Name: ______________________ Class: __________________ Date: KEY ID: A

Math 10 - Ch.6 - LINEAR SYSTEMS Practice Test /40

Multiple Choice
Identify the choice that best completes the statement or answers the question. **Show your work in the space provided.**

1. Which linear system has the solution $x = 5$ and $y = -4$?

   a. $x + 3y = 12$
   $4x - 2y = -27$

   b. $2x + 3y = 5$
   $-2x + y = 11$

   c. $3x + y = 11$
   $-2x + 4y = -26$

   d. $x + 3y = 5$
   $2x + 4y = 10$

substitute $x=5$ and $y=-4$ into each system. If the variables satisfy both equations then $(5,-4)$ is the solution.

a. $5+3(-4) \stackrel{?}{=} 12$
$5+(-12) \stackrel{?}{=} 12$
$-7 \neq 12$
$\therefore$ NOT a.

b. $2(5)+3(-4) \stackrel{?}{=} 5$
$10-12 \stackrel{?}{=} 5$
$-2 \neq 5$
$\therefore$ NOT b.

c. $3(5)+(-4) \stackrel{?}{=} 11$
$15-4 = 11$ yes ✓
$-2(5)+4(-4) \stackrel{?}{=} -26$
$-10+(-16) = -26$ ✓yes
$\therefore$ C.

2. Create a linear system to model this situation:

   In a board game, Judy scored 2 points more than four times the number of points Ann scored. There was a total of 57 points scored.

   a. $j = 2 + 4a$
   $j + a = 57$

   b. $j - 2 = 4a$
   $j + 2a = 57$

   c. $j + 2 = 4a$
   $j + a = 57$

   d. $a = 2 + 4j$
   $j + a = 57$

3. Without graphing, determine the slope of the graph of the equation:
   HINT: Write the equation in slope-intercept form
   $5x + 5y = 10$

   a. 1
   b. –1
   c. 5
   d. 5

$5y = -5x + 10$
$y = \frac{-5x+10}{5}$
$y = \frac{-5x}{5} + \frac{10}{5}$
$y = -x + 2$ $m=1$

or slope $= \frac{-A}{B}$ for equations in standard form
$= \frac{-5}{5} = -1$

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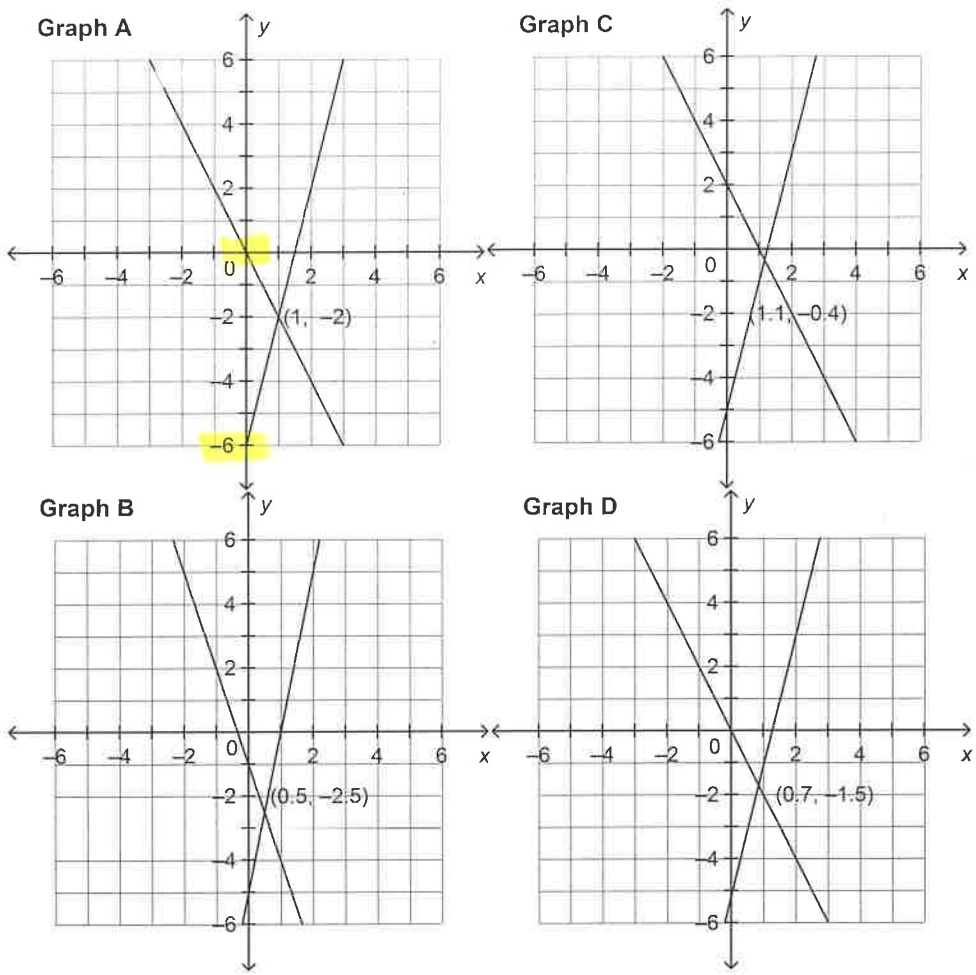
4. Which graph represents the solution of the linear system:
HINT: Write both equations in slope-intercept form
$y = -2x$ → slope $= -2$, y-int $= 0$
$y + 6 = 4x$ → $y = 4x - 6$ → slope $= 4$, y-int $= -6$



a. Graph B
b. Graph A
c. Graph C
d. Graph D

5. Use substitution to solve this problem:
The perimeter of a rectangular field is 256 m. The length is 22 m longer than the width. What are the dimensions of the field? **(SHOW YOUR WORK)**

a. 55 m by 77 m
b. 65 m by 87 m
c. 75 m by 53 m
d. 45 m by 67 m

① $2W + 2L = 256$
② $L = W + 22$
substitute ② into ① for L
$2W + 2(W+22) = 256$
$2W + 2W + 44 = 256$

$4W + 44 = 256$
$4W = 256 - 44$
$4W = 212$
$W = \frac{212}{4}$

$W = 53$
sub. for W into ②
$L = W + 22$
$L = 53 + 22$
$L = 75$

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6. Without graphing, determine which of these equations represent parallel lines.
HINT: Write both equations in slope-intercept form or use slope $= \frac{-A}{B}$

i) $-7x + 6y = 10$ $\longrightarrow$ $m = \frac{-(-7)}{6} = 7/6$
ii) $-5x + 6y = 10$ $\longrightarrow$ $m = \frac{-(-5)}{6} = 5/6$
iii) $-3x + 6y = 10$ $\longrightarrow$ $m = \frac{-(-3)}{6} = 3/6 = 1/2$
iv) $-7x + 6y = 12$ $\longrightarrow$ $m = \frac{-(-7)}{6} = 7/6$

a. ii and iii
b. i and ii
c. i and iv
d. i and iii

7. Determine the number of solutions of the linear system:
HINT: Write both equations in slope-intercept form
$3x - 5y = 49$ $\longrightarrow$ $-5y = -3x + 49$ $\longrightarrow$ $y = \frac{-3x+49}{-5}$ $\longrightarrow$ $y = 3/5x - 49/5$
$-9x + 15y = 3$ $\longrightarrow$ $15y = 9x + 3$ $\longrightarrow$ $y = \frac{9x+3}{15}$ $\longrightarrow$ $y = 9/15x + 3/15$

$y = 3/5x + 3/15$

a. one solution
b. no solution
c. two solutions
d. infinite solutions

same slope, different y-int., $\therefore$ parallel $\longrightarrow$ no solution

8. Determine the number of solutions of the linear system:
HINT: Write both equations in slope-intercept form
$8x + 3y = 149$ $\longrightarrow$ $3y = -8x + 149$ $\longrightarrow$ $y = \frac{-8x+149}{3}$ $\longrightarrow$ $y = -8/3x + 149/3$
$10x - 6y = 430$ $\longrightarrow$ $-6y = -10x + 430$ $\longrightarrow$ $y = \frac{-10x+430}{-6}$ $\longrightarrow$ $y = 10/6x - 430/6$

a. no solution
b. one solution
c. two solutions
d. infinite solutions

different slope, $\therefore$ one solution

9. Determine the number of solutions of the linear system:
HINT: Write both equations in slope-intercept form
$9x + 6y = 240$ $\longrightarrow$ multiply by -4 $\longrightarrow$ $-36x - 24y = -960$
$-36x - 24y = -960$

a. 2 solutions
b. one solution
c. infinite solutions
d. no solution

same eqn. $\therefore$ same line

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10. Two lines in a linear system have the same slope, but different y-intercepts. How many solutions does the linear system have?

a. two solutions
b. no solution
c. infinite solutions
d. one solution

11. What is the common difference of the arithmetic sequence, 7, 11, 15, ...

$11-7=4$ or, $15-11=4$

answer: 4

12. Use substitution to solve this linear system. (3 marks)
$x = 2 + y$ ①
$3x + 12y = -174$ ②

substitute ① into ② for x
② $3(2+y)+12y=-174$
$6+3y+12y=-174$
$6+15y=-174$
$15y=-174-6$

$15y=-180$
$y=\frac{-180}{15}$
$y=-12$

sub. $y=-12$ into ①
$x=2+(-12)$
$x=-10$

answer: $(-10,-12)$

13. Use the addition strategy to solve this linear system. (3 marks)
① $4x - 3y = 10$
② $2x + 5y = 18$ $\xrightarrow{\times(-2)}$

$4x-3y=10$
$+\ -4x-10y=-36$
$-13y=-26$
$y=2$

sub. $y=2$ into ② and solve for x

② $2x+5(2)=18$
$2x+10=18$
$2x=18-10$
$2x=8$
$x=4$

answer: $(4,2)$

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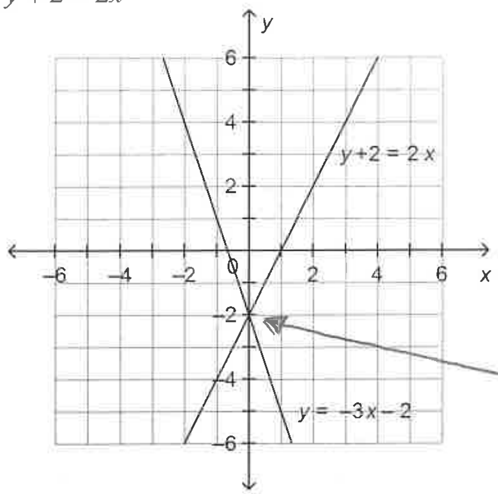
14. Use the graph to solve the linear system: (1 mark)
Hint: Look at the graph and identify the coordinate where the lines intersect.
$y = -3x - 2$
$y + 2 = 2x$



answer: (0, -2)

15. For what value of k does the linear system below have infinite solutions? (2 marks)
HINT: Write both equations in slope-intercept form
$\frac{3}{4}x + y = 13 \xrightarrow{\times 2} \frac{6}{4}x + 2y = 26$
$kx + 2y = 26$

$\therefore k = \frac{6}{4} = \frac{3}{2}$

answer: $\frac{3}{2}$

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16. Use the equation $t_n = a + (n-1)d$ to determine

a) the 12th term, where a = 4 and d = 7

$t_{12} = 4 + (12-1)7$

$t_{12} = 4 + (11)7$

$t_{12} = 4 + 77$

$t_{12} = 81$

answer: $t_{12} = 81$

b) the 40th term, where a = -0.75 and d = 0.5

$t_{40} = -0.75 + (40-1)(0.5)$

$= -0.75 + (39)(0.5)$

$= -0.75 + 19.5$

$= 18.75$

answer: $t_{40} = 18.75$

17. Find the number of terms in the arithmetic sequence where a = -3, d = 5 and $t_n = 82$

$82 = -3 + (n-1)5$

$82 = -3 + 5n - 5$

$82 = 5n - 8$

$82 + 8 = 5n$

$90 = 5n$

answer: $n = 18$

$90/5 = n$

$n = 18$

18. Find the first term of an arithmetic sequence where the 4th term is 2 and the 18th term is 30. (2 marks)

$t_4=2 \longrightarrow 2=a+(4-1)d \longrightarrow$ ① $2=a+3d \xrightarrow{\times -1} -2=-a-3d$

$t_{18}=30 \longrightarrow 30=a+(18-1)d \longrightarrow$ ② $30=a+17d \longrightarrow$ ⊕ $30=a+17d$

$28=14d \longrightarrow \boxed{d=2}$

substitute d=2 into ①

$\therefore\ 2=a+3(2)$

$2=a+6$

$2-6=a \longrightarrow$

answer: $a=-4$

19. Find x so that the values given are consecutive terms of an arithmetic sequence. (3 marks).

2x, 3x+2, 5x+3

$2x,\ 3x+2,\ 5x+3$

d d

$\therefore\ 3x+2-2x = 5x+3-(3x+2)$ because both sides = d

$x+2 = 5x+3-3x-2$

$x+2 = 2x+1$

$2-1 = 2x-x$

$1 = x$

answer: $x=1$

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20. Find the sum of the first 25 terms of the series 11 + 15 + 19 + ...

in this case $a = 11$, $d = 4$, $n = 25$

use $S_n = \frac{n}{2}(2a + (n-1)d)$

$S_{25} = \frac{25}{2}(2(11) + (25-1)4)$

$= \frac{25}{2}(22 + (24)4)$

$= \frac{25}{2}(22 + 96)$

$= \frac{25}{2}(118)$

$= 1475$

answer: $S_{25} = 1475$

21. Find the sum of the series 5 + 9 + 13 + ...+ 97 (2 marks)

① Determine the number of terms in the series. $a = 5$, $d = 4$, $t_n = 97$

Use $t_n = a + (n-1)d$

$97 = 5 + (n-1)4$

$97 = 5 + 4n - 4$

$97 = 4n + 1$

$97 - 1 = 4n$

$96 = 4n$

$\frac{96}{4} = n$

$n = 24$

② $S_n = \frac{n}{2}(a + l)$ where $a = 5$, $l = 97$ and $n = 24$

$S_{24} = \frac{24}{2}(5 + 97)$

$= \frac{24}{2}(102)$

$= 1224$

answer: $S_{24} = 1224$

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22. How many terms are in the series?

$$\sum_{n=2}^{12} 3n + 1$$

The number of terms in a series defined by $\sum_{n}^{k}$ is $k-n+1$

$\therefore$ the number of terms in this series is $12-2+1=11$

answer: 11

Evaluate: (2 marks)

$$\sum_{n=2}^{12} 3n + 1$$

the series looks like

$3(2)+1,\ 3(3)+1,\ 3(4)+1, \ldots 3(12)+1=37$

$7, 10, 13, \ldots 37$

in this case $a=7$, $d=3$, $n=11$ (as determined above)

use the equation $S_n = \frac{n}{2}(2a+(n-1)d)$

$\therefore S_{11} = \frac{11}{2}(2(7)+(11-1)3)$

$= \frac{11}{2}(14+(10)3)$

$= \frac{11}{2}(14+30)$

$= \frac{11}{2}(44)$

$= 11(22)$

OR use $S_n = \frac{n}{2}(a+l)$

where $n=11$

$a=7$

$l=37$

$\therefore S_{11} = \frac{11}{2}(7+37)$

$S_{11} = \frac{11}{2}(44)$

$S_{11} = 11(22)$

$S_{11} = 242$

answer: 242

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Problem

23. **a)** Write a linear system to model the situation:

A sports club charges an initiation fee and a monthly fee. At the end of 4 months, a member had paid a total of \$501. At the end of 9 months, she had paid a total of \$601.

$I + 4M = 501$

$I + 9M = 601$

b) Solve the linear system by **substitution** to solve the related problem:
What are the initiation fee and the monthly fee? (3 marks)

① $I + 4M = 501 \longrightarrow I = 501 - 4M$ ③

② $I + 9M = 601$

substitute ③ into ② for I

② $501 - 4M + 9M = 601$

$5M = 601 - 501$

$5M = 100$

$M = 20 \longrightarrow$ sub into ③ $I = 501 - 4(20)$

$= 501 - 80$

$= 421$

answer: monthly fee = \$20
initiation fee = \$421

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24. Use the addition strategy to solve this linear system. (2 marks)

① $4s - 4c = 20$ $\xrightarrow{\times 3}$ $12s - 12c = 60$

② $12s + 12c = 100$ $\longrightarrow \oplus$ $12s + 12c = 100$

$$24s = 160$$

$$s = \frac{160 \div 8}{24 \div 8}$$

$$s = \frac{20}{3}$$

substitute for s into ①

$$4\left(\tfrac{20}{3}\right) - 4c = 20$$

$$\frac{80}{3} - 4c = 20$$

multiply each term by the denominator

$$3\left(\tfrac{80}{3}\right) - 3(4c) = 3(20)$$

$$80 - 12c = 60$$

$$-12c = 60 - 80$$

$$-12c = -20$$

$$c = \frac{-20 \div -4}{-12 \div -4}$$

$$c = \tfrac{5}{3}$$

answer $c = \tfrac{5}{3}$ $s = \tfrac{20}{3}$