = \sqrt{34}$   
(f) –
2.  $l = 4\sqrt{5}$
3. Yes
4. –
5. –
6.  $AB = \sqrt{41}$
7.  $l = 5\sqrt{2}$
8.  $l = \sqrt{5}$ , No
9. 12
10.  $(12, 2), (2, 2)$
11. No
12.  $d = 10\sqrt{2}$
13. (a)  $C = (5, 0)$ . Answers may vary.  
(b)  $D = (5, 1)$ . Answers may vary.  
(c)  $x = 5$   
(d) –
14. (a) 13, 17, 13, 17  
(b) –

15. (a)  $AP = BP = 2\sqrt{5}$   
 (b)  $(3, 5), (2, 2), (4, 8)$ . Answers may vary.  
 (c) No  
 (d)  $y = 3(x - 2) + 2$
16.  $(10, 3), (-6, 3)$
17.  $-$
18. (a)  $(0, 0), (6, 0)$ . Answers may vary.  
 (b)  $(0, 4), (4, 2)$ . Answers may vary.  
 (c)  $(0, 4), (2, 2)$ . Answers may vary.
19.  $AB = BC = \sqrt{10}$
20.  $C = (6, 3)$ . Infinite. Answers may vary for  $C$ .
21.  $(0, 0), (\sqrt{13}, 0)$ . Answers may vary.
22.  $(0, 0), (2, 3)$
23.  $(0, 0), (\sqrt{13}, 0), (2 + \sqrt{13}, 3), (\sqrt{13}, 6), (0, 6), (-2, 3)$ . Answers may vary.
24.  $24 - 12\sqrt{2}, 24\sqrt{2} - 24$
25. There are an infinite number of different ways.
26. 208m
27.  $AP = BP = 5\sqrt{2}$ .  
 2 more equidistant points:  $Q = (2, 2), R = (5, 3)$ . Answers may vary.  
 All equidistant points:  $y = \frac{1}{3}(x - 2) + 2$ .
28. Short leg:  $21 - 7\sqrt{5}$   
 Long leg:  $42 - 14\sqrt{5}$   
 Hypotenuse:  $21\sqrt{5} - 35$
29.  $\frac{5}{12}$
30.  $(0, 5 + 4\sqrt{2}), (0, 5 - 4\sqrt{2})$
31. (a)  $(0, 0), (4, 1)$ . Answers may vary.  
 (b) No.
32. Yes.
33. (a) Yes.  
 (b)  $\overline{KL}$   
 (c)  $\angle KLM$

- (d)  $\angle BAC$   
 (e) They're congruent.
34. They sum to  $90^\circ$ .
35. It's a right angle.
36. (a)  $-$   
 (b)  $\frac{b}{a}$  is the negative reciprocal of  $\frac{-a}{b}$ .
37.  $-$
38.  $-$
39. A line with an undefined slope is perfectly vertical while a line with a slope of 0 is perfectly horizontal.
40.  $n = \frac{49}{4}$
41.  $x = 1$ . Answers may vary.
42.  $y = 1$ . Answers may vary.
43. They're the same line.  $-50x + 30y = 90$ .
44.  $-$
45. No.
46. (a)  $y = \frac{1}{2}(x - 5) + 5$   
 (b)  $4x - 5y = 8$
47. Yes.
48.  $(\frac{15}{8}, \frac{15}{8})$
49.  $m = -1$
50. Yes.
51. (a)  $-$   
 (b)  $\angle Q$ ; CPTC
52.  $\triangle ACT \cong \triangle ION$   
 $\triangle ATC \cong \triangle INO$   
 $\triangle CAT \cong \triangle OIN$   
 $\triangle CTA \cong \triangle ONI$   
 $\triangle TAC \cong \triangle NIO$   
 $\triangle TCA \cong \triangle NOI$

53.  $\triangle BAL \cong \triangle GEL$   
 $\triangle ELB \cong \triangle ALG$   
 $\triangle GEA \cong \triangle BAE$   
 $\triangle ABG \cong \triangle EGB$
54.  $\angle ABC$  or  $\angle CBA$  or  $\angle B$  (different ways of writing the same thing).
55.  $\overline{AB}$
56. (a)  $PNMRQ$   
(b)  $\angle Q$
57. (a)  $d_{AP} = \sqrt{(x+1)^2 + (y-5)^2}$   
(b)  $d_{BP} = \sqrt{(x-5)^2 + (y-2)^2}$   
(c)  $\sqrt{(x+1)^2 + (y-5)^2} = \sqrt{(x-5)^2 + (y-2)^2}$   
(d)  $4x - 2y = 1$   
(e)  $(2, 3.5)$   
(f)  $m_{AB} = -\frac{1}{2}$ ;  $m_P = 2$   
(g) —
58. (a) The distance between  $(x, y)$  and  $(3, 5)$  is equal to the distance between  $(x, y)$  and  $(7, -1)$ .  
(b)  $2x - 3y = 4$
59. (a) —  
(b) —  
(c)  $(6, 9.5)$   
(d)  $(6.2, 9.8)$
60. (a)  $10x - 8y = -35$   
(b)  $(4.5, 10)$ . Answers may vary.  
(c)  $\overline{PA} = \overline{PB}$
61. (a)  $(21, 16)$   
(b)  $(30, 22)$   
(c)  $(3 + 3t, 4 + 2t)$
62. —
63.  $x = 1 + t$ ;  $y = 2 + 3t$ . Answers may vary.
64.  $(-3.5, -0.5)$
65.  $(0, 16.9)$

66. (a) –  
 (b)  $\frac{\Delta y \text{ from a 1 unit increase in } t}{\Delta x \text{ from a 1 unit increase in } t}$   
 (c)  $y = \frac{11}{3} + \frac{2}{3}x$
67. –
68. (a)  $[7, 2]$   
 (b)  $[14, 8]$   
 (c)  $[-7, -4]$   
 (d)  $[7, 4]$
69. (a)  $[3, 6]$   
 (b)  $[3, -2]$   
 (c)  $[-100, 40]$
70. (a) 12 miles east and 16 miles north  
 (b) 20 miles  
 (c) 10 miles/hour
71. (a) 48 miles  
 (b) 4.8 hours  
 (c) 28.8 miles east and 38.4 miles north of his departure point.
72. (a)  $A' = (6, 5)$ ,  $B' = (8, -2)$ ,  $C' = (11, 4)$   
 (b)  $B'' = (-1, 0)$ ,  $C'' = (2, 6)$
73.  $K' = (5, 3)$ ,  $L' = (9, 0)$ ,  $M' = (6, -4)$ . Each vertex slides  $\sqrt{29}$ .
74. It depends on whether the triangle is supposed to be right.
75. (a) 5 units/second  
 (b)  $[3, 4]$   
 (c)  $(-3 + 3t, 1 + 4t)$   
 (d)  $\frac{4}{3}$
76. Yes, yes, yes, no.
77. (a)  $[4, -12]$   
 (b)  $[-4, 12]$
78.  $(a + 2, b - 4)$
79. Answers may vary.  $(0, 0)$ ,  $(7, 1)$ ,  $(12, 6)$ ,  $(5, 5)$
80. (a) 132 miles east and 110 miles north

- (b)  $(-3 + 90t, 5 + 70t)$
81.  $[8, 06]$
82. –
83. –
84. (a) –  
 (b) –  
 (c) SSA doesn't always imply congruence because in scenarios like (b) there are two incongruent triangles that satisfy SSA.
85. –
86. –
87. –
88. –
89. –
90. –
91. –
92. –
93. –
94. (a) 2 AM  
 (b) It means that Kirby's position is determined by time.  
 (c)  $(-6, 1.5)$   
 (d)  $(-4t, -3t + 6)$
95. (a) If point  $P$  is equidistant from the coordinate axes, then point  $P$  is on the line  $y = x$ .  
 (b) No,  $(-1, 1)$  is a counterexample.  
 (c) Answers may vary. If  $ABCD$  is a square, then  $ABCD$  is a rectangle.  
 (d) Answers may vary. If  $A$ ,  $B$ , and  $C$  are not colinear, then  $A$ ,  $B$ , and  $C$  form a triangle.
96. If a triangle has side lengths  $a$ ,  $b$ , and  $c$  such that  $a^2 + b^2 = c^2$ , then the triangle has a right angle, and the side with length  $c$  is the hypotenuse.
97. –
98. (a) –

- (b)  $d = \sqrt{(3-2t)^2 + (4+t)^2}$
  - (c)  $(\frac{8}{5}, \frac{21}{5})$
  - (d)  $(\frac{4}{5}, \frac{23}{5})$
99. –
100. (a)  $s = 3\sqrt{5}$  miles/minute  
 (b)  $4\sqrt{10}$  miles  
 (c)  $t = 8$  minutes
101. (a) –  
 (b)  $\sqrt{13}$
102. (a)  $(2, 1)$   
 (b)  $[-12, 5]$   
 (c)  $(x, y) = (2 - 24t, 1 + 10t)$
103. (a)  $[-6, 8]$   
 (b)  $[-\frac{3}{5}, \frac{4}{5}]$   
 (c)  $[\frac{3}{5}, -\frac{4}{5}]$   
 (d)  $[6, -8]$   
 (e)  $[\frac{3}{5}c, -\frac{4}{5}c]$
104. (a)  $[60, -15]$   
 (b)  $[5, 5\sqrt{2}]$   
 (c)  $[\frac{3}{8}, \frac{-1}{3}]$   
 (d)  $[\frac{p^2}{q}, p]$
105. (a) 5  
 (b) 10,080  
 (c) 2016  
 (d)  $5t$
106. –
107. –
108. –
109. They are congruent.
110. –
111. –

112. (a)  $x = \frac{3}{5}t + 9$ ;  $y = \frac{4}{5}t - 2$   
 (b)  $x = \frac{3}{20}t + 9$ ;  $y = \frac{1}{5}t - 2$   
 (c)  $x = -\frac{3}{5}t + 9$ ;  $y = -\frac{4}{5}t - 2$   
 (d)  $x = -3t + 9$ ;  $y = -4t - 2$

113. –

114. –

115. –

116. (a)

$$P_3 = (-17, 19)$$

$$P_2 = (-9, 12)$$

$$P_{-2} = (23, -16)$$

$$P_{1.5} = (-5, \frac{17}{2})$$

(b)  $y = \frac{33}{8} - \frac{7}{8}x$

(c) Both the  $x$ - and  $y$ -coordinates are changing at a constant rate.

117. (a)  $\vec{AB} = [2, -9]$

(b)  $\vec{AB} = [3t, -4t]$

118. (a)  $[-\frac{8}{5}, \frac{14}{5}]$

(b)  $[4, -7]$

(c)  $[\frac{4}{\sqrt{65}}, -\frac{7}{\sqrt{65}}]$

(d)  $[8, -14]$

(e)  $[7, 4]$

(f)  $[-\frac{4c}{\sqrt{65}}, \frac{7c}{\sqrt{65}}]$

119. (a) It moves 3 meters to the left and 4 meters up every second.

(b) It moves 180 meters to the left and 240 meters up every second.

(c)

$$x = -2 - 180t$$

$$y = 6 + 240t$$

120. (a)  $t = 1\text{s}$

(b) The bug is on the line to the right of the  $x$ -intercept.

121. (a)  $m = -4$



- (b)  $s = \sqrt{17}$  units/minute
  - (c)  $t = 3$  minutes
  - (d)  $t = 3$  minutes
  - (e)  $-95$  or  $194$  seconds
122.  $y$ -intercept:  $(0, -\frac{26}{3})$   
 $x$ -intercept:  $(\frac{13}{2}, 0)$
123. I would find the length of all 4 sides and make sure there were two distinct pairs of congruent adjacent sides.
124.  $-$
125.  $-$
126.  $-$
127.  $-$
128. (a)  $(5, \frac{71}{12})$   
 (b)  $7.58$
129.  $-$
130.  $-$
131.  $68 \text{ cm}^2$
132. (a)  $-$   
 (b) No
133.  $(-\frac{1}{3}, 2), (\frac{4}{3}, 3)$
134.  $(-5, 6)$ . Answers may vary.
135.  $(\frac{48}{13}, \frac{32}{13})$
136.  $(\frac{96}{13}, \frac{40}{13})$
137.  $(4, -1)$
138. (a)  $(2, 3)$   
 (b)  $t = \frac{37}{18}$   
 (c) The value of  $t$  at which  $P_t$  intersects  $4x + 3y = 18$ .  
 (d)  $(\frac{13}{6}, \frac{28}{9})$   
 (e)  $(-\frac{5}{2}, 0)$
139. The opposite sides have the same slope, so they must be parallel.
140. (a) The direction vector has the same slope as the line.

- (b) Answers may vary.  $[5, -2], [15, -6]$ .
- (c) They all have the same slope. In other words, they're all multiples of  $[5, -2]$ .
141. (a)  $m = -\frac{a}{b}$
- (b)  $[a, b]$  has a slope of  $\frac{b}{a}$ , and every direction vector has a slope of  $-\frac{a}{b}$ , so their slopes are opposite reciprocals.
142.  $[2, -3]$
143.  $(x, y) = (-19 + 8t, -7 + 6t)$
144. (a)  $(x, y) = (1 + 4t, 5 + 12t)$
- (b)  $(-6, -16)$
- (c)  $4\sqrt{10}$  units/hour
145.  $x = \frac{4}{11}$
146.  $-$
147.  $-$
148.  $\triangle A \cong \triangle B \cong \triangle C \cong \triangle E$
149.  $45^\circ$
150. Answers may vary.  $[\frac{12}{13}, -\frac{18}{13}]$ .
151.  $(-1, -7)$
152. (a)  $(3, 0), (0, 2)$
- (b)  $[2, 3]$
- (c)  $(x, y) = (6 + 2t, 3 + 3t)$
- (d)  $t = -\frac{15}{13}$
- (e)  $(\frac{48}{13}, -\frac{6}{13})$
- (f)  $(\frac{48}{13}, -\frac{6}{13})$
153. (a)  $[8, -6]$
- (b)  $[-\frac{9}{2}, -6]$
154. (a) 2
- (b)  $-\frac{1}{2}$
- (c) They are perpendicular.
- (d)  $\sqrt{5}$
155.  $y = \frac{2}{3}(x - 1) + 5$

156. (a) It's isosceles.  
 (b) It's equilateral.
157. (a) There's a typo in this question. It should say  $\overline{BA} > \overline{BE}$ .  
 (b) –  
 (c)  $\overline{BA} + \overline{CA} > \overline{BE} + \overline{CA} > \overline{BE} + \overline{CE} = \overline{BC}$
158.  $\sqrt{5}$
159. (a) –  
 (b) Reflect  $\triangle KLM$  over  $y = 2x$ .  
 (c)  $(3, -4)$
160. (a) –  
 (b)  $(\frac{72}{13}, \frac{30}{13})$   
 (c) Rotate  $\triangle ARM$  counterclockwise.
161. The positions are moving in the same direction, but they start at different points, and one is moving three times faster than the other.
162. (a)  $[2, 1]$   
 (b)  $(x, y) = (2t, t)$   
 (c)  $Q = (\frac{8}{5}, \frac{4}{5})$   
 (d)  $\overrightarrow{AQ} = [\frac{8}{5}, \frac{4}{5}]$   
 (e)  $B = (\frac{16}{5}, \frac{8}{5})$   
 (f)  $t = \frac{8}{5}$
163.  $Q = (1, 2)$
164.  $P = (1, 2)$
165.  $F \rightarrow$  midpoint of  $\overline{GH} \rightarrow D$ . There are 4 possible paths.
166.  $P_t$  is on the perpendicular bisector of  $\overline{AB}$  because the path defined by  $P_t$  runs through the midpoint of  $\overline{AB}$  and has an opposite reciprocal slope.
167.  $(\frac{49}{25}, \frac{68}{25})$
168. –
169. (a) –  
 (b) –  
 (c)  $T = (7 - \frac{21}{\sqrt{65}}, 7 - \frac{12}{\sqrt{65}})$   
 $D = (8 - \frac{24}{\sqrt{65}}, 1 - \frac{3}{\sqrt{65}})$
170. –

171. –
172. –
173. –
174. (a)  $y = -2(x - 2) + 5$   
 (b)  $y = -7(x - \frac{5}{2}) + \frac{13}{2}$   
 (c)  $(3, 3)$
175. (a) It reflects any inputted point over the line  $y = x$ .  
 (b) –  
 (c)  $P' = (3, 1), Q' = (5, 2), R' = (5, 6)$   
 (d) –  
 (e) Counterclockwise
176. (a)  $(5, 7)$   
 (b)  $(\frac{60}{13}, \frac{79}{13})$
177.  $(\frac{43}{13}, \frac{72}{13})$
178. (a) The vector  $[-3, 2]$  is not perpendicular to  $y = 2x$ . To find the reflection of the point, we have to move along a perpendicular vector.  
 (b)  $(-\frac{12}{5}, \frac{16}{5})$
179. (a) Translation –  $P' = (4, -1), Q' = (4, 0), R' = (6, -1)$   
 (b) Reflection –  $P' = (3, -1), Q' = (4, -1), R' = (3, 1)$   
 (c) Rotation –  $P' = (1, 3), Q' = (1, 2), R' = (-1, 3)$
180. (a)  $A' = (0, 0), B' = (0, 10), C' = (-3, 8)$   
 (b) Rotation  
 (c) –
181.  $S' = (0, 0), H' = (4, 3), A' = (-3, 4)$   
 $M' = (-7.4, 3.2), O' = (0, 0), R' = (-5, 5)$   
 Morgan was correct.
182. (a)  $A' = (0, 7), B' = (-3, 8)$   
 (b) Translates by vector  $[-2, 4]$   
 (c) Yes
183. Shane was correct.
184. (a)  $A' = (-4, -2), B' = (2, 4)$   
 (b) It doubles the point's distance from the origin.

(c)  $3\sqrt{2}$

(d)  $6\sqrt{2}$

(e) No

185.  $y = 3(x - 2) + 3$

186.  $(\frac{11}{5}, \frac{23}{5})$

187. Answers may vary.  $(5, 5)$

188.  $-$

189.  $P = (9, 0)$  or  $(16, 0)$

190. 191-194 pending

195.  $[7, 12]$