# END OF COURSE ALGEBRA I 

## Form M0118, CORE 1

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## Algebra I Formula Sheet

## Geometric Formulas


$A=\frac{1}{2} b h$

$p=4 s$
$A=s^{2}$

$p=2(l+w)$
$A=l w$

$V=l w h$
$S . A .=2(l w+l h+w h)$

$A=\frac{1}{2} h\left(b_{1}+b_{2}\right)$
$V=\pi r^{2} h$
S.A. $=2 \pi r(h+r)$

$C=2 \pi r$
$A=\pi r^{2}$

$c^{2}=a^{2}+b^{2}$

Abbreviations

| milligram | mg |
| :--- | :--- |
| gram | g |
| kilogram | kg |
| milliliter | mL |
| liter | L |
| kiloliter | kL |
| millimeter | mm |
| centimeter | cm |
| meter | m |
| kilometer | km |
| square centimeter | $\mathrm{cm}^{2}$ |
| cubic centimeter | $\mathrm{cm}^{3}$ |


| ounce | oz |
| :--- | :--- |
| pound | lb |
| quart | qt |
| gallon | gal. |
| inch | in. |
| foot | ft |
| yard | yd |
| mile | mi. |
| square inch | $\mathrm{sq} \mathrm{in}$. |
| square foot | sq ft |
| cubic inch | $\mathrm{cu} \mathrm{in}$. |
| cubic foot | cu ft |


| volume | $V$ |
| :--- | :--- |
| total surface area | $S . A$. |
| area of base | $B$ |


| year | yr |
| :--- | :--- |
| month | mon |
| hour | hr |
| minute | min |
| second | sec |

## Directions

Read each question and choose the best answer. Then fill in the circle on your answer document for the answer you have chosen. For this test you may assume that the value of the denominator is not zero.

## SAMPLE

$$
\text { If } f(x)=x^{2}+2 x+3, \text { what is the value of } f(x) \text { when } x=6 ?
$$

A 27
B 42
C 51
D 60

1 Which is most likely the graph of a line with a positive slope?

A


B


C


D


2 Given the following equation, which could be the value of $\boldsymbol{x}$ ?

$$
(x-1)(x+3)=5
$$

F 1
G $\quad-2$
H -3
J -4

3 Line $l$ has slope 2 and goes through (1,3). Which is one form of the equation for line $l$ ?

A $\quad y=x+2$
B $y=2 x+1$
C $y=3 x+2$
D $y=2 x+5$

4 What is the solution set for the following quadratic equation?

$$
x^{2}-4 x+4=0
$$

F $\quad\{2\}$

G $\{-2\}$
H $\quad\{-2,2\}$
J $\{1,3\}$

5

$$
\left\{\begin{array}{l}
4 x-3 y=10 \\
x+4 y=-7
\end{array}\right.
$$

What is the solution to the system of equations shown above?

A $(1,-2)$

B $\quad(-11,1)$
C $\left(-2,-\frac{5}{4}\right)$
D $(-15,2)$

6 What is the slope of the line $y=\frac{-1}{3} x-\frac{2}{3}$ ?
F 3
G $\quad-\frac{1}{3}$
H $\quad \frac{-2}{3}$
J -3

7 What are the $x$-intercepts of the graph of the following equation?

$$
y=x^{2}+6 x-7
$$

A - 7 and -1
B 1 and 7
C - 1 and 7
D - 7 and 1

8 What is the solution to the following inequality?

$$
6(x+1) \geq 7
$$

F $\quad x \geq \frac{13}{6}$
G $\quad x \geq \frac{1}{6}$
H $\quad x \geq 1$

J $x \geq 6$

9 Andrea has 37 coins, all nickels and dimes. The value of the 37 coins is $\$ 3.10$. How many dimes does Andrea have?

A 12
B 19
C 25
D 31

10 To train for a bicycle road race, Enrique needs to ride 150 miles per week at an average rate of $\mathbf{2 5}$ miles per day. The equation $M=150-25 d$ gives the number of miles, $M$, left to ride after $d$ days. Which graph shows the number of miles Enrique has left to ride after $d$ days?

F
Remaining Mileage


G


H


J


11


Which is closest to the slope of the line graphed above?
A $\frac{-3}{2}$
B $\frac{-2}{3}$
C $\frac{2}{3}$
D $\frac{3}{2}$

12 What is the slope of the line that passes through $(-3,-5)$ and $(4,-2)$ ?
F 1
G $\frac{3}{7}$
H $\frac{-3}{7}$
J -1

13 What is the solution to the following system of equations?

$$
\left\{\begin{array}{l}
x+2 y=5 \\
3 x+2 y=7
\end{array}\right.
$$

A $x=3, y=4$
B $x=1, y=3$
C $x=1, y=2$
D $x=3, y=1$

14 What is the solution to the following equation?

$$
7 x-5=2 x+5
$$

$$
\begin{array}{ll}
\mathbf{F} & x=2 \\
\mathbf{G} & x=3 \\
\mathbf{H} & x=4 \\
\mathbf{J} & x=5
\end{array}
$$

15 The dashed line on each grid represents $y=x$. On which grid is $y=4 x-2$ apparently represented as well?

A


B


C


D


16 Jerri wrote these steps when solving an equation.

$$
\begin{aligned}
& \quad 17(x+3)=6-4 \\
& \text { Step 1: } 17 x+51=6-4 \\
& \text { Step 2: } 17 x+51=2 \\
& \text { Step 3: } 17 x=-49 \\
& \text { Step 4: } x=\frac{-49}{17}
\end{aligned}
$$

## Which property justifies Step 1 ?

F Associative property for addition
G Commutative property for addition
H Distributive property
J Additive identity property

17 What value of $m$ satisfies the equation shown below?

$$
5(m-5)=3(m+1)
$$

A 14
B 9
C 3.5
D - 7.5

18


Which equation best represents the line shown on the grid?
F $y=x-4$
G $y=4 x$
H $x=4$
J $y=4$

19 Which expression is not equivalent to the following expression?

$$
3 \times 3 \times 3 \times 3 \times 3 \times 3
$$

A $3^{3} \cdot 3^{2}$
B $3^{1} \cdot 3^{5}$
C $9^{3}$
D $27^{2}$

20 Which is a factored form of the following expression?

$$
2 x^{2}-6 x
$$

F $2\left(x^{2}-3\right)$

G $2 x(x-3)$

H $2 x(1-3 x)$

J $(2 x+3)(x-2)$

21 Written in simplest radical form, $\sqrt{32}$ is equal to -
A $2 \sqrt{4}$
B $2 \sqrt{16}$
C $4 \sqrt{2}$
D $8 \sqrt{2}$

22 If $x \neq 0$, what is the quotient when the following division is performed?

$$
2 x \longdiv { 6 x ^ { 3 } + 4 x ^ { 2 } + 2 x }
$$

F $3 x^{2}+2 x$
G $3 x^{2}+2 x+1$
H $6 x^{3}+4 x^{2}$
J $6 x^{2}+4 x+2$

23 If 112 children sign up for a field trip and each vehicle carries $x$ children, which expression could be used to determine the number of vehicles needed for the trip?

A $112-x$

B $112 x$
C $\frac{112}{x}$
D $\frac{x}{112}$

24 Which is equivalent to the following expression?

$$
3 a(2 a+b)
$$

F $6 a^{2}+b$
G $6 a^{2}+3 a b$
H $5 a^{2}+b$
J $5 a^{2}+3 a b$

25 If $x \neq 0$, which is equivalent to the following expression?

$$
\frac{2 x^{4}-6 x^{3}+4 x^{2}+10 x}{2 x}
$$

A $x^{3}-3 x^{2}+2 x+5$
B $x^{3}-6 x^{3}+4 x^{2}+5 x$
C $2 x^{3}-6 x^{2}+4 x+5$
D $2 x^{4}-6 x^{3}+4 x^{2}+5 x$

26 Which expression is equivalent to the following expression?

$$
\left(3 x^{2} y^{2}\right)^{3}
$$

F $3 x^{5} y^{5}$
G $9 x^{5} y^{5}$
H $9 x^{6} y^{6}$
J $27 x^{6} y^{6}$

27 Which is equivalent to the following expression?

$$
(3 x+1)(4 x-1)
$$

A $12 x^{2}-1$
B $12 x^{2}-x-1$
C $12 x^{2}+x-1$
D $12 x^{2}+7 x-1$

28 Which is a factor of $a^{2}-81$ ?
F $a+3$
G $a+9$
H $a+27$
J $a+81$

29 What is the value of the expression $\frac{x^{y}+z}{z}$ if $x=4, y=2$, and $z=2$ ?
A 5
B 9
C 10
D 16

30 What is the following product?

$$
\left(2 p q^{2} r^{3}\right)\left(5 q^{3} r^{4} s\right)
$$

F $\quad 7 q^{5} r^{7}$
G $7 q^{6} r^{12}$
H $10 p q^{5} r^{7} s$
J $10 p q^{6} r^{12} s$

31 Which equation fits the pattern in the table?

| $x$ | $y$ |
| :---: | :---: |
| 2 | 3 |
| 4 | 4 |
| 6 | 5 |
| 8 | 6 |

A $y=\frac{1}{3} x+3$
B $\quad y=\frac{1}{2} x+2$
C $y=x+1$

D $y=2 x-1$

32 In which table does $\boldsymbol{y}$ not vary directly as $\boldsymbol{x}$ ?

F | $\boldsymbol{x}$ | -2 | -1 | 0 | 1 |
| :--- | :--- | :--- | :--- | :--- |
| $\boldsymbol{y}$ | -10 | -5 | 0 | 5 |

G | $\boldsymbol{x}$ | 1 | 2 | 3 | 4 |
| :---: | :---: | :---: | :---: | :---: |
| $\boldsymbol{y}$ | 10 | 20 | 30 | 40 |

H | $\boldsymbol{x}$ | 0 | 1 | 2 | 3 |
| :---: | :---: | :---: | :---: | :---: |
| $\boldsymbol{y}$ | 0 | 3 | 6 | 9 |

J

| $\boldsymbol{x}$ | -2 | -1 | 1 | 2 |
| :--- | :--- | :--- | :--- | :--- |
| $\boldsymbol{y}$ | -1 | -2 | 2 | 1 |

33 The following equation defines a function of $x$.

$$
f(x)=-2 x+3
$$

If $(6, n)$ is an element of the function, what is the value of $n ?$
A -9
B $\quad-6$
C -4
D 0

34 The number of water bottles used during a team's football practice varies directly with the temperature. If a team uses 75 bottles when the temperature is $60^{\circ}$, what is the temperature if they use 120 bottles?

F $96^{\circ}$
G $92^{\circ}$
H $84^{\circ}$
J $80^{\circ}$

35 If $f(2)=13$, which could be the equation for $f(x)$ ?

A $\quad f(x)=x^{2}+8$
B $\quad f(x)=x+x^{2}$

C $\quad f(x)=2 x^{3}+5$
D $\quad f(x)=3 x^{2}+1$

36 The points in the table lie on the graph of a linear function.

| $\boldsymbol{x}$ | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | ---: | ---: | ---: |
| $\boldsymbol{y}$ | 1 | 4 | 7 | 10 | 13 |

Which could be the function?
F $\quad y=x$
G $y=2 x-1$
H $y=3 x-2$
J $y=4 x-3$

37 Which is a zero of the function defined by the following equation?

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

A -6
B $\quad-3$
C 2
D 3

38 The ordered pairs in the sets shown below are of the form ( $x, y$ ). In which set of ordered pairs is $y$ a function of $x$ ?

F $\{(-3,4),(1,-9),(1,4)\}$
G $\{(0,-5),(0,4),(0,5)\}$
H $\{(1,-1),(2,-1),(3,-3)\}$
J $\{(0,1),(1,-1),(1,0)\}$

39 If $f(x)=3 x^{2}+2 x-1$, what is $f(0)$ ?
A -1
B 0
C 1
D 4

Which graph does not represent a function of $x$ ?

F


G


H


J


41 The depth of a lake, $d$, varies directly with $r$, the amount of rainfall last month. If $\boldsymbol{k}$ is the constant of variation, which equation represents the situation?

A $\quad d=\frac{r}{k}$
B $\quad d=\frac{k}{r}$
C $\quad d=k+r$

D $\quad d=k r$

42 Each of the following tables contains elements of an $(x, y)$ relationship. Which table contains four points that cannot lie on the graph of a function of $x$ ?

F

| $\boldsymbol{x}$ | 0 | 2 | 3 | 4 |
| :--- | ---: | ---: | ---: | ---: |
| $\boldsymbol{y}$ | -1 | -2 | -3 | -4 |

G

| $\boldsymbol{x}$ | 1 | 2 | 3 | 2 |
| :--- | :--- | :--- | :--- | :--- |
| $y$ | 4 | 2 | 2 | 4 |

H

| $\boldsymbol{x}$ | -1 | -2 | 3 | 4 |
| :--- | ---: | ---: | ---: | ---: |
| $\boldsymbol{y}$ | 2 | 4 | 6 | 8 |

J

| $\boldsymbol{x}$ | 0 | 1 | 5 | 6 |
| :--- | :--- | :--- | ---: | ---: |
| $\boldsymbol{y}$ | 5 | 9 | 2 | -1 |

43 Kayla works four days a week as a waitress and as a nanny. The hours she works each day are shown.
waitress
nanny $\left[\begin{array}{cccc}6 & 5 & 4 & 7 \\ 4 & 4 & 6 & 3\end{array}\right]$

Once school starts, she wants to cut all her hours by one-half. Which matrix represents the new work schedule?

A $\left[\begin{array}{rrrr}6 & 5 & 4 & 7 \\ 2 & 2 & 3 & 1.5\end{array}\right]$
B $\left[\begin{array}{rrrr}12 & 10 & 8 & 14 \\ 8 & 8 & 12 & 6\end{array}\right]$
C $\left[\begin{array}{rrrr}3 & 2.5 & 2 & 3.5 \\ 2 & 2 & 3 & 1.5\end{array}\right]$
D $\left[\begin{array}{rrrr}3 & 2.5 & 2 & 3.5 \\ 4 & 4 & 6 & 3\end{array}\right]$

44 The heights in inches of each member of the four groups of a choir are represented in the box-and-whisker plots.


Which group has the median with the greatest value?
F Soprano
G Alto
H Tenor
J Bass

45 Alvin and Ben compared the weights of the members of each of their respective teams in their Physical Education class.

| Alvin's Team <br> Weights <br> (pounds) | Ben's Team <br> Weights <br> (pounds) |
| :---: | :---: |
| 135 | 134 |
| 126 | 127 |
| 119 | 120 |
| 123 | 122 |
| 131 | 130 |
| 125 | 126 |
| 120 | 122 |
| 132 | 133 |

What is the difference in the median weights of the two teams?
A 0.250 lb
B $\quad 0.375 \mathrm{lb}$
C $\quad 0.500 \mathrm{lb}$
D $\quad 1.000 \mathrm{lb}$

46 The enrollment at an elementary school is represented by the following matrix.
boys
girls $\left[\begin{array}{l}150 \\ 145\end{array}\right]$

If $60 \%$ of the boys and $60 \%$ of the girls are selected for a field trip, which matrix represents the number of students going on the field trip?

F $\left[\begin{array}{c}90 \\ 58\end{array}\right]$
G $\left[\begin{array}{l}150 \\ 145\end{array}\right]$
H $\left[\begin{array}{c}60 \\ 58\end{array}\right]$
J $\left[\begin{array}{l}90 \\ 87\end{array}\right]$

47 What is the difference of the two matrices?

$$
\left[\begin{array}{lll}
5 & -2 & 10 \\
4 & -5 & 20 \\
1 & -3 & 30
\end{array}\right]-\left[\begin{array}{lll}
9 & -3 & 15 \\
1 & -4 & 21 \\
8 & -7 & 30
\end{array}\right]
$$

A $\left[\begin{array}{lll}4 & 1 & 5 \\ 3 & 1 & 1 \\ 7 & 4 & 0\end{array}\right]$

B $\left[\begin{array}{rrr}14 & -5 & 25 \\ 5 & -9 & 41 \\ 9 & -10 & 60\end{array}\right]$

C $\left[\begin{array}{rrr}-4 & 1 & -5 \\ 3 & -1 & -1 \\ -7 & 4 & 0\end{array}\right]$

D $\quad\left[\begin{array}{rrr}-4 & 7 & -14 \\ -3 & -1 & -24 \\ 2 & 4 & 0\end{array}\right]$

48 Sally believes that the more time she spends in the grocery store, the more money she spends. Her recent purchases are recorded in the table.

| Minutes in <br> Store, $\boldsymbol{x}$ | Dollars <br> Spent, $\boldsymbol{y}$ |
| :---: | :---: |
| 5 | 8 |
| 12 | 29 |
| 15 | 31 |
| 18 | 45 |
| 22 | 73 |
| 26 | 68 |

Which linear equation best fits the data?
F $y=-3+10 x$
G $y=-10+3 x$
H $y=10+3 x$
J $y=-10-3 x$

49 Debbie recorded the time it took seven children of different ages to run one lap around the track.

| Age of Child <br> (years) | Time <br> (seconds) |
| :---: | :---: |
| 4 | 225 |
| 8 | 185 |
| 10 | 138 |
| 11 | 130 |
| 14 | 112 |
| 14 | 106 |
| 18 | 52 |

Using a linear equation of best fit, which is closest to the length of time it should take Debbie's 6 -year-old niece to run one lap?

A 200 sec
B 185 sec
C 170 sec
D 140 sec

50 Which is equivalent to the following scalar product?

$$
-2.1\left[\begin{array}{lll}
0.0 & 3.0 & 5.0 \\
9.0 & 0.0 & 4.0 \\
8.0 & 6.0 & 0.0
\end{array}\right]
$$

$$
\begin{aligned}
& \mathbf{F}\left[\begin{array}{rrr}
0.0 & -6.3 & -10.5 \\
9.0 & 0.0 & 4.0 \\
8.0 & 6.0 & 0.0
\end{array}\right] \\
& \mathbf{G} \quad\left[\begin{array}{rrr}
0.0 & 3.0 & 5.0 \\
-18.9 & 0.0 & 4.0 \\
-16.8 & 6.0 & 0.0
\end{array}\right] \\
& \mathbf{H} \quad\left[\begin{array}{rrr}
-2.1 & -6.3 & -10.5 \\
-18.9 & -2.1 & -8.4 \\
-16.8 & -12.6 & -2.1
\end{array}\right] \\
& \mathbf{J}\left[\begin{array}{rrr}
0.0 & -6.3 & -10.5 \\
-18.9 & 0.0 & -8.4 \\
-16.8 & -12.6 & 0.0
\end{array}\right]
\end{aligned}
$$

Answer Key-EOCO20-M0118

| Test Sequence Number | Correct Answer | Reporting Category | Reporting Category Description |
| :---: | :---: | :---: | :---: |
| 1 | A | 003 | Equations and Inequalities |
| 2 | J | 003 | Equations and Inequalities |
| 3 | B | 003 | Equations and Inequalities |
| 4 | F | 003 | Equations and Inequalities |
| 5 | A | 003 | Equations and Inequalities |
| 6 | G | 003 | Equations and Inequalities |
| 7 | D | 003 | Equations and Inequalities |
| 8 | G | 003 | Equations and Inequalities |
| 9 | C | 003 | Equations and Inequalities |
| 10 | F | 003 | Equations and Inequalities |
| 11 | A | 003 | Equations and Inequalities |
| 12 | G | 003 | Equations and Inequalities |
| 13 | C | 003 | Equations and Inequalities |
| 14 | F | 003 | Equations and Inequalities |
| 15 | A | 003 | Equations and Inequalities |
| 16 | H | 003 | Equations and Inequalities |
| 17 | A | 003 | Equations and Inequalities |
| 18 | H | 003 | Equations and Inequalities |
| 19 | A | 001 | Expressions and Operations |
| 20 | G | 001 | Expressions and Operations |
| 21 | C | 001 | Expressions and Operations |
| 22 | G | 001 | Expressions and Operations |
| 23 | C | 001 | Expressions and Operations |
| 24 | G | 001 | Expressions and Operations |
| 25 | A | 001 | Expressions and Operations |
| 26 | J | 001 | Expressions and Operations |
| 27 | C | 001 | Expressions and Operations |
| 28 | G | 001 | Expressions and Operations |
| 29 | B | 001 | Expressions and Operations |
| 30 | H | 001 | Expressions and Operations |
| 31 | B | 002 | Relations and Functions |
| 32 | J | 002 | Relations and Functions |
| 33 | A | 002 | Relations and Functions |
| 34 | F | 002 | Relations and Functions |
| 35 | D | 002 | Relations and Functions |
| 36 | H | 002 | Relations and Functions |
| 37 | D | 002 | Relations and Functions |
| 38 | H | 002 | Relations and Functions |
| 39 | A | 002 | Relations and Functions |
| 40 | H | 002 | Relations and Functions |
| 41 | D | 002 | Relations and Functions |
| 42 | G | 002 | Relations and Functions |
| 43 | C | 004 | Statistics |
| 44 | J | 004 | Statistics |
| 45 | D | 004 | Statistics |
| 46 | J | 004 | Statistics |
| 47 | C | 004 | Statistics |
| 48 | G | 004 | Statistics |
| 49 | A | 004 | Statistics |
| 50 | J | 004 | Statistics |

Algebra I, Core 1

| If you get this many items correct: | Then your converted scale score is: |
| :---: | :---: |
| 0 | 000 |
| 1 | 212 |
| 2 | 244 |
| 3 | 264 |
| 4 | 278 |
| 5 | 290 |
| 6 | 299 |
| 7 | 308 |
| 8 | 315 |
| 9 | 322 |
| 10 | 328 |
| 11 | 334 |
| 12 | 340 |
| 13 | 345 |
| 14 | 350 |
| 15 | 355 |
| 16 | 360 |
| 17 | 364 |
| 18 | 369 |
| 19 | 373 |
| 20 | 377 |
| 21 | 382 |
| 22 | 386 |
| 23 | 390 |
| 24 | 394 |
| 25 | 398 |
| 26 | 402 |
| 27 | 406 |
| 28 | 410 |
| 29 | 414 |
| 30 | 418 |
| 31 | 423 |
| 32 | 427 |
| 33 | 431 |
| 34 | 436 |
| 35 | 440 |
| 36 | 445 |
| 37 | 450 |
| 38 | 456 |
| 39 | 461 |
| 40 | 467 |
| 41 | 473 |
| 42 | 480 |
| 43 | 487 |
| 44 | 496 |
| 45 | 505 |
| 46 | 517 |
| 47 | 531 |
| 48 | 551 |
| 49 | 583 |
| 50 | 600 |

