Name: _____

Teacher: _____

Menihek High School

MATHEMATICS 2201

Final Exam June 2016

Value: 100 marks **Time: 2 hours**

General Instructions

1. Do NOT remove any sheets from this exam. Candidates are required to do **ALL** items. Formulas are provided below.

2. The examination consists of the following parts:

Part 1:	Selected Response	*Value: 45%*
Part 2:	Constructed Response	*Value: 55%*

3. A self-powered calculator may be used for calculations and to obtain special values.

4. For Section B items, candidates are reminded to show all necessary steps and calculations as credit may be given for incomplete or partially correct solutions. Correct answers without calculations will not merit full marks.

Student Checklist

The items below are your responsibility. Please ensure that they are completed.

- ☐ Write your name on the top of this page.
- ☐ Write your name on the answer sheet for Section A.
- ☐ Write your teacher's name on the top of this page.
- ☐ Check this exam to see that there are no missing pages.

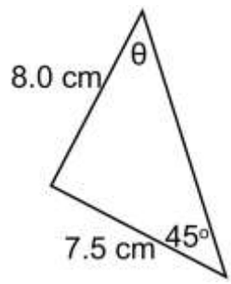
FORMULAE

$\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$	$a^2 = b^2 + c^2 - 2bccosA$	$cosA = \frac{b^2 + c^2 - a^2}{2bc}$

$\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$	$z = \frac{x - \mu}{\sigma}$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

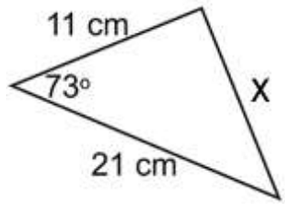
Part 1 – Selected Response: **Shade the letter of the best answer on your answer sheet (1.5% each)**

1. What is the measure of θ to the nearest degree?



(A) 41^0
(B) 42^0
(C) 48^0
(D) 49^0

2. What is the measure of x to the nearest tenth of a centimeter?



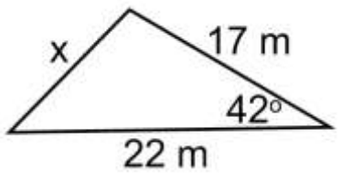
(A) 11.0
(B) 20.7
(C) 26.4
(D) 426.9

3. What information do you need to know about a triangle to use the sine law?

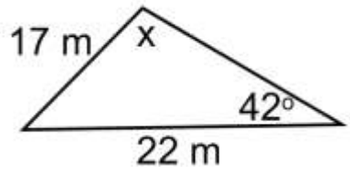
(A) all the sides
(B) all the angles
(C) two sides and the contained angle
(D) two angles and the contained side

4. Which triangle would require the law of cosines to solve for *x*?

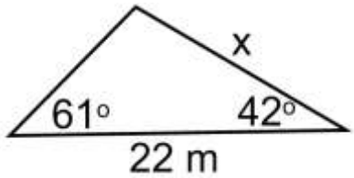
(A)



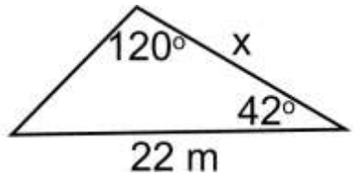
(B)



(C)



(D)



5. What is $12\sqrt{50} - 8\sqrt{2}$ in fully simplified form?

(A) $4\sqrt{48}$
(B) $20\sqrt{2}$
(C) $20\sqrt{48}$
(D) $52\sqrt{2}$

6. What is $\frac{\mathbf{7\sqrt{15}}}{\mathbf{3\sqrt{6}}}$ in fully simplified form?

   (A) $\frac{7\sqrt{10}}{6}$
   (B) $\frac{7\sqrt{15}}{6}$
   (C) $\frac{7\sqrt{10}}{18}$
   (D) $\frac{7\sqrt{15}}{18}$

7. What is $\mathbf{3y\sqrt[3]{4y}}$ as an entire radical?

   (A) $\sqrt[3]{12y^3}$
   (B) $\sqrt[3]{12y^4}$
   (C) $\sqrt[3]{108y^3}$
   (D) $\sqrt[3]{108y^4}$

8. Alexander was asked to simplify $\mathbf{3\sqrt[3]{64x^5}}$, but he did not get the correct answer. At what step did he make his **first** error?

   Solution:
   Step 1: $3 \cdot \sqrt[3]{64} \cdot \sqrt[3]{x^5}$
   Step 2: $3 \cdot 4 \cdot \sqrt[3]{x^3} \cdot \sqrt[3]{x^2}$
   Step 3: $3 \cdot 4 \cdot x^2 \cdot \sqrt[3]{x^2}$
   Step 4: $16x^2\sqrt[3]{x^2}$

   (A) 1
   (B) 2
   (C) 3
   (D) 4

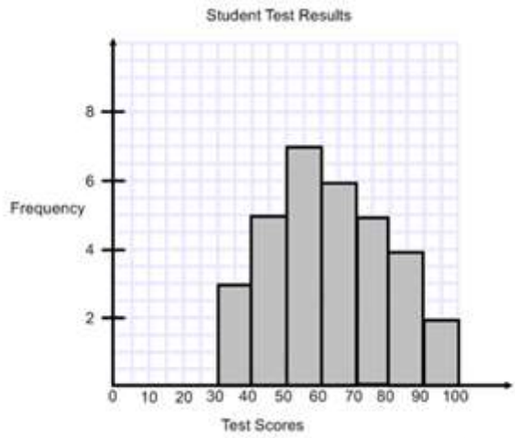
9. What is the restriction on the variable for $\frac{5}{\sqrt{x+2}}$?

   (A) $x < -2$
   (B) $x > -2$
   (C) $x \leq -2$
   (D) $x \geq -2$

10. The weights of all the students in class were determined. It was later found that the scale used was inaccurate and that 5 kg had to be added to each student's weight. What would stay the same based on the new weight measures?

    (A) Central tendency
    (B) Mean
    (C) Median
    (D) Standard deviation

11. How many scores are greater than or equal to 40?



(A) 12
(B) 24
(C) 29
(D) 32

12. The ages of the participants in a charity hockey match are normally distributed with a mean of 45 years and a standard deviation of 9 years. What percent of players are between 27 and 63 years of age?

(A) 34 %
(B) 68 %
(C) 95 %
(D) 99 %

13. What is the vertex of the quadratic function $= -3x^2 - 12x - 4$?

(A) (-2,-40)
(B) (-2,8)
(C) (-4, -100)
(D) (18, -760)

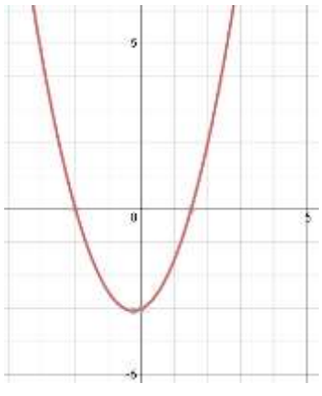
14. What is the range of the quadratic function $= -(x - 3)^2 + 6$?

(A) $\{y|y \geq 3, y \epsilon R\}$
(B) $\{y|y \leq 3, y \epsilon R\}$
(C) $\{y|y \geq 6, y \epsilon R\}$
(D) $\{y|y \leq 6, y \epsilon R\}$

15. Which statement is true about the quadratic function $y = -3(x + 6)(x - 4)$?

(A) It is in vertex form and the graph opens downwards.
(B) The graph of has one x-intercept and opens upwards.
(C) The graph is wider than the graph of $y = x^2$ and opens upwards.
(D) The graph has x-intercepts at $x = -6$ and $x = 4$ and opens downwards.

16. What are the roots to the quadratic function graphed below?



(A) $x = -2, x = -3$
(B) $x = -2, x = -\frac{3}{2}$
(C) $x = -2, x = \frac{3}{2}$
(D) $x = 2, x = \frac{3}{2}$

17. What are the coordinates to the y-intercept for the quadratic function $f(x) = -x^2 + 13x - 4$?

(A) (-4,0)
(B) (4,0)
(C) (0,-4)
(D) (0,4)

18. What are the exact roots to the equation $8x^2 + 2x - 1 = 0$?

(A) $\left\{-\frac{1}{2}, \frac{1}{4}\right\}$
(B) $\left\{\frac{1}{2}, -\frac{1}{4}\right\}$
(C) $\{-2, 4\}$
(D) $\{2, -4\}$

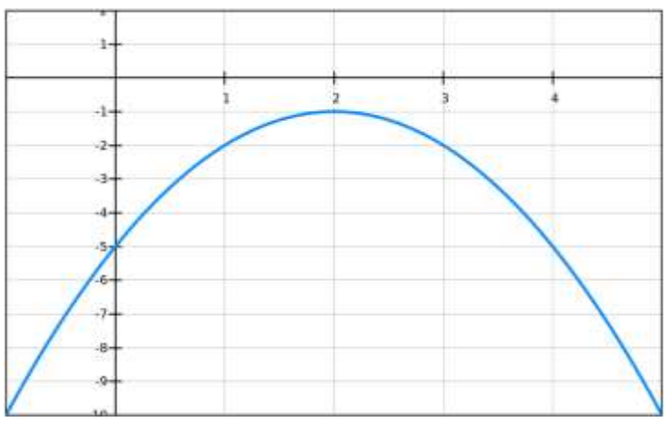
19. The expression $\frac{4 \pm \sqrt{60}}{2}$ are roots to a quadratic equation. What are these roots in simplified form?

(A) $1 \pm \frac{\sqrt{15}}{2}$
(B) $2 \pm \sqrt{15}$
(C) $2 \pm 2\sqrt{15}$
(D) $\frac{4 \pm 2\sqrt{30}}{2}$

20. Which equation in below has roots at $x = -2$ and $= 8$?

(A) 0 = a(x-2)(x+8)
(B) 0 = a(x+2)(x+8)
(C) 0 = a(x-2)(x-8)
(D) 0= a(x+2)(x-8)

21. Given the graph of $= -x^2 + 4x - 5$, which statement is true?



(A) The equation $-x^2 + 4x - 5 = 0$ has one root because the graph has one y intercept.
(B) The vertex is below the x-axis therefore the equation $-x^2 + 4x - 5 = 0$ has one root.
(C) The vertex is below the x-axis therefore the equation $-x^2 + 4x - 5 = 0$ has no roots.
(D) There are no x-intercepts therefore the equation $-x^2 + 4x - 5 = 0$ will have two roots.

22. What are the roots to $4x^2 - 80 = 0$ in simplest form?

(A) $x = \pm\sqrt{5}$
(B) $x = \pm 2\sqrt{5}$
(C) $x = \pm 4\sqrt{5}$
(D) $x = \pm 5$

23. Which is the **worst** buy?

(A) 3 L of orange juice for $9.99
(B) 8 L of orange juice for $20.88
(C) 12 L of orange juice for $37.44
(D) 24 L of orange juice for $64.80

24. A secret box measuring 25 cm by 30 cm by 35 cm has its dimensions increased using a scale of 3 cm : 1 cm. By what factor does the volume get increased by?

(A) $\frac{1}{27}$
(B) $\frac{1}{3}$
(C) 3
(D) 27

25. Given the sequence {40,-20, 10, -5,...} using inductive reasoning, what would be a conjecture for the **7th** term?

(A) Term 7 would be -1.25
(B) Term 7 would be -0.625
(C) Term 7 would be 0.625
(D) Term 7 would be 1.25

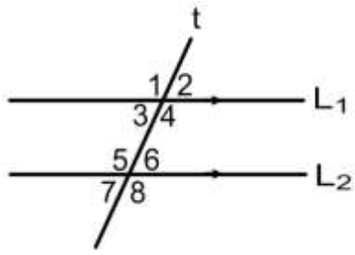
26. Mark made the following conjecture: “If a number is divisible by 2 then it is also divisible by 4." Which of the options presented below would be a counterexample to this conjecture?

(A) -8
(B) -18
(C) 20
(D) 3564

27. Which expression below can be used to represent the **product** of three consecutive natural numbers?

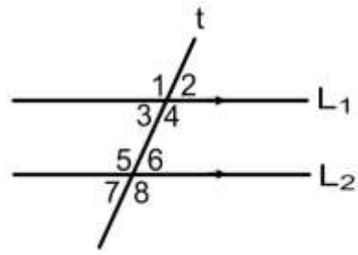
(A) n + (n+1) + (n+2)
(B) n(n+1)(n+2)
(C) (n - 4)(n-2)(n)
(D) n(n+3)(n+6)

28. In the diagram $\angle 5 = 124^0$. If L_1 and L_2 are parallel, then what is the measure of $\angle 3$?



(A) 56°
(B) 62°
(C) 124°
(D) 180°

29. In the diagram at the right, lines L_1 and L_2 are parallel and are cut by transversal t. Which two angles are alternate exterior?



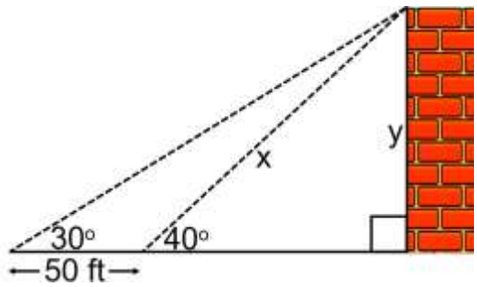
(A) $\angle 1 \; and \; \angle 5$
(B) $\angle 2 \; and \; \angle 7$
(C) $\angle 6 \; and \; \angle 7$
(D) $\angle 7 \; and \; \angle 8$

30. What is the sum of the interior angles of a regular polygon with 20 sides?

(A) 1620°
(B) 2880°
(C) 3240°
(D) 3600°

Part 2 – Constructed Response: **Show all workings in the space provided.** **(55% total)**

31. A person on the ground looks up to the top of a building at an angle of elevation of 30^0. After moving 50 feet closer, the angle of elevation is now 40^0 as shown in the diagram. Using the law of sines and/or cosines, algebraically determine the length of **x** and use it to find the height of the building, **y** to the nearest foot. **(7%)**



32. Simplify the following expression: $(2\sqrt{5} + \sqrt{3})(\sqrt{12} + \sqrt{5})$ (**4%**)

33. For the equation $\sqrt{4x+9} = 5$, state the restriction on x, solve the equation and check for extraneous solutions. **(4%)**

34. A company produces bungee cords. The lengths of the bungee cords produced are normally distributed, with a mean of 45.2 cm and a standard deviation of 1.3 cm. To be accepted by quality control, bungee cords must have a length of at least 42.0 cm to a maximum of 48.0 cm.

    (A) Find z-scores for bungee cords of length 42 and 48 cm respective. Use it to find the area under the curve on the z-standard normal distribution. Using your answer, determine what percent, to 2 decimal places, of bungee cords produced will be accepted? (A shaded diagram may be of use here) (**5 %**)

    (B) If 20, 000 bungee cords are produced, how many, to the nearest whole number, would one expect to be accepted? (**1 %**)

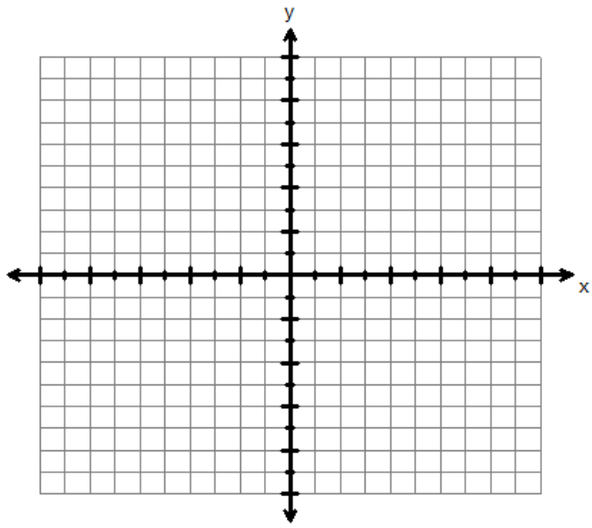
35. For the quadratic function $y = x^2 + 2x - 8$, find the following:

(A) the equation of the axis of symmetry **(1%)**

(B) a table of values with vertex in the middle **(1%)**

x	y

(C) a sketch of the graph clearly showing (A) and (B) **(2%)**

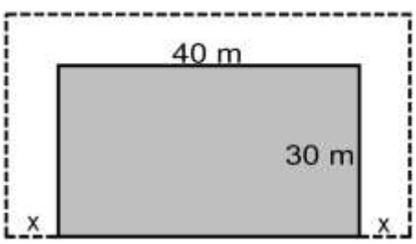


36. A golf ball is hit from ground level and it takes 4 seconds to land on the green. After 2 seconds, the ball reached a maximum height of 50 m. Using this information find the equation of the path of the ball in VERTEX or FACTORED form. Use your function to determine the height of the ball after 3.5 s. **(4%)**

37. Algebraically determine the ***exact*** roots to the quadratic equation in ***simplified*** form by putting the equation in standard form first. **(4%)**

$$2x(x-6) = -14$$

38. Mary has a garden where she would like to put a walkway of uniform width around the garden as shown in the diagram. The rectangular garden has dimensions of 40 m by 30m. When the walkway is put in place around the garden the new combine area of the walkway and the garden is now 1750m^2. Set up a quadratic equation to represent the total area and determine the width of the walkway that is around the garden. **(5%)**



39. Melissa designed a rectangular crest that was 12 cm by 10 cm for her school's jacket. The crest was then enlarged to create a poster that had an area of 2430 cm^2. Find the scale factor needed for such an enlargement and use it to determine what are the dimensions of the poster?

(**4 %**)

40. Edith discovered a number trick: Pick any number. Multiply the number by 4. Add 100 to your product. Divide your sum by 2. Subtract 50 from your quotient.

(A) Give two **inductive** examples of the number trick using the numbers 12 and 19. **(2%)**

(B) Make a conjecture about the result of the number trick based on your two inductive examples. **(1%)**

(C) Prove the number trick **deductively**.

Let n = **(3%)**

1)

2)

3)

4)

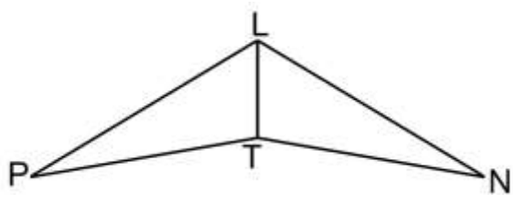
5) Conclusion:

41. Use either a paragraph or two-column format to complete the proof: **(5%)**

Given: $\overline{LT}$ bisects $\angle PLN$

$\angle \mathrm{P} = \angle \mathrm{N}$

Prove: $\Delta \mathrm{PLT} \cong \Delta \mathrm{NLT}$



Statement	Justification

END Have a safe and happy summer.