Linear Relations

Answer Key

Multiple Choice

Identify the choice that best completes the statement or answers the question.

A 1. In the equation $P = 7n + 6$, determine the value of P when $n = 9$.

a. 69 b. 22 c. 105 d. 96

$P = 7n+6$
$= 7(9)+6$
$= 63+6$
$= 69$

C 2. In a table of values for a pattern, $P = 12$ when $n = 3$. Determine the equation that might represent the pattern.

a. $P = 4n + 6$ b. $P = 24 - 3n$ c. $P = 4(6 - n)$ d. $P = 4(n + 6)$

$12 = 4(3)+6$ ✗ $12 = 24-3(3)$ ✗ $12 = 4(6-3)$ ✓ $12 = 4(3+6)$ ✗
$12 = 12$ $12 = 4(9)$

A 3. The pattern in this table continues. Determine the expression that relates the number of triangles to the figure number.

Figure, f	1	2	3	4	5
Number of Triangles, t	2	4	6	8	10

+2 +2 +2 +2

$t = 2f + 0$
$= 2(3)$
$= 6 + 0$

a. $2f$ b. $2 + t$ c. $2t$ d. $2 + f$

B 4. This pattern of unit squares continues. Which equation below relates the number of squares, n, to the figure number, f?

Hint:

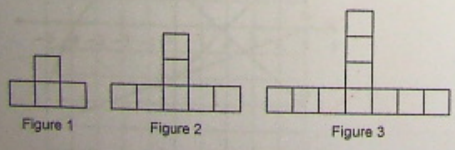


Figure 1 Figure 2 Figure 3

f	n
1	4)+3
2	7)+3
3	10

i) $n = 3f + 4$
ii) $n = 3f + 1$
iii) $f = 3n + 1$
iv) $f = 4 + 3n$

$n = 3f + 1$
$= 3(2)$
$= 6 + 1$

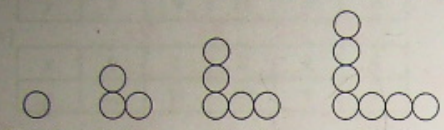
a. iii b. ii c. iv d. i

C 5. The cost to print stickers is \$6.55, plus \$0.55 per sticker. $C = 6.55 + 0.55s$
Determine an equation that relates the total cost, C dollars, to the number of stickers, s.
a. $C = 0.55s$ b. $C = 6.55 + s$ c. $C = 6.55 + 0.55s$ d. $C = 7.1s$

B 6. The cost to rent a piece of equipment is \$24, plus \$8.27 per hour.
Calculate the cost of renting the equipment for 6 h.
a. \$1190.88 b. \$73.62 c. \$193.62 d. \$38.27

$y = 24 + 8.27x$
$= 24 + 8.27(6)$
$= 24 + 49.62$
$= 73.62$

A 7. Determine an equation that relates the number of circles, C, to the figure number, n.



n	C
1	1
2	3
3	5
4	7

$C = 2n - 1$
$= 2(2)$
$= 4 - 1$

a. $C = 2n - 1$ b. $C = n \times n - 1$ c. $C = 2n + 1$ d. $C = n + 1$

A 8. The pattern in this table continues. Determine an equation that relates the term value to the term number.

Term Number, s	1	2	3	4	5
Term Value, w	6	10	14	18	22
		+4	+4	+4	+4

$w = 4s + 2$
$4(2)$
$8 + 2$

a. $w = 4s + 2$ b. $w = 6s$ c. $w = 3s + 2$ d. $w = 2s + 4$

B 9. A pattern can be represented by the equation $H = 6n - 1$. Use your equation skills. ☺
Which equations could represent the same pattern?
i) $H = 6(n-1) + 5$
ii) $H = 5(n+1) + n$
iii) $H = 7n - (n+1)$
iv) $H = 5n - (1-n)$

$H = 6(n-1) + 5$
$= 6n - 6 + 5$
$= 6n - 1$ *

$H = 5(n+1) + n$
$= 5n + 5 + n$
$= 6n + 5$

$H = 7n - (n+1)$
$= 7n - n - 1$
$= 6n - 1$ *

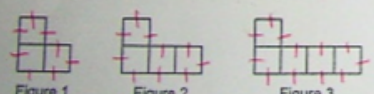
$H = 5n - (1-n)$
$= 5n - 1 + n$
$= 6n - 1$ *

a. i, ii, and iii b. i, iii, and iv c. i, ii, and iv d. All of these

C 10. This pattern of unit squares continues.
Which equation below relates the perimeter, P, to the figure number, n?

$P = 2n + 6$

C 10. This pattern of unit squares continues.
Which equation below relates the perimeter, P, to the figure number, n?

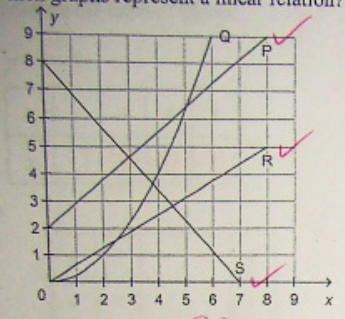


n	P
1	8
2	10
3	12

a) i) $P = 6n + 2$
b) ii) $P = 2n + 4$
c) iii) $P = 2n + 6$
d) iv) $P = 2n + 8$

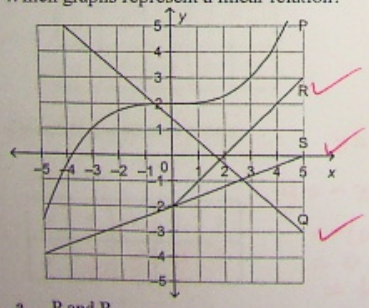
$P = 2n + 6$
$= 2(2)$
$= 4 + 6$

B 11. Which graphs represent a linear relation?



a. P only b. P, R, and S c. P and S d. P and R

B 12. Which graphs represent a linear relation?



a. P and R
b. Q, R, and S
c. Q and S
d. Q and R

A

13. Which tables of values represent a linear relation?

i)

x	1	2	3	4	5
y	4	7	12	19	28

+3 +5 NO!

ii)

x	0	1	2	3	4
y	0	5	10	15	20

+5 +5 +5 +5 Yes!

iii)

x	1	2	3	4	5
y	5	9	13	17	21

+4 +4 +4 +4 Yes!

iv)

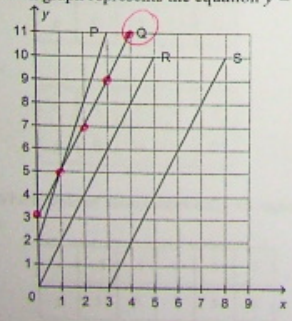
x	0	1	2	3	4
y	12	11	10	9	8

-1 -1 -1 -1 Yes!

(a.) ii, iii, and iv b. ii and iii c. All of these d. i and iv

B

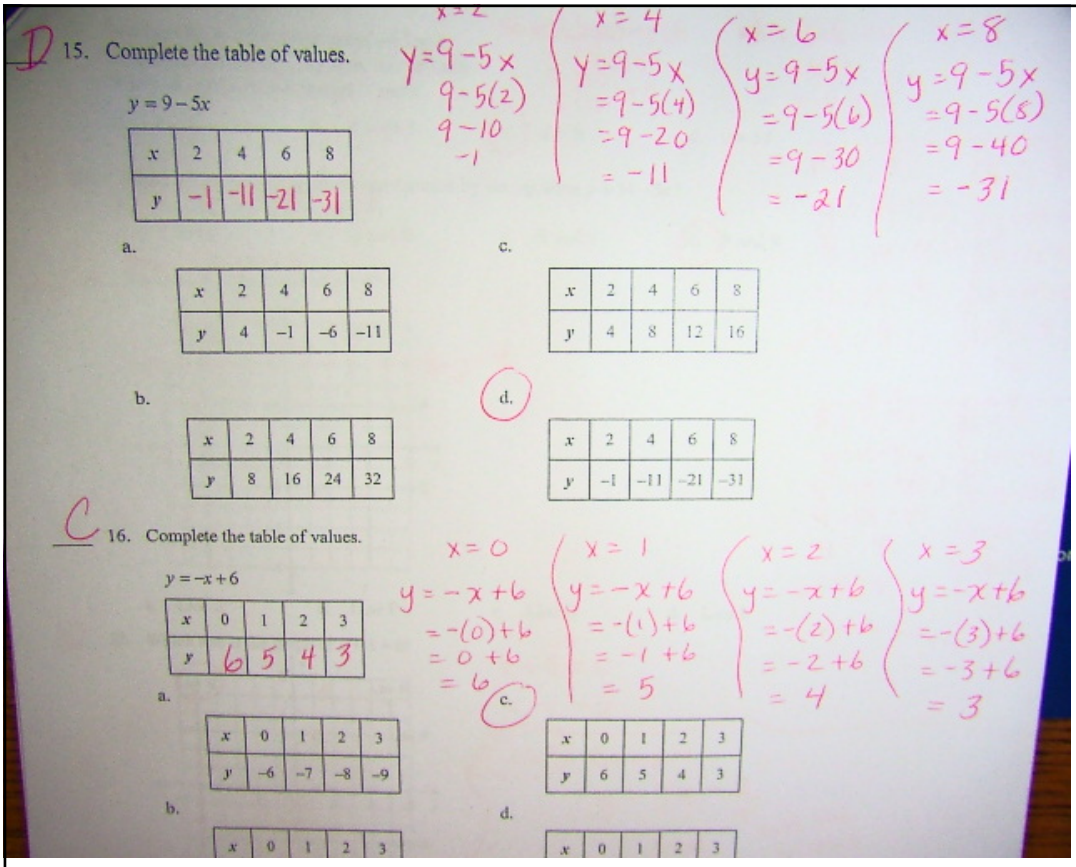
14. Which graph represents the equation $y = 2x + 3$?



$y = \frac{2}{1}x + 3$ ← y-intercept "where the line hits the y-axis."

slope = $\frac{2}{1}$ $\frac{\text{rise}}{\text{run}}$

a. Line S (b.) Line Q c. Line P d. Line R



D 15. Complete the table of values.

$y = 9 - 5x$

x	2	4	6	8
y	-1	-11	-21	-31

$x = 2$: $y = 9 - 5x$, $9 - 5(2)$, $9 - 10$, -1

$x = 4$: $y = 9 - 5x$, $= 9 - 5(4)$, $= 9 - 20$, $= -11$

$x = 6$: $y = 9 - 5x$, $= 9 - 5(6)$, $= 9 - 30$, $= -21$

$x = 8$: $y = 9 - 5x$, $= 9 - 5(8)$, $= 9 - 40$, $= -31$

a.

x	2	4	6	8
y	4	-1	-6	-11

c.

x	2	4	6	8
y	4	8	12	16

b.

x	2	4	6	8
y	8	16	24	32

d.

x	2	4	6	8
y	-1	-11	-21	-31

C 16. Complete the table of values.

$y = -x + 6$

x	0	1	2	3
y	6	5	4	3

$x = 0$: $y = -x + 6$, $= -(0) + 6$, $= 0 + 6$, $= 6$

$x = 1$: $y = -x + 6$, $= -(1) + 6$, $= -1 + 6$, $= 5$

$x = 2$: $y = -x + 6$, $= -(2) + 6$, $= -2 + 6$, $= 4$

$x = 3$: $y = -x + 6$, $= -(3) + 6$, $= -3 + 6$, $= 3$

a.

x	0	1	2	3
y	-6	-7	-8	-9

c.

x	0	1	2	3
y	6	5	4	3

b.

x	0	1	2	3

d.

x	0	1	2	3

A 17. This table of values represents a linear relation. Complete the table.

x	1	3	5	7
y	9	17	25	33

+2 +2 +2

+8 +8 +8

Look for the pattern.

a.

x	1	3	5	7
y	9	17	25	33

b.

x	1	3	5	7
y	9	17	21	25

c.

x	1	3	5	7
y	9	17	19	21

d.

x	1	3	5	7
y	9	17	45	63

B 18. Which table of values represents the equation $y = 11 - 4x$?

a.

x	−2	−1	0	1	2
y	5	6	7	8	9

b.

x	−2	−1	0	1	2
y	19	15	11	7	3

c.

x	−2	−1	0	1	2
y	3	7	11	15	19

d.

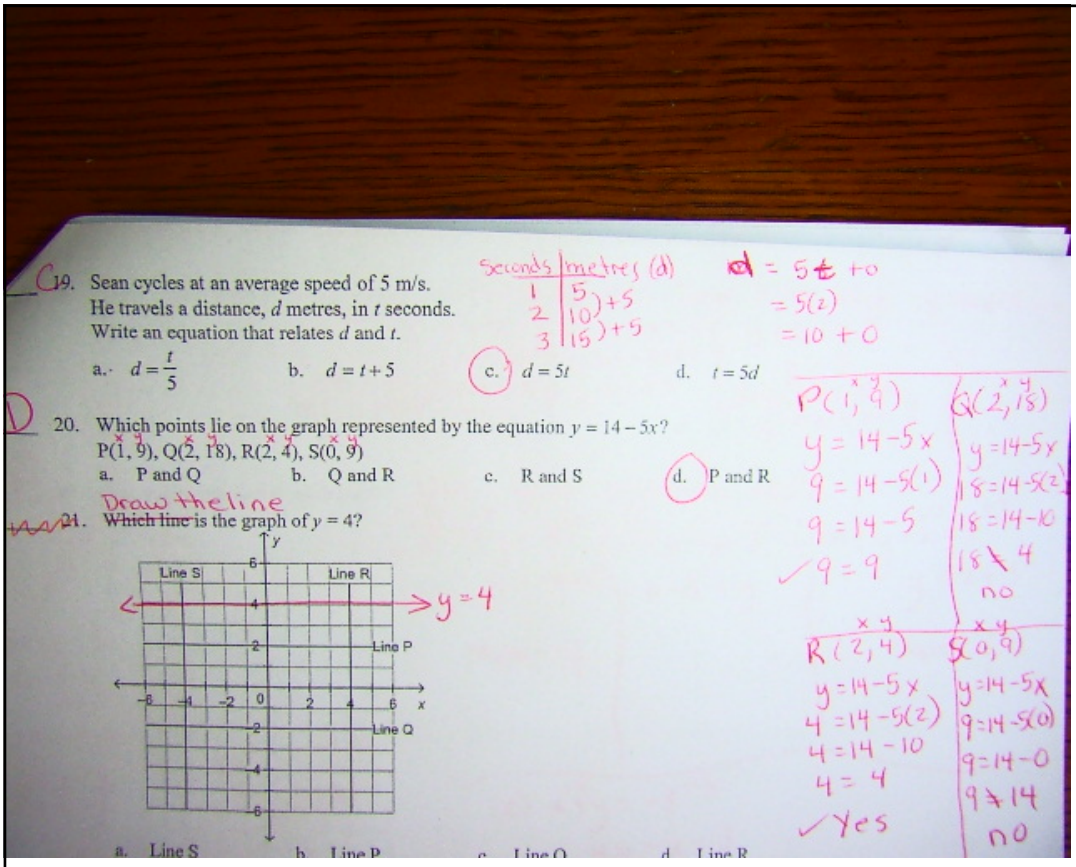
x	−2	−1	0	1	2
y	−14	−7	0	7	14

$x = -2$
$y = 11 - 4x$
$= 11 - 4(-2)$
$= 11 + 8$
$= 19$

$x = -1$
$y = 11 - 4x$
$= 11 - 4(-1)$
$= 11 + 4$
$= 15$

$x = 0$
$y = 11 - 4x$
$= 11 - 4(0)$
$= 11 - 0$
$= 11$

$x = 1$
$y = 11 - 4x$
$= 11 - 4(1)$
$= 11 - 4$
$= 7$



C 19. Sean cycles at an average speed of 5 m/s.
He travels a distance, d metres, in t seconds.
Write an equation that relates d and t.

a. $d = \frac{t}{5}$ b. $d = t + 5$ c. $d = 5t$ d. $t = 5d$

Seconds	metres (d)
1	5
2	10
3	15

$d = 5t + 0$
$= 5(2)$
$= 10 + 0$

D 20. Which points lie on the graph represented by the equation $y = 14 - 5x$?
P(1, 9), Q(2, 18), R(2, 4), S(0, 9)

a. P and Q b. Q and R c. R and S d. P and R

P(1, 9): $y = 14 - 5x$; $9 = 14 - 5(1)$; $9 = 14 - 5$; ✓ $9 = 9$

Q(2, 18): $y = 14 - 5x$; $18 = 14 - 5(2)$; $18 = 14 - 10$; $18 \neq 4$; no

R(2, 4): $y = 14 - 5x$; $4 = 14 - 5(2)$; $4 = 14 - 10$; $4 = 4$; ✓ Yes

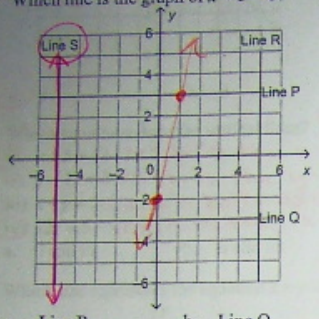
S(0, 9): $y = 14 - 5x$; $9 = 14 - 5(0)$; $9 = 14 - 0$; $9 \neq 14$; no

~~21. Which line~~ Draw the line is the graph of $y = 4$?

a. Line S b. Line P c. Line Q d. Line R

a. Line S b. Line P c. Line Q d. Line R

D 22. Which line is the graph of $x + 5 = 0$?



$x + 5 = 0$ (−5 −5)

$x = -5$

22.5 Graph $y = 5x - 2$ ↑ hits the y-axis

$\frac{5}{1}$ $\frac{\text{rise}}{\text{run}}$

a. Line R b. Line Q c. Line P d. Line S

___ 23. For the equation $4x - 2y = 8$, make a table of values for $x = -2$, 0, and 2.

a.

x	−2	0	2
y	−8	−4	0

$4(-2) - 2y = 8$

$-8 - 2y = 8$

$\frac{-2y}{-2} = \frac{16}{-2}$

$y = -8$

b.

x	−2	0	2
y	−8	0	1

c.

x	−2	0	2
y	8	4	1

x	y
−2	−8
0	−4
2	

$4x - 2y = 8$

$4(0) - 2y = 8$

$\frac{-2y}{-2} = \frac{8}{-2}$

$y = -4$

d.

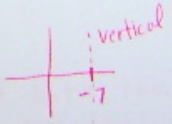
x	−2	0	2
y	0	−4	8

C 24. Describe the graph of the equation $x + 7 = 0$.

a. A vertical line that intersects the x-axis at 7.
b. A horizontal line that intersects the y-axis at −7.
c. A vertical line that intersects the x-axis at −7.
d. A horizontal line that intersects the y-axis at 7.

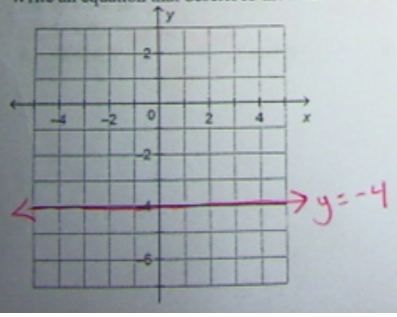
$x + 7 = 0$ (−7 −7)

$x = -7$



A

25. Write an equation that describes the line.



a. $y = -4$ b. $x = 4$

c. $y = 4$ d. $x = -4$

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26. Which equation describes a horizontal line? A horizontal line hits the y-axis...

i) $x+9=2$
ii) $y+x=9$
iii) $y-x=0$
iv) $y+2=9$

a. iv

$x+9=2$, $-9 \quad -9$, $x=-7$, No, hits the x-axis

b. ii

$y+x=9$, Hits both the x and y axes

c. i

$y-x=0$, Hits both axes

d. iii

$y+2=9$, $-2 \quad -2$, $y=7$, Yes, hits the y-axis at 7

27. Which equation describes the graph?

i) $x+y=3$
ii) $x-y=3$
iii) $y-x=3$
iv) $x+y=-3$

Use your equation skills.

i) $x+y=3$, $-x \quad -x$, $y=-x+3$, slope $=\frac{-1}{1}$

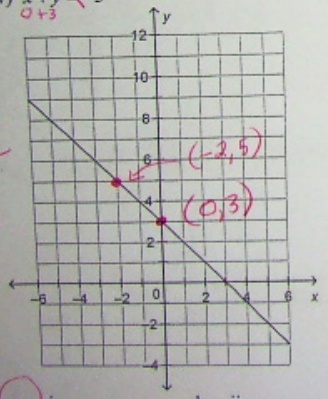
ii) $x-y=3$, $-3 \quad -3$, $x-3=y$

iii) $y-x=3$, $+x \quad +x$, $y=x+3$, slope $=\frac{1}{1}$

iv) $x+y=-3$, $-x \quad -x$, $y=-x-3$

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

$y-x=3$
$5-(-2)=3$
$5+2=3$
$7 \neq 3$
no



a. i

b. ii

c. iii

d. iv

OR pick any point on the line and fill it in to each equation. (0,3) worked for both equations i and iii. Choose another point.

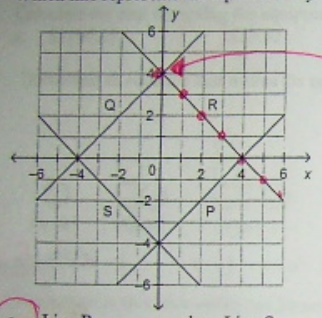
a. i b. ii c. iii d. iv Choose another point

D 28. Which equations describe vertical lines? Vertical lines hit the x-axis.

i) $x+5=12$ yes, hits the x-axis only
ii) $y-12=5$ no, hits the y-axis
iii) $x+y=5$ no, hits both axes
iv) $12x=5$ yes, hits the x-axis only

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

A 29. Which line represents the equation $x+y=4$?



$x+y=4$
$-x \quad -x$
$y=-x+4$

Slope $=-\frac{1}{1}$
down 1
over 1

a. Line R b. Line S c. Line P d. Line Q

B 30. Which equations describe oblique lines? Oblique lines hit both the x and y axes, so both the x and y must be represented.

i) $5x+9=14$ only x-axis
ii) $5x+9y=14$ both axes
iii) $9y+5=14$ only y-axis
iv) $5x=9y$ both axes

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