## 0623AI

1 The expression $9 m^{2}-100$ is equivalent to

1) $(3 m-10)(3 m+10)$
2) $(3 m-10)(3 m-10)$
3) $(3 m-50)(3 m+50)$
4) $(3 m-50)(3 m-50)$

2 Which expression represents an irrational number?

1) $\sqrt{16}+\sqrt{1}$
2) $\sqrt{25}+\sqrt{4}$
3) $\sqrt{36}+\sqrt{7}$
4) $\sqrt{49}+\sqrt{9}$

3 Which linear equation represents a line that passes through the point $(-3,-8)$ ?

1) $y=2 x-2$
2) $y=2 x-8$
3) $y=2 x+13$
4) $y=2 x-14$

4 The expression $\left(5 x^{2}-x+4\right)-3\left(x^{2}-x-2\right)$ is equivalent to

1) $2 x^{2}-2 x+2$
2) $2 x^{2}+2 x+10$
3) $2 x^{4}-2 x^{2}+2$
4) $2 x^{4}-2 x^{2}+10$

5 The $24^{\text {th }}$ term of the sequence $-5,-11,-17,-23, \ldots$ is

1) -149
2) -143
3) 133
4) 139

6 When completing the square for $x^{2}-18 x+77=0$, which equation is a correct step in this process?

1) $(x-9)^{2}=4$
2) $(x-3)^{2}=2$
3) $x= \pm 13$
4) $x-9= \pm 9$

7 Which function will have the greatest value when $x>1$ ?

1) $g(x)=2(5)^{x}$
2) $f(x)=2 x+5$
3) $h(x)=2 x^{2}+5$
4) $k(x)=2 x^{3}+5$

8 Mike uses the equation $b=1300(2.65)^{x}$ to determine the growth of bacteria in a laboratory setting. The exponent represents

1) the total number of bacteria currently
2) the initial amount of bacteria present
3) the percent at which the bacteria are growing
4) the number of time periods

9 A company ships an average of 30,000 items each week. The approximate number of items shipped each minute is calculated using the conversion

1) $\frac{30,000 \text { items }}{1 \text { week }} \bullet \frac{7 \text { days }}{1 \text { week }} \bullet \frac{60 \mathrm{~min}}{1 \mathrm{hr}} \bullet \frac{1 \text { day }}{24 \text { hrs }}$
2) $\frac{30,000 \text { items }}{1 \text { week }} \bullet \frac{1 \text { week }}{7 \text { days }} \bullet \frac{1 \text { day }}{24 \mathrm{hrs}} \bullet \frac{1 \mathrm{hr}}{60 \mathrm{~min}}$
3) $\frac{1 \text { week }}{30,000 \text { items }} \bullet \frac{1 \text { week }}{7 \text { days }} \bullet \frac{1 \text { day }}{24 \mathrm{hrs}} \bullet \frac{1 \mathrm{hr}}{60 \mathrm{~min}}$
4) $\frac{1 \text { week }}{30,000 \text { items }} \bullet \frac{7 \text { days }}{1 \text { week }} \bullet \frac{24 \mathrm{hrs}}{1 \text { day }} \bullet \frac{60 \mathrm{~min}}{1 \text { hr }}$

10 A function is graphed below.


A possible equation for this function is

1) $f(x)=(x+2)(x-3)$
2) $f(x)=(x-2)(x+3)$
3) $f(x)=(x-2)^{2}(x+3)$
4) $f(x)=(x-2)(x+3)(x-12)$

11 If $g(x)=-x^{2}-x+5$, then $g(-4)$ is equal to

1) -15
2) -7
3) 17
4) 25

12 A movie theater's popcorn box is a rectangular prism with a base that measures 6 inches by 4 inches and has a height of 8 inches. To create a larger box, both the length and the width will be increased by $x$ inches. The height will remain the same. Which function represents the volume, $V(x)$, of the larger box?

1) $V(x)=(6+x)(4+x)(8+x)$
2) $\quad V(x)=(6+x)(4+x)(8)$
3) $V(x)=(6+x)+(4+x)+(8+x)$
4) $V(x)=(6+x)+(4+x)+(8)$

13 The expression $300(4)^{x+3}$ is equivalent to

1) $300(4)^{x}(4)^{3}$
2) $300\left(4^{x}\right)^{3}$
3) $300(4)^{x}+300(4)^{3}$
4) $300^{x}(4)^{3}$

14 Ashley only has 7 quarters and some dimes in her purse. She needs at least $\$ 3.00$ to pay for lunch. Which inequality could be used to determine the number of dimes, $d$, she needs in her purse to be able to pay for lunch?

1) $1.75+d \geq 3.00$
2) $1.75+0.10 d \geq 3.00$
3) $1.75+d \leq 3.00$
4) $1.75+0.10 d \leq 3.00$

15 The formula for the area of a trapezoid is $A=\frac{1}{2}\left(b_{1}+b_{2}\right) h$. The height, $h$, of the trapezoid may be expressed as

1) $2 A-b_{1}-b_{2}$
2) $\frac{2 A-b_{1}}{b_{2}}$
3) $\frac{1}{2} A-b_{1}-b_{2}$
4) $\frac{2 A}{b_{1}+b_{2}}$

16 The function $f(x)=|x|$ is multiplied by $k$ to create the new function $g(x)=k|x|$. Which statement is true about the graphs of $f(x)$ and $g(x)$ if $k=\frac{1}{2}$ ?

1) $g(x)$ is a reflection of $f(x)$ over the
2) $g(x)$ is wider than $f(x)$. $y$-axis.
3) $g(x)$ is a reflection of $f(x)$ over the
4) $g(x)$ is narrower than $f(x)$. $x$-axis.

17 Some adults were surveyed to find out if they would prefer to buy a sports utility vehicle (SUV) or a sports car. The results of the survey are summarized in the table below.

|  | SUV | Sports Car | Totals |
| :---: | :---: | :---: | :---: |
| Male | 21 | 38 | 59 |
| Female | 135 | 46 | 181 |
| Totals | 156 | 84 | 240 |

Of the number of adults that preferred sports cars, approximately what percent were males?

1) 15.8
2) 45.2
3) 64.4
4) 82.6

18 The solution to $2 x^{2}=72$ is

1) $\{9,4\}$
2) $\{-4,9\}$
3) $\{6\}$
4) $\{ \pm 6\}$

19 Three quadratic functions are given below.

$$
\begin{gathered}
\text { I. } \\
f(x)=(x+2)^{2}+5
\end{gathered}
$$

II.

| $\mathbf{x}$ | -4 | -3 | -2 | -1 | 0 | 1 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{g}(\mathbf{x})$ | -3 | 2 | 5 | 5 | 2 | -3 |



Which of these functions have the same vertex?

1) I and II, only
2) I and III, only
3) II and III, only
4) I, II, and III

20 The domain of the function $f(x)=x^{2}+x-12$ is

1) $(-\infty,-4]$
2) $(-\infty, \infty)$
3) $[-4,3]$
4) $[3, \infty)$

21 A father makes a deal with his son regarding his weekly allowance. The first year, he agrees to pay his son a weekly allowance of $\$ 10$. Every subsequent year, the allowance is recalculated by doubling the previous year's weekly allowance and then subtracting 8 . Which recursive formula could be used to calculate the son's weekly allowance in future years?

1) $a_{n}=2 n-8$
2) $a_{1}=10$

$$
a_{n+1}=2 a_{n}-8
$$

2) $a_{n}=2(n+1)-8$
3) $a_{1}=10$

$$
a_{n+1}=2\left(a_{n}-8\right)
$$

22 What is the solution to the inequality below?

$$
4-\frac{2}{5} x \geq \frac{1}{3} x+15
$$

1) $x \leq 11$
2) $x \leq-15$
3) $x \geq 11$
4) $x \geq-15$

23 Which statement is correct about the polynomial $3 x^{2}+5 x-2$ ?

1) It is a third-degree polynomial with a constant term of -2 .
2) It is a third-degree polynomial with a leading coefficient of 3 .
3) It is a second-degree polynomial with a constant term of 2 .
4) It is a second-degree polynomial with a leading coefficient of 3 .

24 A store manager is trying to determine if they should continue to sell a particular brand of nails. To model their profit, they use the function $p(n)$, where $n$ is the number of boxes of these nails sold in a day. A reasonable domain for this function would be

1) nonnegative integers
2) real numbers
3) rational numbers
4) integers

25 Solve the equation algebraically for $x:-2.4(x+1.4)=6.8 x-22.68$
26 The function $f(x)$ is graphed on the set of axes below.


State the zeros of $f(x)$. Explain your reasoning.
27 Breanna creates the pattern of blocks below in her art class.


A friend tells her that the number of blocks in the pattern is increasing exponentially. Is her friend correct? Explain your reasoning.

28 The data set $20,36,52,56,24,16,40,4,28$ represents the number of books purchased by nine book club members in a year. Construct a box plot for these data on the number line below.


Algebra I Regents Exam 0623
www.jmap.org
29 Given:

$$
\begin{aligned}
& A=x+5 \\
& B=x^{2}-18
\end{aligned}
$$

Express $A^{2}+B$ in standard form.
30 The two relations shown below are not functions.
Relation I:


Relation II:
$\{(-5,-2),(-4,0),(-2,1),(-1,3),(-4,4)\}$
Explain how you could change each relation so that they each become a function.
31 Factor $2 x^{2}+16 x-18$ completely.
32 Solve $3 d^{2}-8 d+3=0$ algebraically for all values of $d$, rounding to the nearest tenth.

Algebra I Regents Exam 0623
www.jmap.org
33 Graph $f(x)=|x|+1$ and $g(x)=-x^{2}+6 x+1$ on the set of axes below.


Based on your graph, determine all values of $x$ for which $f(x)=g(x)$.

34 Jean recorded temperatures over a 24 -hour period one day in August in Syracuse, NY. Her results are shown in the table below.

| Time (hour) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Temperature $\left({ }^{\circ} \mathrm{F}\right)$ | 80 | 75 | 70 | 78 | 92 | 89 | 85 | 80 | 74 |

Her data are modeled on the graph below.


State the entire interval over which the temperature is increasing. State the three-hour interval that has the greatest rate of change in temperature. State the average rate of change from hour 12 to hour 24. Explain what this means in the context of the problem.

35 Solve the following system of inequalities graphically on the set of axes below.

$$
\begin{aligned}
2 x+3 y & \geq-6 \\
x & <3 y+6
\end{aligned}
$$

Label the solution set $S$.


Is the point $(4,-2)$ in the solution set? Explain your answer.
36 Suzanna collected information about a group of ponies and horses. She made a table showing the height, measured in hands (hh), and the weight, measured in pounds (lbs), of each pony and horse.

| Height (hh) <br> x | Weight (lbs) <br> y |
| :---: | :---: |
| 11 | 264 |
| 12 | 638 |
| 13 | 700 |
| 14 | 850 |
| 15 | 1000 |
| 16 | 1230 |
| 17 | 1495 |

Write the linear regression equation for this set of data. Round all values to the nearest hundredth. State the correlation coefficient for the linear regression. Round your answer to the nearest hundredth. Explain what the correlation coefficient indicates about the linear fit of the data in the context of the problem.

37 Dana went shopping for plants to put in her garden. She bought three roses and two daisies for $\$ 31.88$. Later that day, she went back and bought two roses and one daisy for $\$ 18.92$. If $r$ represents the cost of one rose and $d$ represents the cost of one daisy, write a system of equations that models this situation. Use your system of equations to algebraically determine both the cost of one rose and the cost of one daisy. If Dana had waited until the plants were on sale, she would have paid $\$ 4.50$ for each rose and $\$ 6.50$ for each daisy. Determine the total amount of money she would have saved by buying all of her flowers during the sale.

## Answer Section



PTS: 2 REF: 062305ai NAT: F.IF.A. 3 TOP: Sequences
KEY: explicit
6 ANS: 1
$x^{2}-18 x+81=-77+81$
$(x-9)^{2}=4$
PTS: 2 REF: 062306ai NAT: A.REI.B. 4 TOP: Solving Quadratics
KEY: completing the square
7 ANS: 1 PTS: 2 REF: 062307ai NAT: F.LE.A. 3
TOP: Families of Functions
8 ANS: $4 \quad$ PTS: 2
REF: 062308ai NAT: F.LE.B. 5
TOP: Modeling Exponential Functions
9 ANS: 2 PTS: 2 REF: 062309ai NAT: N.Q.A. 1
TOP: Conversions KEY: dimensional analysis
10 ANS: 3 PTS: 2 REF: 062310ai NAT: A.APR.B. 3
TOP: Graphing Polynomial Functions
11 ANS: 2
$g(-4)=-(-4)^{2}-(-4)+5=-7$
PTS: 2 REF: 062311ai NAT: F.IF.A. 2 TOP: Functional Notation
12 ANS: 2
PTS: 2
REF: 062312ai NAT: A.CED.A. 2
TOP: Modeling Quadratics
13 ANS: $1 \quad$ PTS: 2
TOP: Modeling Exponential Functions
14 ANS: 2 PTS: 2 REF: 062314ai NAT: A.CED.A. 1
TOP: Modeling Linear Inequalities

15 ANS: 4
$2 A=\left(b_{1}+b_{2}\right) h$
$\frac{2 A}{b_{1}+b_{2}}=h$
PTS: 2 REF: 062315ai NAT: A.CED.A. 4 TOP: Transforming Formulas
16 ANS: 3 PTS: 2 REF: 062316ai NAT: F.BF.B. 3
TOP: Graphing Absolute Value Functions
17 ANS: 2
$\frac{38}{84} \approx 45.2 \%$
PTS: 2 REF: 062317ai NAT: S.ID.B. 5 TOP: Frequency Tables
KEY: two-way
18 ANS: 4
$2 x^{2}=72$
$x^{2}=36$
$x= \pm 6$
PTS: 2 REF: 062318ai NAT: A.REI.B. 4 TOP: Solving Quadratics
KEY: taking square roots
19 ANS: 3
$f$ and $h$ 's vertex is $(-2,5)$. $g$ 's axis of symmetry is $x=-1.5$.
PTS: 2 REF: 062319ai NAT: F.IF.C. 9 TOP: Comparing Functions
20 ANS: 2 PTS: 2 REF: 062320ai NAT: F.IF.A. 2
TOP: Domain and Range
21 ANS: 3 PTS: 2 REF: 062321ai NAT: F.LE.A. 2
TOP: Sequences KEY: recursive
22 ANS: 3

$$
\begin{aligned}
-\frac{2}{5} x & \geq \frac{1}{3} x+11 \\
-\frac{11}{15} x & \geq 11 \\
-\frac{15}{11}\left(-\frac{11}{15} x\right) & \leq\left(-\frac{15}{11}\right) 11 \\
x & \leq-15
\end{aligned}
$$

PTS: 2 REF: 062322ai NAT: A.REI.B. 3 TOP: Solving Linear Inequalities
23 ANS: 4
PTS: 2
REF: 062323ai NAT: A.SSE.A. 1
TOP: Modeling Expressions
24 ANS: $1 \quad$ PTS: 2
TOP: Domain and Range
REF: 062324ai
NAT: F.IF.B. 5
KEY: context

25 ANS:
$-2.4(x+1.4)=6.8 x-22.68$
$-2.4 x-3.36=6.8 x-22.68$

$$
\begin{aligned}
19.32 & =9.2 x \\
2.1 & =x
\end{aligned}
$$

PTS: 2 REF: 062325ai NAT: A.REI.B. 3 TOP: Solving Linear Equations
26 ANS:
$\pm 2,3$ are the $x$-intercepts of $f$.
PTS: 2 REF: 062326ai NAT: A.APR.B. 3 TOP: Zeros of Polynomials
27 ANS:
No, because the number of blocks is increasing by a constant amount.
PTS: 2 REF: 062327ai NAT: F.LE.A. 1 TOP: Families of Functions
28 ANS:


PTS: 4 REF: 062328ai NAT: S.ID.A. 1 TOP: Box Plots
KEY: represent
29 ANS:
$(x+5)^{2}+x^{2}-18=x^{2}+10 x+25+x^{2}-18=2 x^{2}+10 x+7$
PTS: 2 REF: 062329ai NAT: A.APR.A. 1 TOP: Operations with Polynomials
KEY: multiplication
30 ANS:
I: Change $(4,30)$ to an open circle. II: Remove $(-4,4)$.
PTS: 2 REF: 062330ai NAT: F.IF.A. 1 TOP: Defining Functions
31 ANS:
$2\left(x^{2}+8 x-9\right)=2(x+9)(x-1)$
PTS: 2 REF: 062331ai NAT: A.SSE.A. 2 TOP: Factoring Polynomials
32 ANS:
$\frac{8 \pm \sqrt{(-8)^{2}-4(3)(3)}}{2(3)} \approx 0.5,2.2$

PTS: 2 REF: 062332ai NAT: A.REI.B. 4 TOP: Solving Quadratics
KEY: quadratic formula

ANS:


PTS: 4 REF: 062333ai NAT: A.REI.D. 11 TOP: Other Systems
34 ANS:
$6-12 ; 9-12 ; \frac{74-92}{24-12}=-\frac{3}{2}$; The temperature drops $3^{\circ}$ every 2 hours.
PTS: 2 REF: 062334ai NAT: F.IF.B. 6 TOP: Rate of Change
35 ANS:


$$
\text { ; No, because } 4<3(-2)+6 \text { is false. }
$$

PTS: 4
REF: 062335ai
NAT: A.REI.D. 12 TOP: Graphing Systems of Linear Inequalities
36 ANS:
$y=184.89 x-1706.07,0.99$, As the height of the horse increases, the weight of the horse increases.
PTS: 4 REF: 062336ai NAT: S.ID.B. 6 TOP: Regression
KEY: linear with correlation coefficient
37 ANS:

$$
\begin{aligned}
& 3 r+2 d=31.88 ; 3 r+2(18.92-2 r)=31.88 ; \quad 2(5.96)+d=18.92 ; 31.88+18.92-(5(4.50)+3(6.50)) \\
& 2 r+d=18.92 \quad 3 r+37.84-4 r=31.88 \\
& 11.92+d=18.92 \\
& d=7 \\
& \text { 50.80-42 } \\
& r=5.96 \\
& 8.80
\end{aligned}
$$

PTS: 6
REF: 062337ai
NAT: A.CED.A. 3 TOP: Modeling Linear Systems

