MATH 05　　　　　　　　　　　　　　　　　　　　　　Exam 2

Nikos Apostolakis　　　　　　　　　　　　　　　　　July 18, 2016

Name: _____ A n s w e r s _____

> **Directions:** Write your answers in the provided space. To get full credit you *must* show all your work. Simplify your answers whenever possible. Be certain to indicate your final answer clearly. **Each problem is worth 5 points**

1. Evaluate: $13 - 28 \div 4 \cdot 2$

   A. 1　　B. -1　　C. 6　　D. -6

2. Write a mathematical statement that represent the following English statement:

   $$\overbrace{+5}^{} \quad \overbrace{3x}^{} \quad =$$

   Five more than three times a number is 65. $\times$

   Let x be the number

   $$3x + 5 = 65$$

3. Evaluate $a^2 - b^2$, when $a = 3$ and $b = -3$.　　$(3)^2 + (-3)^2 = 9 + (-9) = 0$

   A. 18　　B. -18　　☐ C. 0 ☐　　D. 12

4. Evaluate the expression $x^2 - 2xy + y^2$, when $x = 3$ and $y = -2$.

   $$(3)^2 - 2(3)(-2) + (-2)^2 = 9 - 2(3)(-2) + 4$$
   $$= 9 - 6(-2) + 4$$
   $$= 9 + 12 + 4$$
   $$= 21 + 4$$
   $$= \boxed{25}$$

5. Evaluate the expression

   $$\frac{-x^2 + 3}{2 - x} \quad = \quad \frac{-(-2)^2 + 3}{2 - (-2)}$$

   when $x = -2$.

   A. $\dfrac{1}{4}$

   $$= \frac{-4 + 3}{2 + 2}$$

   ☐ B. $-\dfrac{1}{4}$ ☐

   C. $\dfrac{12}{5}$

   $$= \frac{-1}{4}$$

   D. -12

   $$= \boxed{-\frac{1}{4}}$$

For the following two statements indicate whether they are true or false:

6. If $x = \dfrac{1}{2}$ and $y = -\dfrac{2}{3}$, then $4x + 6y = -2$

   [A. True]   B. False.

7. If $x = -2$ and $y = 4$, then $x^2 + y = y^2 + 3x - 1$

   A. True   [B. False.]

(handwritten right side)

$4\left(\dfrac{1}{x_1}\right)^{2} + 6\left(-\dfrac{2}{3}\right)^{2} = -2$

$\Longleftrightarrow 2 + (-4) = -2$

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

$\Longleftrightarrow 4 + 4 = 16 + 3(-2) - 1$

$\Longleftrightarrow 8 = 16 - 6 - 1$

$\Longleftrightarrow 8 = 7$

8. Solve for a: $5(2 - 3a) = 1 - 12a$ $\Longleftrightarrow 10 - 15a = 1 - 12a$

   A. $a = 5$ B. $a = -5$ [C. $a = 3$]   D. $a = -3$

   (handwritten) $\Longleftrightarrow -15a + 12a = 1 - 10$
   $\Longleftrightarrow -3a = -9 \Longleftrightarrow a = \dfrac{-9}{-3}$
   $\Longleftrightarrow a = 3$

9. Find the number that satisfies the statement in Question 2.

   (handwritten)
   $3x + 5 = 65 \Longleftrightarrow 3x = 65 - 5$
   $\Longleftrightarrow 3x = 60$
   $\Longleftrightarrow x = \dfrac{60}{3}$
   $\Longleftrightarrow \boxed{x = 20}$

10. If x represents a number, which equation is correct translation of the sentence?

    15 is 12 less than 2 times a number.

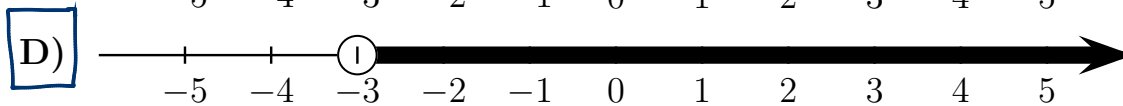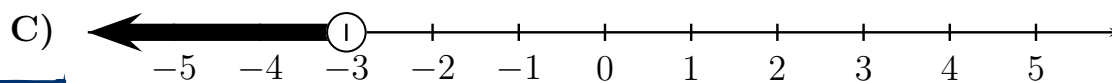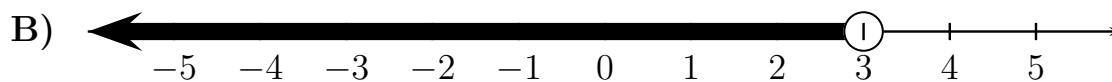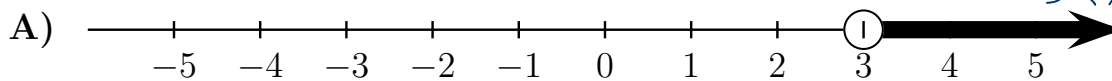   A. $15 = 12 - 2x$ B. $15 = 2(x - 12)$ [C. $15 = 2x - 12$]   D. $15 = 2(12 - x)$

11. Find the graph of the solution to the inequality $2x - 6 < 5x + 3$ *(handwritten)* $\Longleftrightarrow -6 - 3 < 5x - 2x$
    $\Longleftrightarrow -9 < 3x$
    $\Longleftrightarrow -3 < x \Longleftrightarrow x > -3$

    A) *(number line from −5 to 5, open circle at 3, shaded to the right)*

    B) *(number line from −5 to 5, open circle at 3, shaded to the left)*

    C) *(number line from −5 to 5, open circle at −3, shaded to the left)*

    [D)] *(number line from −5 to 5, open circle at −3, shaded to the right)*

12. Solve for z: $2x - 4z = 3 - y$ *(handwritten)* $\Longleftrightarrow 2x - 3 + y = 4z$

    A. $z = \dfrac{2x - y + 3}{4}$

    B. $z = \dfrac{3 - 2x - y}{4}$ *(handwritten)* $\Longleftrightarrow \dfrac{2x - 3 + y}{4} = z$

    [C.] $z = \dfrac{2x + y - 3}{4}$

    D. $z = -4(2x + y - 3)$

13. The following is the graph of the solution set of a linear inequality.
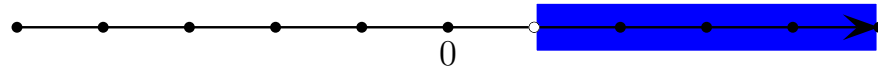
The inequality is:

A. $x + 1 > 2$ B. $x + 1 < 2$ C. $x + 1 \geq 2$ D. $x + 1 \leq 2$

$\Longleftrightarrow x > 1$ ✓ $\Longleftrightarrow x < 1$ $\Longleftrightarrow x \geq 1$ $\Longleftrightarrow x \leq 1$

14. Solve the equation: $\dfrac{x-2}{5} + \dfrac{8-x}{3} = x$ $LCD = 15$

$$\Longleftrightarrow \overset{3}{\cancel{15}} \dfrac{(x-2)}{\cancel{5}_1} + \overset{5}{\cancel{15}} \cdot \dfrac{(8-x)}{\cancel{3}_1} = 15x$$

$$\Longleftrightarrow 3x - 6 + 40 - 5x = 15x$$

$$\Longleftrightarrow -2x + 34 = 15x$$

$$\Longleftrightarrow 34 = 15x + 2x$$

$$\Longleftrightarrow \dfrac{\overset{2}{\cancel{34}}}{\cancel{17}} = \dfrac{17x}{17}$$

$$\Longleftrightarrow \boxed{x = 2}$$

15. Solve the equation:

$$-2(3x - 1) = 5(x + 2) - 11x + 7$$

$$\Longleftrightarrow -6x + 2 = 5x + 10 - 11x + 7$$

$$\Longleftrightarrow -6x + 2 = -6x + 17$$
$$ +6x +6x$$

$$\Longleftrightarrow 2 = 17$$

This is not true.

So the equation has $\underline{no\ solutions}$

16. Evaluate the expression $b^2 - 4ac$, when $a = -2$, $b = -3$, $c = 2$.

$$(-3)^2 - 4(-2)(2) = 9 - 4(-2)(2)$$
$$= 9 + 8 \cdot 2$$
$$= 9 + 16$$
$$= \boxed{25}$$

17. Find b if when $x = 2$, $y = -3$, and $m = 2$, the following equation is true:

$$y = mx + b$$

Substituting the given values we get

$$-3 = 2 \cdot 2 + b \iff -3 = 4 + b$$
$$\iff -3 - 4 = b$$
$$\iff \boxed{-7 = b}$$

18. Solve the following equation:

$$3(x + 7) - 8 = x + 3 \iff 3x + 21 - 8 = x + 3$$
$$\iff 3x + 13 = x + 3$$
$$\qquad\qquad -x \qquad\qquad -x$$
$$\iff 2x + 13 = 3$$
$$\qquad\qquad -13 \qquad -13$$
$$\iff \frac{2x}{2} = \frac{-10}{2} \; 5$$
$$\iff \boxed{x = -5}$$

19. Solve the following inequality, and graph the solution set in the provided graph.

$$9 - 2(2x + 3) \geq -7x - 3$$

$\Longleftrightarrow 9 - 4x - 6 \geq -7x - 3$

$\Longleftrightarrow -4x + 3 \geq -7x - 3$
$\qquad\quad +7x \qquad\qquad +7x$

$\Longleftrightarrow 3x + 3 \geq -3$
$\qquad\qquad -3 \qquad -3$

$\Longleftrightarrow \dfrac{3x}{3} \geq \dfrac{-6}{3}{}^{2}$

$\Longleftrightarrow \boxed{x \geq -2}$

The graph of the solution set is:

20. For a linear equation with one unknown both 0 and -7 are solutions. Which of the following must necessarily be true?

    A. There are no other solutions.

    B. -3.5 is also a solution.

    C. We can't know all solutions.

    D. This can't happen with a linear equation.

For a linear equation with one variable one of
the following three statements is true
- It has no solutions
- It has exactly one solution.
- All numbers are solutions

Since our equation has at least two solutions
the first two cases are not true. So all
numbers are solutions. In particular -3.5
is also a solution