Year 10 Worksheet 1: Linear Relations

Question 1: Answer the following.

(1) Simplify $4x - 2x \times 3y + 7y + 10xy - 3y$

A. $4xy$ B. $8xy$ C. $4(x + y)$ D. $4(x + xy + y)$ E. $4(xy + y)$

(2) Simplify $\frac{6x-2}{3} \times \frac{4}{3x-1}$

A. $\frac{6x-2}{3x-1}$ B. $\frac{4x-6}{3x-1}$ C. $\frac{6x-2}{3}$ D. $\frac{24}{9}$ E. $\frac{8}{3}$

(3) Simplify $\frac{3}{x-2} - \frac{2}{2x-1}$

A. $\frac{4x+1}{2(x-2)(x-1)}$ B. $\frac{4x+1}{(x-2)(2x-1)}$ C. $\frac{1}{(x-2)(2x-1)}$

D. $\frac{6x+2x-6}{(2x-1)(x-2)}$ E. $\frac{x-3}{(x-2)(2x-1)}$

(4) Solve for x when $-3(2x - 6) = 3x$

A. -⅔ B. ⅔ C. 1 D. -2 E. 2

(5) If the line $2x - ay + 6 = 0$ has a point $(-1, 1)$, find a.

A. ½ B. -2 C. 2 D. 4 E. -4

(6) Find the gradient and y-intercept of $3x + 4y = 8$

A. -¾ and 2 B. -3 and 8 C. ¾ and -2 D. 3 and -8 E. -¾ and 8

(7) Find the equation of the line joining 2 points $(1, 2)$ and $(2, -2)$

A. $y - 4x = 6$ B. $y = 4 - \frac{1}{2}x$ C. $4y = 6 - 2x$

D. $\frac{1}{2}y + 4 = x$ E. $y = 6 - 4x$

(8) $(2.5, -5)$ is the midpoint of the line segment joining 2 points $(a, 0)$ and $(0, b)$. Find a and b.

A. $a = 2.5$ $b = 0$ B. $a = 5$ $b = -10$ C. $a = -2.5$ $b = -10$ D. $a = 2.5$ $b = 10$ E. $a = -5$ $b = 10$

(9) Find the equation of the line that is parallel to $6x - 2y - 5 = 0$ and passes through the point $(0.5, 0.5)$.

A. $\frac{1}{3}y + x = -1$ B. $3y + x = 1$ C. $y = 3x - 1$

D. $\frac{1}{3}y - 3x = 1$ E. $3y - x = 1$

(10) Which point is **not** in the region of $3x - 4y \leq 8$?

A. $(-3, 1)$ B. $(2, 2)$ C. $(1, -4)$ D. $(0, 8)$ E. $(0, -2)$

Question 2: Answer the following.

1	Expand and simplify the following. a. $9ab - 4b + ab - 2b + 7a$ b. $4xy \times 2x \times 3y$ c. $24xy \div 3x$ d. $5(a + 2) - 8$ e. $-2m(9m - 3) + 5m^2$ f. $3(2x + y) - 5y + 4(x - 2)$

2	Simplify the following fractions by canceling the common factors. a. $\frac{28x-8}{4} + \frac{2x-2}{2}$ b. $\frac{7x}{3} \times \frac{21x+6}{14x}$ c. $\frac{5x-5}{24} \div \frac{x-1}{6}$ d. $\frac{18}{2x+4} \div \frac{9x}{x+2}$

3	Solve the following linear equations. a. $5x - 4 = 11$ b. $2(1 - 5x) = 10 - 3(2x + 4)$ c. $\frac{7x-4}{9} = 5$ d. $\frac{3x-5}{8} = \frac{x+4}{4}$
4	Solve the following inequalities. a. $3x - 5 > 13$ b. $4x + 2 \leq 3(x - 8)$

	c. $2 - \frac{x}{2} < 5$ d. $-3x \geq -3(4 - 3x)$
5	Sketch the following linear relations, labeling the x and y intercepts (points where the graph cuts the x and y axes) a. $y = 2x - 6$ b. $y = 7 - 3x$

c. $y = 5$

d. $x = -4$

e. $x - 4y = 6$

f. $2x + 5y = 10$

6	Find the gradient and equation of the line that passes through the points: a. $(5, 2)\ and\ (3, -2)$ b. $(1, 4)\ and\ (2, 1)$ c. $(-2, -2)\ and\ (-1, -6)$ d. $(-2, 3)\ and\ (-1, 9)$
7	Find the midpoint and exact length of the line joining these points. a. $(5, 2)\ and\ (3, -2)$ b. $(1, 4)\ and\ (2, 1)$ c. $(-2, -2)\ and\ (-1, -6)$ d. $(-2, 3)\ and\ (-1, 9)$

8	Using the **substitution** method, find the solutions for the following simultaneous equations. a. $7x + 2y = 24$ $4x + y = 15$ b. $5x - 8y = 45$ $9x - 8y = 49$ c. $4x - y = 8$ $6x + y = 22$ d. $3x + 3y = 18$ $5x + 3y = 28$
9	Using the **elimination** method, find the solutions for the following simultaneous equations. a. $x + 2y = 14$ $3x + 4y = 34$ b. $5x + y = 17$ $8x - 2y = 2$ c. $2x + 3y = 13$ $2x + y = 7$ d. $2x + y = 12$ $6x + 5y = 40$

10	Determine the equation of the line that is: a. Parallel to the line $y = 2x - 5$ and passes through the point $(-2, 5)$ b. Parallel to the line $y = 10$ and passes through the point $(5, 3)$ c. Perpendicular to the line $y = x + 8$ and has a y-intercept at $(0, 9)$ d. Perpendicular to the line $y = 12 - 4x$ and passes through the point $(4, 4)$

Personalised English & Math Tutoring

Redeem Free Assessment

Answer Key

Question 1: Answer the following.

(1) Simplify $4x - 2x \times 3y + 7y + 10xy - 3y$

A. $4xy$ B. $8xy$ C. $4(x + y)$ D. $4(x + xy + y)$ E. $4(xy + y)$

Answer: D

(2) Simplify $\frac{6x-2}{3} \times \frac{4}{3x-1}$

A. $\frac{6x-2}{3x-1}$ B. $\frac{4x-6}{3x-1}$ C. $\frac{6x-2}{3}$ D. $\frac{24}{9}$ E. $\frac{8}{3}$

Answer: E

(3) Simplify $\frac{3}{x-2} - \frac{2}{2x-1}$

A. $\frac{4x+1}{2(x-2)(x-1)}$ B. $\frac{4x+1}{(x-2)(2x-1)}$ C. $\frac{1}{(x-2)(2x-1)}$

D. $\frac{6x+2x-6}{(2x-1)(x-2)}$ E. $\frac{x-3}{(x-2)(2x-1)}$

Answer: B

(4) Solve for x when $-3(2x - 6) = 3x$

A. -⅔ B. ⅔ C. 1 D. -2 E. 2

Answer: E. 2

(5) If the line $2x - ay + 6 = 0$ has a point $(-1, 1)$, find a.

A. ½ B. -2 C. 2 D. 4 E. -4

Answer: D. 4

(6) Find the gradient and y-intercept of $3x + 4y = 8$

A. -¾ and 2 B. -3 and 8 C. ¾ and -2 D. 3 and -8 E. -¾ and 8

Answer: A

(7) Find the equation of the line joining 2 points $(1, 2)$ and $(2, -2)$

A. $y - 4x = 6$ B. $y = 4 - \frac{1}{2}x$ C. $4y = 6 - 2x$

D. $\frac{1}{2}y + 4 = x$ E. $y = 6 - 4x$

Answer: E. y= 6 - 4x

(8) $(2.5, -5)$ is the midpoint of the line segment joining 2 points $(a, 0)$ and $(0, b)$. Find a and b.

A. $a = 2.5$, $b = 0$ B. $a = 5$, $b = -10$ C. $a = -2.5$, $b = -10$ D. $a = 2.5$, $b = 10$ E. $a = -5$, $b = 10$

Answer: B

(9) Find the equation of the line that is parallel to $6x - 2y - 5 = 0$ and passes through the point $(0.5, 0.5)$.

A. $\frac{1}{3}y + x = -1$ B. $3y + x = 1$ C. $y = 3x - 1$

D. $\frac{1}{3}y - 3x = 1$ E. $3y - x = 1$

Answer: C

(10) Which point is **not** in the region of $3x - 4y \leq 8$?

A. $(-3, 1)$ B. $(2, 2)$ C. $(1, -4)$ D. $(0, 8)$ E. $(0, -2)$

Answer: C

Question 2: Answer the following.

1 Expand and simplify the following.

a. $9ab - 4b + ab - 2b + 7a$

Group like terms

$= 9ab + ab - 4b - 2b + 7a$

Add similar elements: $9ab + ab = 10ab$

$= 10ab - 4b - 2b + 7a$

Add similar elements: $-4b - 2b = -6b$

$= 10ab - 6b + 7a$

b. $4xy \times 2x \times 3y$

Multiply the numbers: $4 \cdot 2 \cdot 3 = 24$

$= 24xyxy$

Apply exponent rule: $aa = a^2$

$xx = x^2$

$= 24x^2yy$

Apply exponent rule: $aa = a^2$

$yy = y^2$

$= 24x^2y^2$

c. $24xy \div 3x$

Cancel the common factor: x

$= \frac{24y}{3}$

Divide the numbers: $\frac{24}{3} = 8$

$= 8y$

d. $5(a + 2) - 8$

Expand $5(a+2)$: $5a + 10$

$= 5a + 10 - 8$

Subtract the numbers: $10 - 8 = 2$

$= 5a + 2$

e. $-2m(9m-3)+5m^2$

Expand $-2m(9m-3)$: $-18m^2+6m$

$=-18m^2+6m+5m^2$

Group like terms

$=-18m^2+5m^2+6m$

Add similar elements: $-18m^2+5m^2=-13m^2$

$=-13m^2+6m$

f. $3(2x+y)-5y+4(x-2)$

$=6x+3y-5y+4x-8$

Add similar elements: $3y-5y=-2y$

$=6x-2y+4x-8$

Group like terms

$=6x+4x-2y-8$

Add similar elements: $6x+4x=10x$

$=10x-2y-8$

2 Simplify the following fractions by canceling the common factors.

a. $\frac{28x-8}{4}+\frac{2x-2}{2}$

Factor $28x-8$: $4(7x-2)$

$=\frac{4(7x-2)}{4}$

Cancel the common factor: 4

$=7x-2$

b. $\frac{7x}{3}\times\frac{21x+6}{14x}$

Cancel the common factor: x

$=\frac{7(21x+6)}{3\cdot 14}$

Factor the number: $14=7\cdot 2$

$=\frac{7(21x+6)}{3\cdot 7\cdot 2}$

Cancel the common factor: 7

$=\frac{21x+6}{3\cdot 2}$

Factor $21x + 6$: $3(7x + 2)$

$$= \frac{3(7x+2)}{3 \cdot 2}$$

Cancel the common factor: 3

$$= \frac{7x+2}{2}$$

c. $\frac{5x-5}{24} \div \frac{x-1}{6}$

$$= \frac{(5x-5) \cdot 6}{24(x-1)}$$

Cancel $\frac{(5x-5) \cdot 6}{24(x-1)}$: $\frac{5}{4}$

$$= \frac{5}{4}$$

d. $\frac{18}{2x+4} \div \frac{9x}{x+2}$

$$= \frac{18(x+2)}{(2x+4) \cdot 9x}$$

Cancel $\frac{18(x+2)}{(2x+4) \cdot 9x}$: $\frac{1}{x}$

$$= \frac{1}{x}$$

3	Solve the following linear equations.

a. $5x - 4 = 11$

Move 4 to the right side

$5x = 15$

Divide both sides by 5

$x = 3$

b. $2(1 - 5x) = 10 - 3(2x + 4)$

Expand $2(1 - 5x)$: $2 - 10x$

Expand $10 - 3(2x + 4)$: $-6x - 2$

$2 - 10x = -6x - 2$

Move 2 to the right side

$-10x = -6x - 4$

Move $6x$ to the left side

$-4x = -4$

Divide both sides by -4

$x = 1$

c. $\frac{7x-4}{9} = 5$

Multiply both sides by 9

$7x - 4 = 45$

Move 4 to the right side

$7x = 49$

Divide both sides by 7

$x = 7$

d. $\frac{3x-5}{8} = \frac{x+4}{4}$

Apply fraction cross multiply: if $\frac{a}{b} = \frac{c}{d}$ then $a \cdot d = b \cdot c$

$(3x - 5) \cdot 4 = 8(x + 4)$

Expand $(3x - 5) \cdot 4$: $12x - 20$

Expand $8(x + 4)$: $8x + 32$

$12x - 20 = 8x + 32$

Move 20 to the right side

$12x = 8x + 52$

Move $8x$ to the left side

$4x = 52$

Divide both sides by 4

$x = 13$

4 Solve the following inequalities.

a. $3x - 5 > 13$

Move 5 to the right side

$3x > 18$

Divide both sides by 3

$x > 6$

b. $4x + 2 \leq 3(x - 8)$

Expand $3(x-8)$: $3x - 24$

$4x + 2 \leq 3x - 24$

Move 2 to the right side

$4x \leq 3x - 26$

Move $3x$ to the left side

$x \leq -26$

c. $2 - \frac{x}{2} < 5$

Move 2 to the right side

$-\frac{x}{2} < 3$

Multiply both sides by 2

$-x < 6$

Multiply both sides by -1

$x > -6$

d. $-3x \geq -3(4 - 3x)$

Expand $-3(4-3x)$: $-12 + 9x$

$-3x \geq -12 + 9x$

Move $9x$ to the left side

$-12x \geq -12$

Multiply both sides by -1

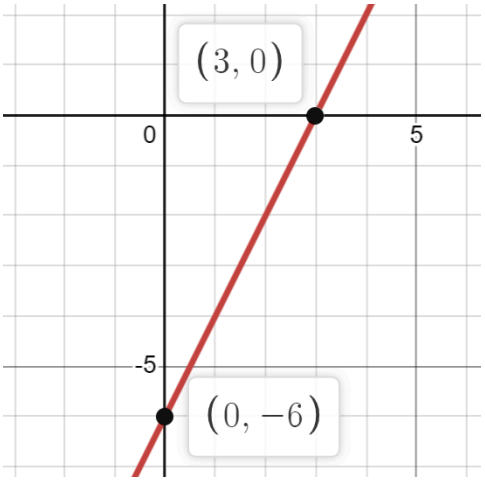
$12x \leq 12$

Divide both sides by 12

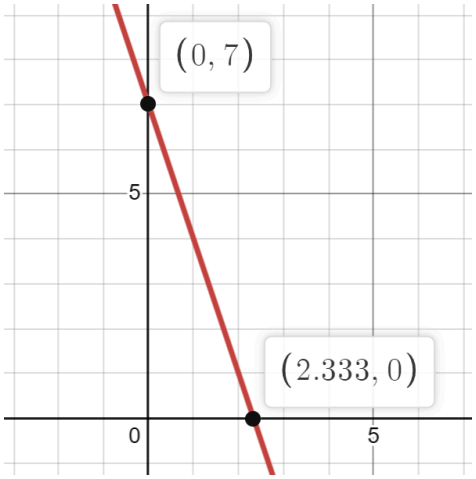
$x \leq 1$

5 Sketch the following linear relations, labeling the x and y intercepts (points where the graph cuts the x and y axes)

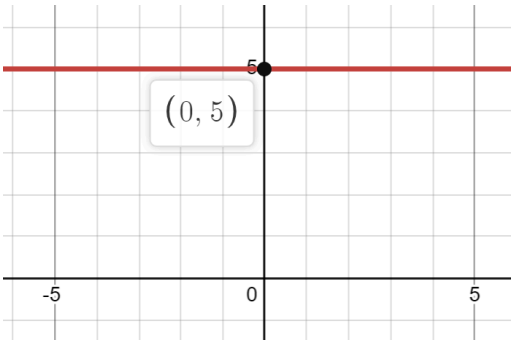
a. $y = 2x - 6$



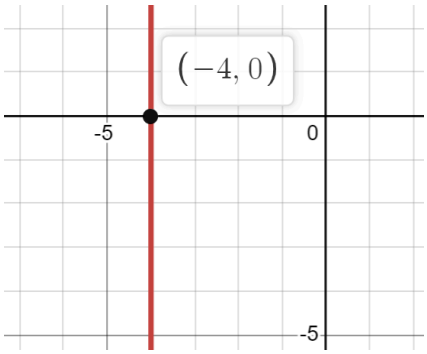
b. $y = 7 - 3x$



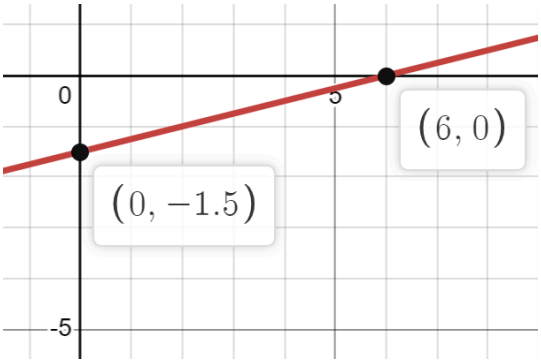
c. $y = 5$



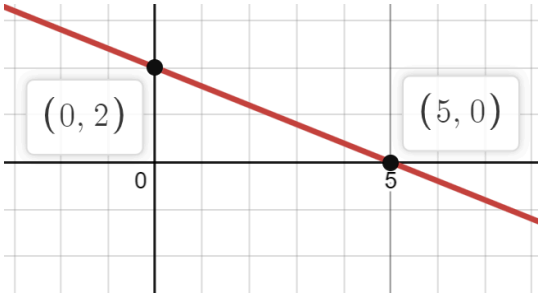
d. $x = -4$



e. $x - 4y = 6$



f. $2x + 5y = 10$



6	Find the gradient and equation of the line that passes through the points: a. $(5, 2)\ and\ (3, -2)$ Gradient = 2 $y = 2x - 8$ b. $(1, 4)\ and\ (2, 1)$ Gradient = -3 $y = -3x + 7$ c. $(-2, -2)\ and\ (-1, -6)$ Gradient = -4 $y = -4x - 10$ d. $(-2, 3)\ and\ (-1, 9)$ Gradient = 6 $y = 6x + 15$
7	Find the midpoint and exact length of the line joining these points. a. $(5, 2)\ and\ (3, -2)$ Midpoint = (4,0) Distance = $2\sqrt{5}$ b. $(1, 4)\ and\ (2, 1)$ Midpoint = (3/2 , 5/2) Distance = $\sqrt{10}$ c. $(-2, -2)\ and\ (-1, -6)$ Midpoint = (-3/2 , -4) Distance = $\sqrt{17}$ d. $(-2, 3)\ and\ (-1, 9)$ Midpoint = (-3/2, 6) Distance = $\sqrt{37}$
8	Using the substitution method, find the solutions for the following simultaneous equations. a. $7x + 2y = 24$ $4x + y = 15$ Solution: $x = 6,\ y = -9$ b. $5x - 8y = 45$ $9x - 8y = 49$ Solution: $x = 1,\ y = -5$ c. $4x - y = 8$ $6x + y = 22$ Solution: $x = 3,\ y = 4$ d. $3x + 3y = 18$ $5x + 3y = 28$ Solution: $x = 5,\ y = 1$

9	Using the elimination method, find the solutions for the following simultaneous equations. a. $x + 2y = 14$ $3x + 4y = 34$ Solution: $x = 6,\ y = 4$ b. $5x + y = 17$ $8x - 2y = 2$ Solution: $x = 2,\ y = 7$ c. $2x + 3y = 13$ $2x + y = 7$ Solution: $x = 2,\ y = 3$ d. $2x + y = 12$ $6x + 5y = 40$ Solution: $x = 5,\ y = 2$
10	Determine the equation of the line that is: a. Parallel to the line $y = 2x - 5$ and passes through the point $(-2, 5)$ Answer: $y = 2x + 9$ b. Parallel to the line $y = 10$ and passes through the point $(5, 3)$ Answer: $y = 3$ c. Perpendicular to the line $y = x + 8$ and has a y-intercept at $(0, 9)$ Answer: $y = 9 - x$ d. Perpendicular to the line $y = 12 - 4x$ and passes through the point $(4, 4)$ Answer: $y = 3 + ¼\,x$