## ACT Test 1 Section 2

## Instructions for Math Questions

Solve each problem, choose the correct answer, and then fill in the corresponding letter on your answer sheet.
You are permitted to use a calculator.

Note:
Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word line indicates a straight line.
4. The word average indicates arithmetic mean.

1 Evaluate $2-\{5+(2-3)+[2-(3-4)]\}$
(A) 5
(B) -5
(C) -3
(D) 1
(E) 2

2 If $x$ is an odd integer and $y$ is even, then which of the following must be an even integer?
I. $2 x+3 y$
II. $x y$
III. $x+y-1$
(F) I only
(G) II only
(H) I and II only
(J) II and III only
(K) I, II, and III

3 If $x^{-2}-9=0$, solve for $x$.
(A) 3
(B) $-\frac{1}{3}$
(C) $\frac{1}{3}$
(D) $\pm 3$
(E) $\pm \frac{1}{3}$

4 If a and b are odd integers, which of the following must be an even integer?
I. $\frac{a+b}{2}$
II. $a b-1$
III. $\frac{a b+1}{2}$
(F) I only
(G) II only
(H) I and II only
(J) II and III only
(K) I, II, and III only
4. If $\frac{\frac{1}{b}}{3}=\frac{1}{4}$, then $b=$
(A) $\frac{1}{4}$
(B) $\frac{3}{4}$
(C) $\frac{13}{4}$
(D) $\frac{4}{3}$
(E) 12

6 If the cost of a box of 12 pens is $\$ 7.20$ and a box of 16 pencils costs $\$ 4.00$, what is the cost of 3 pens and 3 pencils?
(F) $\$ 1.30$
(G) $\$ 2.55$
(H) $\$ 2.65$
(J) $\$ 3.50$
(K) $\$ 9.20$

1 If $\frac{\frac{2}{x}}{3}=\frac{3}{7}$, then $x=$
(A) 6
(B) 7
(C) 9
(D) 14
(E) 16

8 What value must $x$ take on in order for the following equation to be true:
$\frac{7}{x+3}=\frac{8}{x+5}$ ?
(F) 3
(G) 5
(H) 7
(J) 8
(K) 11

9 Two statements, p and q , are defined as follows:
$\mathrm{p}: \mathrm{a}+\mathrm{b}<\mathrm{c}+\mathrm{d}$
q: $\mathrm{a}<\mathrm{c}, \mathrm{b}<\mathrm{d}$
Which of the following is true?
(A) p implies q .
(B) p and q imply each other.
(C) $q$ implies $p$
(D) q is the contrapositive of $p$.
(E) Neither $q$ or $p$ implies the other.

10 If $\frac{2}{3} x=1$, then $\frac{3}{4}+x=$
(F) $\frac{9}{4}$
(G) 2
(H) $\frac{7}{4}$
(J) 1
(K) $\frac{3}{4}$

11 If $x=3$ and $y=-2$, then $\frac{1}{2 x}+\frac{1}{3 y}-\frac{2 x y}{3 x+2 y}=$
(A) $\frac{7}{5}$
(B) $\frac{8}{5}$
(C) $\frac{9}{5}$
(D) $\frac{11}{5}$
(E) $\frac{12}{5}$

12 If $\frac{7}{x+4}=\frac{5}{x+6}$, then $\mathrm{x}=$
(F) -11
(G) -7
(H) 5
(J) 7
(K) 11

13 If $\frac{3}{\frac{4}{g}}=(7-a) g$, then $a=$
(A) $\frac{3}{4}$
(B) $\frac{16}{3}$
(C) 5
(D) $\frac{25}{4}$
(E) 17
14. If $|2 x-5|=3$, then $x=$
(F) $-2 \frac{1}{2}$ or 3
(G) $2 \frac{1}{2}$ or 4
(H) 1 or 3
(J) 1 or 4
(K) 0 or -3

1-5 Find all roots of the equation

$$
(x+1)\left(x^{2}+4 x-5\right)=0
$$

(A) $\{-1,4,-5\}$
(B) $\{1,2,3\}$
(C) $\{-5,-1,1\}$
(D) $\{1,4,5\}$
(E) $\{-1,2,3\}$

16 If $f(x)=3 x+5$ and $3<x<5$, then $f(x)$ is between
(F) 10 and 16
(G) 12 and 18
(H) 14 and 20
(J) 16 and 22
(K) 18 and 24

17 Simplify $8 x^{2}-\left[7 x-\left(x^{2}-x+5 y\right)\right]+(2 x-3 y)$.
(A) $9 x^{2}-6 x+2 y$
(B) $8 x^{2}-x+2 y$
(C) $x^{2}+2$
(D) $7 x^{2}+2+3 y$
(E) 0

18 How many integers are in solution set of

$$
|2 x-6|<3 ?
$$

(F) None
(G) One
(H) Two
(J) Three
(K) Four

19 The fraction $\frac{\frac{2}{b^{2} a^{2}}}{\frac{1}{b^{2}-2 b}}$ may be expressed more compactly as
(A) $\frac{2 a}{b}$
(B) $\frac{b-4}{b}$
(C) $\frac{a b}{b^{2}-a}$
(D) $\frac{b-a}{a}$
(E) $\frac{2 b-4}{b a^{2}}$

20 If $x y \neq 0$, then $\frac{\frac{1}{x}-\frac{1}{y}}{\frac{1}{x^{2}}-\frac{1}{y^{2}}}=$
(F) $\frac{x y}{x+y}$
(G) $x y$
(H) $\frac{1}{x+y}$
(J) $\frac{-x y}{x-y}$
(1K) $\frac{x y}{x-y}$

21 The solution set of $\frac{7}{x^{2}+8 x+23}=1$ is
(A) $\{8\}$
(B) $\{8,-4\}$
(C) $\{-4\}$
(D) $\{4,-4\}$
(E) $\{16,1\}$

22 If $\frac{a}{b}=4$, then what is $a^{2}-16 b^{2}$ ?
(F) -16
(G) -4
(H) 0
(J) 4
(1K) 16

23 If $\frac{x}{y}=\frac{2}{5}$, then $25 x^{2}-4 y^{2}=$
(A) -5
(B) -2
(C) 0
(D) 2
(E) 5

24 If $a b c \neq 0$, then $\frac{3 b^{3} a^{2}}{33 a^{3} b^{6}(c b)^{4}}=$
(F) $\frac{11 b}{a^{3}}$
(G) $\frac{11}{a b^{8} \mathrm{c}^{4}}$
(H) $\frac{b^{3} a}{11 c^{4}}$
(J) $\frac{1}{11 a b^{7} \mathrm{c}^{4}}$
(K) $\frac{1}{11 a^{3} b^{6} c^{4}}$

24 Solve the equation $\mathrm{I}=\frac{E}{R}\left(1-e^{-\frac{R t}{L}}\right)$ for $t$.
(A) $t=\frac{-R \log _{e}\left(1^{-\frac{E}{R I}}\right)}{R \log e}$
(B) $t=-\frac{L}{R} \log _{e}\left(1-\frac{R \mathrm{I}}{E}\right)$
(C) $t=-\frac{R}{L} \log _{e}\left(\frac{R \mathrm{I}+1}{E}\right)$
(D) $t=\frac{L}{R} \log _{e}\left(\frac{R \mathrm{I}}{E}\right)$
(E) $t=\log _{e}\left(\frac{1+R \mathrm{I}}{E}\right)$

26 If $2^{(6 x-8)}=16$, then $x=$
(F) 2
(G) 4
(H) 10
(J) 1
(K) 6

27 If $f(x)=x+1, g(x)=2 x-3$ and an operation * is defined for all real numbers $a$ and $b$ by the equation $a * b=2 a+b-a b$, then $f(3) * g(4)=$
(A) -9
(B) -7
(C) -1
(D) 0
(E) 5
$28 \frac{\frac{2 x-8}{x+1}}{\frac{3 x^{2}-12 x}{x^{2}-1}}=$
(F) $\frac{2}{x^{2}}$
(G) $\frac{3 x^{2}}{2}$
(H) $\frac{2}{3}(16-x)$
(J) $\frac{2(x-1)}{3 x}$
(1) $\frac{x-5}{6 x}$

24 If $\log 2+2 \log x=\log (4 x-2)$, then $x=$
(A) -4
(B) -2
(C) 0
(D) 1
(E) 2

30 If $x^{2 a}=(2 x)^{a}$ and $a=-1$, then $x=$
(F) 0
(G) -2
(H) 1
(J) 2
(K) 3

31 The solution of $\frac{2 x+1}{x^{2}-4}>0$ is
(A) $x>2$
(B) $x>1$
(C) $x>2$ or $x<\frac{1}{2}$
(D) $x>2$ or $-2<x<-\frac{1}{2}$
(E) $x>2$ or $x<-2$

32 What is the solution to the pair of equations

$$
\left\{\begin{array}{l}
x-3 y=1 \\
2 x+y=2
\end{array} ?\right.
$$

(F) $x=1$ and $y=0$
(G) $x=2$ and $y=0$
(H) $x=3$ and $y=1$
(J) $x=0$ and $y=1$
(K) $x=0$ and $y=2$

33 If $\frac{1}{a}=\frac{1}{\frac{1}{b}}$ and $2<a<5$, then
(A) $\frac{1}{2}>b>\frac{1}{5}$
(B) $2>b>\frac{1}{2}$
(C) $5>b>2$
(D) $\frac{-1}{5}>b>\frac{-1}{2}$
(E) $\frac{1}{2}>b>-2$

34 The diagonal of a square has endpoints $(3,6)$ and $(-1,2)$. What is its area?
(F) 10
(G) 13
(H) 16
(J) 32
(K) 40

35 Line A passes through point $P(-6,5)$ and makes a $45^{\circ}$ angle with the $x$-axis. The equation of a perpendicular (to line $A$ ) line passing through point $P$ is
(A) $y=x-11$
(B) $y=-x+11$
(C) $y=-x-1$
(D) $y=x-3$
(E) $y=-x-11$

36 At what point do the lines $y=7 x$ and $3 y=4 x+7$ intersect?
(F) $(7,17)$
(G) $(17,56)$
(H) $(0,7)$
(J) $\left(\frac{7}{17}, \frac{49}{17}\right)$
(K) $\left(\frac{7}{17}, \frac{1}{17}\right)$

31 If $y=3 x$ lies in Quadrants I and III, then $y=|3 x|$ lies in Quadrants
(A) III and IV.
(B) I and II.
(C) I and III.
(D) I, II, and III.
(E) I only.

38 The coordinates of the vertices of a right triangle are $(1,3),(5,3)$, and $(1,6)$. Find the slope of its hypotenuse.
(F) $-\frac{3}{4}$
(G) $-\frac{5}{3}$
(H) $\frac{4}{3}$
(J) $-\frac{1}{4}$
(K) 2

39 If point $P$ has coordinates $(3,-6)$ and point $Q$ has coordinates $(15,5)$, the coordinates of the midpoint of the line segment between the two points is
(A) $\left(9,-\frac{1}{2}\right)$
(B) $\left(18, \frac{1}{2}\right)$
(C) $(15,3)$
(D) $\left(-\frac{1}{2}, 1\right)$
(E) $\left(15,-\frac{1}{2}\right)$

40 What is the distance between the line $y=4 x+9$ and the point $(10,4)$ ?
(F) $\frac{8}{15}$
(G) 8
(H) $\frac{52}{\sqrt{15}}$
(J) $\frac{85}{19}$
(K) $\frac{45}{\sqrt{17}}$

41 In which quadrants does the solution of the system lie?

$$
\left\{\begin{array}{l}
y<-x+3 \\
y<x-3
\end{array}\right.
$$

(A) III and IV
(B) I, III and IV
(C) II and IV
(D) I, and II
(E) II and III

42
In the system

$$
\left\{\begin{array}{l}
a x+b y=20 \\
b x+a y=16
\end{array}\right.
$$

the solution is $x=2$ and $y=1$. What are the coefficients $a$ and $b$ ?
(F) $\begin{aligned} & a=2 \\ & b=1\end{aligned}$
(G) $\begin{aligned} & a=8 \\ & b=7\end{aligned}$
(H) $\begin{aligned} & a=8 \\ & b=4\end{aligned}$
(J) $\begin{aligned} & a=7 \\ & b=14\end{aligned}$
(K) $\begin{aligned} & a=9 \\ & b=4\end{aligned}$

43 A circle whose center is at $C(-4,1)$ passes through the point $D(-2,2)$. Find the length of the radius.
(A) $\sqrt{3}$
(B) $\sqrt{7}$
(C) $\sqrt{5}$
(D) $\sqrt{13}$
(E) $\sqrt{10}$


A square is inscribe in a circle. The area of the circle is $\pi$. What is the area of the square?
(F) $\frac{\pi}{2}$
(G) $\frac{3 \pi}{2}$
(H) $\sqrt{2}$
(J) 2
(K) $\frac{\pi}{\sqrt{2}}$

45


Circles $A, B$, and $C$ are tangent to one another. Find the radius of circle $A$ if $A B=7, A C=5$, and $B C=9$.
(A) 1
(B) 2
(C) $\frac{7}{2}$
(D) $\frac{11}{2}$
(E) $\frac{3}{2}$

46

$A B C D$ is a parallelogram; $A E=7 x-1$, and $E C=5 x+5$. Find $A C$.
(F) 40
(G) 20
(H) 30
(J) 25
(K) 10
4) A triangle has angles measuring $x, y$, and $x+y$.

The triangle must be
(A) isosceles.
(B) scalene.
(C) right.
(D) equilateral.
(E) obtuse.

48 A square has a diagonal of length $r$. A second square has twice the area of the first square.
What is the perimeter of the second square?
(F) $r^{2}$
(G) $r^{2} \sqrt{2}$
(H) $r \sqrt{2}$
(J) $2 r$
(K) $4 r$

49 Two triangles are similar. The larger one is 4 times larger in area than the smaller one. Find the number by which the corresponding sides of the smaller triangle must be multiplied to equal the sides of the larger triangle.
(A) $\sqrt{3}$
(B) $\sqrt{2}$
(C) 2
(D) 4
(E) $\sqrt{5}$


In the accompanying figure of a circle centered about point $O$, the measure of arc $\overparen{A B}$ is $\frac{\pi}{5}$ radians. Find $\angle O B A$.
(F) $36^{\circ}$
(G) $144^{\circ}$
(H) $90^{\circ}$
(J) $72^{\circ}$
(K) $17^{\circ}$

51 The ratio of the areas of two circles is 25:16. What number, when multiplied by the smaller diameter, will give the larger diameter?
(A) $\frac{5}{4}$
(B) $\frac{5}{2}$
(C) 5
(D) $\frac{25}{4}$
(E) 4

56 The set of points with the property that the distances from each point to two fixed points has constant difference is
(F) a circle
(G) an ellipse
(H) a hyperbola
(J) a parabola
(K) a pair of parallel lines

57 For the triangle below, determine $\sin 2 \alpha$.

(A) $\frac{1}{2}$
(B) 0
(C) $\frac{\sqrt{2}}{2}$
(D) $\frac{-2}{\sqrt{2}}$
(E) $\frac{\sqrt{3}}{2}$

58 The product $(\sin \alpha)(\cos \alpha)(\tan \alpha)(\sec \alpha)(\cot \alpha)$ is equivalent to
(F) $\sin \alpha$
(G) $\tan \alpha$
(H) $\cot \alpha$
(J) $\cos \alpha$
(K) $\csc \alpha$

59 Find the area of the triangle below.

(A) $2 \sqrt{5}$
(B) $20 \sqrt{20}$
(C) $2 \sqrt{3}$
(D) $9 \sqrt{5}$
(E) $10 \sqrt{20}$

60 Which of the following is a sketch of $y=|\sin x|$ ?
(F)

(G)

(H)

(J)


Name
Teacher $\qquad$

Date

Class
$\qquad$
$\qquad$

## Section \#1

| 1 | (A)(B)(C) | 28 | (F)(G)(1) |
| :---: | :---: | :---: | :---: |
| 2 | (F)(H) | 24 | (A)(B)(C) |
| 3 | (A)(B)(C) | 30 | (F)(G)(J) |
| 4 | (F)(H)( | 31 | (A)(B)(C) |
| 5 | (A)(B)(C) | 32 | (F)(G)(J) |
| 6 | (F)(H)(J) | 38 | (A)(B)(C) |
| 1 | (A)B(C) | 34 | (F)(G)(J) |
| 8 | (F)(G)(J) | 35 | (A)(B)(C) |
| 9 | (A)B(C) | 36 | (F)(H) |
| 10 | (F)(H) | 31 | (A)(B)(C) |
| 11 | (A)(B)(C) | 38 | (F)(G)(J) |
| 12 | (F)(H)( | 39 | (A)(B)(C) |
| 13 | (A)(B)(C) | 40 | (F)(G)(J) |
| 14 | (F)(G)(1) | 41 | (A)(B)(C) |
| 15 | (A)(B)(C) | 42 | (F)(G)(J) |
| 16 | (F)(G)(1) | 43 | (A)(B)(C) |
| 17 | (A)(B)(C) | 4 | (F)(G)(J) |
| 18 | (F)(H)(J) | 45 | (A)(B)(C) |
| 19 | (A)(B)(C) | 46 | (F)(G)(1) |
| 20 | (F)(G)(J) | 47 | (A) (B)(C) |
| 21 | (A)(B)(C) | 48 | (F)(H)(J) |
| 22 | (F)(H)(J) | 49 | (A)(B)(C) |
| 23 | (A)(B)(C) | 50 | (F)(H)(J) |
| 24 | (F)(H)(J) | 51 | (A)(B)(C) |
| 25 | (A)(B)(C) | 52 | (F)(G)(1) |
| 26 | (F)(G) (1) | 58 | (A)(B)(C) |
| 21 | (A)(B)(C) | 54 | (F)(H)( |

## Section \#2

| 1 | (A)(B)(C)(E) |
| :---: | :---: |
| 2 | (F)(H)(1)® |
| 3 | (A)(B)(C)(E) |
| 4 | (F)(H)®® |
| 5 | (A)(B)(C)E |
| 6 | (F)(H)®® |
| 7 | (A)(B)(C)(E) |
| 8 | (F)(H)®® |
| 9 | (A)(B)(C)(E) |
| 10 | (F)(H)(1) |
| 11 | (A)(B)(C)(E) |
| 12 | (F)(G)(1)® |
| 18 | (A)(B)(C)(E) |
| 14 | (F)(H)® |
| 15 | (A)(B)(C)(E) |
| 16 | (F)(H)® |
| 17 | (A)(B)(C)(E) |
| 18 | (F)(H)® |
| 19 | (A)(B)(C)(E) |
| 20 | (F)(G)(1)® |
| 21 | (A)(B)(C)(E) |
| 22 | (F)(G)(1)K |
| 23 | (A)(B)(C)(E) |
| 24 | (F)(H)®® |
| 25 | (A)(B)(C)(E) |

## Section \#2 (cont.)

| 26 | (F)(CH\|(1) | 51 | (A)(B)(C)(D)(E) | 1 | (A)(B)(C)(D) | 26 | (F)(G)(1)(1) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 21 | (A)(B)(C)(D) ${ }^{\text {c }}$ | 52 | (F)(G)(H)(1)® | 2 | (F)(C)H(1) | 21 | (A)(B)(C)(D) |
| 28 | (F)(C)H1(1)® | 58 | (A)(B)(C)(D) | 3 | (A)(B)(C)(D) | 28 | (F)(C)(1) |
| 29 | (A)(B)(C)(E) | 54 | (F)(G)(H)(1)® | 4 | (F)(G)(1) | 29 | (A) (B)(C)(D) |
| 30 | (F)(C)H1(1)® | 55 | (A)(B)(C)(D)(E) | 5 | (A)(B)(C)(D) | 30 | (F)(C)[1] |
| 31 | (A)(B)(C)(D)(E) | 56 | (F®(H)(1)® | 6 | (F)(C)(1)(1) | 31 | (A)(B)(C)(D) |
| 32 | (F)(CH)® | 51 | (A)(B)(C)(D)(E) | 1 | (A)(B)(C)(D) | 32 | (F)(G)(1)(1) |
| 33 | (A)(B)(C)(D) | 58 | (F)(G)(1)(1)® | 8 | (F)(G)(H)(1) | 33 | (A)(B)(C)(D) |
| 34 | (F)(G)H1(1) | 59 | (A)(B)(C)(1) | 9 | (A)(B)(C)(D) | 34 | (F)( $\mathrm{H}^{\text {(1) }}$ |
| 35 | (A)(B)(C)(1) ${ }^{\text {a }}$ | 60 | (F)(G)(1)(1) | 10 | (F)(C)(1) | 35 | (A) (B)(C)(D) |
| 36 | (G)H(1)® |  |  | 11 | (A)(B)(C)(D) | 36 | (F)( (1) $^{\text {( }}$ ) |
| 31 | (A)(B)(C)(D)(E) |  |  | 12 | (F)(G)(H)(1) | 37 | (A)(B)(C)(D) |
| 38 | (F)(C)H(1)® |  |  | 18 | (A)(B)(C)(1) | 38 | (F)( ( $_{(1)(1)}$ |
| 39 | (A)(B)(C)(E) |  |  | 14 | (F)(G)H(1) | 39 | (A) (B)(C)(D) |
| 40 | (F)(C)H1(1)® |  |  | 15 | (A)(B)(C)(D) | 40 | (F)(C)(1) |
| 41 | (A)(B)(C)(D)(E) |  |  | 16 | (F)(G)(H)(1) |  |  |
| 42 | (G®(1)® |  |  | 17 | (A)(B)(C)(1) |  |  |
| 43 | (A)B(C)(D) ${ }^{\text {( }}$ |  |  | 18 | (F)(C)H(1) |  |  |
| 44 | (F)(C)(H)(1)® |  |  | 18 | (A)(B)(C)(D) |  |  |
| 45 | (A)(B)(C)(D)(E) |  |  | 20 | (F)(C)H(1) |  |  |
| 46 | (F)(CH)® ${ }_{\text {® }}$ |  |  | 21 | (A)(B)(C)(D) |  |  |
| 47 | (A)(B)(C)(D) ${ }^{\text {c }}$ |  |  | 22 | (F)(C)H(1) |  |  |
| 48 | (F)(G)H1(1)® |  |  | 23 | (A)(B)(C)(D) |  |  |
| 48 | (A)B(C)(D) |  |  | 24 | (F)(C)(1) |  |  |
| 50 | (F)(C)H(1)® |  |  | 25 | (A)(B)(C)(D) |  |  |

## Section \#4

| 1 | (A)(B)(C)(D) | 26 | (F)( ( $_{(1)(1)}$ |
| :---: | :---: | :---: | :---: |
| 2 | (F)(C)H(1) | 21 | (A)(B)(C)(D) |
| 3 | (A)(B)(C)(D) | 28 | (F)(C)(1) |
| 4 | ©(G)H(1) | 29 | (A)(B)(C)(D) |
| 5 | (A)(B)(C)(D) | 30 | (F)(G) $(1)$ |
| 6 | (F)(G)(H)(1) | 31 | (A)(B)(C)(D) |
| 1 | (A)(B)(C)(D) | 32 | (F)(G) $(1)$ |
| 8 | (F)(G)(H)(1) | 33 | (A)(B)(C)(D) |
| 9 | (A)(B)(C)(D) | 34 | (F)( $\mathrm{H}_{\text {( }}$ (1) |
| 10 | (F)(C)(1) | 35 | (A)(B)(C)(D) |
| 11 | (A)(B)(C)(D) | 36 | (F)(G)(1)(1) |
| 12 | (F)(G)(H)(1) | 31 | (A)(B)(C)(D) |
| 18 | (A)(B)(C)(1) | 38 | (F)(G) $(1)$ |
| 14 | (F)(G)(H)(1) | 39 | (A)(B)(C)(D) |
| 15 | (A)(B)(C)(D) | 40 | (F)(1)(1) |
| 18 | (F)(G)H(1) |  |  |
| 17 | (A)(B)(C)(D) |  |  |
| 18 | (F)(G)(H)(1) |  |  |
| 19 | (A)(B)(C) |  |  |
| 20 | (F)(G)(H)(1) |  |  |
| 21 | (A)(B)(C)(D) |  |  |
| 22 | (F)(G)H(1) |  |  |
| 23 | (A)(B)(C)(D) |  |  |
| 24 | (F)(G)(H)(1) |  |  |
| 25 | (A)(B)(C)( |  |  |

