The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the questions in Parts II, III, and IV directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.
Notice ...

Tackling this examination, a graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions. Any work done on this sheet of scrap graph paper will not be scored. A sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will not be scored. A sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet.

Scrap paper is not permitted for any part of this examination. You may remove this sheet from this booklet.

The formulas that you may need to answer some questions in this examination are found at the end of this book.
Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or question.

Bryan’s hockey team is purchasing jerseys. The company charges $250 for a one-time set-up fee and $23 for each printed jersey. Which expression represents the total cost of \( x \) number of jerseys for the team?

(1) \( 23x + 250 \)
(2) \( 23(x + 250) \)
(3) \( 23x + 250 \)
(4) \( 23 \)
Which table represents a function?

2

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>-3</td>
<td>2</td>
</tr>
<tr>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>x</td>
</tr>
</tbody>
</table>

3

Which expression is equivalent to \((x - 3) + (1 - x)\)?

(1) \(5x^2 + 5\) 
(2) \(5x^2 - 6\) 
(3) \(5x^2 + 12x + 12\) 
(4) \(5x^2 - 12\)

Use this space for computations.
6 The value of \( x \) that satisfies the equation \( \frac{1}{x} + x = \frac{3}{4} \) is

A survey was given to 12th-grade students of West High School to determine the location for the senior class trip. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niagara Falls</td>
<td>56</td>
</tr>
<tr>
<td>Darien Lake</td>
<td>74</td>
</tr>
<tr>
<td>New York City</td>
<td>92</td>
</tr>
<tr>
<td>88</td>
<td>71</td>
</tr>
<tr>
<td>103</td>
<td>6</td>
</tr>
</tbody>
</table>

To the nearest percent, what percent of the boys chose Niagara Falls?

(1) 12 (2) 24 (3) 44 (4) 74

The vertex of \( g(x) \) is

(1) 7 units below the vertex of \( f(x) \)
(2) 7 units above the vertex of \( f(x) \)
(3) 7 units to the right of the vertex of \( f(x) \)
(4) 7 units to the left of the vertex of \( f(x) \)

Josh graphed the function \( g(x) = 3(x-1)^2 + 2 \). He then graphed \( f(x) \) on the same coordinate plane.

Josh graphed the function \( f(x) \) is

(1) \( x \) units to the left of the vertex of \( f(x) \)
(2) \( x \) units to the right of the vertex of \( f(x) \)
(3) \( x \) units below the vertex of \( f(x) \)
(4) \( x \) units above the vertex of \( f(x) \)

The vertex of \( f(x) \) is

(1) \( x = 1 \) and \( y = 2 \) on the same coordinate plane.

The function \( g(x) = 3(x-1)^2 + 2 \). He then graphed

The function \( \frac{1}{x} + x = \frac{3}{4} \) is

The value of \( x \) that satisfies the equation

\[ \frac{1}{10} + x = \frac{3}{4} \]

Use this space for computations.
Which type of function is shown in the graph below?

1. linear
2. exponential
3. square root
4. absolute value

8. The expression $16x^2/11002 = 81$ is equivalent to

(1) $(8x/11002)(8x/11002)$
(2) $(8x/11002)(8x/11002)$
(3) $(4x/11002)(4x/11002)$
(4) $(4x/11002)(4x/11002)$
The owner of a landscaping business wants to know how much time, on average, his workers spend mowing one lawn. Which is the most appropriate rate with which to calculate an answer to his question?

- (1) lawns per employee
- (2) lawns per day
- (3) employee per lawns
- (4) hours per lawn

A ball is thrown into the air from the top of a building. The height, \( h(t) \), of the ball above the ground \( t \) seconds after it is thrown can be modeled by \( h(t) = -16t^2 + 64t + 80 \). How many seconds after being thrown will the ball hit the ground?

- (1) 5
- (2) 2
- (3) 80
- (4) 144

Which equation is equivalent to \( y = x^2 + 24x + 18 \)?

- (1) \( y = (x + 12)^2 - 162 \)
- (2) \( y = (x - 12)^2 - 162 \)
- (3) \( y = (x + 12)^2 + 162 \)
- (4) \( y = (x - 12)^2 + 162 \)
Use this space for computations.

When \((x)(x)\) is expressed as a polynomial in standard form, which statement about the resulting polynomial is true?

1. The constant term is 2.
2. The leading coefficient is 2.
3. The degree is 2.
4. The number of terms is 3.

The population of a city can be modeled by

\[ P(t) = 3810(1.0005)^t \]

where \(P(t)\) is the population after \(t\) years. Which function is approximately equivalent to \(P(t)\)?

1. \(P(t) = 3810(1.0035)^t\)
2. \(P(t) = 26,670(0.1427)^t\)
3. \(P(t) = 3810(0.1427)^t\)
4. \(P(t) = 26,670(1.0035)^t\)
The functions $f(x)$ and $g(x)$ are graphed on the set of axes below. For which value of $x$ is $f(x) \neq g(x)$?

\[\begin{array}{ll}
1 & 2 \\
3 & 4 \\
\end{array}\]
Use this space for computations.

15 What is the range of the box plot shown below?

16 Which expression is not equivalent to \(2x^2/2\)?

I. \((2 + x)(3 + x)\)  
II. \((2 + x)(6 + x)\)  
III. \((4 + x)(3 + x)\)  
IV. \((3 + x)(4 + x)\)
The quadratic functions $r(x)$ and $q(x)$ are given below.

The function with the smallest minimum value is

1. $q(x)$, and the value is $-9$
2. $r(x)$, and the value is $-16$
3. $r(x)$, and the value is $-1$
4. $r(x)$, and the value is $-2$

$8 - x^2 + x^3 = (x) b$

The quadratic functions $r(x)$ and $b(x)$ are given below.

<table>
<thead>
<tr>
<th>$r(x)$</th>
<th>$b(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-12</td>
<td>0</td>
</tr>
<tr>
<td>-15</td>
<td>-1</td>
</tr>
<tr>
<td>15</td>
<td>-2</td>
</tr>
<tr>
<td>15</td>
<td>-3</td>
</tr>
<tr>
<td>12</td>
<td>-4</td>
</tr>
<tr>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>
A child is playing outside. The graph below shows the child’s distance, \( d(t) \), in yards from home over a period of time, \( t \), in seconds.

Which interval represents the child constantly moving closer to home?

(1) \( 0 \leq t \leq 1 \) (2) \( 1 \leq t \leq 2 \) (3) \( 2 \leq t \leq 3 \) (4) \( 3 \leq t \leq 4 \)

\[ 6 \leq t \leq 4 \] (4) \[ 3 \leq t \leq 2 \] (2) \[ 4 \leq t \leq 3 \] (3) \[ 2 \leq t \leq 0 \] (1)

If \( a = \frac{1}{2} \) and \( an = \frac{3}{2} \), then \( a \) equals

(1) 75 (2) 147 (3) 180 (4) 900

\( d(t) \) in yards from home over a period of time, \( t \), in seconds.
The length of a rectangular patio is 7 feet more than its width, \( w \). The area of a patio, \( A(w) \), can be represented by the function:

\[
A(w) = w^2 + 7w
\]

21 A dolphin jumps out of the water and then back into the water. His

jump could be graphed on a set of axes where \( x \) represents time and \( y \) represents distance above or below sea level. The domain for this

graph is best represented using a set of

(1) integers
(2) positive integers
(3) real numbers
(4) positive real numbers

22 Which system of linear equations has the same solution as the one

shown below?

(\( x = y = 5 \))

(\( 2x + 2y = 10 \) and \( x = 5 \))

Use this space for

computations.

20 The length of a rectangular patio is \( l \) feet more than its width, \( w \). The
23 Which interval represents the range of the function \( h(x) = 2x^2 - 2x - 4.5 \)?

\[ (\infty, -4.5], \quad (\infty, -4.5), \quad (-\infty, 0.5], \quad (-\infty, 0.5) \]

24 What is a common ratio of the geometric sequence whose first term is 5 and third term is 245?

\[ (\text{I}) \quad 5, \quad (\text{II}) \quad 49, \quad (\text{III}) \quad 120, \quad (\text{IV}) \quad 7 \]

25 Use this space for computations.
Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, etc. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, etc. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.
A student is in the process of solving an equation. The original equation and the first step are shown below.

\[ \begin{align*}
\text{Original: } & \quad a \times 6 + 2 \times 5 = 6 + a \\
\text{Step one: } & \quad 3a - 2 + 7 = 6 + a
\end{align*} \]

Which property did the student use for the first step? Explain why this property is correct.
Graph the line whose equation is $2y - 3x = 2$.
Question 27 is continued on the next page.
This linear equation contains the point \((2, k)\). State the value of \(k\).
Work space for question 28 is continued on the next page.

The formula is used to calculate acceleration as the change in velocity over the period of time.

The formula for the final velocity, \( v_f \), in terms of initial velocity, \( v_i \), acceleration, \( a \), and time, \( t \), is:

\[
\frac{t}{t_f - t_i} = a
\]
Work space for question 29 is continued on the next page.
Work space for question 30 is continued on the next page.

Is the product of two irrational numbers always irrational? Justify your answer.
Work space for question 31 is continued on the next page.

31 Solve $6x^2 - 42 = 0$ for the exact values of $x$. 
The set of axes for question 32 is on the next page.

Graph the function:

\[ h(x) = \begin{cases} 0 & \text{if } x \geq 0 \text{ and } x^3 - x^2, \\ 0 & \text{if } 0 > x \text{ and } x^3 - x^2. \end{cases} \]
The set of axes for question 33 is on the next page.

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, etc. Utilize the information provided for each question to determine your answer. If there is no work shown, no answer will receive any credit. If the necessary steps are not shown, the answer itself will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.

\[
\begin{align*}
3x & > 2 - h \\
2x & \leq h + 3
\end{align*}
\]
Question 33 is continued on the next page.
Determine if the point (1,8) is in the solution set. Explain your answer.
On the day Alexander was born, his father invested $5000 in an account with a 1.2% annual growth rate. Write a function, $A(t)$, that represents the value of this investment $t$ years after Alexander's birth.

Determine, to the nearest dollar, how much more the investment will be worth when Alexander turns 32 than when he turns 17.
Stephen collected data from a travel website. The data included a hotel's distance from Times Square in Manhattan and the cost of a room for one weekend night in August. A table containing these data appears below.

<table>
<thead>
<tr>
<th>Distance From Times Square (city blocks) (x)</th>
<th>Cost of a Room (dollars) (y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>293</td>
</tr>
<tr>
<td>13</td>
<td>263</td>
</tr>
<tr>
<td>15</td>
<td>244</td>
</tr>
<tr>
<td>19</td>
<td>224</td>
</tr>
<tr>
<td>24</td>
<td>185</td>
</tr>
<tr>
<td>24</td>
<td>170</td>
</tr>
<tr>
<td>26</td>
<td>244</td>
</tr>
<tr>
<td>26</td>
<td>239</td>
</tr>
<tr>
<td>26</td>
<td>224</td>
</tr>
<tr>
<td>26</td>
<td>244</td>
</tr>
<tr>
<td>26</td>
<td>293</td>
</tr>
</tbody>
</table>

Write the linear regression equation for this data set. Round all values to the nearest hundredth.
Question 35 continued

State the correlation coefficient for this data set, to the nearest hundredth.

Explain what the sign of the correlation coefficient suggests in the context of the problem.
A snowstorm started at midnight. For the first 4 hours, it snowed at an average rate of one-half inch per hour.

Then it started snowing again at an average rate of one-half inch per hour for the next 4 hours until the storm was over.

Then it stopped snowing for 3 hours.

Then it started snowing again at an average rate of one inch per hour for the next 6 hours.

The amount of snow accumulated over the time interval of the storm, graph the amount of snow accumulated over the time interval.
Elapsed Time (in hours)

Accumulated Snowfall (in inches)

Question 36 is continued on the next page.
Determine the average rate of snowfall over the length of the storm. State the rate, to the nearest hundredth of an inch per hour.

Question 36 continued
Question 37 is continued on the next page.

Determine algebraically how many of each type of chicken Allysa purchased.

Write a system of equations that can be used to determine the number of Americana chickens, A, and the number of Delaware chickens, D, she purchased.

Allysa spent $35 to purchase 12 chickens. She bought two different types of chickens. Americana chickens cost $3.75 each and Delaware chickens cost $2.50 each.

\[
\begin{align*}
3.75A + 2.50D &= 35 \\
A + D &= 12
\end{align*}
\]

should be done in pencil. [6] Only 1 credit. All answers should be written in pen, except for graphs and drawings, which necessarily drawn to scale. A correct numerical answer with no work shown will receive no credit. Utilize the information provided to determine your answer. Note that diagrams are not answer the question in this part. A correct answer will receive 6 credits. Clearly indicate
Each Americana chicken lays 2 eggs per day and each Delaware chicken lays 1 egg per day.

At the end of the first week with her 12 chickens, Allysa only sells eggs by the full dozen for $2.50. Determine how much money she expects to take in.
Scrap Graph Paper — this sheet will not be scored.
### The Reference Sheet is continued on the next page.

<table>
<thead>
<tr>
<th>Where ( t \neq 1 )</th>
<th>( S = \frac{t - 1}{u \cdot d^1 - 1} )</th>
<th>Geometric Series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( 1 - u \cdot d^1 ) ( = u \cdot d )</td>
<td>Geometric Sequence</td>
</tr>
<tr>
<td></td>
<td>( p(1 - u) = 1 - u )</td>
<td>Arithmetic Sequence</td>
</tr>
<tr>
<td>( p = \sqrt{\frac{\frac{\pi}{A}}{4}} )</td>
<td>Quadratic Formula</td>
<td></td>
</tr>
<tr>
<td>( \sqrt{a^2 + b^2} )</td>
<td>Pythagorean Theorem</td>
<td></td>
</tr>
</tbody>
</table>

### General Prisms

| \( \text{Pyramid} \) |
|----------------------|----------------|
| \( V = \frac{1}{2} Bh \) | \( \text{Parallelogram} \) |
| \( \text{Circle} \) |
| \( A = \pi r^2 \) | \( \text{Cylinder} \) |
| \( C = 2\pi r \) | \( \text{Sphere} \) |
| \( C = \frac{2\pi d}{3} \) | \( \text{Cone} \) |

### Pyramid

| \( \text{Volume} \) |
|----------------------|----------------|
| \( V = \frac{1}{3} Bh \) | \( \text{Cone} \) |
| \( \text{Cylinder} \) |
| \( V = \pi r^2 h \) | \( \text{Sphere} \) |
| \( C = 2\pi r + \pi d \) | \( \text{Cylinder} \) |
| \( C = \pi r (r + h) \) | \( \text{Sphere} \) |
| \( C = \pi d \) | \( \text{Cone} \) |

### 1 mile = 1.609 kilometers | 1 kilometer = 0.621 miles
1 mile = 1.760 yards | 1 yard = 0.914 meters
1 mile = 5280 feet | 1 foot = 0.305 meter
1 mile = 39.37 inches | 1 inch = 2.54 centimeters

### High School Math Reference Sheet
Cylinder

\[ V = \pi r^2 h \]

Sphere

\[ V = \frac{4}{3} \pi r^3 \]

Cone

\[ V = \frac{1}{3} \pi r^2 h \]

Pyramid

\[ V = \frac{1}{3} Bh \]

Exponential Growth/Decay

\[ A = A_0 e^{k(t - t_0)} \]

Radians

\[ \frac{\text{radians}}{\text{degree}} = \frac{\pi}{180} \]

Degrees

\[ \frac{\text{degree}}{\text{radian}} = \frac{180}{\pi} \]