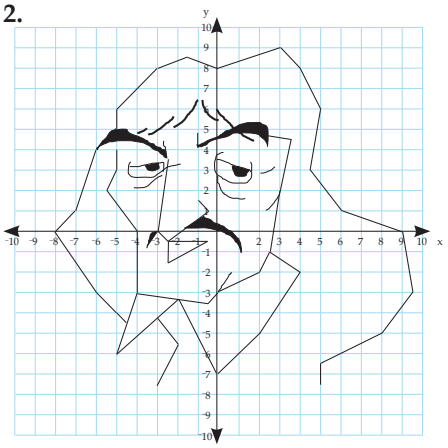
Answers

Page 4

1. *THOMAS EDISON WHO INVENTED THE LIGHTBULB WAS AFRAID OF THE DARK.*

Page 5

2.



Page 8

3. Dist. = 3.6 units (1 dp)

4. Dist. = 10.6 units (1 dp)

5. Dist. = 9.1 units (1 dp)

6. Dist. = 5.4 units (1 dp)

7. Dist. = 17.2 units (1 dp)

8. Dist. = 5 units

9. Dist = 17.5 units (1 dp)

10. Dist. = 10.6 units (1 dp)

11. Dist. = 34.8 units (1 dp)

12. Dist. = 6.7 units (1 dp)

13. Dist. = 5.3 units (1 dp)

14. Dist. = 6.9 units (1 dp)

15. Dist. = 9.4 units (1 dp)

16. Dist. = 4.5x (1 dp)

17. Dist. = 2.2p (1 dp)

18. Dist. = 4z

19. Dist. = 7.3 (1 dp)

20. Length AB = 4.1 units (1 dp)
Length BC = 4.1 units (1 dp)
Length AC = 7.1 units (1 dp)
So ABC is isosceles.

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21. Lgth AB = 3.6 units (1 dp)
Lgth BC = 7.3 units (1 dp)
Lgth CD = 3.6 units (1 dp)
Lgth AD = 7.3 units (1 dp)
Lgth AC = 9.1 units (1 dp)
Lgth BD = 7.1 units (1 dp)
Since side AB = side CD and side BC = side AD but diagonal lengths AC and BD are different then ABCD is a parallelogram.

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22. Dist. = 17.8 km (1 dp)

23. Length AB = 5.8 units (1 dp)
Length BC = 5.8 units (1 dp)
Length AC = 6 units
So ABC is isosceles.

24. k = 5 and $^{-}1$

25. Centre to A = 5 units
Centre to B = 5 units
Centre to C = 5 units
So ABC all on a circle.

26. (0, $^{-}8$) and (0, 4)

27. m = 7 or m = $^{-}1$

28. Distance from the centre to all points except (2, 3) is $\sqrt{50}$ units. So (2, 3) does lie on the circumference of the circle as its distance from the centre is $\sqrt{52}$ units.

Page 10

29. a) 161 m (3 sf)
b) 224 m (3 sf)
c) Andrea, she was only 130 metres away.
d) Dist. are 223.6 m + 80.6 m + 282.3 m = 586.5
i.e. 587 m (3 sf)

Page 11

30. Midpt. = (4, 3)

31. Midpt. = ($^{-}1$, 1)

32. Midpt. = (3.5, 1.5)

33. Midpt. = (3.5, 1)

34. Midpt. = ($^{-}10$, $^{-}11$)

35. Midpt. = (3, 1)

36. Midpt. = (6, 10)

37. Midpt. = (1.5, $^{-}3$)

Page 11 cont...

38. Midpt. = (6.1, 3)

39. Midpt. = ($^{-}2.6$, $^{-}6.25$)

40. Midpt. = ($^{-}1.2$, $^{-}1.75$)

41. Midpt. = (4.5, $^{-}3.15$)

42. Midpt. = (5.2, 1.1)

43. Midpt. = (a + 3, b + 1)

44. Midpt. = (p, q)

45. Midpt. = ($^{-}$a, 3.5b)

46. Midpt. = ($^{-}3$a + 1.5, $^{-}2$b + 2.5)

47. Midpt. = (4.5a, 2a)

48. Midpt. = (4m – 3, $^{-}0.5$n + 5.5)

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49. Q = ($^{-}10$, 3)

50. M = (9.7, 6.2)

51. Centre = ($^{-}0.5$, $^{-}6$)

52. ($^{-}7$, $^{-}7$). Others possible.

53. ($^{-}5$, 14)

54. ($^{-}1$, 7)

55. Midpoints are (1, 1), ($^{-}1$, $^{-}3$) and (2, $^{-}6$)

56. a = 1, b = 3, c = $^{-}11$

57. Centre = (2, 1)
S = (0, 6)

58. D = ($^{-}1$, $^{-}1$)
E = ($^{-}5$, 2)
Length AB = 10 units
Length DE = 5 units

59. a = $^{-}2$, b = 3, x = $^{-}1$, y = 1

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60. a = 4

61. J = $^{-}5$, K = $^{-}4$

62. a) 120 cm x 90 cm
b) (70, 145)
c) (47.5, 115)
(47.5, 175)
(92.5, 115)
(92.5, 175)
d) 37.5 cm

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63. a) $\frac{1}{7}$

b) $\frac{-5}{4}$

c) $\frac{7}{3}$

d) undefined

e) $\frac{6}{5}$

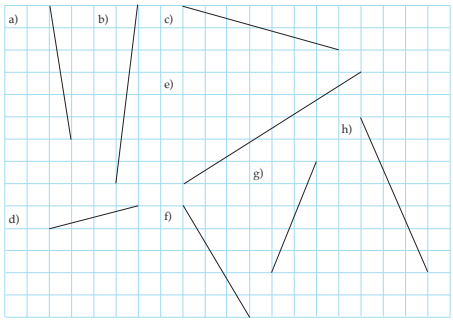
f) 0

g) -1

h) 2

i) $\frac{2}{3}$

64. a), b), c), d), e), f), g), h)



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65. $\frac{1}{3}$ (0.33)

66. $\frac{9}{2}$ (4.5)

67. -2

68. $\frac{1}{3}$ (0.33)

69. 1

70. $\frac{9}{20}$ (0.45)

71. $\frac{1}{5}$ (0.2)

72. 2.0625

73. 3

74. $\frac{b}{a}$

75. $\frac{-b}{4a}$

76. -0.44 (2 sf)

77. -0.034 (2 sf)

78. 2

79. $\frac{7a+1}{a+4}$

Page 17 cont...

80. $b = -5$

81. Gradient AB = $\frac{-2}{3}$ (-0.67)

Gradient BC = $\frac{-2}{3}$ (-0.67)

Gradient AC = $\frac{-2}{3}$ (-0.67)

Since AB, BC and AC all have the same gradient they must lie on the same line hence they are collinear.

82. $a = \frac{-26}{5}$ (-5.2)

83. $a = -8$

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84. $k = -9$

85. $k = 11.25$

86. $k = \frac{23}{3}$ (7.67)

87. $a = 3, b = 3$

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88. $y = \frac{2}{3}x + \frac{7}{3}$ or $2x - 3y + 7 = 0$

89. $y = \frac{-4}{5}x - \frac{6}{5}$ or $4x + 5y + 6 = 0$

90. $y = \frac{1}{7}x + \frac{23}{7}$ or $x - 7y + 23 = 0$

91. $y = x - 6$ or $x - y - 6 = 0$

92. $y = 5$ or $y - 5 = 0$

93. $y = \frac{-1}{2}x + \frac{3}{2}$ or $x + 2y - 3 = 0$

94. $y = 3x - 13$ or $3x - y - 13 = 0$

95. $y = \frac{1}{2}x + 8$ or $x - 2y + 16 = 0$

96. $y = \frac{-2}{5}x - \frac{33}{5}$
or $2x + 5y + 33 = 0$

97. $y = \frac{3}{2}x - \frac{11}{2}$ or $3x - 2y - 11 = 0$

98. $y = \frac{-8}{3}x - \frac{7}{3}$ or $8x + 3y + 7 = 0$

99. $y = -1.5x + 6.65$
or $3x + 2y - 13.3 = 0$

100. $y = 2x - 5$ or $2x - y - 5 = 0$

101. $y = -2x + 1$ or $2x + y - 1 = 0$

102. $y = 3x + 10$ or $3x - y + 10 = 0$

103. $y = \frac{1}{2}x - 7$ or $x - 2y - 14 = 0$

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104. $y = \frac{1}{6}x + \frac{8}{3}a$ or $x - 6y + 16a = 0$

105. $y = -q$ or $y + q = 0$

106. $y = \frac{-5}{2}x + 10.4$
or $5x + 2y - 20.8 = 0$

107. $y = 3x - 2$ or $3x - y - 2 = 0$

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108. $m = \frac{-7}{2}$ (-3.5)

y intercept = $\frac{9}{2}$ (4.5)

109. $m = \frac{-4}{7}$ (-0.57)

y intercept = $\frac{13}{7}$ (1.86)

110. $m = \frac{-1}{3}$ (-0.33)

y intercept = $\frac{3}{4}$ (0.75)

111. $m = \frac{-4}{5}$ (-0.8)

y intercept = $\frac{6}{5}$ (1.2)

112. $y = \frac{2}{3}x - \frac{5}{3}$ or $2x - 3y - 5 = 0$

113. $y = 8x - 12$ or $8x - y - 12 = 0$

114. $y = \frac{17}{4}x + \frac{1}{4}$ or $17x - 4y + 1 = 0$

115. AB, $y = \frac{3}{5}x + \frac{34}{5}$
or $3x - 5y + 34 = 0$
BC, $y = 12x - 16$
or $12x - y - 16 = 0$

116. $y = 3x + 13$ or $3x - y + 13 = 0$

117. $y = \frac{3}{4}x - \frac{21}{4}$ or $3x - 4y - 21 = 0$

118. The points B, D and E.

119. $y = \frac{1}{2}x + 2$ or $x - 2y + 4 = 0$

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120. $6x + 5y = 0$

121. Equation $y = 2x + 13$
or $2x - y + 13 = 0$
Points A, B and C can be substituted into this equation.

122. a) $y = \frac{-1}{4}x + 2$ or $x + 4y - 8 = 0$

b) $y = \frac{1}{2}x + 1$ or $x - 2y + 2 = 0$

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123. Gradient of (2, 1) and (⁻3, 11) equals ⁻2 and gradient of (⁻3, 11) and (⁻1, 7) = ⁻2 hence collinear. Eqn. $y = ⁻2x + 5$

124. $y = ⁻4x + 7$ or $4x + y - 7 = 0$

125. a) $C = 2r + 50$

b) $C = r + 60$

c) Initially first one, but if more than 10 reproductions are required then the second one.

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126. a) Neither
b) Perpendicular
c) Parallel
d) Parallel
e) Perpendicular
f) Neither

127. a) Parallel
b) Perpendicular
c) Perpendicular
d) Neither
e) Parallel
f) Parallel
g) Perpendicular
h) Neither

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128. $y = \frac{⁻5}{2}x - 4$
$5x + 2y + 8 = 0$

129. $y = \frac{⁻4}{3}x + \frac{11}{3}$
$4x + 3y - 11 = 0$

130. $y = \frac{⁻9}{4}x + \frac{5}{4}$
$9x + 4y - 5 = 0$

131. $y = \frac{1}{3}x - \frac{13}{3}$
$x - 3y - 13 = 0$

132. $q = ⁻4\frac{2}{3}$, $y = \frac{2}{3}x - 4$
$2x - 3y - 12 = 0$

133. $y = \frac{⁻12}{10}x + \frac{19}{10}$
$12x + 10y - 19 = 0$

134. $y = \frac{14}{4}x + \frac{15}{4}$
$14x - 4y + 15 = 0$

135. $y = \frac{1}{2}x + \frac{1}{2}$
$x - 2y + 1 = 0$

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136. $y = ⁻3x - 4$
$3x + y + 4 = 0$

137. $y = \frac{-3}{2}x + 4$
$3x + 2y - 8 = 0$

138. $y = \frac{2}{3}x - \frac{19}{3}$
$2x - 3y - 19 = 0$

139. $y = \frac{⁻3}{7}x - \frac{17}{7}$
$3x + 7y + 17 = 0$

140. a) 5 km

b) (7, 5)

c) $y = \frac{1}{3}x + \frac{8}{3}$
$x - 3y + 8 = 0$

d) $y = ⁻3x + 16$
$3x + y - 16 = 0$

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141. a) $m = 3$
$y = 3x + 4$
$3x - y + 4 = 0$

b) $m = 3$
$y = 3x - 6$
$3x - y - 6 = 0$

c) $m = \frac{-1}{3}$
$y = \frac{⁻1}{3}x + \frac{2}{3}$
$x + 3y - 2 = 0$

d) Length of AC = $\sqrt{20}$ (4.47)

Length of BC = $\sqrt{20}$ (4.47)

Length of AB = $\sqrt{40}$ (6.32)

Since AC and BC are equal and the gradient of BC is the negative reciprocal of AC, ABC is a right-angled isosceles triangle.

142. a) $m_{AC} = ⁻3$, $m_{CB} = \frac{1}{3}$
Multiply to give ⁻1 hence perpendicular.

b) $y = ⁻3x + 12$
$3x + y - 12 = 0$

c) $m_{AB} = \frac{-1}{2}$, $m_{perp} = 2$
$y = 2x + 2$
$2x - y + 2 = 0$

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143. a) $y = \frac{3}{4}x + 6$
$3x - 4y + 24 = 0$

b) $3(12) - 4(15) + 24 = 0$

c) Length of AB = 10 m
Length of BD = 10 m
Length of AD = 17.9 m (1 dp)
Since AB = BD triangle is isosceles.

d) Gradient of AD = 2

e) C(8, 12)

f) Gradient of AD = 2
Gradient of CD = ⁻0.5
Since gradients multiply to give ⁻1, AD and CD are perpendicular.

g) 80 m^2

144. a) AB = $\sqrt{13}$

b) $m = \frac{-3}{2}$ (⁻1.5)

c) $y - 0 = \frac{-3}{2}(x - 3)$
$2y = ⁻3(x - 3)$
$2y = ⁻3x + 9$
$3x + 2y - 9 = 0$

d) $y = \frac{⁻3}{2}x + 1$
$3x + 2y - 2 = 0$

e) $k = \frac{-1}{2}$

f) $y = \frac{4}{6}x - \frac{7}{6}$
$4x - 6y - 7 = 0$

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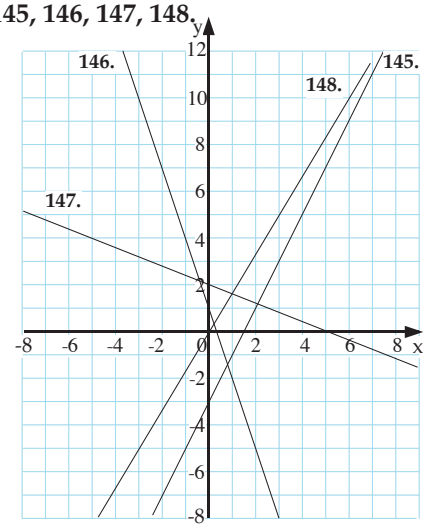
145, 146, 147, 148.



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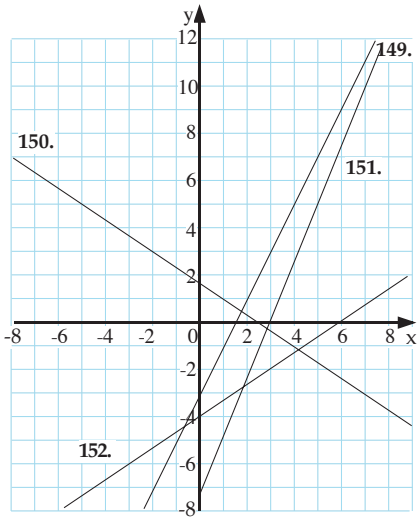
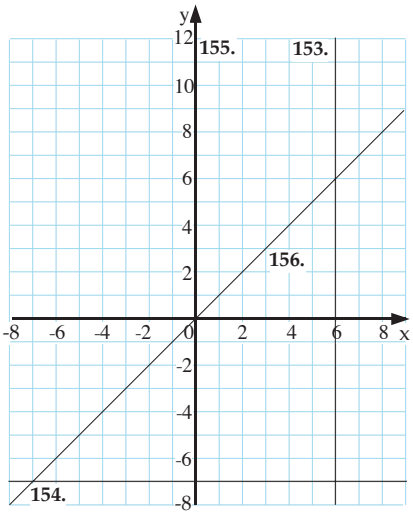
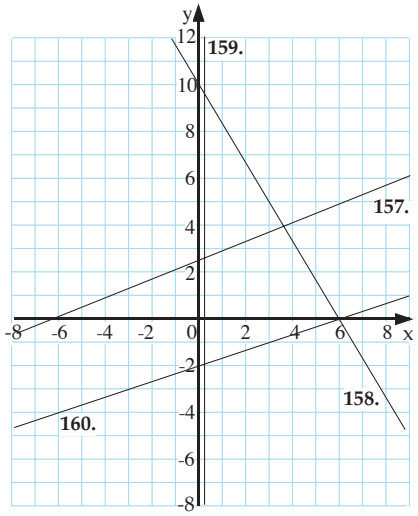
149, 150, 151, 152.



153, 154, 155, 156.



157, 158, 159, 160.



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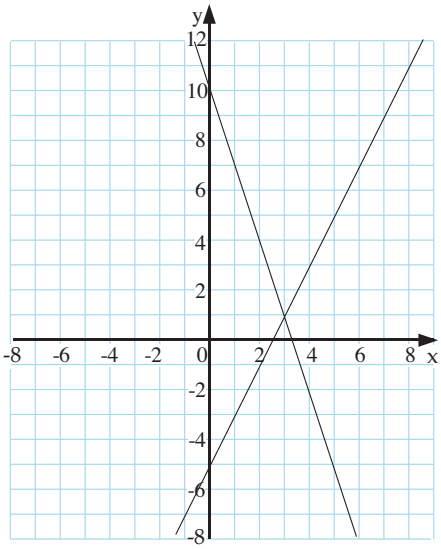
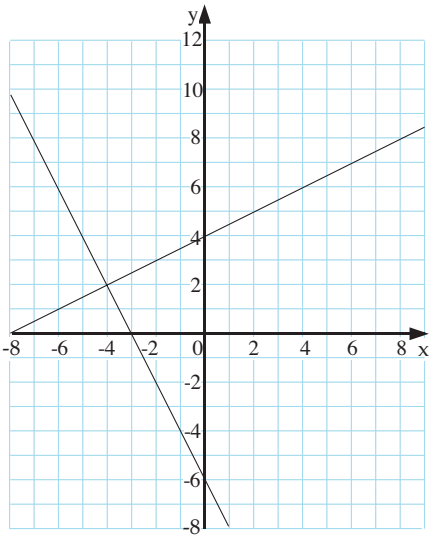
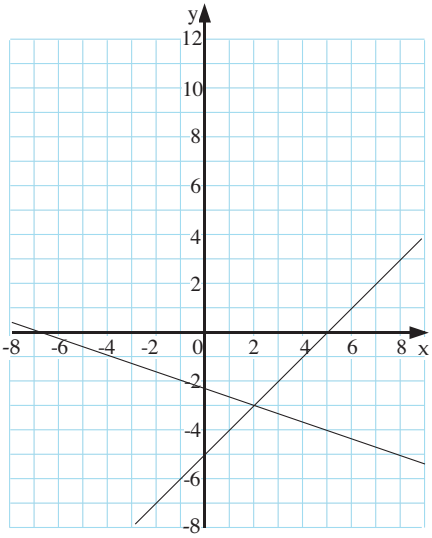
161. (3, 1)



162. (⁻4, 2)



163. (2, ⁻3)



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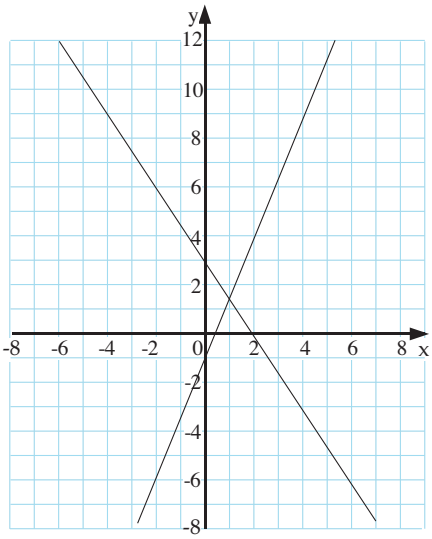
164. (1, 1.5)



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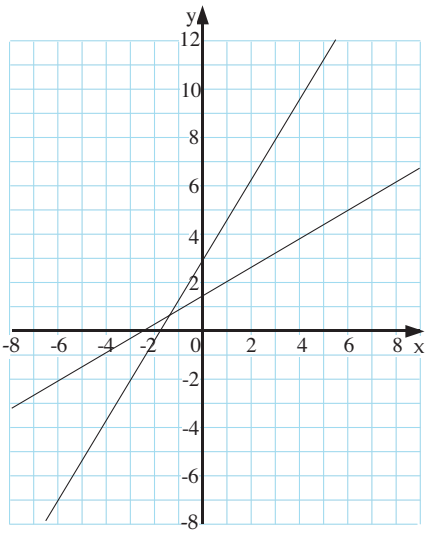
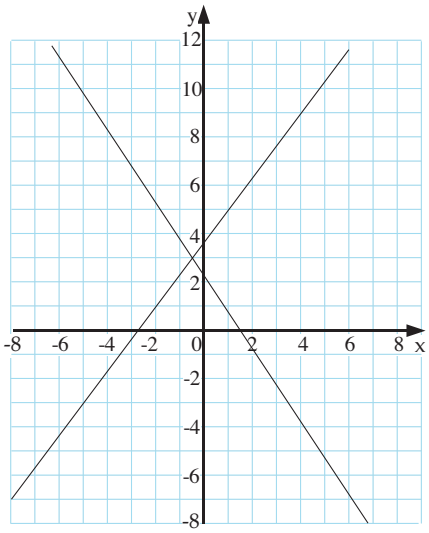
165. (⁻1.5, 0.5)



166. (⁻0.5, 3)



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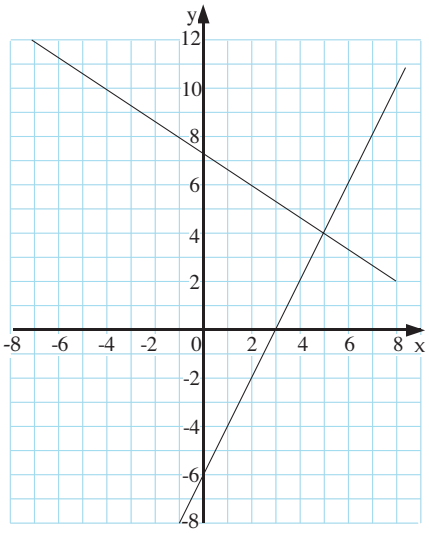
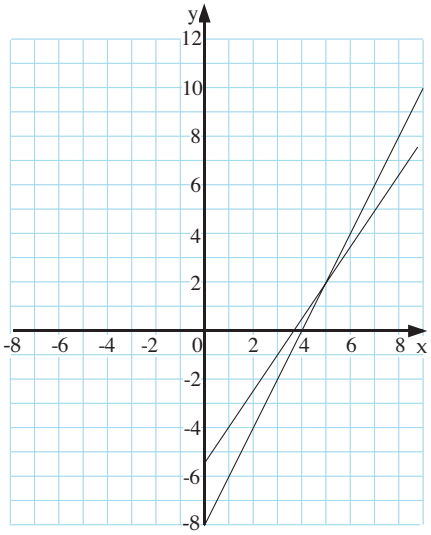
167. (5, 4)



168. (5, 2)



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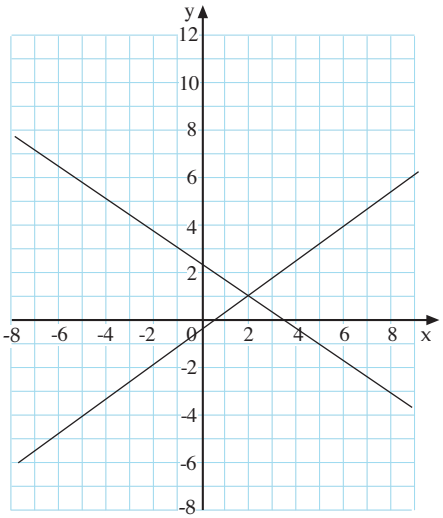
169. (2, 1)



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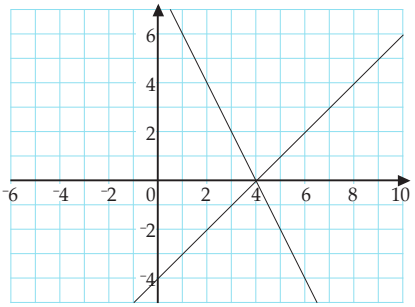
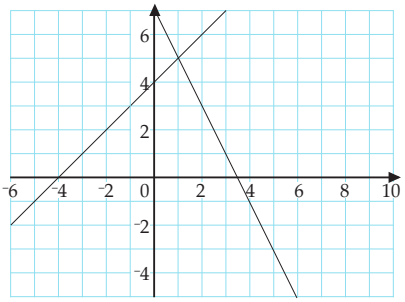
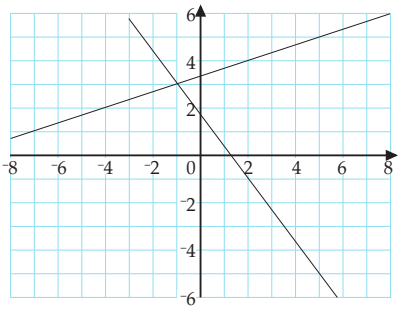
170. (4, 0)



171. (1, 5)



172. (⁻1, 3)



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173. (6, 2)
174. (⁻5, 4)
175. (2, 3)
176. (3, ⁻3)
177. (1, 2)
178. (4, 5)

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179. (0, 3)
180. (⁻4, 1)
181. (3, 0)
182. (0, 4)
183. (3, 6)
184. (3, ⁻1)

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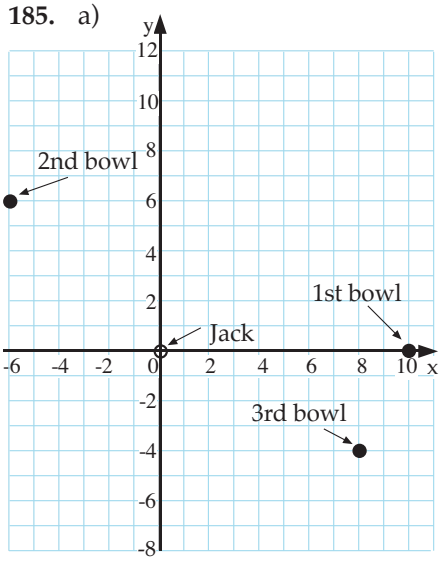
185. a)



b) 1st bowl = 10 cm
2nd bowl = 8.5 cm (1 dp)
3rd bowl = 8.9 cm (1 dp)
Closest bowl is 2nd bowl.

c) 4th bowl = (9, ⁻2)
= 9.2 cm (1 dp)

186. a) Lgth. of AB = $\sqrt{29}$
= 5.4 units (1 dp)

b) Lgth. of CD = $\sqrt{7.25}$
= 2.7 units (1 dp)

c) $11.20 = 0.5h(\sqrt{29} + \sqrt{7.25})$
$h = 2.77$
Lgth. of XD = 2.8 units (1 dp)

d) gradient = 2.5
$5x - 2y - 5 = 0$ or $y = \frac{5}{2}x - \frac{5}{2}$

e) $2x + 5y - 8 = 0$ or $y = \frac{-2}{5}x + \frac{8}{5}$
and Y = (0, 1.6)

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187. a) $16 \times 14 = 224$ km^2

b) Length of S_1S_3
$= \sqrt{(5-2)^2 + (14-4)^2}$
= 10.4 km (1 dp)

c) Grad. of $S_2S_3 = \frac{5-12}{14-1}$
$= \frac{-7}{13}$

d) $y - 12 = \frac{-7}{13}(x - 1)$
$7x + 13y - 163 = 0$

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e) Grad. of $S_1S_2 = \frac{-10}{3}$

Grad. of $S_1S_3 = \frac{3}{10}$

Since one is the negative reciprocal of the other, lines are at right angles. Therefore it is a right-angled triangle.

f) Triangle area =

$0.5 \times \sqrt{109} \times \sqrt{109}$

$= 54.5 \text{ km}^2$

If the 10.4 is used then an answer of 54.1 is obtained and this contains a rounding error.

g) x = 8 and y = 8 so target is (8, 8)

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188. a) $^-2$

b) $m_{AC} \times m_{BD} = ^-1$

c) $x - 2y + 2 = 0$ or $y = \frac{1}{2}x + 1$

$2x + y - 8 = 0$ or $y = ^-2x + 8$

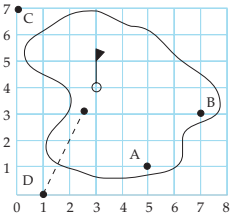
d) (2.8, 2.4)

e) 12.1 km/h (1 dp)

189. a) 18.0 m (1 dp)

b) D, 22.4 m (1 dp)

c) $x + 4y - 19 = 0$ or $y = \frac{^-1}{4}x + \frac{19}{4}$

d) 

1.6 units along and 3.2 units up from player D, in line with the hole.

e) $4x + 3y - 21 = 0$ or $y = \frac{^-4}{3}x + 7$

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190. a) 1118 metres

b) Gradient = $^-0.5$ and using either P or Q gives $x + 2y - 6 = 0$ or $y = \frac{^-1}{2}x + 3$

c) $2x - y + 8 = 0$ or $y = 2x + 8$

d) $(^-2, 4)$

e) 25 hectares (250 000 m^2)

f) $11x + 12y - 6 = 0$, $y = \frac{^-11}{12}x + \frac{1}{2}$

g) 4

h) 0.60 (60%)

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191. Equations of the altitudes

$3x - 2y = ^-5$

$8x + 11y = 37$

$2x + 15y = 47$

Solving any two simultaneously you obtain the orthocentre (0.39, 3.1).

Closest person is Allan at (1, 3)

192. Equations of the medians

$x + y = 9$

$17x - y = 39$

$13x - 5y = 3$

Solving any two simultaneously you obtain the centroid and hence the position of the announcer.

i.e. $x = 2\frac{2}{3}$, $y = 6\frac{1}{3}$

193. Using the distance formula

$\sqrt{(3k+4)^2 + (k-7)^2} = \sqrt{(3k+3)^2 + (k-1)^2}$

$10k^2 + 10k + 65 = 10k^2 + 16k + 10$

$k = 9\frac{1}{6}$

Coordinates of C $(9\frac{1}{6}, 27\frac{1}{2})$

(9.17, 27.5)

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Practice Assessment – Coordinate Geometry

Part A

Grad. AC = 1, Grad BD = $^-1$

Since one gradient is the negative reciprocal of the other,

i.e. $m_{AC} \times m_{BD} = ^-1$ so diagonals are perpendicular.

m(AC) = $\sqrt{72}$ and m(BD) = $\sqrt{8}$

Longest diagonal is AC.

Equation of AC is $x - y + 4 = 0$ or $y = x + 4$

For Achievement students need to have selected and used an appropriate method. Also working is expected and students need to indicate what the calculated answer represents.

Part B

Coordinates of rhombus A(0, 0), B(a, 0), C(a + b, c) and D(b, c).

Grad. AC = $\frac{c}{a+b}$

Grad BD = $\frac{c}{b-a}$

To prove perpendicular $m_{AC} \times m_{BD} = ^-1$

So $\frac{c}{a+b} \times \frac{c}{b-a} = \frac{c^2}{b^2 - a^2}$ (1)

As ABCD is a rhombus then m(AB) = m(BC).

Using the distance formula

$\sqrt{(a-0)^2 + (0-0)^2} = \sqrt{(a+b-a)^2 + (c-0)^2}$

$a^2 = b^2 + c^2$ (2)

Rearranging (2) gives $^-c^2 = b^2 - a^2$ and substituting in (1) gives

$\frac{c^2}{^-c^2} = ^-1$

So diagonals are perpendicular.

For Merit students need to clearly indicate what they are calculating and their solutions need to be linked to the context of the question. Students need to have correctly identified the points A, B, C and D and found the correct expressions for the gradients as well as applied the distance formula and combined these to prove that the diagonals of the rhombus are perpendicular.

Equation of diagonal AC is

$y = \frac{c}{a+b}x$ (1)

Equation of diagonal BD is

$y = \frac{c}{b-a}(x - a)$ (2)

Equating (1) and (2) and solving for x gives $x = \frac{a+b}{2}$ and $y = \frac{c}{2}$

For Excellence students responses need to be clearly communicated with correct mathematical statements. Students need to correctly find the equation of both diagonals and then equate and solve to find the point of intersection. Applicable algebraic working must be shown as well and students need to explain any decisions made in the solution of the problem.