The ball is at the same height when the distance is 0 m, that is before the ball is hit, and when it is 100 m.

b) When $d = 0$, $h = 0$; the height is 0 m before the ball is hit.
When $d = 100$:
$h = -0.002(100)^2 + 0.3(100)$
$h = 10$
When the distance is 100 m, the height of the ball is 10 m for either golf club.

Chapter 8 Review Page 458 Question 12

a) Example: By solving the related system of equations, the scientists would determine the time when both cultures have the same rate of increase of surface area.

b) $S(t) = -0.007t^2 + 0.05t$ ①
$S(t) = -0.0085t^2 + 0.06t$ ②
Substitute for $S(t)$ from ① into ②.
$-0.007t^2 + 0.05t = -0.0085t^2 + 0.06t$
$0.0015t^2 - 0.01t = 0$
$t(0.0015t - 0.01) = 0$
$t = 0$ or $t \approx 6.67$

When $t = 0$:
$S(t) = 0$

When $t \approx 6.67$
$S(t) = -0.007(6.666\ldots)^2 + 0.05(6.666\ldots)$
$S(t) \approx 0.02$

The solutions to the system are (0, 0) and approximately (6.67, 0.02).

c) The solution $t = 0$, $S(t) = 0$ is the start of the experiment, before any growth has occurred. The other solution means that in 6.67 h, or 6h 40 min, the surface area of both cultures is increasing at the same rate, 0.02 mm^2/h.

Chapter 8 Practice Test Page 459 Question 1

Visualize the graphs extended in quadrant I, they will intersect.
The best answer is **C**, the system has solutions in quadrant I and II only.

Chapter 8 Practice Test Page 459 Question 2

Given that $y = \frac{1}{2}(x-6)^2 + 2$ and $y = 2x + k$ have no solution, then

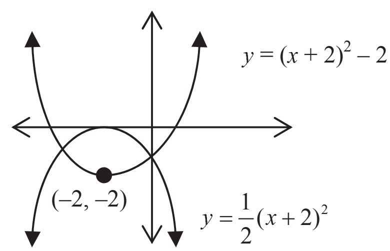
$y = -\frac{1}{2}(x-6)^2 + 2$ and $y = 2x + k$ must have two solutions because the parabola is the reflection in a horizontal line through the vertex of the original one. If the line did not intersect the first parabola at all it must intersect the reflected parabola twice.
C is the best answer.

Chapter 8 Practice Test Page 459 Question 3

The tables of values have two points in common (2, –3) and (4, –3), so the two quadratic functions must have at least these two real solutions.
Answer **B** is the best.

Chapter 8 Practice Test Page 459 Question 4

$y = (x + 2)^2 - 2$ ①
$y = \frac{1}{2}(x+2)^2$ ②



A sketch shows that there must be two solutions. Use the substitution method to determine whether answer C or D is best.
Substitute from ① into ②.

$(x + 2)^2 - 2 = \frac{1}{2}(x+2)^2$

$\frac{1}{2}(x+2)^2 = 2$

$x^2 + 4x + 4 = 4$

$x^2 + 4x = 0$

$x(x + 4) = 0$

$x = 0$ or $x = -4$

Answer **D** is best.

Chapter 8 Practice Test Page 459 Question 5

Connor put incorrect signs in the brackets in line 4.
Line 4 should be $(2m - 5)(m + 3) = 0$.
Answer **D** is best.

Chapter 8 Practice Test Page 459 Question 6

$4x^2 - my^2 = 10$ ①
$mx^2 + ny^2 = 20$ ②
Substitute $x = 2$ and $y = 1$ into ①:
$4(2)^2 - m(1)^2 = 10$
$16 - 10 = m$
$m = 6$
Substitute $x = 2$, $y = 1$ and $m = 6$ into ②:
$6(2)^2 + n(1)^2 = 20$
$n = 20 - 24$
$n = -4$

Chapter 8 Practice Test Page 459 Question 7

a) $5x^2 + 3y = -3 - x$
$2x^2 - x = -4 - 2y$
First rearrange the terms.
$5x^2 + x + 3y = -3$ ①
$2x^2 - x + 2y = -4$ ②
Multiply ① by 2 and ② by –3.

$$\begin{array}{rll} 10x^2 + 2x + 6y &= -6 & ③ \\ \underline{-6x^2 + 3x - 6y} &\underline{= 12} & ④ \\ 4x^2 + 5x \quad\quad &= 6 & ③ + ④ \\ 4x^2 + 5x - 6 &= 0 & \\ (4x - 3)(x + 2) &= 0 & \end{array}$$

$x = \frac{3}{4}$ or $x = -2$
Substitute in ② to determine the corresponding y-values.

When $x = \frac{3}{4}$:

$$\begin{aligned} 2\left(\frac{3}{4}\right)^2 - \frac{3}{4} + 4 &= -2y \\ \frac{9}{8} - \frac{3}{4} + 4 &= -2y \\ \frac{9 - 6 + 32}{8} &= -2y \\ \frac{35}{8} &= -2y \\ y &= -\frac{35}{16} \end{aligned}$$

When $x = -2$:

$$\begin{aligned} 2(-2)^2 - (-2) + 4 &= -2y \\ 14 &= -2y \\ y &= -7 \end{aligned}$$

The solutions are $\left(\frac{3}{4}, -\frac{35}{16}\right)$ and (–2, –7).

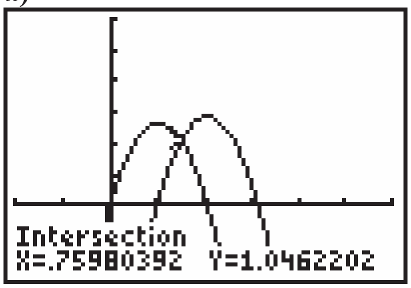
b) $y = 7x - 11$ ①
$5x^2 - 3x - y = 6$ ②
Substitute for y from ① into ②.

$$\begin{aligned} 5x^2 - 3x - (7x - 11) &= 6 \\ 5x^2 - 3x - 7x + 11 - 6 &= 0 \\ 5x^2 - 10x + 5 &= 0 \\ x^2 - 2x + 1 &= 0 \\ (x - 1)(x - 1) &= 0 \end{aligned}$$

Therefore, $x = 1$
Substitute into ① to determine the corresponding value of y.
$y = 7(1) - 11$
$y = -4$
The solution is (1, –4).

Chapter 8 Practice Test Page 460 Question 8

a)



The coordinates of the point of intersection are approximately (0.76, 1.05).

b) Example: 0.76 s after Sophie starts her jump, both dancers are at the same height, 1.05 m.

Chapter 8 Practice Test Page 460 Question 9

a) Perimeter: $2(x + 8 + x + 6) = 8y$

$4x + 28 = 8y$

Area: $(x + 8)(x + 6) = 6y + 3$

$x^2 + 14x + 48 = 6y + 3$

b) Solve the system:

$x + 7 = 2y$ ①

$x^2 + 14x + 45 = 6y$ ②

Substitute $2y = x + 7$ from ① into ②.

$x^2 + 14x + 45 = 3(x + 7)$

$x^2 + 14x – 3x + 45 – 21 = 0$

$x^2 + 11x + 24 = 0$

$(x + 3)(x + 8) = 0$

$x = –3$ or $x = –8$

Reject $x = – 8$ as it would make the width 0.

So, the solution is $x = –3$. Then, the length is 5 m and the width is 3 m.

The perimeter is 16 m and the area is 15 m^2.

Chapter 8 Practice Test Page 460 Question 10

a) For the blue parabola:

The vertex is at (0, 0), so the equation has the form $y = ax^2$.

The parabola passes through (3, 3), so substitute $x = 3$, $y = 3$.

$3 = a(3)^2$

$a = \frac{1}{3}$

For the green parabola:
The vertex is at (1, 0), so the equation has the form $y = a(x - 1)^2$.
The parabola passes through (3, 2), so substitute $x = 3$, $y = 2$.

$2 = a(3 - 1)^2$

$a = \frac{1}{2}$

A system of equations for the two quadratic functions is

$y = \frac{1}{3}x^2$ and $y = \frac{1}{2}(x - 1)^2$.

b) Substitute from the first equation into the second.

$\frac{1}{3}x^2 = \frac{1}{2}(x - 1)^2$

$2x^2 = 3(x^2 - 2x + 1)$

$0 = x^2 - 6x + 3$

Use the quadratic formula with $a = 1$, $b = -6$, and $c = 3$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(3)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{24}}{2}$$

$x = 3 \pm \sqrt{6}$

$x \approx 5.45$ or $x \approx 0.55$

Substitute in $y = \frac{1}{3}x^2$ to find the corresponding y-values.

When $x = 3 + \sqrt{6}$:

$y = \frac{1}{3}(3 + \sqrt{6})^2$

$y = \frac{1}{3}(9 + 6\sqrt{6} + 6)$

$y = 5 + 2\sqrt{6}$

$y \approx 9.90$

When $x = 3 - \sqrt{6}$:

$y = \frac{1}{3}(3 - \sqrt{6})^2$

$y = \frac{1}{3}(9 - 6\sqrt{6} + 6)$

$y = 5 - 2\sqrt{6}$

$y \approx 0.10$

The solutions are approximately (5.45, 9.90) and (0.55, 0.10).