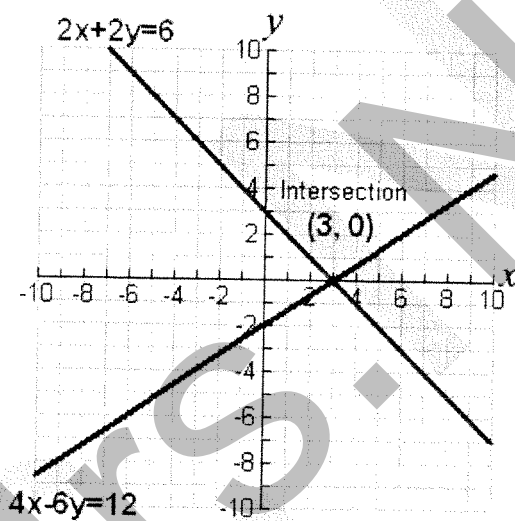


Secondary 4 Cultural

System of Equations Booklet



Mrs. Nassif

Sec 4 – Solving a System of Equations

1 - Graphing Method

Find the point of intersection for the system of equations using the graphing method.

- | | |
|-----------------------------------|--|
| (1) $y = 3x - 4$, $y = -3x + 2$ | (6) $6x + y = 10$, $x - y = 4$ |
| (2) $y = 4x - 1$, $y = -x + 4$ | (7) $y = 2x - 4$, $y = x + 3$ |
| (3) $y = 3x + 4$, $y = -x - 4$ | (8) $y = 2x$, $y = 3x + 1$ |
| (4) $y = x - 4$, $y = -x + 2$ | (9) $y - 4x + 8 = 0$, $y - 6x + 16 = 0$ |
| (5) $y = 1/3x + 2$, $y = -x - 2$ | (10) $y = 1$, $y = 2x$ |

2 - Comparison Method

Find the point of intersection for the system of equations using the comparison method.

- | | |
|------------------------------------|--|
| (1) $Y = x + 5$, $y = 4x + 2$ | (11) $Y = x - 11$, $y = -2x + 19$ |
| (2) $Y = 2x - 6$, $y = -3x + 4$ | (12) $Y = -8x - 16$, $y = 3x - 5$ |
| (3) $Y = 2x - 10$, $y = 4x$ | (13) $Y = 5x - 7$, $y = -1.5x + 6$ |
| (4) $Y = -4x + 5$, $y = x + 10$ | (14) $Y = 4/3 x + 3$, $y = -2/3 x - 3$ |
| (5) $Y = -x + 8$, $y = 3x$ | (15) $Y = 5/4 x - 2$, $y = 2x - 1$ |
| (6) $y = x - 5$, $y = 4x - 23$ | (16) $Y = 1/3 x + 2$, $Y = -x - 2$ |
| (7) $y = 5x - 11$, $y = 2x + 7$ | (17) $Y = -3/2 x - 4$, $y = 1/2 x + 4$ |
| (8) $y = 2x + 1$, $y = -x + 16$ | (18) $Y = 3/4 x + 1$, $y = -1/2 x - 4$ |
| (9) $y = 4x + 6$, $y = -5x - 21$ | (19) $Y = -3/2 x - 2$, $y = -1/2 x + 1$ |
| (10) $Y = -x - 3$, $y = -5x + 17$ | (20) $Y = -x + 2$, $y = x - 4$ |

3 - Substitution Method

Find the point of intersection for the system of equations using the substitution method.

- | | |
|---|---------------------------------------|
| (1) $Y = -x + 3$, $2x + 6y = 30$ | (11) $3x - 2y = 5$, $x = -2y + 15$ |
| (2) $Y = -x + 10$, $5x - 5y = -150$ | (12) $2x + 2y = 1$, $y = -1/2 x + 4$ |
| (3) $-2y + 6x = 38$, $y = 6x - 6$ | (13) $x = 4y + 8$, $4y - 2x + 8 = 0$ |
| (4) $Y = 17x + 18$, $x + y = -18$ | (14) $x + 5y = 14$, $x = 5y - 16$ |
| (5) $X = -y + 3$, $2x + 6y = 30$ | (15) $Y = 3x + 34$, $3x + 3y = -18$ |
| (6) $X = -y + 10$, $5x - 5y = -150$ | (16) $2x + 2y = 6$, $y = -3x - 9$ |
| (7) $-2y + 6x = 38$, $x = y/6 + 1$ | (17) $X + 2y = 14$, $y = -5x + 25$ |
| (8) $-2x = 2y - 6$, $2x + 6y = 30$ | (18) $5x - 4y = 40$, $y = -4x - 10$ |
| (9) $3x - 2y = x + 8$, $y = 2x - 4$ | (19) $Y = 2x - 8$, $x + y = 100$ |
| (10) $3x - 2y + 2 = 0$, $x = -3y + 14$ | (20) $X = y - 10$, $2x + y = 50$ |

4 - Elimination Method

Find the point of intersection for the system of equations using the elimination method.

$$\begin{aligned} (1) \quad & x + y = 1 \\ & -x + y = 5 \end{aligned}$$

$$\begin{aligned} (2) \quad & 3x + 2y = 8 \\ & 4x - 3y = -12 \end{aligned}$$

$$\begin{aligned} (3) \quad & 4x + 3y = 1 \\ & 2x + 5y = 11 \end{aligned}$$

$$\begin{aligned} (4) \quad & 5x - 4y = 5 \\ & 3x + 8y = 16 \end{aligned}$$

$$\begin{aligned} (5) \quad & 5x + 2y = 8 \\ & 3x - 5y = 11 \end{aligned}$$

$$\begin{aligned} (6) \quad & 2x + y = -3 \\ & 3x - y = -12 \end{aligned}$$

$$\begin{aligned} (7) \quad & 2x - y = 8 \\ & x + 3y = 4 \end{aligned}$$

$$\begin{aligned} (8) \quad & 2x + 2y = 4 \\ & -x + 2y = 4 \end{aligned}$$

$$\begin{aligned} (9) \quad & 3x + 4y = 25 \\ & 3x - 3y = -3 \end{aligned}$$

$$\begin{aligned} (10) \quad & x - 5y = 5 \\ & 3x + y = 31 \end{aligned}$$

$$\begin{aligned} (11) \quad & x + 2y = 2 \\ & -2x + 4y = 4 \end{aligned}$$

$$\begin{aligned} (12) \quad & 3x + 4y = 10 \\ & 6x - 4y = 8 \end{aligned}$$

$$\begin{aligned} (13) \quad & 2x + 3y = 3 \\ & 12x - 15y = -48 \end{aligned}$$

$$\begin{aligned} (14) \quad & x + 3y = 0 \\ & 12x + 6y = 7 \end{aligned}$$

$$\begin{aligned} (15) \quad & 3x + 4y = -1 \\ & 6x - 2y = 8 \end{aligned}$$

Independent and Dependent Variables

Remember: The independent variable is a variable quantity in a relation that usually causes the other quantity to vary.

1. Determine the dependent and independent variables in each relation.

a) During the summer holiday, Anne works full-time in a restaurant. She is paid an hourly wage of \$6. Consider the relation between the number of hours worked and her weekly wage.

b) Mark and Lori plan to spend a weekend by the sea before going back to school. Mark stops at a self-serve station to fill up. He notes the gas price on the fuel pump (\$0.64/L), the number of litres of gas pumped into the tank, and the amount he has to pay. Consider the relation between the number of litres of gas purchased and the price of the gas.

c) Christine wants to reimburse her student loan. She decides to save and pay \$100 each month. Consider the relation between the amount reimbursed and the number of months needed to pay off the debt.

d) A kitchen faucet leaks at a rate of 4 mL of water per minute. Reggie is curious and places a container under the faucet to measure the leakage at regular intervals. Consider the relation between time and the amount of water in the container.

e) To join a health club, one must purchase a membership card and pay \$6 per session. Consider the relation between the number of sessions and the total membership cost.

f) To determine the cost of repairing a household appliance, the hourly rate (for the time needed to effect repairs) is added to the basic fee (for travel). Consider the relation between the number of hours needed to repair the appliance and the cost.

g) One litre of paint is enough to cover approximately 10 m^2 . Consider the relation between the amount of paint needed and the area of the surface to be painted.

2. Determine the dependent variable for each relation.

a) The cost of renting a car and the number of kilometres travelled.

b) The number of cars washed and the profit made during a car-wash fundraising drive.

c) The number of guests at a meal and the number of corn cobs served.

d) The number of kilograms lost and the number of minutes spent walking.

e) A bicycle's speed and the distance travelled.

3. Determine the independent variable in each relation.

a) The amount of water in a pool and the time required (in hours) to empty the pool.

b) The number of sweaters sold and the profit made.

c) The duration of a long distance call (in minutes) and the cost of the call.

d) A maple tree's age and height.

e) The amount saved and the number of weekly deposits.

System of Equations
Word Problems

Type 1: Both equations are in functional form.

Ex 1: Two video clubs compete for clients. Club A has no membership fee but charges 4\$ per movie. Club B charges 20\$ for membership but only 3\$ per movie.

- a) Name the variables.
- b) Find the system of equations.
- c) Find the number of movies for which the cost would be the same in both clubs.
- d) What is the cost when the number of movies is the same?
- e) How much will it cost for 3 movies at Club A?

Ex 2: Sink A and Sink B contain 400 L of water and 100 L of water respectively. Sink A is emptied at a rate of 20 L per hour while Sink B has water poured in at a rate of 10 L per hour.

- a) Name the variables.
- b) Find the system of equations.
- c) After how many hours will there be an equal amount of water in both sinks?
- d) After how many hours will sink A contain no more water?

Practice: Type 1 (On Loose-leaf)

- Alex is planning a ski trip to either Mont Avila or Mont Tremblant. Avila charges 15\$ per run plus 20\$ for renting equipment. Tremblant charges 10\$ per run plus 40\$ for renting equipment.
 - Name your variables.
 - Find the system of equations.
 - After how many runs will the cost be the same?
 - What is the cost when it is the same?
 - For 8 runs, which will be a better deal?
- Jordan and Christine have saved money for their CEGEP expenses. Jordan has 1250\$ in the bank while Christine has 1400\$ in the bank from her summer job. Jordan will withdraw 85\$ per week for expenses while Christine will take out 100\$ per week for expenses.
 - Name your variables.
 - Find the system of equations
 - After how many weeks will they have the same amount in the bank?
 - A session in CEGEP is 15 weeks. Will each have enough for the 15 weeks of expenses?
- Sheila and Mark have 335\$ and 500\$ respectively in the bank. Sheila intends on depositing 45\$ per week while Marks plans on depositing 30\$ per week.
 - Name your variables.
 - Find the system of equations.
 - After 8 weeks, who will have more money and by how much?
 - How many weeks will it take for each person to have the same amount of money in the bank?
 - What will the amount be when equal?
- Two different travel agents offer an all-inclusive vacation to Cancun. The cost of the trips by the two companies is represented by

Agent 1: $Y = 150x + 350$

Agent 2: $Y = 175x$

where

x represents the number of days and
 y the cost.

- Find the number of days when the cost will be equal.
- What will be this equal cost?

5. Five years ago, the heavy rain flooded several homes. The first house had 1500 liters of water in its basement while a second house had 2000 liters. Both homeowners rented gas pumps to empty their basements. The first pumped took out 25 liters per minute while the second home emptied 35 liters per minute.
- A.) Name your variables.
 - B.) Find the system of equations.
 - C.) At one time, both homes had the same amount of floodwater in their basement. How many hours did it take to have equal water?
 - D.) When equal, what was the amount of water left in the basement?
 - E.) Which home was empty first? In how many minutes?
 - F.) How long did it take for the first home to be completely emptied?
6. Victor and Gianni are sales representatives for flat screen TV's. Victor's base salary is 350\$ plus a bonus of 150\$ per TV sold. Gianni's base salary is 450\$ plus a bonus of 125\$ per TV sold.
- A.) Find the system of linear equations that represents their salaries.
 - B.) If each sold 6 TV's, find the salary of each person.
 - C.) How many TV's are sold if their salaries are equal?
7. One printing company charges 500\$ plus 1.50\$ for printing each copy of the yearbook. Another company charges 800\$ plus 1\$ for printing each copy. The student council calculated that no matter which printing company they chose, the printing charges would be the same. How many copies of the yearbook need to be printed?
8. Kelly babysits for 9\$ per hour and charges a fixed 15\$ for gas. Mary babysits for 10\$ per hour and no charge for gas. When their number of hours will be equal, what will be their salary?

Type 2: Both equations are in “random” form. (Elimination Method)

Ex 1: Paul bought 2 pens and 4 duo tangs for 5\$. Tanya bought 3 pens and 5 duo tangs for 7\$.

- a) Name the variables.
- b) Find the system of equations.
- c) How much is each item?

- d) How much do 10 pens and 4 duo tangs cost?

Ex 2: At Robertson’s Snack Bar, John, Mary and Peter have each placed orders. John pays 11\$ for 4 hot dogs and 3 drinks. Mary pays 7.80\$ for 3 hot dogs and 2 drinks. How much does Peter pay for 2 hot dogs and 1 drink?

Practice: Type 2 (On Loose-leaf)

- 1) At the local Tim Horton's coffee shop, 2 coffees and 3 muffins cost 5.10\$. Also, 3 coffees and 2 muffins cost 5.40\$.
 - a. Name your variables.
 - b. Find the system of equations that demonstrates these 2 items.
 - c. Find the cost of 1 coffee and 6 muffins.
- 2) A department store is having a suit sale in which jackets and pants are sold at different prices. Sally bought 3 jackets and 2 pairs of pants for 210\$. Her friend Carol bought 2 jackets and 3 pairs of pants for 190\$. How much does each cost?
- 3) At a fruit market, Jill bought 7 boxes of apples and 5 boxes of oranges for 41\$, whereas her friend Harry bought 7 boxes of apples and 8 boxes of oranges for 53\$. What is the cost of one box of apples and one box of oranges?
- 4) For a school play, Janis sold 6 adult tickets and 15 student tickets and collected 48\$. Patrick sold 8 adult tickets and 7 students tickets and collected 38\$. How much would it cost for 10 adult tickets and 3 student tickets?
- 5) Four chocolate bars and three ice creams cost 5.30\$. Two chocolate bars and one ice cream costs 2.20\$. Find the cost of each item.
- 6) James bought 5 apples and 10 oranges for \$4. Donald bought 3 apples and 9 oranges for \$3. The shopkeeper strictly told that there will not be any discounts. What is the cost of 3 apples and 2 oranges?
- 7) The senior classes at High School A and High School B planned separate trips to New York City. The senior class at High School A rented and filled 1 van and 6 buses with 372 students. High School B rented and filled 4 vans and 12 buses with 780 students.

How many students can a van carry?
- 8) Brenda's school is selling tickets to a spring musical. On the first day of ticket sales the school sold 3 senior citizen tickets and 9 child tickets for a total of \$75. The school took in \$67 on the second day by selling 8 senior citizen tickets and 5 child tickets. What is the price of one senior citizen ticket and one child ticket?

- 9) Matt and Ming are selling fruit for a school fundraiser. Customers can buy small boxes of oranges and large boxes of oranges. Matt sold 3 small boxes of oranges and 14 large boxes of oranges for a total of \$203. Ming sold 11 small boxes of oranges and 11 large boxes of oranges for a total of \$220. Find the cost of one small box of oranges and one large box of oranges.
- 10) Rosie and Sheena are selling flower bulbs for a school fundraiser. Customers can buy bags of windflower bulbs and bags of daffodil bulbs. Rosie sold 10 bags of windflower bulbs and 12 bags of daffodil bulbs for a total of \$380. Sheena sold 6 bags of windflower bulbs and 8 bags of daffodil bulbs for a total of \$244. What is the cost of 2 bags of windflower bulbs and 3 bags of daffodil bulbs?

**Type 3: Both equations are in “random” form.
(Substitution Method)**

Ex 1: An exam worth 145 points contains 50 questions. Some of the questions are worth two points and some are worth five points.

- a) Name the variables.

- b) What is the system of equations?

- c) How many two-point questions are on the test?

Ex 2: For the athletics banquet, adult tickets cost 15\$ and student tickets cost 10\$. If 140 tickets were sold, and the total receipts were 1600\$, how many student tickets were sold?

Practice: Type 3 (On Loose-leaf)

- 1) The Lakers scored a total of 80 points in a basketball game by scoring two-point and three-point shots. The Lakers made a total of 37 baskets. How many three-point shots did the Lakers make?
- 2) Kristin spent \$131 on shirts. Fancy shirts cost \$28 and plain shirts cost \$15. If she bought a total of 7 then how many of each kind did she buy?
- 3) There are 13 animals in the barn. Some are chickens and some are pigs. There are 40 legs in all. How many of each animal are there?
- 4) A test consists of a total of twenty questions. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each for a total of 100 points. How many multiple-choice questions are on the test?
- 5) Two thousand tickets were sold in an exhibition on Saturday. The cost of a ticket for an adult is \$4 and for a child is \$2. The total amount collected on Saturday was \$6400. Find the number of adult tickets and child tickets sold on Saturday.
- 6) Antonio loves to go to the movies. He goes both at night and during the day. The cost of a matinee is \$6.00. The cost of an evening show is \$8.00. If Antonio went to see a total of 12 movies and spent \$86.00, how many night movies did he attend?
- 7) Anna writes test to upgrade her level. The test has 25 questions for a total score of 150 points. Among the 25 questions, each multiple-choice question carries 3 points and the descriptive type question carries 8 points. How many multiple choice questions and descriptive type questions are there in the test?
- 8) A movie theater sells tickets for \$9.00 each to non-seniors. Senior citizens receive a discount of \$3.00. One evening the theater sold 636 tickets and took in \$4974 in revenue. How many tickets were sold to senior citizens?
- 9) At a high school championship basketball game 1200 tickets were sold. Student tickets cost \$1.50 each and adult tickets cost \$5.00 each. The total revenue collected for the game was \$3200. How many student tickets were sold? How many adult tickets were sold?

Type 4: Two coordinates are given.

Ex 1: To rent a car, you must pay a fee per kilometer and a fixed amount to rent the car. John rented the car for 30 km and paid 107.50\$. Robert rented the car for 100 km and paid 125\$.

- a) Name the variables.
- b) What are the two coordinates?
- c) What is the fee per kilometer and the fixed amount to rent the car?
- d) How much will it cost Alex to rent the car for 300 km?

Ex 2: Andrea works at a hairdressing salon. She makes a base salary per client plus a fixed weekly salary. Last week, she obtained 550\$ for 30 clients and this week, she obtained 700\$ for 40 clients.

- a) What is her base salary per client and her fixed weekly salary?
- b) How many clients does she need to have to make 1300\$?

Practice: Type 4 (On Looseleaf)

1. To rent a limo, a person must pay a basic fee plus a specific amount for each km the limo is driven. Jason travelled 300 km and paid 120\$ in total. Peter travelled 500 km and paid 160\$. How much will it cost Anna to drive 200 km?
2. John and Linda rented cars from the same dealer. John drove 500 km and paid 200\$, while Linda drove 1000 km and paid 350\$. If Mario wants to go on a 1500 km trip, how much will it cost him?
3. To repair a TV set, a company charges a fixed fee plus a specific rate per hour. Matt paid 100\$ for 2 hours of labor while Jack paid 190\$ for 5 hours of labor. How much will Helen pay to use this service for 4 hours?
4. A pool containing 20 000 L of water is being drained at a constant rate. After 3 hours, the pool still has 14 000 L of water left. At this rate, how long will it take to empty the pool?
5. A taxi cab charges a fee per kilometer plus a one-time fee when entering the cab. John paid 9 \$ for 10 km and Sara paid 14\$ for a 50 km ride. How much will Mara pay for 12.5 km ride?
6. An orthodontist charges a down payment plus a monthly fee for clients who need braces. The rate is the same for everybody. After a 12-month period, Adam paid his debt of 4900\$. After a 24-month period, Sophia paid her debt of 7300\$. The orthodontist tells James he needs braces for 30 months. Will James be able to have braces if his budget is 8000\$?
7. Michael wants to buy a Honda Civic for 40 000\$. He will need to put a down payment and pay a monthly fee. Over a 5-month period, Michael will have paid 2500\$. Over a 15 month period, Michael will have paid 5 500\$. After how many months will the car be totally paid off?
8. Annie will pay a 300 000\$ house by putting a down payment on a house and then by paying a yearly fee. After 10 years, she will have paid 26 000\$ and after 20 years, she will have paid 32 000\$. What was her yearly fee and down payment?
9. Hydro Quebec charges a membership fee plus a small fee per Kilowatt hours (kWh). Last month, I used 100 kWh and paid 58\$ and this month I paid 74\$ for 300 kWh. What is the membership fee and the fee per Kilowatt hours?

11. REUSABLE BAGS

As part of a fundraising campaign, students sold two types of reusable bags: recycled material bags and cotton bags.

The profit is the same for each recycled material bag sold. The profit is the same for each cotton bag sold.

The table below provides information on the sales during the first three weeks of the fundraising campaign.

	Number of recycled material bags sold	Number of cotton bags sold	Total profit
Week 1	15	30	\$71.25
Week 2	32	20	\$64.00
Week 3	27	43	?

What was the total profit from the sales for Week 3 of the fundraising campaign?

11. TABLETS

Three schools in a school board bought tablets from the same supplier. Some of the tablets have a storage capacity of 16GB, and the others have a storage capacity of 32GB.

The cost of all the 16GB tablets is the same. The cost of all the 32GB tablets is the same.

The table below provides information on the purchases made by these schools.

	Number of 16GB tablets	Number of 32GB tablets	Total cost of the tablets
School 1	11	10	\$8 054
School 2	29	16	\$16 580
School 3	23	?	\$15 983

How many tablets with a storage capacity of 32GB did School 3 buy?

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13. VIVIAN'S BIRTHDAY DINNER

Last Sunday, Gerald treated his whole family to dinner at a restaurant to celebrate his mother Vivian's 90th birthday. Family members were sitting at three different tables.

Each family member could choose either the Asian meal or the Mediterranean meal.

After dinner, the server gave the following three bills to Gerald. The taxes are included in the totals indicated.




Bill for table 1	Bill for table 2	Bill for table 3
<u>6</u> Asian meals	<u>4</u> Asian meals	<u>?</u> Asian meals
<u>2</u> Mediterranean meals	<u>3</u> Mediterranean meals	<u>5</u> Mediterranean meals
Total: \$173	Total: \$159.50	Total: \$212.50

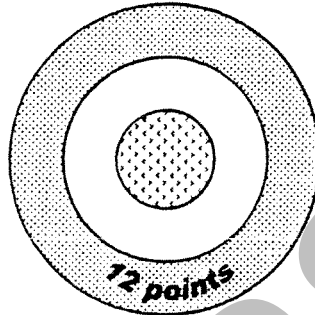
How many people sitting at table 3 chose the Asian meal?

2. EIGHT DARTS

At an agricultural show, contestants throw 8 consecutive darts at a circular target divided into 3 distinct sections: a purple section, a yellow section and a red section.

The number of points earned depends on the colour of the section in which the dart lands. Contestants score 12 points when a dart lands in the red section.

LEGEND	
	PURPLE
	YELLOW
	RED



The following table provides information on the performances of three contestants.

	Number of darts that landed in the purple section	Number of darts that landed in the yellow section	Number of darts that landed in the red section	Points scored
Matthew	2	6	0	130
Roxanne	4	1	3	142
Zoe	3	3	2	?

How many points did Zoe score?

11. BITE-SIZED CHOCOLATES

A chocolate maker produces bite-sized chocolates in two different shapes: balls and hearts. All the chocolates of the same shape are congruent and have the same mass.

The chocolate maker packages the chocolates in bags of different sizes.

A 128-gram bag holds 8 balls and 5 hearts.

A 261-gram bag holds 18 balls and 9 hearts.

The chocolate maker puts 10 balls in a third bag. He wants to add enough hearts to bring the mass of the bag to 325 grams.

How many hearts does the chocolate maker need to add to the third bag?

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14. ZOE'S PURCHASE

An art supply store sells bottles and tubes of paint.

- ♦ The cost of each bottle of paint is the same.
- ♦ The cost of each tube of paint is the same.
- ♦ Three times the cost of a bottle of paint is \$17 more than the cost of a tube of paint.
- ♦ The total cost of 11 bottles and 4 tubes is \$110.25.

Zoe bought 3 bottles and 7 tubes of paint from this store.

What was the total cost of Zoe's purchase?

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VISUAL REPRESENTATION

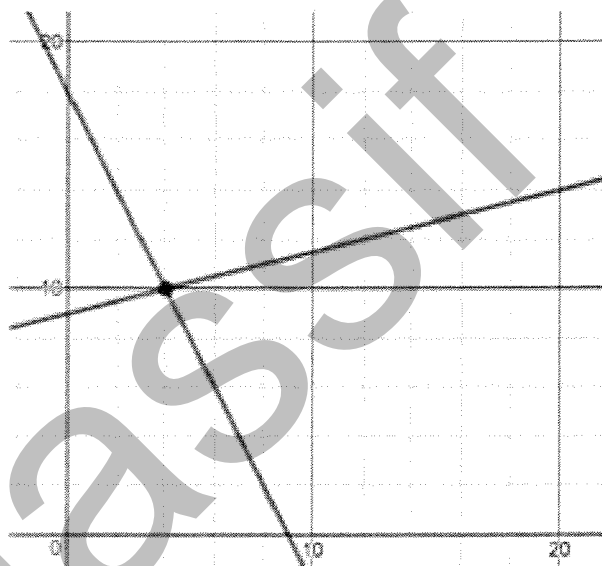
System of Equations

1

What are the coordinates of the point where both lines from the graph below intersect?

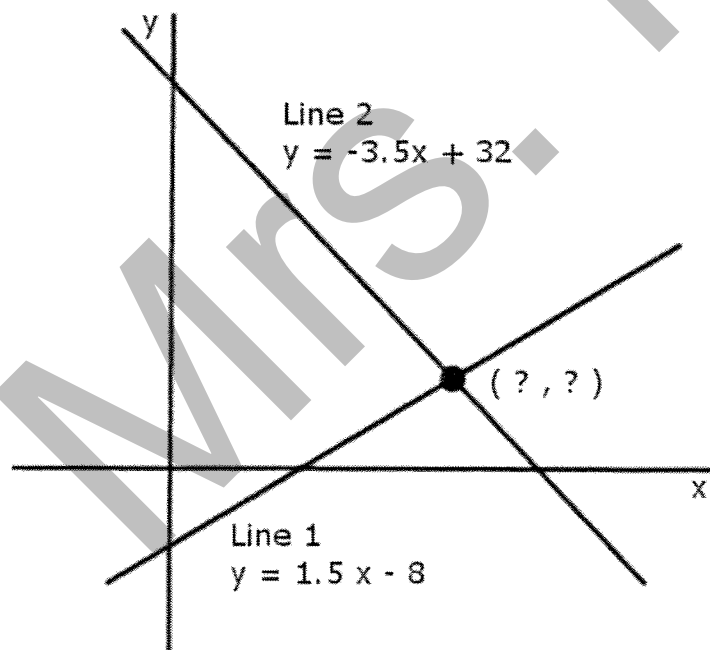
Line 1: $y = 0.25x + 9$

Line 2: $y = -2x + 18$

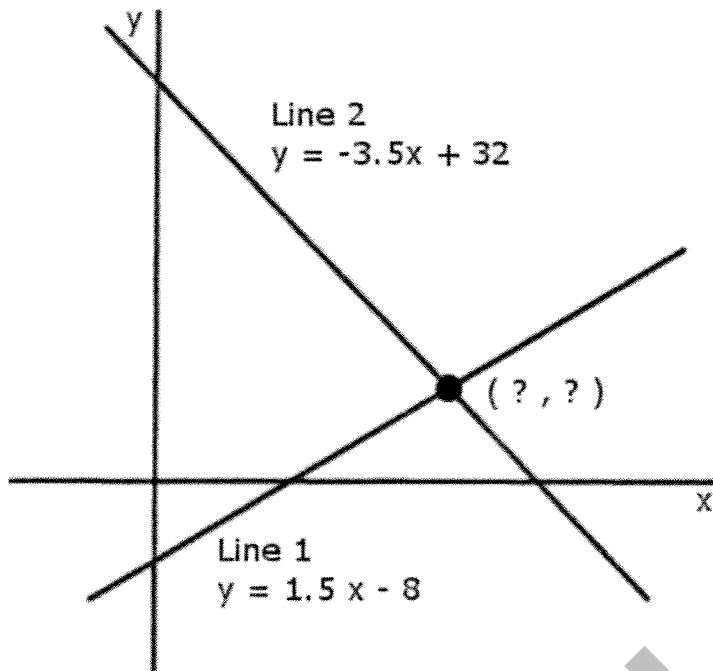


What is the *point of intersection* between lines 1 and 2 shown below?

2

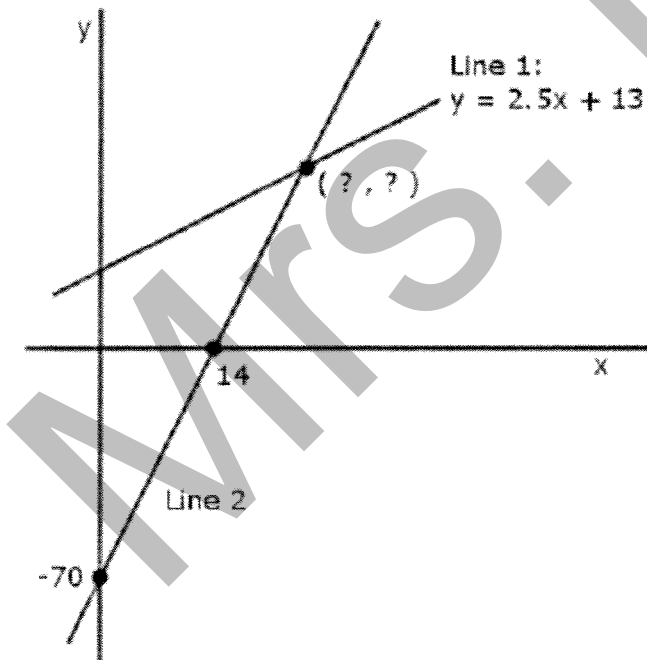


3 What is the *point of intersection* between lines 1 and 2 shown below?



Find the point of intersection between the two lines below.

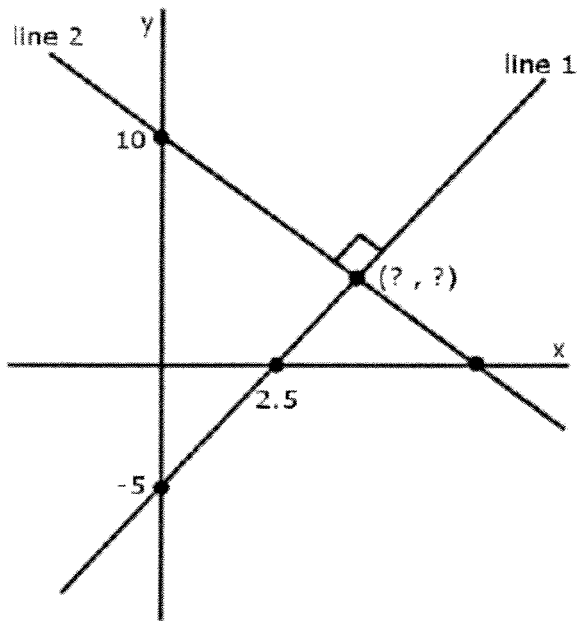
4



5

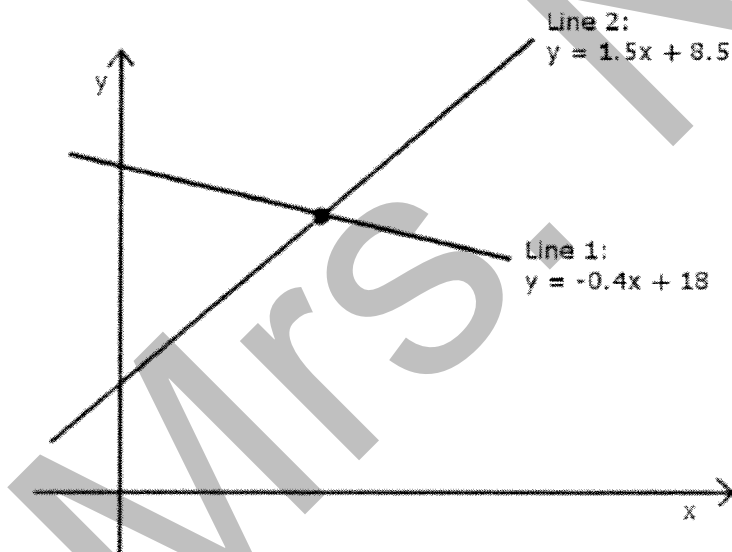
What is the *point of intersection* between lines 1 and 2 shown below?

(Hint: N.R.S.)



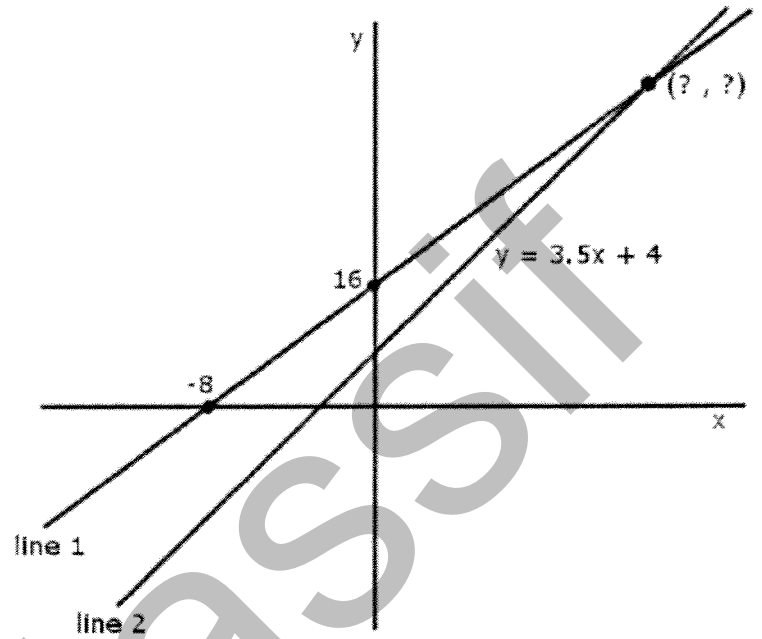
6

What is the *point of intersection* between lines 1 and 2 shown below?



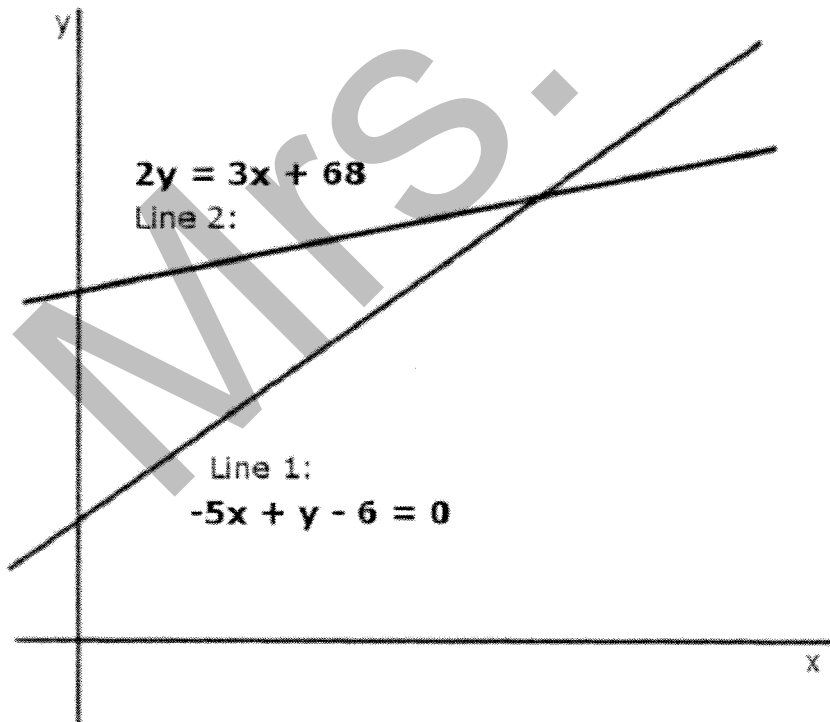
7

What is the *point of intersection* between lines 1 and 2 shown below?



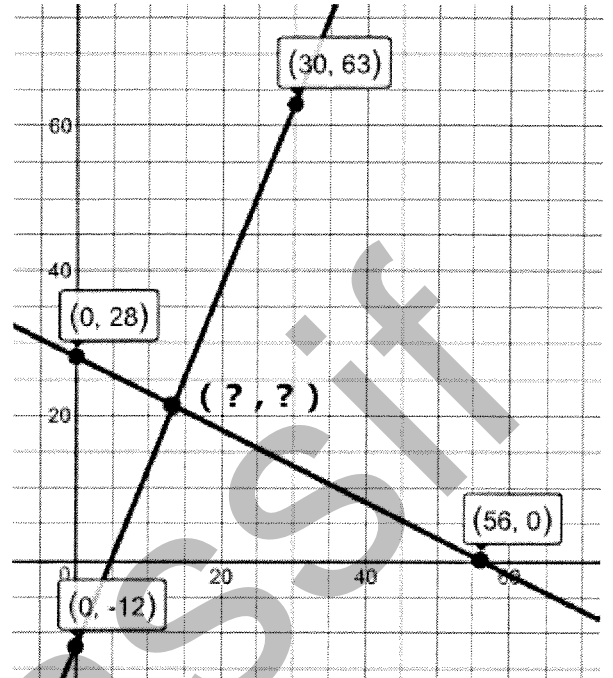
8

What is the *point of intersection* between lines 1 and 2 shown below?



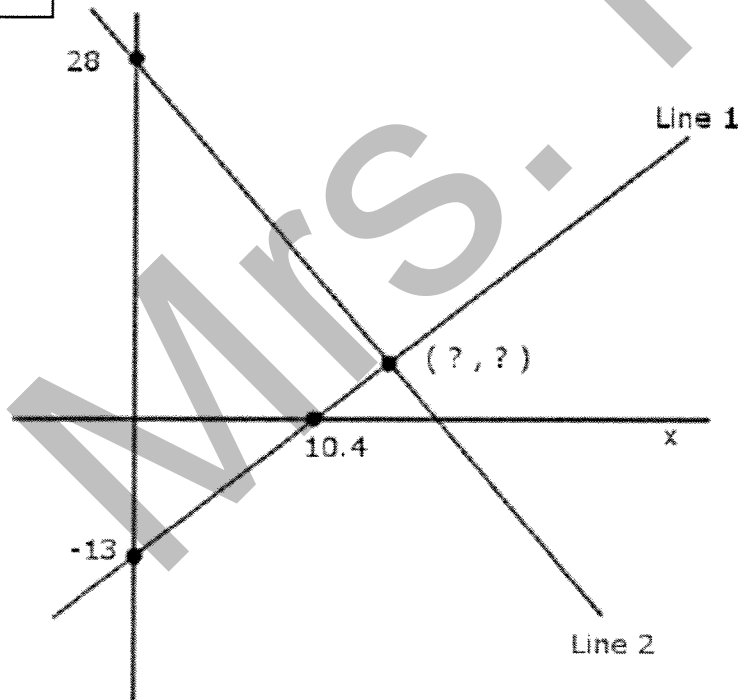
9

What are the coordinates of the point where both lines from the graph below intersect (meet)?



10

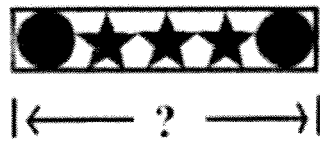
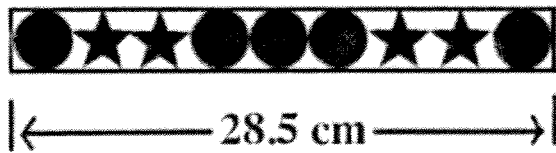
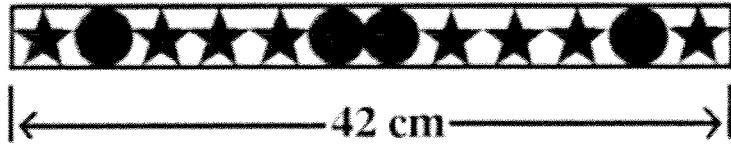
What is the *point of intersection* between lines 1 and 2 shown below?



11

Determine the length of the smallest segment.

- What does 'x' represent in this problem? _____
- What does 'y' represent in this problem? _____

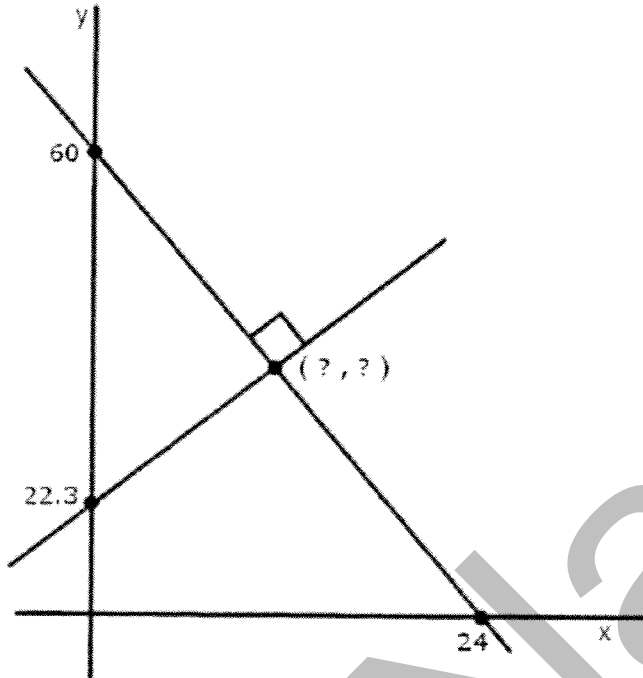


Mrs. Nassif

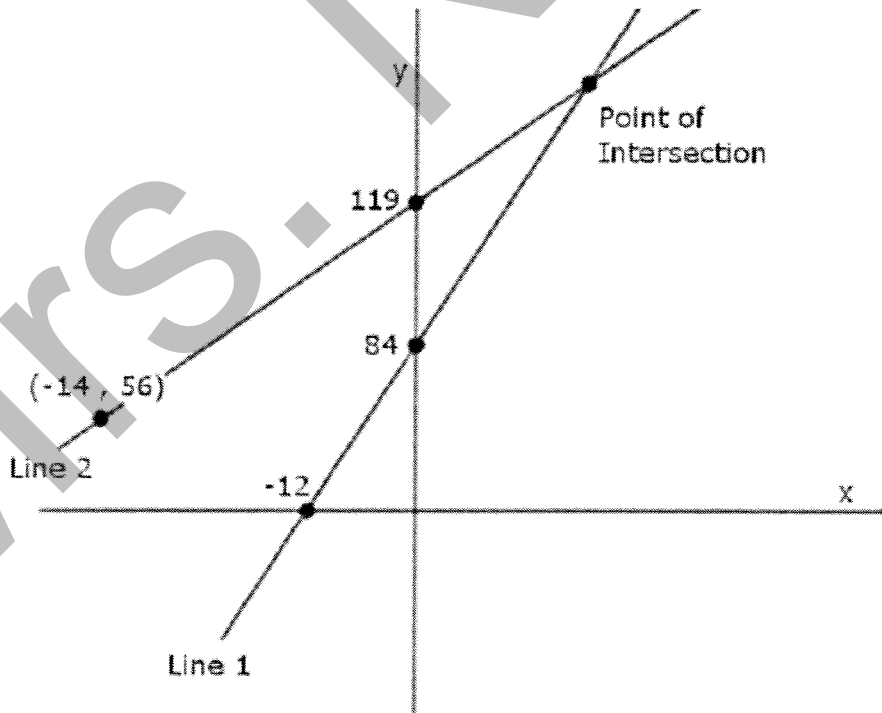
12

Line 1 and line 2 are meet at 90 degrees.

What is the *point of intersection* between lines 1 and 2 shown below?



13



Mrs. Nassif

NAME: _____

SPECIAL CASES

Part A: Determine the type of line for each pair. (Parallel, Perpendicular, Secant or Coincident)

Equation 1	Equation 2	Type of Line
1. $Y = 3x + 2$	$Y = -1/3 x + 1$	
2. $Y = 2/3 x - 1$	$Y = -3/2 x + 2$	
3. $Y = 2x + 3$	$Y = -1/2 x - 1$	
4. $Y = -2x + 3$	$Y = 1/2 x - 4$	
5. $Y = -1/3 x + 2$	$Y = 3x - 1$	
6. $Y = 2x - 3$	$Y = -1/2 x + 2$	
7. $Y = 1/2 x - 3$	$Y = 5x - 3$	
8. $Y = 2x + 1$	$Y = 2x - 3$	
9. $Y = -3x + 2$	$Y = -1/2 x + 2$	
10. $Y = -3x + 1$	$Y = 3x + 2$	
11. $Y = -x + 2$	$Y = x - 3$	
12. $Y = 3/2 x + 3$	$Y = 1/2 x + 2$	
13. $Y = -3/2 x$	$Y = -2/3 x$	
14. $Y = 2x - 5$	$Y = 2x - 5$	
15. $Y = -4x$	$Y = 1/4 x$	
16. $X + y = 3$	$2x + 2y = 6$	
17. $x - y = 2$	$3x - 3y = 4$	
18. $2x + 2y = 6$	$8x + 8y = 24$	
19. $Y = 1/2 x + 5$	$Y = 1/2 x + 5$	
20. $Y = 2x + 6$	$Y = 1/2 x + 8$	
21. $Y = 3x + 2$	$Y = 3x - 6$	
22. $Y = 2x - 3$	$Y = -1/2 x + 2$	
23. $Y = 5x - 2$	$Y = 5x + 3$	
24. $Y = -x + 3$	$Y = x + 2$	
25. $Y = 2x - 1$	$Y = 2x + 1$	
26. $Y - 4 = x$	$Y + 6 = x$	
27. $Y + 1 = 2/3 x$	$Y - 8 = -3/2 x$	
28. $Y + 2 = 6x$	$Y - 1 = -1/6 x$	
29. $y + 4 - 3x = 0$	$Y - 3x + 4 = 0$	
30. $Y = 2x - 1$	$Y = -1/2 x + 3$	
31. $Y - 4 = 2x$	$Y - 2x = 4$	
32. $14x - 2y = 18$	$8x - 2y = -12$	
33. $3y + 2x = 18$	$3x - 2y = 2$	
34. $4x + 2y = 8$	$2x + y = 3$	
35. $6x + 3y - 24 = 0$	$0 = 2x - y - 4$	
36. $3y + 6x = 18$	$Y = 1/2 x - 6$	

Part B: Parallel and Perpendicular Lines

Are the lines L1 and L2 passing through the given pairs of points parallel, perpendicular or neither parallel nor perpendicular?

- L1: (1, 2), (3, 1) and L2: (0, -1), (2, 0)
- L1: (0, 3), (3, 1) and L2: (-1, 4), (-7, -5)
- L1: (2, -1), (5, -7) and L2: (0, 0), (-1, 2)
- L1: (1, 0), (2, 0) and L2: (5, 5), (-10, -5)
- L1: (-2, 5), (2, 7) and L2: (5, 1), (5, 13)
- Is it possible for two lines with negative slopes to be perpendicular?

Part C: Parallel Lines

Write the equation in functional form of the lines that is parallel to the graph of each equation and passes through the given point.

- $y = 3x + 6$, (4, 7)
- $y = x - 4$, (-2, 3)
- $y = \frac{1}{2}x + 5$, (4, 5)
- $y = 2x + 4$, (-1, 2)
- $y = -5x + 1$, (2, -1)
- $y = 2x - 3$, (-5, 3)
- $y = -4x - 2$, (4, -4)
- $7y + 4x = 3$, (-4, -7)
- $y = -8x + 3$, y-int = 2
- $y = \frac{4}{5}x + 1$, y-int = -6
- $y = \frac{1}{2}x + 6$, y-int = -2
- $y = -4x - 9$, y-int = 3
- $3x - y = 5$, y-int = (0, -7)
- $2x - y = 5$, x-int = (3, 0)
- $2x + y = 5$, x-int = -2
- $3y = 2x - 3$, (-6, 4)

Part D: Perpendicular Lines

Write the equation in functional form of the lines that is perpendicular to the graph of each equation and passes through the given point.

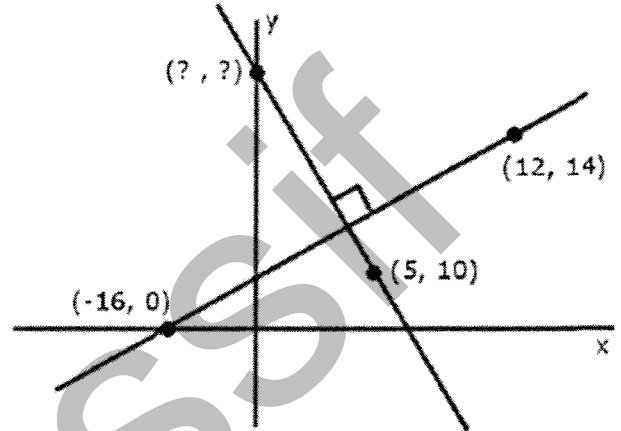
- $y = 3x + 6$, (4, 7)
- $y = x - 4$, (-2, 3)
- $y = \frac{1}{2}x + 5$, (4, 5)
- $y = 2x + 4$, (-1, 2)
- $y = -5x + 1$, (2, -1)
- $y = 2x - 3$, (-5, 3)
- $y = -4x - 2$, (4, -4)
- $7y + 4x = 3$, (-4, -7)
- $y = -8x + 3$, y-int = 2
- $y = \frac{4}{5}x + 1$, y-int = -6
- $y = \frac{1}{2}x + 6$, y-int = -2
- $y = -4x - 9$, y-int = 3
- $3x - y = 5$, y-int = (0, -7)
- $3x - y = 5$, x-int = (3, 0)
- $2x + y = 5$, x-int = -2
- $3y = 2x - 3$, (-6, 4)

VISUAL REPRESENTATION

Parallel and Perpendicular Lines

1

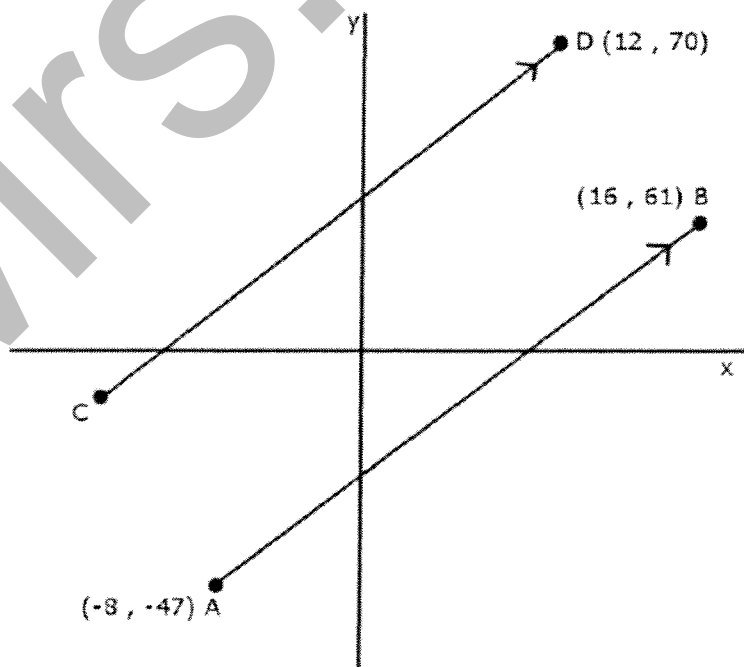
What is the y-intercept of a line travelling *perpendicular* to one passing through $(-16, 0)$ and $(12, 14)$, but passing instead through $(5, 10)$?



2

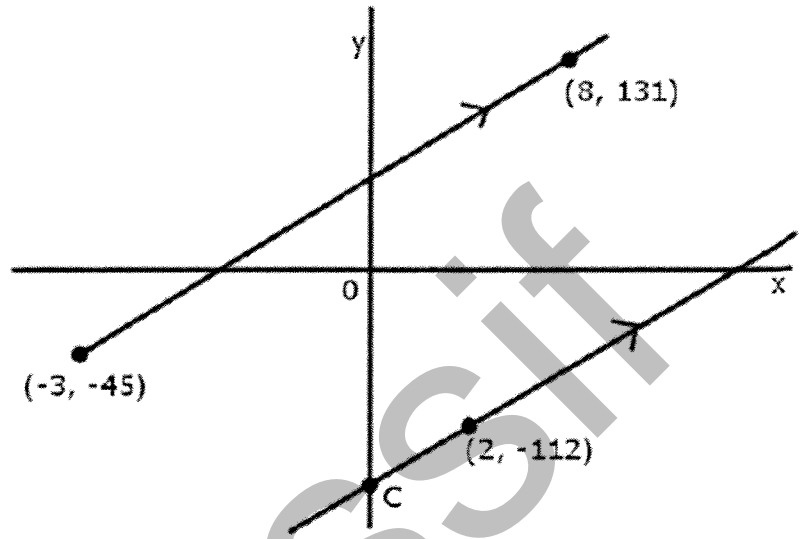
Lines AB and CD are parallel.

What is the equation of line CD?



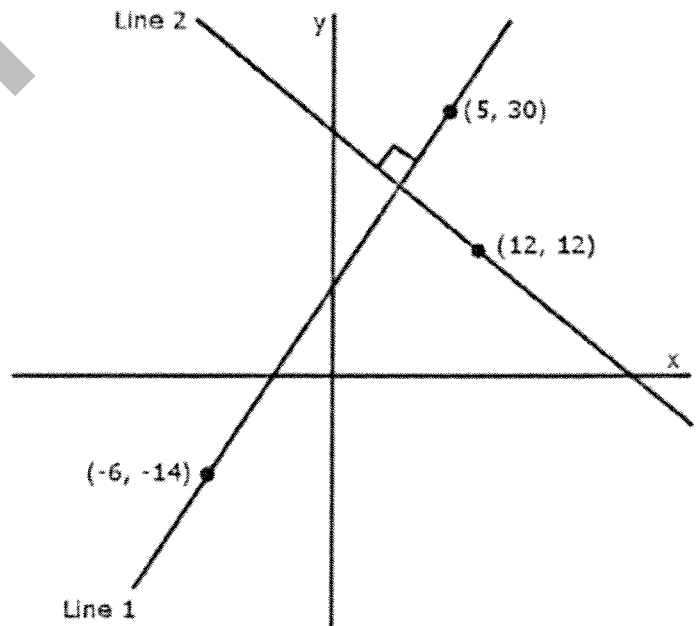
3

What are the coordinates of point C?



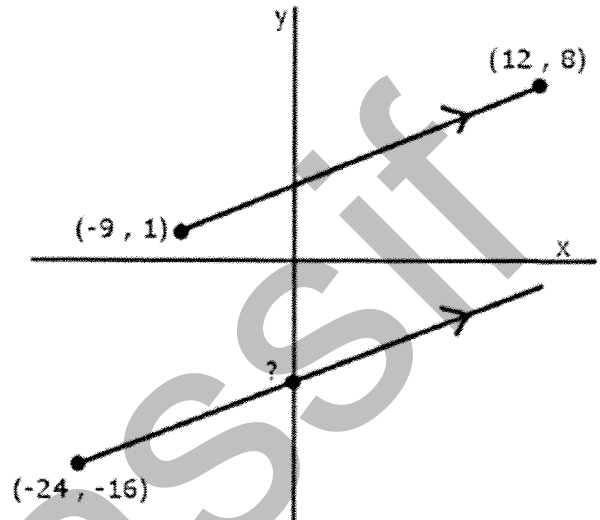
4

Line 1 and Line 2 are perpendicular.
What is the equation of line 2?



5

What is the y-intercept of a line travelling *parallel* to one passing through $(-9, 1)$ and $(12, 8)$, but passing instead through $(-24, -16)$?

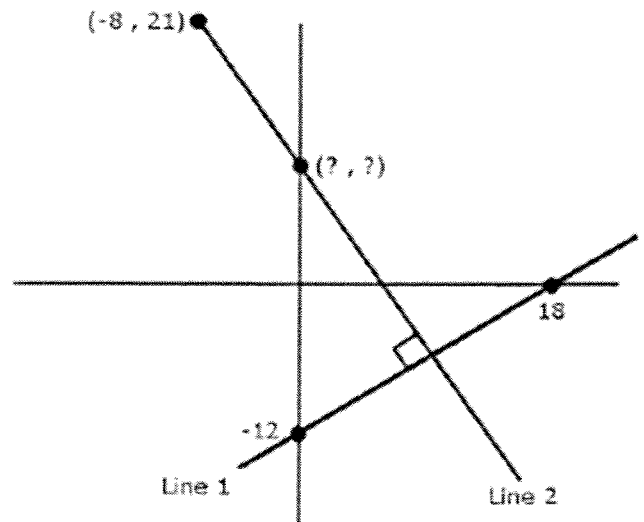
**6**

Line 1 has an x-intercept of 18 and a y-intercept of -12.

Line 2 is perpendicular to line 1.

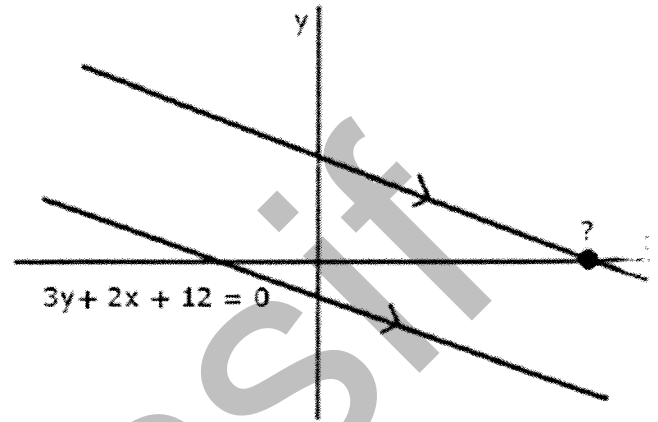
Line 2 passes through point $(-8, 21)$

- What is the equation of line 2?
- What is the y-intercept of line 2?



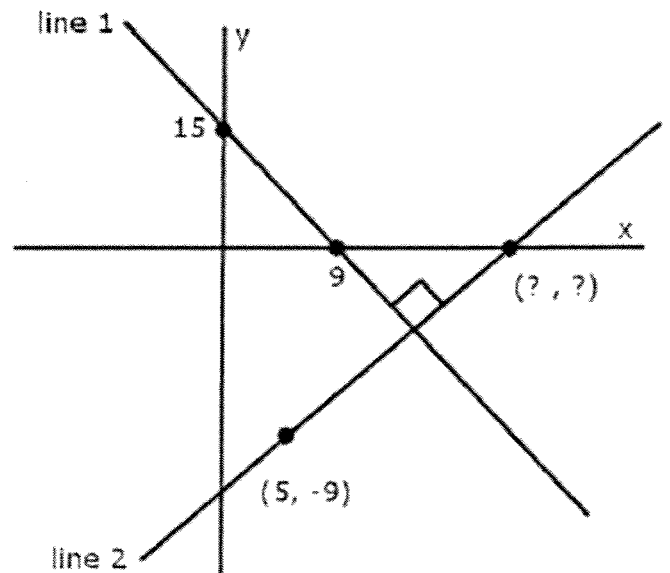
7

What is the **x-intercept** of a line travelling parallel to one defined by the rule $3y + 2x + 12 = 0$, but passing instead through $(-18, 22)$?

**8**

Line 1 has an **x-intercept** of 9 and a **y-intercept** of 15.

Line 2 is **perpendicular** to line 1.
Line 2 passes through point $(5, -9)$
What is the **x-intercept** line 2?



9

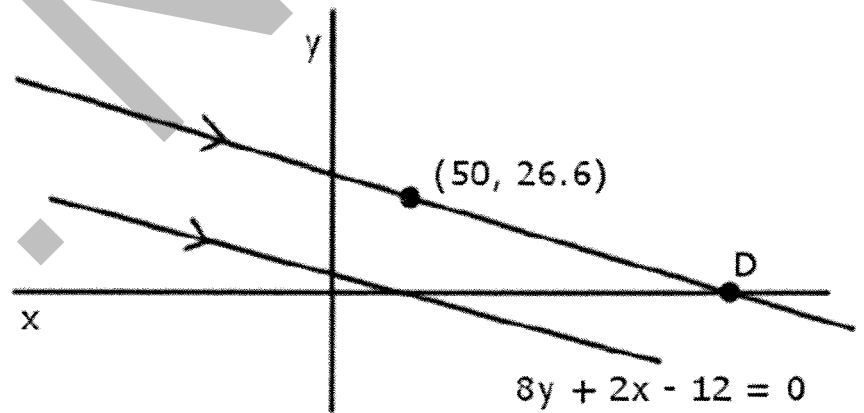
Are the following lines parallel and distinct, parallel and coincident, or not parallel at all?
Explain your answer.

Line 1: $4y = 10x - 24$

Line 2: $-15x + 6y + 36 = 0$

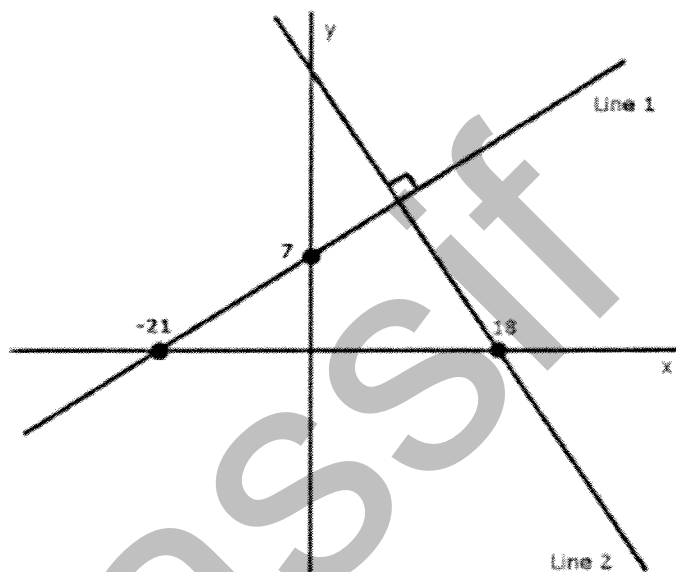
10

What are the coordinates of point D?



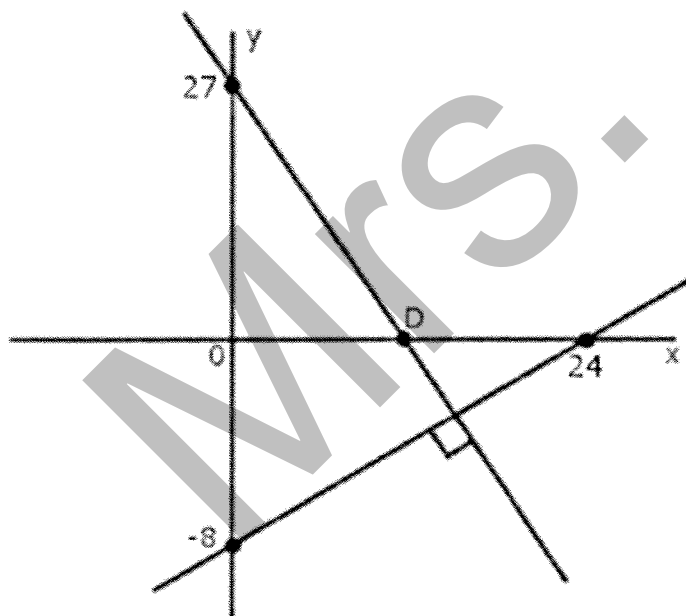
11

What is the equation of line 2?



12

What are the coordinates of point D?

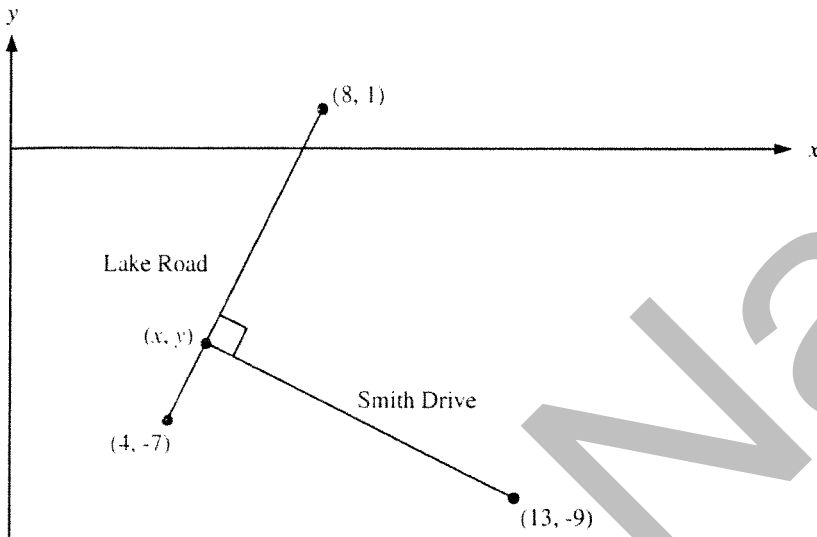


PARALLEL AND PERPENDICULAR LINES

- 1 Lake Road passes through points $(4, -7)$ and $(8, 1)$ on the Cartesian map below, scaled in kilometres.

Pietra lives on Smith Drive at the location given by the coordinates $(13, -9)$. She wants to jog to Lake Road, which is perpendicular to Smith Drive.

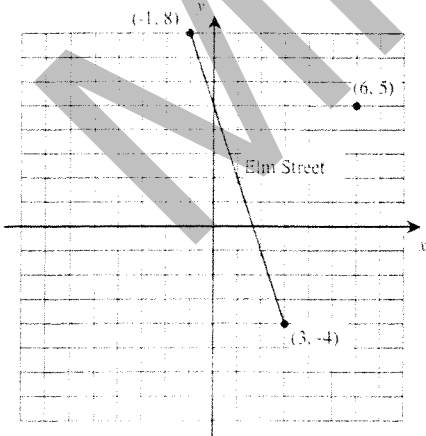
What are the coordinates (x, y) of the point at which Pietra reaches Lake Road?



NOTE: The diagram is not drawn to scale.

- 2 The city of Chateaugay uses a Cartesian grid for mapping out roads. Elm Street has endpoints $(-1, 8)$ and $(3, -4)$.

The town manager wishes to find the equation of a line representing Valour Lane which is perpendicular to Elm Street and passes through the point $(6, 5)$. What is the equation of the line that represents Valour Lane?



- 3 In a Cartesian plane, line segment AB passes through points A(2, 4) and B(8, 16). Line l is perpendicular to this segment and passes through point C(4, 8).

What is the equation of line l ?

- 4 The equation of line l_1 in a Cartesian plane is $2x - 3y + 8 = 0$. Line l_2 is parallel to the first line and passes through the point (5, -2).

What is the equation of line l_2 ?

- 5 Two lines are drawn in a Cartesian plane. The equations of these lines are $y = \frac{3}{2}x + 5$ and $y = \frac{2}{3}x + 5$.

What is the relative position of these lines?

- A) They are parallel and distinct.
- B) They are parallel and coincident.
- C) They are perpendicular to each other.
- D) They intersect but are not perpendicular to each other.

- 6 The map of a city is drawn in a Cartesian co-ordinate system.

On this map, the street on which the school and the arena are located is represented by the line whose equation is $y = 3x - 2$. The street where the church and the post office are located is represented by the equation $y = -3x - 2$.

What is characteristic of the lines representing these two streets?

- A) They are perpendicular.
- B) They intersect and are not perpendicular.
- C) They are distinct and parallel.
- D) They are coincident.

7 Which one of the following statements is true in a Cartesian plane?

- A) Every straight line has an x -intercept.
- B) Every straight line has a y -intercept.
- C) Two straight lines with the same slope are necessarily parallel.
- D) Two straight lines with the same y -intercept are necessarily perpendicular.

8 The two main streets of a city are perpendicular. These can be drawn in a Cartesian plane.

The line representing street A passes through the points $(0, -60)$ and $(70, 10)$.
The line representing street B passes through the point $(90, -30)$.

Which of the following equations defines the line representing street B?

- A) $y = -x - 60$
- B) $y = x - 60$
- C) $y = x + 60$
- D) $y = -x + 60$

9 Determine if the following pairs of equations represent lines which are :
- parallel and distinct
- intersecting
- coincident
- perpendicular

- a) $d : 2x + y - 3 = 0$ and $d' : 3x - 4y + 1 = 0$
- b) $d : 4x - y + 3 = 0$ and $d' : x + 4y - 2 = 0$
- c) $d : x - 2y + 3 = 0$ and $d' : -4x + 8y - 12 = 0$
- d) $d : 3x - 4y + 1 = 0$ and $d' : 6x - 8y - 9 = 0$
- e) $d : y + 5 = 0$ and $d' : x - 3 = 0$

10 According to the following equations, determine the relative positions of the lines.

$$y(x) = 2x + 9$$

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

- A) The lines are perpendicular.
- B) The lines are intersecting and non-perpendicular.
- C) The lines are parallel and distinct.
- D) The lines are collinear.

Mrs. Nassif