Name: _____   Date: _____

Pre-Calculus 11
Final Exam Multiple Choice and Numerical Response

Record your answers on the sheet provided.

1. Which of the following completes the geometric sequence _____, 8, 24, _____, _____?

   A −8, 40, 56   **B** $\frac{8}{3}$, 8, 24, 72, 216   **C** −8, 16, 32   **D** −8, 36, 322

2. Which of the following completes the geometric sequence 6, _____, _____, _____, 7776?

   A 1948.5, 3891, 5833.5   **B** 42, 172, 1080   **C** 36, 216, 1296   **D** 36, −216, 1296

3. The formula for the sum of the first n terms of an arithmetic series is $S_n = n^2 - 2n$. What are the first 4 terms of the series?

   A −1, 1, 3, 5   **B** 0, −1, 0, 3   **C** −1, 0, 3, 8   **D** 0, −1, −1, 2

4. What is $6.814\overline{72}$ expressed as fraction?

   A $\frac{681\,472}{100\,000}$ **B** $\frac{37\,481}{11\,000}$ **C** $\frac{37\,481}{5500}$ **D** $\frac{681\,472}{10\,000}$

5. The volume of a sphere is 2304π cm³. Determine the radius using the formula $r = \sqrt[3]{\frac{3V}{4\pi}}$, where V is the volume in cubic units and r is the radius.

   A 8 cm   **B** 12 cm   **C** 42 cm   **D** 1728 cm
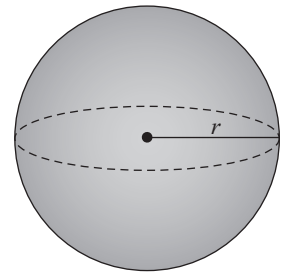
6. What is the value of θ, $0° \leq \theta < 360°$, if $\sin \theta = 0.3256$?

   A 0.006   **B** 19°and 199°   **C** 19° and 161°   **D** 199° and 341°

7. What is the value of θ, $0° \leq \theta < 360°$, if $\tan \theta = -\frac{1}{\sqrt{3}}$?

   A −0.01   **B** 30° and 150°   **C** 150° and 300°   **D** 150° and 330°

Numerical Response

8. What is the reference angle to an angle of 120° in standard position?

Numerical Response

9. The point P(6, −5) lies on the terminal arm of an angle in standard position. What is the value of the angle, to the nearest degree?

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Use this information to answer #10–13.

In a company telephone tree, each employee is to call 3 other employees. The tree begins with the company president.

10. At what level are 243 employees contacted?

 A 4   **B** 5   **C** 6   **D** 7

11. How many employees are contacted at the 8th level?

 A 729   **B** 2187   **C** 6561   **D** 19 683

12. By the 8th level, how many employees in total have been contacted?

 A 729   **B** 2187   **C** 3280   **D** 9840

13. Suppose there are 3500 employees in the company. By what level will all the employees have been contacted?

 A 9   **B** 10   **C** 11   **D** 12

14. Two ferries leave Tsawwassen, BC, at 1:00 p.m. The first vessel travels on a bearing of N68°W toward Departure Bay at a speed of 26 km/h. The second vessel travels at a speed of 35 km/h on a bearing of S33°W toward Swartz Bay. How far apart are the ferries at 1:30 p.m.?

 A 19.5 km   **B** 23.3 km   **C** 23.7 km   **D** 47.4 km

Use this information to answer #15–17.

The height in feet, h, of a ball thrown in the air after t seconds is given the equation $h(t) = -16t^2 + 48t + 3$.

15. What is the maximum height that the ball reaches?

 A 36 ft   **B** 39 ft   **C** 43 ft   **D** 51 ft

16. How long does it take for the ball to reach the maximum height?

 A 1.1 s   **B** 1.5 s   **C** 1.8 s   **D** 2.2 s

17. To the nearest hundredth of a second, how long is the ball is in the air?

 A 2.83 s   **B** 3.00 s   **C** 3.06 s   **D** 3.17 s

Numerical Response

18. What is the least root of the equation $6x^2 + 5x + 1 = 0$? Express your answer in decimal form.

Numerical Response

**19.** What is the greatest common factor of the expression $3x^2 + 6x - 21$?

20. In $\triangle ABC$, where $\angle A = 24°$, $a = 60$, and $b = 90$, which of the following solves the triangle where c is the largest side?

 A $\angle A = 24°$, $\angle B = 52°$, $\angle C = 104°$, $a = 60$, $b = 90$, $c = 119$
 B $\angle A = 24°$, $\angle B = 65°$, $\angle C = 91°$, $a = 60$, $b = 90$, $c = 110$
 C $\angle A = 24°$, $\angle B = 142°$, $\angle C = 14°$, $a = 60$, $b = 90$, $c = 36$
 D $\angle A = 24°$, $\angle B = 38°$, $\angle C = 118°$, $a = 60$, $b = 90$, $c = 130$

21. The ratio of the radii of two circles is $3:2$. Expressed in terms of π, what are the areas of the circles if the radius of the larger circle is $(2 + \sqrt{x})$ cm and the radius of the smaller circle is $(2 - \sqrt{x})$ cm, $x \geq 0$?

 A larger circle: $\dfrac{x + 3}{x + 2} + \dfrac{x + 11}{x^2 - 5x - 14}$; smaller circle: $\dfrac{1150}{625}\pi$

 B larger circle: $\dfrac{54}{25}\pi$; smaller circle: $\dfrac{46}{25}\pi$

 C larger circle: $\dfrac{144}{625}\pi$; smaller circle: $\dfrac{64}{625}\pi$

 D larger circle: $\dfrac{144}{25}\pi$; smaller circle: $\dfrac{64}{25}\pi$
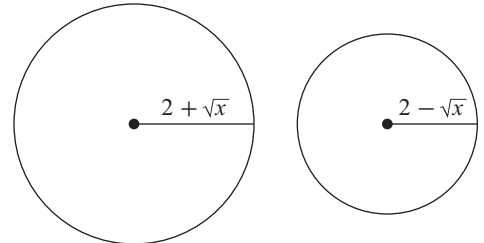
22. Natalie is building a rectangular greenhouse. Since it is adjacent to her house, she only needs to build three sides of the greenhouse. Natalie's budget will allow her to build walls with a total length of 20 ft. What dimensions will ensure a greenhouse with the maximum possible area?

 A 5 ft × 5 ft   **B** 6.6 ft × 6.6 ft   **C** 10 ft × 5 ft   **D** 10 ft × 10 ft

Use this information to answer #23–24.
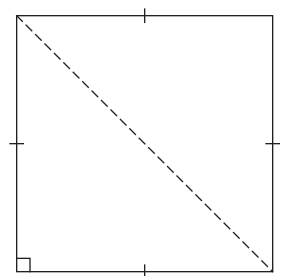
A square yard has an area of 98 m².

23. What are the dimensions of the yard in simplest radical form?

 A $7\sqrt{2}$ m by $7\sqrt{2}$ m   **B** $\sqrt{98}$ m by $\sqrt{98}$ m
 C $7\sqrt{14}$ m by $7\sqrt{14}$ m   **D** $98\sqrt{1}$ m by $98\sqrt{1}$ m

24. What is the length of a diagonal of the yard in simplest radical form?

 A $\sqrt{14}$ m   **B** 14 m   **C** $14\sqrt{2}$ m   **D** 20 m

25. What is the solution to $\sqrt{2x + 3} - \sqrt{x + 2} = 2$?

    A There are no solutions.   **B** $x = 1$

    C $x = 1$ and $x = 23$ **D** $x = 23$

26. What is the solution to $|5x + 1| = -3x + 15$?

    A There are no solutions.   **B** $x = \dfrac{14}{8}$

    C $x = -8$ **D** $x = \dfrac{14}{8}$ and $x = -8$

27. You and a friend go on a cycling trip. On the first day, you plan to travel a total distance of 56 km, 14 km of which is uphill. On level ground, you cycle at a speed of b km/h. You slow down by 4 km/h when going uphill. If your total travel time is 5 h, what is your speed on level ground?

    A $b = 2.7$ **B** $b = 12.5$ **C** $b = 2.7$ and $b = 12.5$ **D**   There are no solutions.

Use this information to answer #28–29.

For the following rational expression, $\dfrac{x + 3}{x + 2} + \dfrac{x + 11}{x^2 - 5x - 14}$

28. Which of the following is the sum?

    A $\dfrac{x^2 - 3x + 10}{(x - 7)(x + 2)}$ **B** $\dfrac{x - 5}{x - 7}$ **C** $\dfrac{x + 3}{x + 2} + \dfrac{x + 11}{(x - 2)(x - 7)}$ **D** $\dfrac{x + 5}{x - 7}$

29. What are the restrictions on the variable?

    A $x \neq -2, x \neq 5$ **B** $x \neq 7$ **C** $x \neq -2, x \neq 7$ **D** $x \neq 5, x \neq 7$

Numerical Response

30. Solve for x: $\sqrt{(x^2 - 16)} = \sqrt{(x - 4)}$.

Use this information to answer #31–32.

For the following rational expression, $\dfrac{x + 5}{x^2 - 9} + \dfrac{x - 5}{2x - 6} = \dfrac{x}{x + 3}$

31. What is the solution to the equation?

    A $x = 1$ **B** $x = 5$ **C** $x = 5$ and $x = 1$ **D** There is no solution.

32. What are the restrictions on the variable?

    A $x \neq 3, x \neq -3$ **B** $x \neq -3$ **C** $x \neq 5$ **D** $x \neq 5, x \neq -5$

Numerical Response

33. For what value of x is $\dfrac{x^2 - 9}{x - 2}$ undefined?

Use this information to answer #34–35.

Patrick makes exercise weights. For his 10-lb dumbbells, Patrick guarantees that the actual weight of his dumbbells is within 4 oz of 10 lbs. (Note: 1 lb = 16 oz)

34. What absolute value equation expresses the range of the actual weight of the dumbbells?

    A $|x - 10| = 4$ **B** $|x - 160| = 4$ **C** $|x - 10| = 16$ **D** $|x - 4| = 160$

35. What is the range of the weight of the dumbbells, in ounces?

    A 144 oz−176 oz   **B** 150 oz−170 oz   **C** 156 oz−164 oz   **D** 158 oz−162 oz

Numerical Response

36. One winter day, the temperature in Salmon Arm, BC, increased from −15°C to 2°C. What is the absolute value of the change?

Numerical Response

37. What value corrects the equation that incorrectly states that the absolute value of +3 plus the absolute value of −7 equals 4?

Use this information to answer #38–39.

The diameter of a steel ball bearing is 1.75 in. The ball bearing has a tolerance of ±0.008 in.

38. Which of the following is an absolute value equation for the upper and lower limits of the diameter of the bushing?

    A $|x - 1.75| = 0.008$ **B** $|x - 1.75| = 0.08$

    C $|x - 0.008| = 1.75$ **D** $|x - 0.08| = 1.75$

39. Which of the following are the limits?

    A 1.746 − 1.754 inches   **B** 1.7 − 1.79 inches

    C 1.67 − 1.83 inches   **D** 1.742 − 1.758 inches

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Use this grid to sketch a graph to help you answer #40–41.
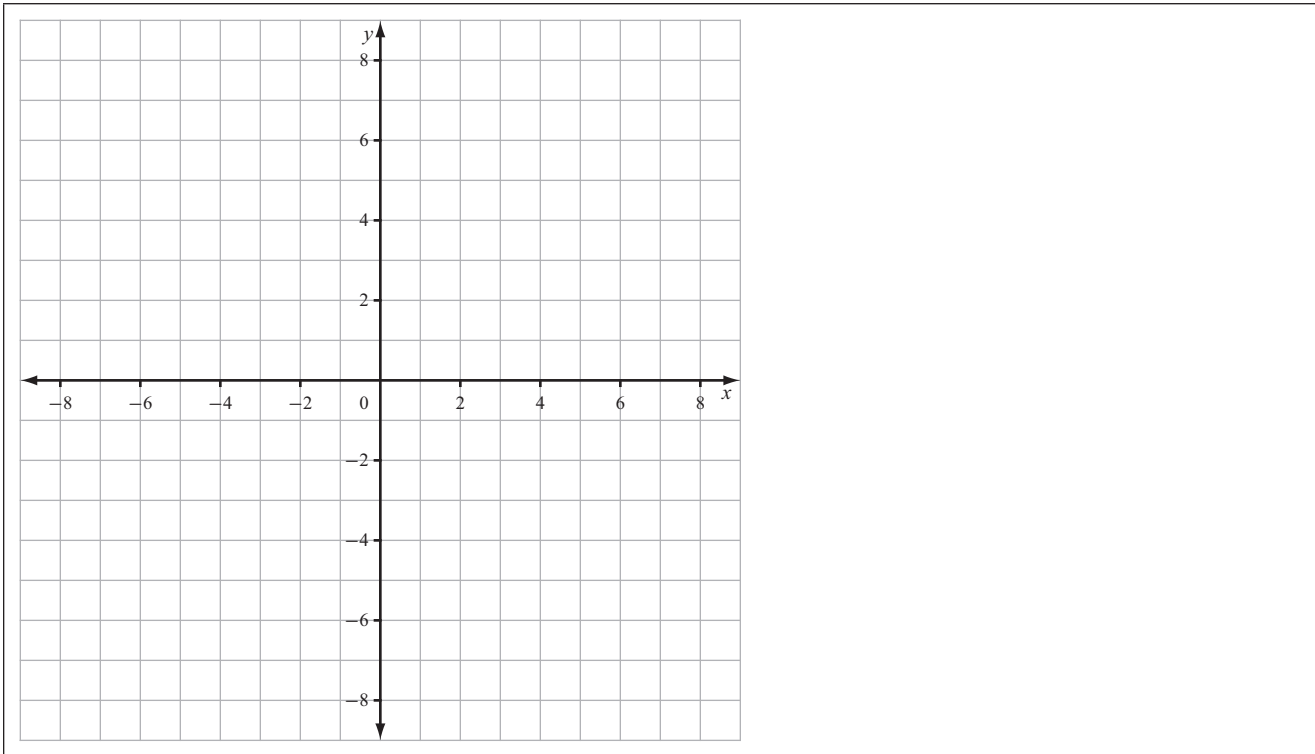
40. Given $y = -2(x + 4)^2 + 5$, what is the equation of the axis of symmetry of the graph of the function?

   A $x = -4$ **B** $x = -2$ **C** $x = 4$ **D** $x = 5$

41. What is the domain and range of the function $y = -2(x + 4)^2 + 5$?

   A domain: $\{x \mid x \in R\}$; range: $\{y \mid y \in R\}$
   B domain: $\{x \mid x \in R\}$; range: $\{y \mid y \geq 5, y \in R\}$
   C domain: $\{x \mid x \geq -4; x \in R\}$, range: $\{y \mid y \leq 5, y \in R\}$
   D domain: $\{x \mid x \in R\}$; range: $\{y \mid y \leq 5, y \in R\}$

42. Given $y = -\dfrac{1}{3}x^2 - 2x - 2$, what are the x-intercepts and y-intercepts of the graph of the function?

   A x-intercept: $(-1.3, 0)$; y-intercept: $(0, -2)$
   B x-intercepts: $(-4.7, 0)$ and $(-1.3, 0)$; y-intercept: $(0, -2)$
   C x-intercept: $(0, -2)$; y-intercept: $(-1.3, 0)$
   D x-intercept: $(0, -2)$; y-intercepts: $(-4.7, 0)$ and $(-1.3, 0)$

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Use this information to answer #43–44.

> The popularity, p, of an Internet game is modelled by $p = -0.1d^2 + 2d + 35$, where d is the number of days the game has been available.

43. Which statement best explains why is it reasonable for this situation to be modelled by a quadratic function?

  A It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually starts low and becomes increasingly popular over time.

  B It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually starts high and then decreases over time.

  C It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game remains constant over time.

  D It is reasonable for this situation to be modelled by a quadratic function because the popularity of a game usually increases, peaks, and then decreases over time.

44. On which day will the game be most popular?

  A 10th day   **B** 20th day   **C** 35th day   **D** 45th day

45. The equation $x^2 - 2x + 36 = 0$ has how many roots?

  A no real roots   **B** 1 real root   **C** 2 real roots   **D** 4 real roots

46. Which statement best describes why an equation with a discriminant of zero has one distinct real root?

  A Consider the quadratic equation. When the discriminant is zero, the distinct real root is zero.

  B Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \dfrac{\pm\sqrt{b^2 - 4ac}}{2a}$.

  C Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \dfrac{-b \pm 0}{2a}$, or $x = \dfrac{-b}{2a}$.

  D Consider the quadratic equation. When the discriminant is zero, the equation is reduced to $x = \dfrac{b \pm 0}{2a}$, or $x = \dfrac{b}{2a}$.

47. Which quadratic equation has roots of $-\dfrac{4}{5}$ and 3?

  A $x^2 - \dfrac{4}{5}x + 3 = 0$ **B** $x^2 + 11x - 12 = 0$

  C $5x^2 - 11x - 12 = 0$ **D** $5x^2 + 11x - 12 = 0$

48. Given $y = \left|\dfrac{1}{3}x + 2\right|$, what are the x-intercept, y-intercept, domain, and range?

  A x-intercept: $(-6, 0)$; y-intercept: $(0, -2)$; domain: $\{x \mid x \in R\}$; range: $\{y \mid y \in R\}$

  B x-intercept: $(-6, 0)$; y-intercept: $(0, -2)$; domain: $\{x \mid x \in R\}$; range: $\{y \mid y \geq 0, y \in R\}$

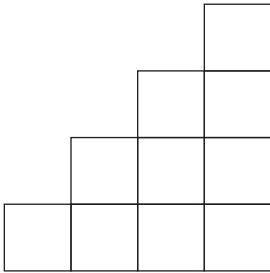 **C** x-intercept: $(-6, 0)$; y-intercept: $(0, 2)$; domain: $\{x \mid x \in R\}$; range: $\{y \mid y \in R\}$

  D x-intercept: $(-6, 0)$; y-intercept: $(0, 2)$; domain: $\{x \mid x \in R\}$; range: $\{y \mid y \geq 0, y \in R\}$;

49. Which of the following is an example of an arithmetic sequence?
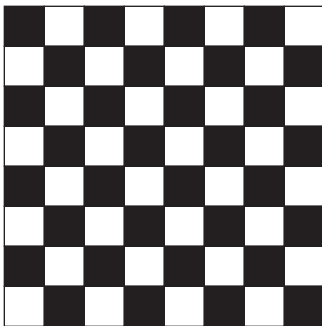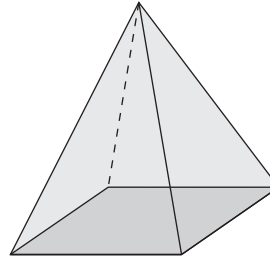
A

B
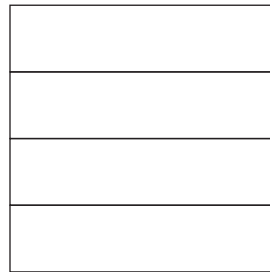
C

D

50. What is the best rule for determining the general term of an arithmetic sequence?

A an ordered list of terms in which the difference between consecutive terms is constant
B an ordered list of terms in which the difference between consecutive terms is growing
C an ordered list of terms in which the difference between constant terms is variable
D an ordered list of variables in which the difference between consecutive terms is constant

Use this diagram to answer #51.
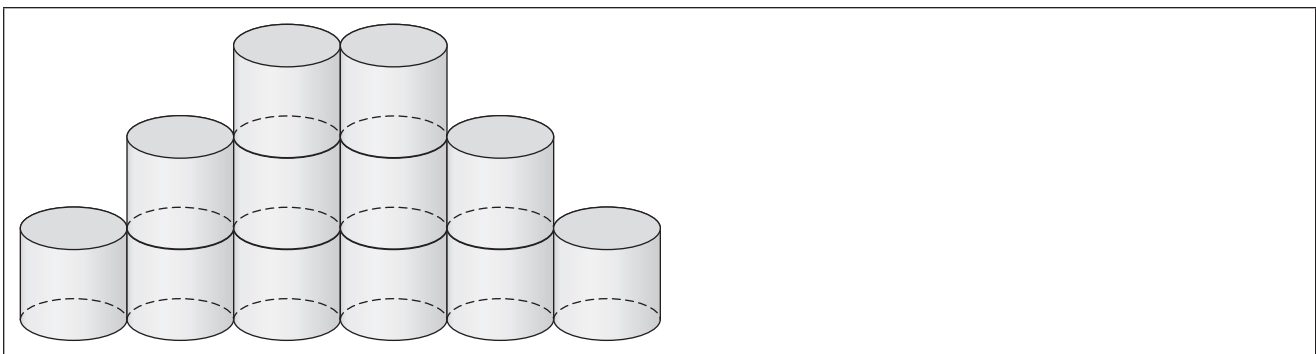
51. If the stack has 16 cans in the third row from the bottom, how many cans are in the bottom row?

A 20   **B** 18   **C** 16   **D** 8