Pre-Calculus 11 Final Review

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Name: ______________________ Date: ______________

BLM U1-4

Unit 1 Test

4. Determine the exact value of sin 210°.

A $\frac{\sqrt{3}}{2}$

B $-\frac{\sqrt{3}}{2}$

C $\frac{1}{2}$

D $-\frac{1}{2}$

5. Given the coordinates of points on the terminal arm of angles in standard position which point does not have the same reference angle as point P(2, −6)?

A (−2, 6)
B (−6, 2)
C (2, 6)
D (−2, −6)

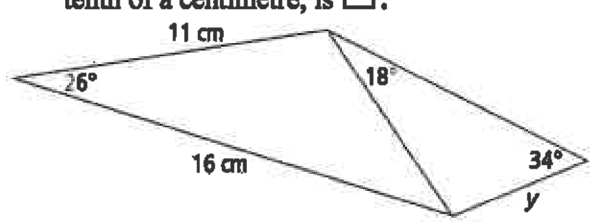
Numerical Response

Complete the statements in # 6 to 11.

6. The sum of the series $51 + 45 + 39 + \ldots + (-27)$ is $\square$.

7. Given $\cos\theta = \frac{\sqrt{2}}{2}$, the largest value of θ where $0° \leq \theta < 360°$ is $\square$ degrees.

8. In the diagram, the length of y, to the nearest tenth of a centimetre, is $\square$.



9. An angle of 280°, when drawn in standard position, would terminate in quadrant $\square$.

10. The exact value of tan 45° is $\square$.

11. The exact value of cos 270° is $\square$.

13. The terminal arm of angle θ passes through the point R(−15, −8).

a) Determine the distance from the origin to point R.

b) Determine the exact value of sin θ to the nearest tenth of a degree?

14. In △ABC, ∠A = 40°, a = 10 cm, and b = 15 cm.

a) Determine algebraically the number of possible triangles that can be drawn, or whether the triangle does not exist.

b) Sketch a diagram to represent the possible triangles.

c) If the triangle exists, determine the measure of ∠B to the nearest tenth of a degree.

Name: ______________________ Date: ______________

BLM U2-4

Unit 2 Test

Multiple Choice

For #1 to 7, choose the best answer.

1. Which statement is true regarding transformations of the graph of $y = x^2$ to the graph of $y = -(x + 1)^2 + 4$.
   - **A** There is a reflection in the x-axis, a vertical translation 4 units up and a horizontal translation of 1 unit left.
   - **B** There is a vertical stretch by a factor of 2 and a vertical translation of 4 units up.
   - **C** There is a reflection in the x-axis and a horizontal translation of 1 unit right.
   - **D** There is a vertical stretch by a factor of $\frac{1}{2}$ and a reflection in the y-axis.

2. When comparing the graphs of $y = ax^2$ and $y = (ax)^2$, $a \neq 0$, which of the following statements is true?
   - **A** When $a = -2$, both graphs are drawn in the same quadrant.
   - **B** When $a > 1$, the graph of $y = ax^2$ will be wider than the graph of $y = (ax)^2$.
   - **C** The graphs will be identical when $a = -1$.
   - **D** The graphs will never be congruent.

3. A quadratic function has a vertex at (6, –2). If the value of a is negative when the equation is in the form $y = ax^2 + bx + c$, then its graph will have
   - **A** two x-intercepts
   - **B** one x-intercept
   - **C** no x-intercepts
   - **D** a minimum value of –2

4. A quadratic function $y = ax^2 + bx + c$ has its vertex at a point above the x-axis. If $a > 0$, then the value of the discriminant is
   - **A** positive
   - **B** negative
   - **C** 0
   - **D** 1

5. A rectangular field bordering a river is to be enclosed with 600 m of fencing. No fence is needed along the riverbank. What equation represents the maximum area enclosed by the fence?
   - **A** $A = -x^2 + 600x$
   - **B** $A = -2x^2 + 600x$
   - **C** $A = -x^2 + 300x$
   - **D** $A = -2x^2 + 300x$

6. Which quadratic equation has roots of –2 and 3?
   - **A** $x^2 - x - 6 = 0$
   - **B** $x^2 + x + 6 = 0$
   - **C** $x^2 - x + 6 = 0$
   - **D** $x^2 + x - 6 = 0$

7. What are the roots of the equation $x^2 + 8x + 10 = 0$?
   - **A** $-4 \pm \sqrt{13}$
   - **B** $-4 \pm \sqrt{6}$
   - **C** $-8 \pm \sqrt{18}$
   - **D** $-8 \pm \sqrt{6}$

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BLM U2–4 (continued)

Numerical Response

Complete the statements in #8 to 10.

8. Consider the quadratic equation $10x^2 - 27x + 14 = 0$. The largest root of the equation is $\square$.

9. The value of a that causes $ax^2 - 2x - 3 = 0$ to have a double root is $\square$.

10. When the graph of the quadratic function $y = -x^2 + 6x - 13$ is translated two units to the right, the x-coordinate of the vertex will be $\square$.

Written Response

11. A specific quadratic function has a range described by $\{y \mid y \geq -7, y \in \mathrm{R}\}$ and has x-intercepts at 2 and 5.
    a) Identify the following characteristics of the graph:
       - equation of the axis of symmetry ____________
       - vertex ____________
       - direction of opening ____________
       - domain ____________
       - coordinates of the y-intercept________
    b) Write the equation of the quadratic function in the form $y = a(x - p)^2 + q$.

12. Determine the following characteristics of the quadratic function $y = 4x^2 - 8x + 1$. Use this information to sketch the graph.
    - vertex ____________
    - domain ____________
    - range ____________
    - direction of opening ____________
    - axis of symmetry ____________
    - x-intercepts ____________
    - y-intercepts ____________

13. Devin is playing for his high-school basketball team. He shoots the ball in an attempt to score a 3-point basket. The path of the ball can be modelled by the equation $h(d) = -0.067d^2 + 0.67d + 2$, where h represents the height of the basketball in metres, and d represents the horizontal distance travelled by the ball in metres.
    a) From what height does Devin release the basketball?
    b) What is the ball's maximum height?
    c) The height of the rim on the backboard is 3.05 m. If Devin scores, how far is he standing from the backboard?

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Unit 3 Test

Multiple Choice

For #1 to 4, choose the best answer.

1. Which equation is false?

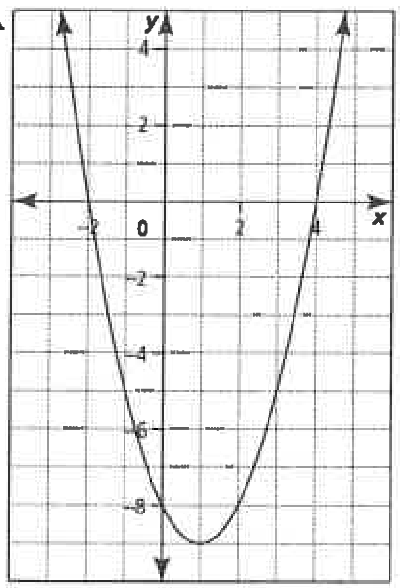
   A $\sqrt{250a^2} = 5a\sqrt{10}$

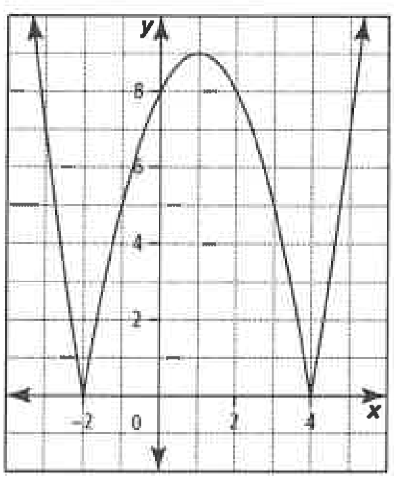
   B $\left(2\sqrt{6x}\right)\left(3\sqrt{18x^2}\right) = 36x\sqrt{3x},\ x \geq 0$

   C $3\sqrt{5} + 7\sqrt{5} = 10\sqrt{5}$

   D $\sqrt{(-6)^2} = -6$

2. Given $f(x) = x^2 - 2x - 8$, which graph represents $y = |f(x)|$?

A


B


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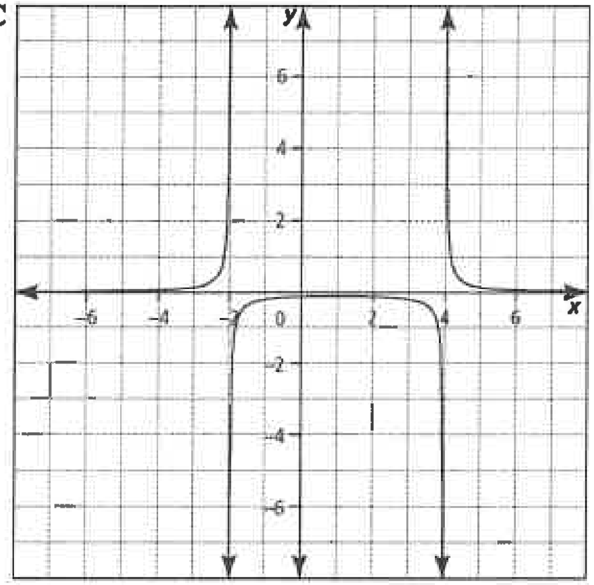
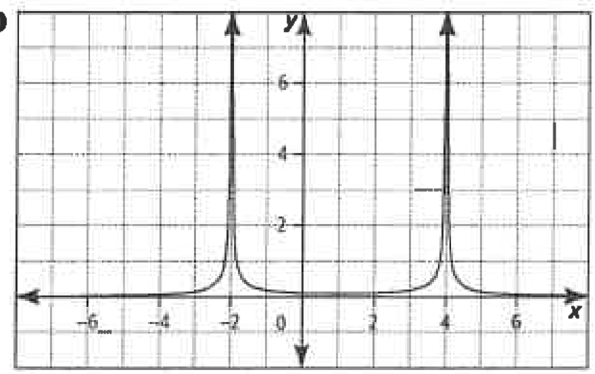


D


3. Determine the difference between $\dfrac{x+1}{x-2}$ and $\dfrac{x-1}{x+2}$.

   A $\dfrac{6x}{x^2-4}$

   B $-\dfrac{1}{2}$

   C $\dfrac{4}{(x+2)(x-2)}$

   D $\dfrac{2x^2+4}{x^2-4}$

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4. The equation $\frac{r^2+6r+5}{2r+2}=\frac{r+5}{2}$ is

   A always true, $x \in R$

   B never true, $x \in R$

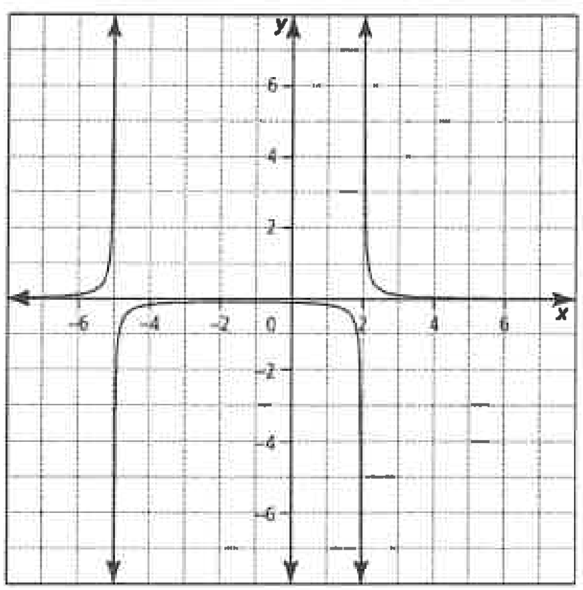
   C sometimes true, $x \in R$

   D true for $r = -1$

Numerical Response

Complete the statements in #5 to 7.

7. Using the graph of $y = \frac{1}{f(x)}$, the function $f(x)$ can be described as $f(x) = x^2 + mx - 10$, where the value of m is $\square$.



Written Response

8. Consider the equation $\sqrt{-3x-5} - 3 = x$.

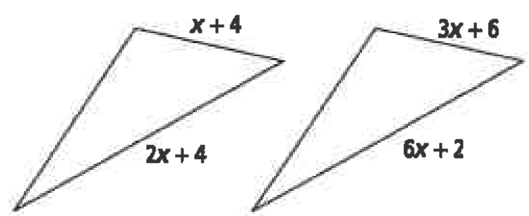
   a) Determine any restriction(s) on x in the equation.

   b) Solve the equation algebraically.

   c) Verify by substitution whether the values determined in part b) are roots of the equation.

   d) Explain your reasoning for rejecting any value(s) from part b) as roots of the equation.

9. Consider the similar triangles shown.



   a) Write a proportion to compare the similar sides.

   b) List any restrictions on the variable, x.

   c) Solve the rational equation and determine the length of each given side of both triangles.

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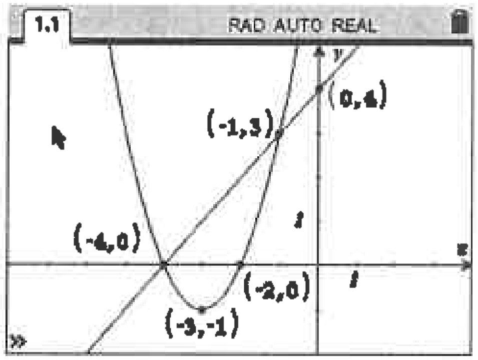
Unit 4 Test

Multiple Choice

For #1 to 5, choose the best answer.

1. The solution to the system of linear-quadratic equations shown on the graph is



A (–1, 3) **B** (–3, –1)
C (–4, 0) or (–1, 3) **D** (–4, 0) or (–2, 0)

2. How many solutions are there for the following system of equations?

$y = 2(x - 5)^2 - 2$
$y = 2(x - 4)^2 - 3$

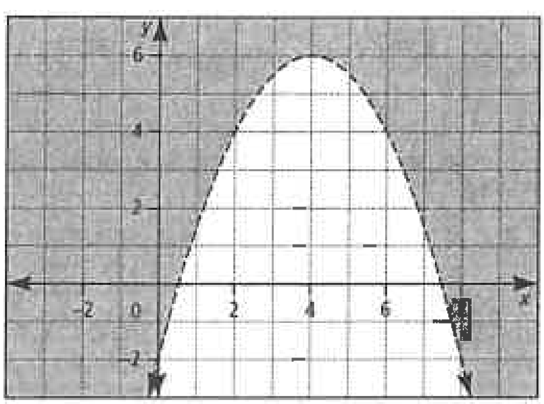
A zero **B** one **C** two **D** an infinite number

3. Which test point should not be used to determine the solution region for the linear inequality $y < -\frac{1}{3}x + 2$?

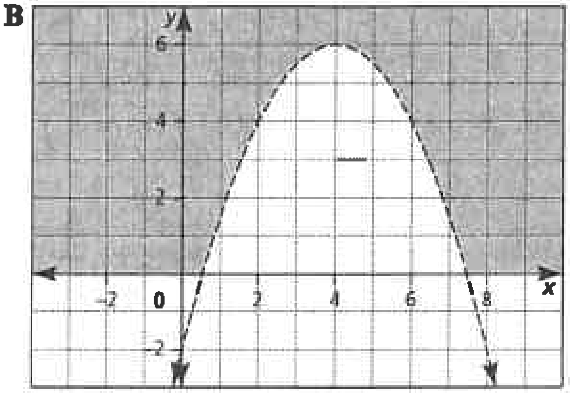
A (0, 0) **B** (1, 1) **C** (3, 1) **D** (–2, 1)

4. Which graph represents the inequality $y > -\frac{1}{2}x^2 + 4x - 2$?

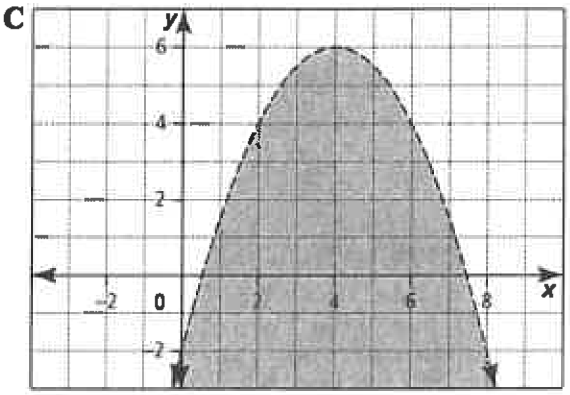
A



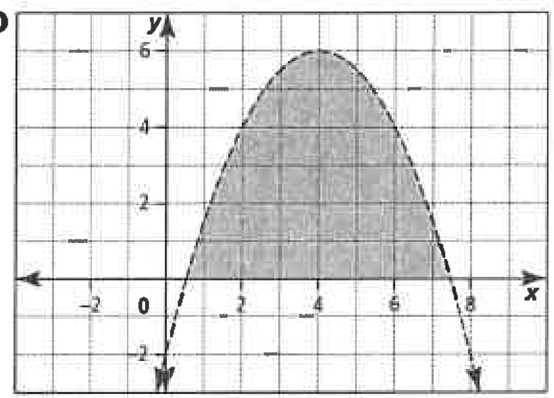
B



C



D



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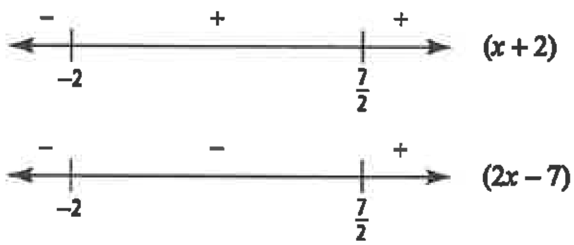
5. A student uses sign analysis to determine the solution set for the inequality $2x^2 - 3x - 16 \geq -2$. The partial solution is shown.



The solution set for the inequality $2x^2 - 3x - 16 \geq -2$ is

A $\left\{x \mid -2 \leq x \leq \frac{7}{2}, x \in \mathrm{R}\right\}$

B $\left\{x \mid x \leq -2 \text{ or } x \geq \frac{7}{2}, x \in \mathrm{R}\right\}$

C $\{x \mid x \geq -2, x \in \mathrm{R}\}$

D $\left\{x \mid x \geq \frac{7}{2}, x \in \mathrm{R}\right\}$

Numerical Response

Complete the statements in #6 to 8.

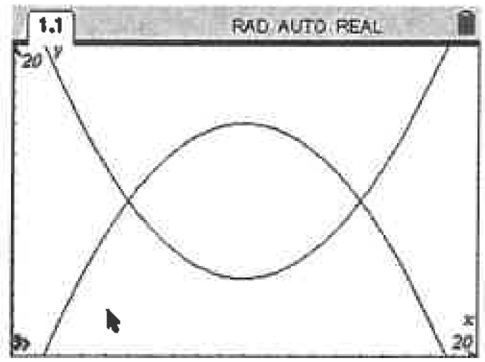
6. The solutions to a system of linear-quadratic equations can be represented by ordered pairs in the form (a, b). The largest value of b, to the nearest tenth, for the following system of equations is □.

$$x + 2y - 5 = 0$$
$$2x^2 - 5x + y - 1 = 0$$

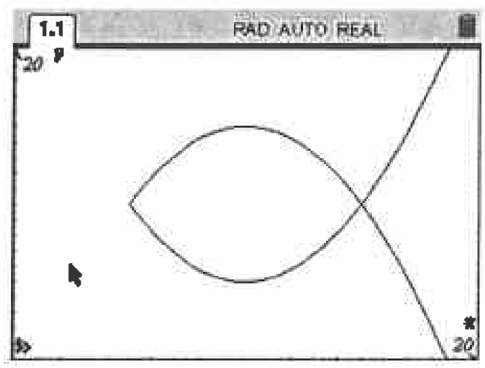
7. For the quadratic-quadratic system of equations shown, the value of k that would result in an infinite number of solutions is □.

$$3x^2 - 5x + ky - 10 = 0$$
$$12x^2 - 20x + 5y - 40 = 0$$

8. You can use a graphing calculator to create parabolic art. You can draw a fish by graphing $y = 0.2(x - 10)^2 + 5$ and $-0.2(x - 10)^2 + 15$, using window settings of 0 to 20 for both axes. You get the following results.



To graph only the fish, as shown below, the domain of the graphs is restricted to $\{x \mid x \geq a, a \in \mathrm{R}\}$, where $a = □$.



Written Response

9. Joseph has a budget of \$40 each month for movies and video games. Renting a movie costs \$5 and renting a video game costs \$8.
   a) Write an inequality to represent the number of movies and games that Joseph can rent within his budget. State what your variables represent.
   b) Graph the solution.
   c) Explain how the solution to the inequality relates to the situation.

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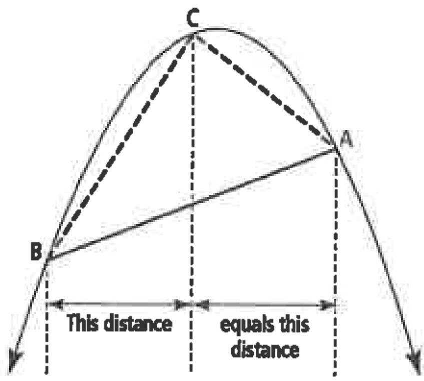
BLM U4-3
(continued)

10. The Greek mathematician Archimedes used a method of decomposing a portion of a parabola into triangles to determine the area under the parabola. The parabola shown can be modelled by the equation $y = -2x^2 + 15x - 21$, and the solid line can be modelled by $x - y - 1 = 0$.



a) Determine the points of intersection of the line and the parabola.

b) Explain in words how you could determine the coordinates of vertex C of the triangle.

11. Demonstrate one of the strategies to solve the inequality $6x^2 - 19x + 15 < 5$. You may wish to use case analysis, roots and test points, or sign analysis.

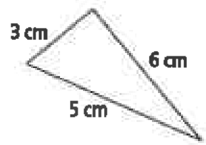
BLM 2–9 Chapter 2 Test

1. B **2.** B **3.** C **4.** D **5.** A **6.** 9.5 yd **7.** 21.9 cm

8. 14 cm **9. a)** $-\sqrt{3}$ **b)** $\frac{-\sqrt{3}}{2}$ **c)** $\frac{\sqrt{2}}{2}$

10. a) 20° **b)** 20°, 200°, 340°

11. a)

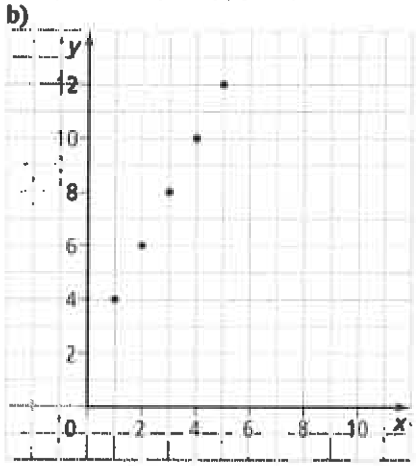


b) 29.9°, 56.3°, 93.8°

12. 12.5 ft and 6.4 ft

BLM U1–4 Unit 1 Test

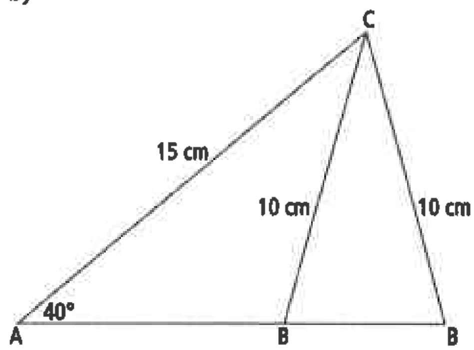
1. A **2.** B **3.** D **4.** D **5.** B **6.** 168 **7.** 315
8. 4.3 **9.** IV **10.** 1 **11.** 0
12. a) $t_n = 4 + (n - 1)(2)$ or $t_n = 2n + 2$
b)



c) $f(n) = 2n + 2$. The slope of the graph of the function is 2. The common difference of the arithmetic sequence is 2.
d) The domain of the arithmetic sequence is $n \in N$. Therefore, the graph is discrete. The domain of the function is $n \in R$. Therefore, the graph would be continuous.

13. a) 17 **b)** $\sin\theta = -\frac{8}{17}$, $\cos\theta = -\frac{15}{17}$, $\tan\theta = \frac{8}{15}$
c) $\theta = 208.1°$

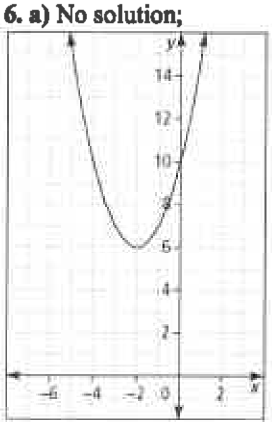
14. a) $a < b$ is true. Compare the values of a and $b \sin A$. $a > b \sin A$ because $10 > 9.6418\ldots$. Therefore, two triangles exist.
b)



c) $\angle B = 74.6°$ or $105.4°$

5. a) $-2 \pm \sqrt{5}$ **b)** $\frac{1 \pm 2\sqrt{2}}{2}$ **c)** $\frac{-5 \pm \sqrt{3}}{4}$ **d)** $2 \pm \sqrt{7}$

6. a) No solution;



b) 0, –7; Factor method: can be factored quickly because x is a common factor

c) $-\frac{5}{2}$; Factor method: a perfect square trinomial

d) $-4 \pm \sqrt{3}$; Complete the square method: already in the form $(x + a)^2 = b$

e) $\frac{-1 \pm \sqrt{7}}{6}$; Quadratic formula: exact values are required for the answer

7. a) –3 **b)** $-\frac{1}{2}$

BLM 4–8 Chapter 4 Review #22

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{b^2}{4a^2} - \frac{c}{a}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

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

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

Subtract c from both sides.
Divide both sides by a.
Complete the square.
Factor the perfect square trinomial.
Take the square root of both sides.
Solve for x.

BLM 4–9 Chapter 4 Test

1. A **2.** B **3.** D **4.** B **5.** A

6. $\frac{5\sqrt{5}}{2}$ or 5.59 s

7. a) In line 2, –4 should be in brackets. $\frac{2 \pm \sqrt{10}}{2}$.

b) In step 3, each term should have been divided by 15. $\frac{-3 \pm \sqrt{39}}{15}$.

8. a) $x = 2$ or 8; Example: Factoring, because the equation is easily factored to $(x - 2)(x - 8)$.

b) $x = -7$ or $x = \frac{2}{3}$; Example: Quadratic formula, because the equation is not readily factored.

c) $x = 3 \pm \sqrt{2}$; Example: Completing the square, because it is easy to find the perfect square.

d) $x = 1$ or 5; Example: Determining square roots, because it is easy to find the roots for $(x - 3)^2 = 4$

9. $x^2 + 5x - 10 = 0$; $\frac{-5 \pm \sqrt{65}}{2}$

10. $|k| > \frac{5}{2}$

11. 11.3 m by 9.3 m

12. $\frac{2}{3}$ or $\frac{3}{2}$

13. 2.57 s

BLM U2–4 Unit 2 Test

1. A **2.** B **3.** C **4.** B **5.** B

6. A **7.** B **8.** 2 **9.** $a = \frac{1}{3}$ **10.** 5

11. a) $x = 3.5$; $(3.5, -7)$; up; all real numbers; $(0, 31.1)$

b) $y = \frac{28}{9}(x - 3.5)^2 - 7$

12. $(1, -3)$; all real numbers; $y \geq -3$; up; $x = 1$; x-intercepts have values of 1.87 and 0.13; y-intercept has a value of 1

13. a) 2 m **b)** 3.67 m **c)** 8.05 m

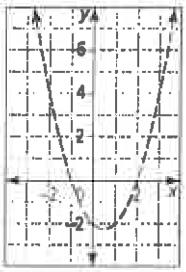
BLM U3–5 Unit 3 Test

1. D **2.** B **3.** A **4.** C
5. 3
6. 300.7
7. 3
8. a) $x \le -\frac{5}{3}$
b) $x = -2$ or $x = -7$
c) The value $x = -7$ is extraneous.
d) When substituting a value of -7 for x in the original equation, the equality does not hold true.
9. a) $\frac{x+4}{3x+6} = \frac{2x+4}{6x+2}$
b) $x \neq -2$, $x \neq -\frac{1}{3}$; Since the side lengths must be positive, $x \ge -\frac{1}{3}$.
c) $x = 8$

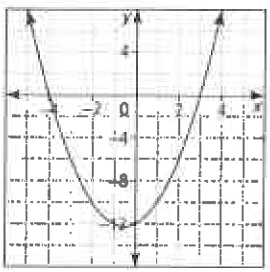
10. a) Isolate the absolute value expression by adding $2x$ to both sides of the equation.
b) $x = -1$ or $x = \frac{1}{3}$
c) Example: When evaluating an absolute value expression, the result is positive. However, a variable within an absolute value symbol can have a negative value.

c) Example: The number of tickets must be a whole number. The number of tickets can be various combinations of 0 to 10 adult tickets and 0 to 15 children's tickets, where the total cost does not go over \$150.

13. a) Example: $x^2 - x - 2 < 0$



b) Example: $x^2 + x - 12 \geq 0$



14. $\{P \mid 30 < P < 70, P \in \mathrm{R}\}$

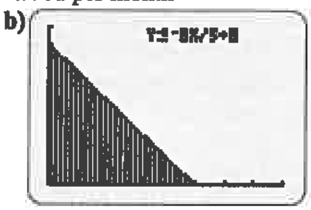
BLM U4–3 Unit 4 Test

1. C **2.** B **3.** C **4.** A **5.** B

6. 2.4 **7.** $\frac{5}{4}$ or 1.25 **8.** 5

9. a) $5m + 8v \leq 40$, where m is the number of movies rented per month and v is the number of video games rented per month

b)



c) Example: The number of movies or games must be whole numbers. The number of movies rented must be fewer than or equal to 8 and the number of video games rented must be fewer than or equal to 5.

10. a) (2, 1) and (5, 4)

b) Example: The x-coordinate is halfway between 2 and 5, so it is 3.5. Substitute this value into the quadratic equation to determine the y-coordinate to be 6.625. So, the coordinates of vertex C are (3.5, 7).

11. Solutions should include one of the following strategies: case analysis, roots and test points, or sign analysis. $\{x \mid \frac{2}{3} < x < \frac{5}{2}, x \in \mathrm{R}\}$