

وزارة التربية والتعليم
MINISTRY OF EDUCATION

الصف الثامن عام رياضيات ريفيل الوحدة الرابعة

Linear Relationships and Slope

اِحجِزْ مَكانَكَ وَاستَعِدَّ لِلْامتِحَانِ بِثِقَةٍ كَامِلَةٍ

احصل على الشرح الكامل للصف من خلال:

التواصل والحجز عبر الـ Whatsapp
اضغط على الرقم: 0566991363



Mr. Aghead

للتواصل والحجز

للانتقال إلى المواقع
اضغط هنا

شرح الدروس

انضم للقناة

MR. AGHEAD 0566991363

للتواصل اضغط الرقم:
0566991363

Mr. Aghead

يمكنكم الحصول على



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لا تتردد في التواصل
معنا قم بمسح الـ QR

احصل على الشرح كاملاً بـ 99 درهم فقط

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Lesson 4-1 Proportional Relationships and Slope

Mastering Proportional Relationships & Slope

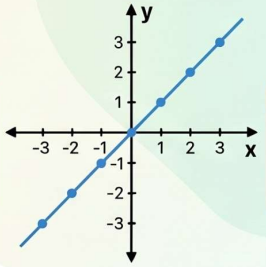
Core Concepts of Proportionality

The Proportional Rule

Two quantities are proportional if they have a constant ratio or unit rate ($m = y/x$).

Slope Equals Unit Rate

In linear relationships, the slope, unit rate, and constant rate of change are identical.



The Origin Point (0,0)

The graph of any proportional relationship must be a straight line passing through the origin.

3-Step Solution Process

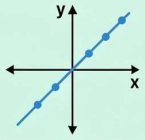
1 Step 1: Find the Unit Rate

$$\frac{\text{Cost}}{\text{Hours}} = \frac{\$12}{4} = \frac{\$3}{1\text{ Hour}}$$

Write the rate as a fraction (e.g., Cost/Hours) and simplify to find the value per unit.

2 Step 2: Create a Table and Graph

x (Hours)	y (Cost)
1	$3
2	$6
3	$9



List x and y values to find ordered pairs, then plot them on a coordinate plane.

3 Step 3: Interpret the Slope



$$\text{Slope} = \frac{\text{Change in } y}{\text{Change in } x} = \frac{\$3}{1\text{ Hour}} = 3$$

Use the formula "Change in y / Change in x" to find and explain the rate.

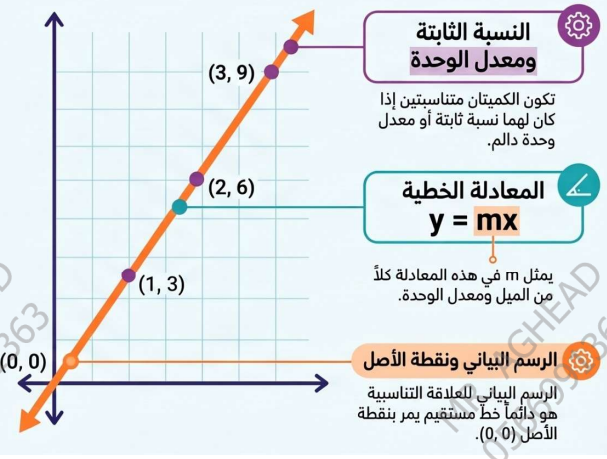
Visualizing Constant Rate: y = 3x

Equation	Ordered Pair	Slope (m)
$y = 3x$	(1, 3) and (2, 6)	3

فهم العلاقات التناسبية والميل

يستعرض هذا الدليل المفاهيم الأساسية للعلاقات التناسبية، حيث ترتبط الكميات بنسبة ثابتة.
يوضح الدليل كيفية استخدام الجداول والمعادلات والرسوم البيانية لإيجاد "الميل" الذي
يتطابق تماماً مع "معدل الوحدة" في هذه العلاقات.

الخطوة 1: التعرف على العلاقة التناسبية



النسبة الثابتة ومعدل الوحدة

تكون الكميتان متناسبتين إذا كان لهما نسبة ثابتة أو معدل وحدة دائم.

المعادلة الخطية

$y = mx$

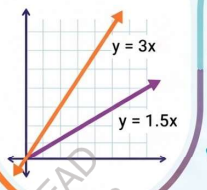
يمثل m في هذه المعادلة كلاً من الميل ومعدل الوحدة.

الرسم البياني ونقطة الأصل

الرسم البياني للعلاقة التناسبية هو دائماً خط مستقيم يمر بنقطة الأصل (0, 0).

الخطوة 2: خطوات الحل والمقارنة

مقارنة العلاقات المختلفة

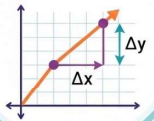


التمثيل البياني للمعادلة

قيمة x (المدخلات)	قيمة y (المخرجات) y=3x
1	3
2	6
3	9

حساب الميل من نقطتين

$$\text{الميل} = \frac{\text{(التغير في y)}}{\text{(التغير في x)}}$$



حساب الميل من نقطتين

الميل الميل = التنير ÷ (التغير y)
في مقها x = (التغير في x
لأي نقطتين على الخط

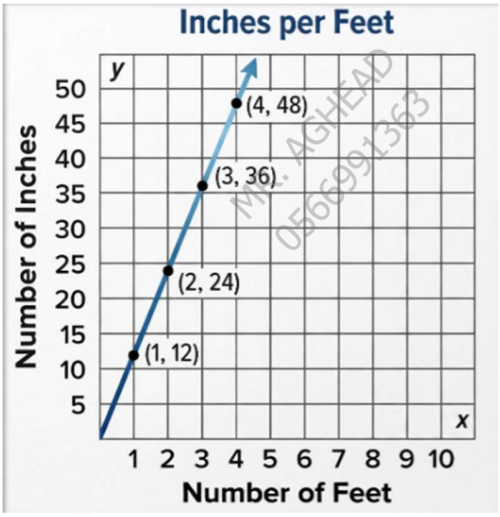
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❖ **Example 1 check**

1. The graph shows the relationship between feet and inches.



Part A

Which of the following is the correct interpretation of the slope?

Ⓐ The slope of the line is $\frac{12}{1}$. This means that there are 12 inches in 1 foot.

Ⓑ The slope of the line is $\frac{1}{12}$. This means that there are 12 inches in 1 foot.

Ⓒ The slope of the line is $\frac{24}{1}$. This means that there are 24 inches in 1 foot.

Ⓓ The slope of the line is $\frac{36}{2}$. This means that there are 36 inches in 2 feet.

Part B

Find the unit rate and compare it to the slope.

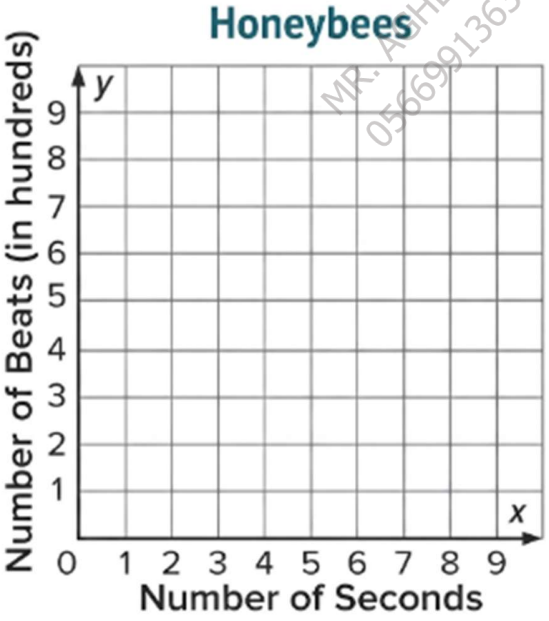
A	The unit rate is $\frac{12}{1}$ and both the unit rate and the slope have the same value.
B	The unit rate is $\frac{1}{12}$, and the slope is greater than the unit rate
C	The unit rate is $\frac{1}{12}$ but the slope has a different value.
D	The unit rate is $\frac{1}{12}$and both the unit rate and the slope have the same value.

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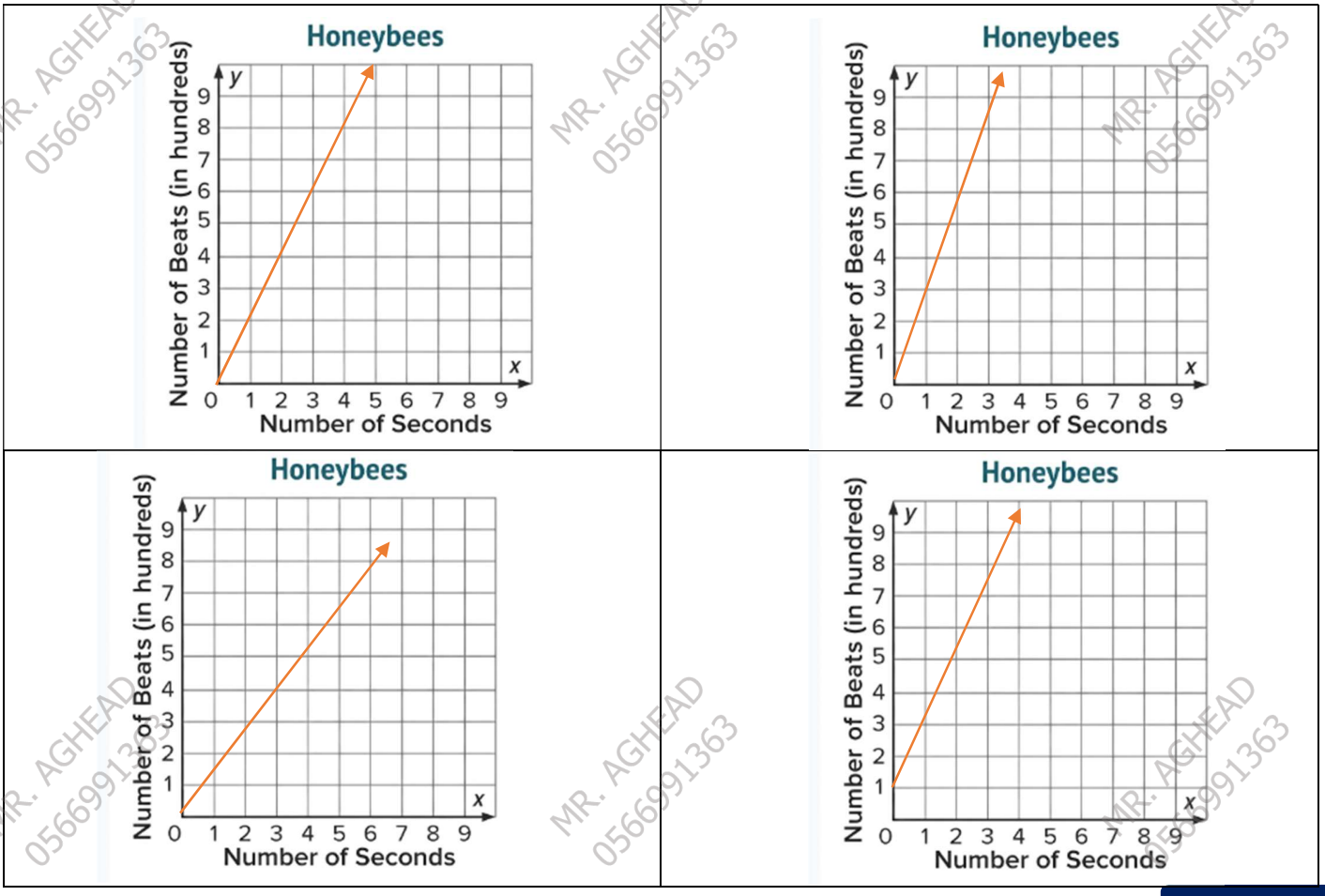
❖ **Example 2 check**

2. The number of times y a honeybee can beat its wings and the time in seconds x are in a proportional linear relationship. This situation can be represented by y = 200x.



Part A

Graph the equation on the coordinate plane.



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Part B

Which of the following is the correct interpretation of the slope?

Ⓐ The slope of the line is $\frac{1}{100}$. This means the honeybee beats its wings 100 times per second.

Ⓑ The slope of the line is $\frac{100}{1}$. This means the honeybee beats its wings 100 times per second.

Ⓒ The slope of the line is $\frac{1}{200}$. This means the honeybee beats its wings 200 times per second.

Ⓓ The slope of the line is $\frac{200}{1}$. This means the honeybee beats its wings 200 times per second.

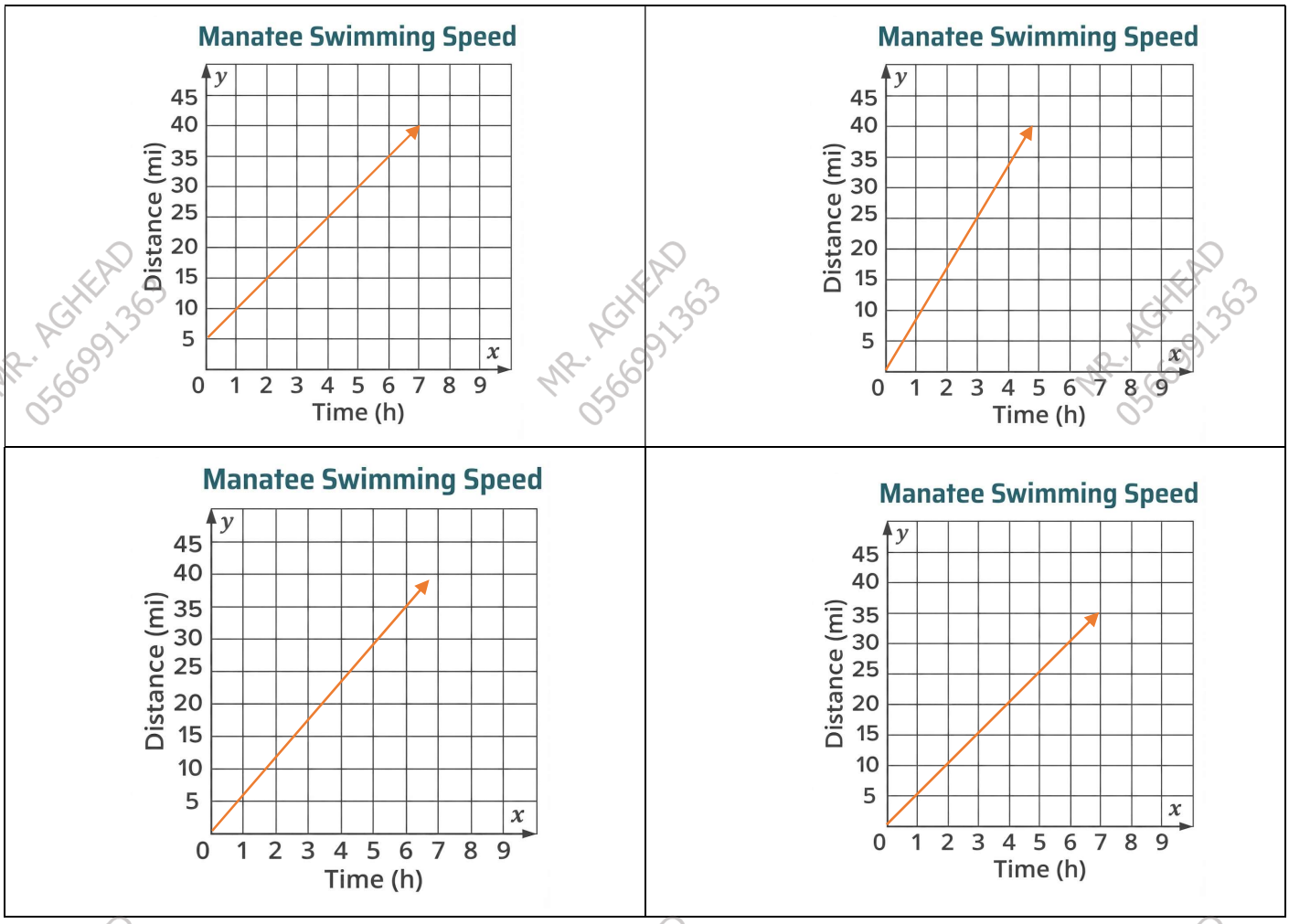
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❖ **Example 3 check**

3. A manatee can swim an average of 10 miles every 2 hours Assume the distance y in miles is proportional to the number of hours x the manatee swam.

Part A

Graph this relationship on the coordinate plane.



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Part B

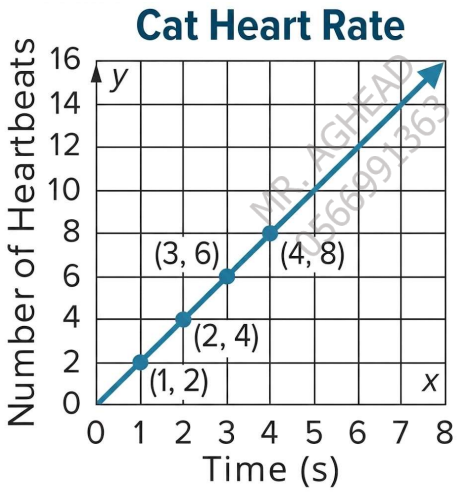
Find and interpret the slope.

A	slope is 3
B	slope is 4
C	slope is 5
D	slope is 7

❖ **Example 4 check**

4. The equation y = 1.5x represents the relationship between the number of heartbeats yand the time in seconds x for a dog. The graph shows the heartbeats for a cat.

Which animal has a faster heart rate?



A	dog
B	cat

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❖ **Example 5 check**

5. Annie's current earnings are shown in the table. She was offered a new job that will pay $7.95 per hour. Assume that her earnings are proportional to the number of hours worked.

Which job pays more each hour?

A	old job
B	new job

Current Earnings	
Hours, x	Money Earned ($), y
2	14.50
3	21.75
4	29.00
5	36.25

❖ **Apply check**

6. Noah is comparing the cost of two types of silicone wristbands. For Style A, the cost can be represented by the equation y = 0.65x, where y represents the cost in dollars and x represents the number of wristbands. For Style B, the costs are shown in the table. Which wristband style costs less for 100 wristbands? How much less?

A	10 $
B	47 $
C	65 $
D	18 $

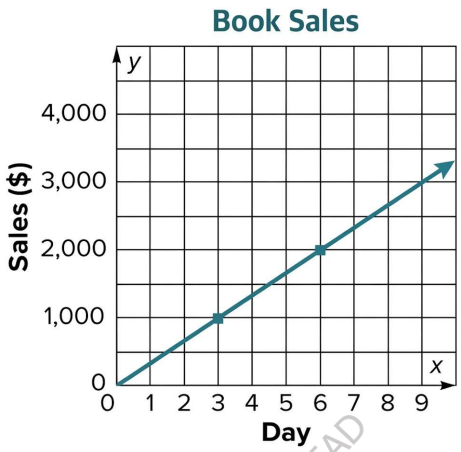
Style B	
Number of Wristbands, x	Total Cost ($), y
50	23.50
150	70.50

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❖ **Practice**

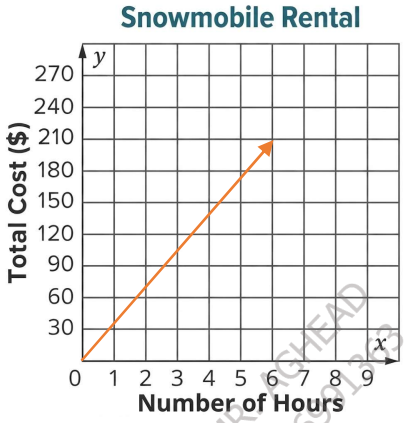
7. The graph shows the amount of book sales over several days. Find and interpret the slope. Then find the unit rate and compare it to the slope. (Example 1)

A	The slope is $\frac{1000}{3}$ and unit rate is 333.3 both the unit rate and the slope have the same value.
B	The slope is $\frac{1000}{3}$ and unit rate is 100.3 and the slope is greater than the unit rate
C	The slope is $\frac{100}{3}$ and unit rate is 333.3 but the slope has a different value.
D	The slope is $\frac{3}{1000}$ and unit rate is 333.3 both the unit rate and the slope have the same value.



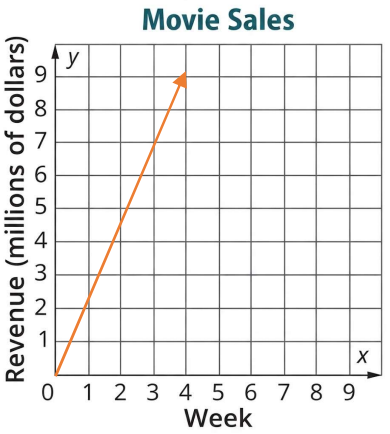
8. The cost y of renting a snowmobile for x hours is a proportional relationship. This can be represented by the equation y = 33.75x Graph the equation. Then find and interpret the slope. (Example 2)

A	slope is $\frac{5}{1}$
B	slope is 4
C	slope is $\frac{33.75}{1}$
D	slope is $\frac{33.75}{10}$



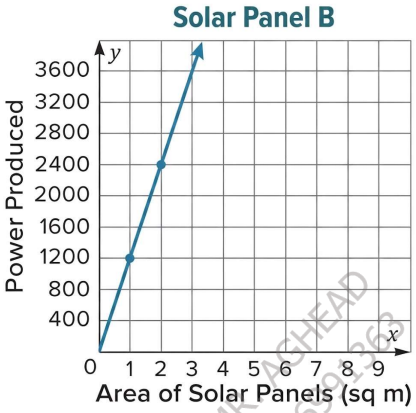
9. By the end of its fourth week, a movie had grossed $9.2 million. Assume the revenue y in millions of dollars is proportional to the week x. Graph this relationship on the coordinate plane. Then find and interpret the slope. (Example 3)

A	slope is $\frac{2.3}{1}$
B	slope is 4
C	slope is $\frac{3.3}{1}$
D	slope is $\frac{33.75}{10}$



10. The amount of power y solar panel A can produce with an area of x square meters can be represented by the equation y = 1,020x. The amount of power a solar panel B can produce is shown on the graph. Which solar panel can produce more power? Explain. (Example 4)

A	solar panel A
B	solar panel B



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Lesson 4-2 Slope of a Line

Mastering the Slope of a Line

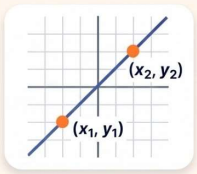
Direction Matters
Understanding Slope Direction



Positive Slope (Upward) | Negative Slope (Downward) | Zero Slope (Horizontal) | Undefined Slope (Vertical)

Slope = Rise / Run

The ratio of vertical change to horizontal change between two points.



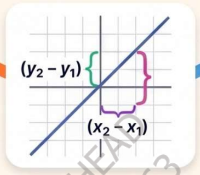
1. Identify Two Points

Select any two distinct points on the line or table.

Step-by-Step Calculation

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

The Slope Formula



2. Apply the Slope Formula

Subtract the *y*-coordinates, then divide by the difference of the *x*-coordinates.

$$\frac{8-4}{4-2} = 2$$

Reduce $\frac{4}{2} = 2$

3. Simplify the Ratio

Reduce the resulting fraction to find the simplest rate of change.

Quick Reference: Formulas & Logic

Method	Formula / Symbol	Logic
The Formula	$m = \frac{y_2 - y_1}{x_2 - x_1}$	Difference in *y* over difference in *x*.
Special: Horizontal	$m = 0$	No vertical change (rise = 0).
Special: Vertical	Undefined	No horizontal change (run = 0).

دليل إتقان حساب ميل الخط المستقيم

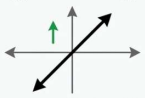
أساسيات فهم الميل

الميل هو "الارتفاع" مقسوماً على "المسافة الأفقية"

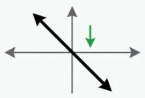
$$\text{الميل} = \frac{\text{الارتفاع } (\Delta y)}{\text{المسافة الأفقية } (\Delta x)}$$

هو النسبة بين التغير في قيم y والتغير في قيم x بين نقطتين.

أربعة أشكال للميل



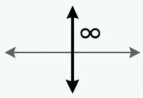
الميل الموجب



الميل السالب



الميل الصفري



الميل غير المعرف

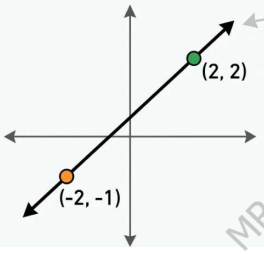
صيغة الميل الرياضية

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

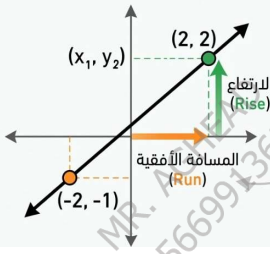
تُستخدم الصيغة لإيجاد الميل عند معرفة إحداثيات نقطتين.

خطوات الحل: حساب الميل من الرسم البياني

1. حدد نقطتين على الخط ← 2. احسب الارتفاع (Rise) والمسافة ← 3. اكتب النسبة وبسّط الناتج



اختر أي نقطتين واضحتين (مثل (2, 2) و (-2, -1)) لتسهيل الحساب.



عد الوحدات رأسياً (التغير في y) وأفقياً (التغير في x) بين النقطتين.

$$\text{الميل (Slope)} = \frac{\text{الارتفاع (Rise)}}{\text{المسافة الأفقية (Run)}}$$

$$= \frac{2-(-1)}{2-(-2)} = \frac{3}{4}$$

ضع الارتفاع فوق المسافة الأفقية في كسر وبسّطه لأبسط صورة.

$$\text{الميل} = \frac{3}{4}$$

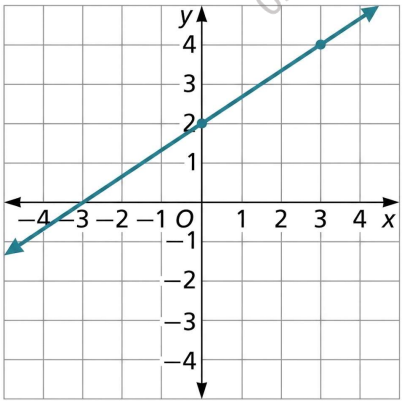
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❖ **Example 1 check**

1. Find the Slope of the Line

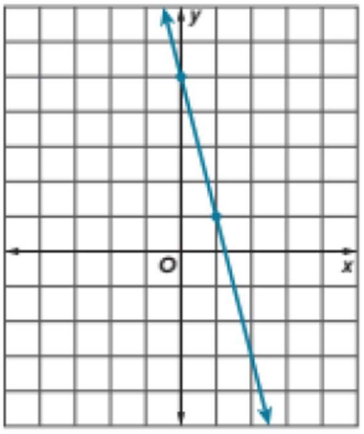
A	$m = \frac{3}{2}$
B	$m = \frac{2}{3}$
C	$m = \frac{1}{3}$
D	$m = \frac{1}{2}$



❖ **Example 2 check**

2. Find the Slope of the Line

A	m = 2
B	m = -2
C	m = 4
D	m = -4



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❖ **Example 3 check**

3. The points given in the table lie on a line. Find the slope of the line.

x	y
1	3
−7	−1
−15	−5
−23	−9

A	$m = \frac{3}{2}$
B	$m = \frac{2}{3}$
C	$m = \frac{1}{3}$
D	$m = \frac{1}{2}$

❖ **Example 4 check**

4. Find the slope of the line that passes through A(-3, 2), B(5, -4)

A	$m = -\frac{3}{2}$
B	$m = -\frac{2}{3}$
C	$m = -\frac{3}{4}$
D	$m = \frac{1}{2}$

❖ **Example 5 check**

5. Find the slope of the line that passes through A(-4, 5), B(2, 5)

A	m = 0
B	m = 1
C	m = 2
D	m = 3

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❖ **Example 6 check**

6. Which of the following represents the slope of the line that passes through L(-2, 3), M(-2, 8)?

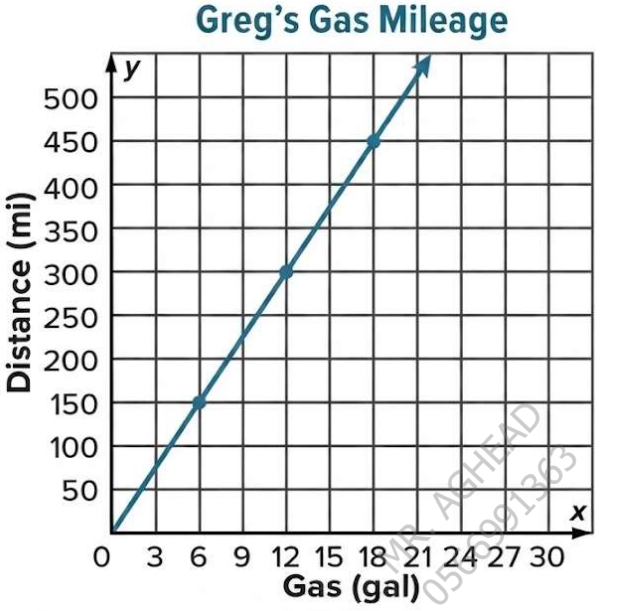
A	0
B	5
C	$-\frac{5}{4}$
D	The slope is undefined

❖ **Apply check**

7. Lisa and Greg were comparing the gas mileage on their cars. Lisa recorded her gas mileage in a table, while Greg recorded his gas mileage on a graph. Assume the points lie on a line. Whose car gets better gas mileage?

A	lisa's car is better
B	Greg's car is better

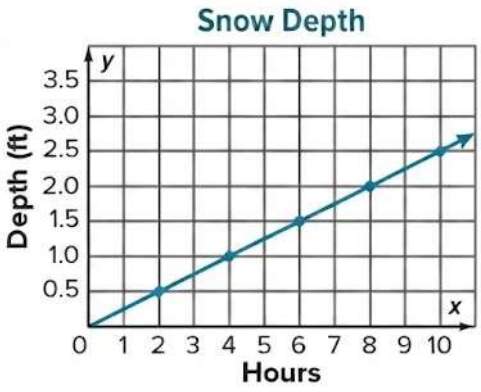
Gas (gal), x	4	8	12	16
Distance (mi), y	108	216	324	432



❖ **Practice**

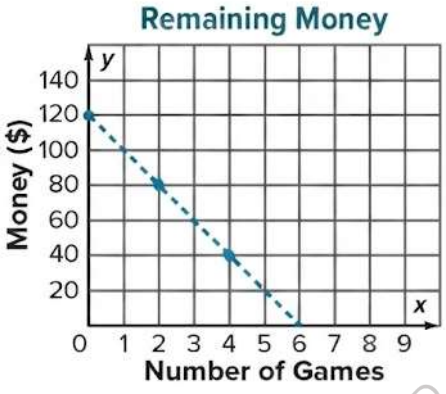
8. The graph shows the depth in feet of snow after each two-hour period during a snowstorm. Find the slope of the line. (Example 1)

A	0.25
B	0
C	-20
D	-1



9. The graph shows the amount of money left after buying video games. Find the slope of the line. (Example 2)

A	0.25
B	0
C	-20
D	-1



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10. The points given in the table lie on a line. Find the slope of the line. (Example 3)

A	$-\frac{3}{2}$
B	$-\frac{3}{4}$
C	$-\frac{4}{3}$
D	$\frac{1}{2}$

x	−1	2	5	8
y	3	−1	−5	−9

Find the slope of the line that passes through each pair of points. (Examples 4–6)

11. M(3, 5), N(2, 6)

A	0.25
B	0
C	-20
D	-1

12. G(-3, 2), H(7, 2)

A	0.25
B	0
C	-20
D	-1

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13. E(6, 8), F(6, -2)

A	0
B	1
C	-2
D	The slope is undefined

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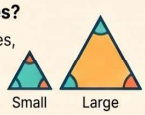
Lesson 4-3 Similar Triangles and Slope

Calculating Constant Slope using Similar Triangles

Core Concepts of Similarity

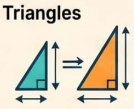
What are Similar Figures?

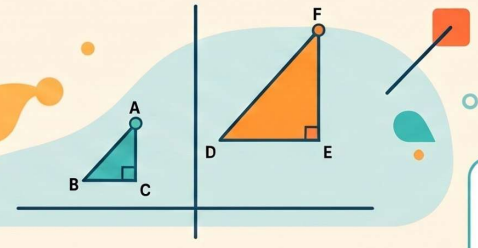
Figures with identical shapes, congruent angles, and proportional corresponding side lengths.



Proportionality of Slope Triangles

Triangles on the same line have equal ratios of vertical "rise" to horizontal "run."

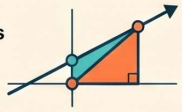




Step-by-Step Solution to Find Slope

Step 1: Form the Slope Triangles

Use any two distinct points on a line to draw a right triangle.



Step 2: Determine Rise and Run

Count the units for the vertical side (rise) and the horizontal side (run).

Step 3: Calculate and Simplify the Ratio

Divide the rise by the run to find the numerical slope of the line.

Visualizing the Ratio Comparison

Small Triangle

Rise = 3 Run = 2

Slope Ratio $\frac{\text{Rise}}{\text{Run}} = \frac{3}{2}$

Large Triangle

Rise = 6 Run = 4

Slope Ratio $\frac{\text{Rise}}{\text{Run}} = \frac{6}{4} = \frac{3}{2}$

Slope = $\frac{3}{2}$

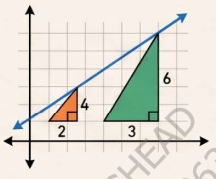
المثلثات المتشابهة والميل

مفاهيم أساسية



الأشكال المتشابهة

هي أشكال لها نفس الشكل تمامًا ولكن ليس بالضرورة نفس الحجم، وتكون زواياها متطابقة وأضلاعها متناسبة.



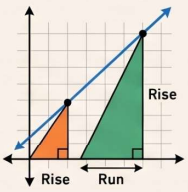
مثلثات الميل

هي مثلثات قائمة تقع على نفس الخط المستقيم، وتستخدم لتمثيل ميل الخط بيانياً.

خطوات إيجاد ميل الخط المستقيم

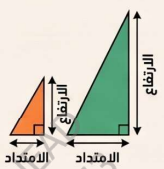
1 تحديد مثلثات الميل

اختر أي نقطتين على الخط وارسم مثلثاً قائماً يمثل المسافة الرأسية (الارتفاع) والأفقية (الامتداد).



2 حساب النسبة (الارتفاع ÷ الامتداد)

اقسم طول الضلع الرأسي (Rise) على طول الضلع الأفقي (Run) لكل مثلث.



3 التبسيط والمقارنة

ستجد أن النسبة ثابتة دائماً لجميع المثلثات على نفس الخط، وهي ميل (m).

النسبة = $\frac{\text{الارتفاع}}{\text{الامتداد}}$

$\frac{4}{2} = 2$

النسبة = $\frac{\text{الارتفاع}}{\text{الامتداد}}$

$\frac{6}{3} = 2$

مثال عملي

المثلث	الارتفاع (Rise)	الامتداد (Run)	النسبة (الميل)
المثلث الصغير	4	2	$\frac{4}{2} = 2$
المثلث الكبير	6	3	$\frac{6}{3} = 2$

الميل ثابت لجميع لجميع المثلثات = 2

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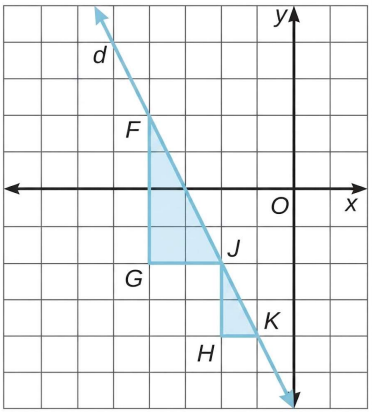
احصل على الشرح كاملاً بـ 99 درهم فقط

للتواصل اضغط الرقم: 0566991363

❖ Example 1 check

1. The graph of line d is shown. Use the similar slope triangles to compare the slope of segment FJ and the slope of segment JK.

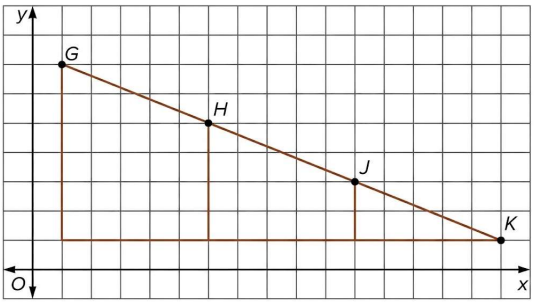
A	slope Fj = 2, slope jk = 2
B	slope Fj = -2, slope jk = -2
C	slope Fj = -2, slope jk = -3
D	slope Fj = 2, slope jk = -4



❖ Example 2 check

2. The plans for a skateboard ramp are shown. Use two points to determine the slope of the ramp. Then verify that the slope is the same by choosing a different set of points.

A	$-\frac{3}{2}$
B	$-\frac{5}{2}$
C	$-\frac{2}{5}$
D	$\frac{1}{2}$

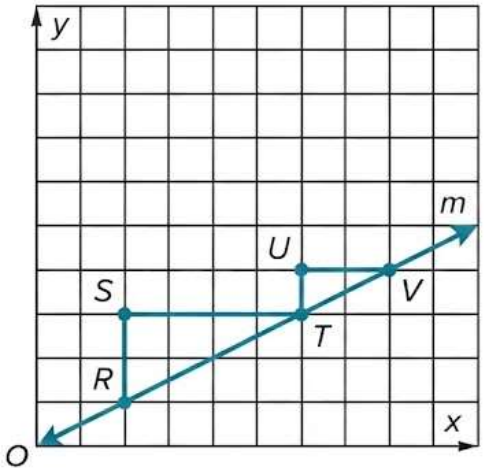


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❖ **practice**

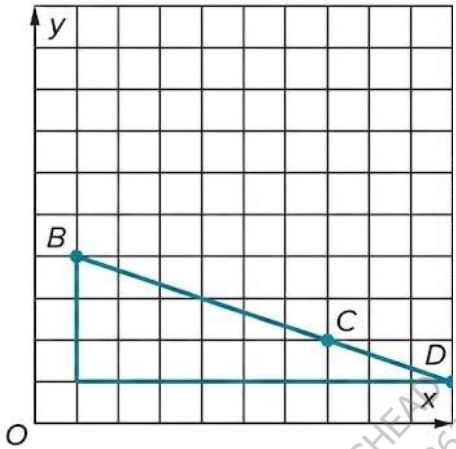
3. The graph of line m is shown. Use the similar slope triangles to compare the slope of segment RT and TV. (Example 1)

A	$-\frac{3}{2}$
B	$-\frac{5}{2}$
C	$-\frac{2}{5}$
D	$\frac{1}{2}$



4. The plans for a zipline are shown. Use two points to determine the slope of the zipline. Then verify that the slope is the same by choosing a different set of points. (Example 2)

A	$-\frac{1}{3}$
B	$-\frac{5}{2}$
C	$-\frac{2}{5}$
D	$\frac{1}{2}$



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Lesson 4-4 Direct Variation

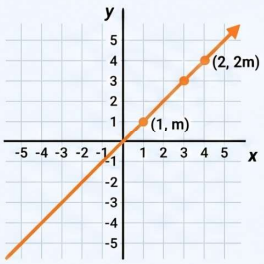
Mastering Direct Variation: A Step-by-Step Guide

Direct variation occurs when the ratio of two variable quantities is constant, creating a proportional linear relationship. This guide explains the core formula and the standard steps to derive equations.

CORE ESSENTIALS

$$y = mx$$

Here, m represents the constant of variation, constant of proportionality, slope, or unit rate.



The Graph Always Passes Through the Origin: Because (0,0) is always a solution, the line must cross the center of the coordinate plane.

$$m = \frac{y}{x}$$

Constant Ratio:
A direct variation exists only when the ratio of y to x remains constant for all points.

HOW TO SOLVE DIRECT VARIATION PROBLEMS

1 Step 1: Find the Constant (*m*)

Calculate the slope by finding the ratio of y to x from a table, graph, or text.



Gymnastics Lessons:
m = 10/1 = 10



Words: Bulk Peanuts ($5.80 for 2 lbs):
m = 5.80/2 = 2.90

	1	2
Flour (cups)	4	8
Oats (cups)	2	4

Table: Baking (4 cups flour for 2 oats):
m = 4/2 = 2

2 Step 2: Write the Equation

Substitute your calculated value of *m* into the standard formula.

$$y = \underbrace{m}_{m}x$$

$y = 10x$
$y = 2.90x$
$y = 2x$

3 Step 3: Interpret the Meaning

Explain what the constant represents, such as "cost per session" or "miles per hour".



$10 per session



$2.90 per lb



2 cups flour per cup of oats

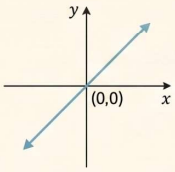
فهم التناسب الطردي: دليلك المبسط

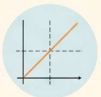
يوضح هذا المحتوى التعليمي مفهوم التناسب الطردي كعلاقة خطية تناسبية، حيث تكون النسبة بين كميتين متغيرتين ثابتة، وكيفية اشتقاق معادلتها $y = mx$ واستخدامها في حل المسائل.

القسم الأول: أساسيات التناسب الطردي



ما هو التناسب الطردي؟
هو علاقة خطية تكون فيها النسبة بين y و x ثابتة دائماً (m).

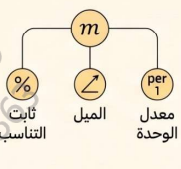




المعادلة والتمثيل البياني
تُمثل بالمعادلة $y = mx$ ويجب أن يمر y خطها البياني بنقطة الأصل (0,0).



معاني الثابت m
يمثل المتغير m في المعادلة كلاً من ثابت التناسب، والميل، ومعدل الوحدة.



القسم الثاني: خطوات حل مسائل التناسب الطردي

جدول بيانات (مثال)

أكواب الدقيق (x)	أكواب الشوفان (y)	النسبة
y	x	y/x
4	2	2
8	4	2
12	6	2

$\rightarrow m = 2$

1 الخطوة 1: إيجاد ثابت التناسب (m)
احسب النسبة بين y و x من جدول أو أوجد الميل من الرسم البياني.

$$y = \underbrace{mx}_{m=2}$$
$$y = 2x$$

2 الخطوة 2: كتابة المعادلة الطردية
قم بالتعويض عن قيمة m المحسوبة في الصيغة العامة للمعادلة $y = mx$.

$$y = 2x$$
$$y = 2 \times 10$$
$$y = 20$$

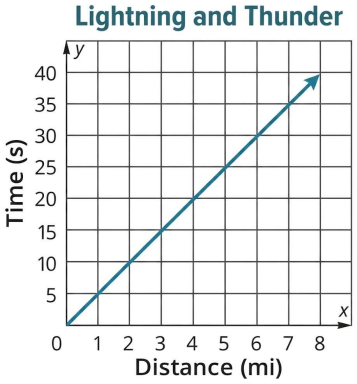
3 الخطوة 3: تفسير النتائج وحل المسألة
استخدم المعادلة الناتجة لإيجاد القيم المجهولة وتفسير معنى معدل الوحدة في سياق المسألة.

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احصل على الشرح كاملاً بـ 99 درهم فقط

❖ **Example 1 check**

1. The time y it takes you to hear thunder varies directly with your distance x from the lightning as shown in the graph.



Part A

Write a direct variation equation to represent this relationship.

A	y = 5x
B	y = 3x
C	y = 7x
D	y = 1x

Part B

Identify the constant of variation and interpret its meaning.

A	The constant of variation is 5; for every mile away from thunder, it takes 5 seconds to hear the sound.
B	The constant of variation is 5; for every 5 miles away from thunder, it takes 1 second to hear the sound.
C	The constant of variation is $1/5$; for every mile away from thunder, it takes 1 second to hear the sound.
D	The constant of variation is 1; for every 5 miles away from thunder, it takes 5 seconds to hear the sound.

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❖ **Example 2 check**

2. The amount of money Olivia earns varies directly with the number of weeks she works. After 4 weeks, Olivia earned $3,000.

Part A

Write a direct variation equation to represent this relationship.

A	y = 250x
B	y = 500x
C	y = 750x
D	y = x

Part B

Identify the constant of variation and interpret its meaning.

A	750, every day, she earns 750 $
B	750, every week, she earns 750 $
C	750, every day, she earns 500 $
D	250, every day, she earns 750 $

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❖ **Example 3 check**

3. The time it takes Madeline to swim laps is shown in the table. The time spent swimming varies directly with the number of laps she swims.

Number of Laps, x	Time (seconds), y
1	45
2	90
3	135
4	180

Part A

Write a direct variation equation to represent this relationship.

A	y = 25x
B	y = 50x
C	y = 75x
D	y = 45x

Part B

Identify the constant of variation and interpret its meaning.

A	35
B	30
C	45
D	60

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❖ **Apply check**

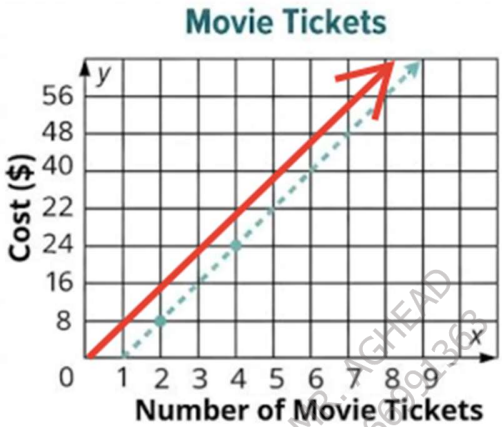
4. A charter bus travels 210 miles in $3\frac{1}{2}$ hours. Assume the distance traveled varies directly with the time traveled. Write and solve a direct variation equation to find how far the bus will travel in 6 hours.

A	y = 60 miles
B	y = 360 miles
C	y = 210 miles
D	y = 100 miles

❖ **Practice**

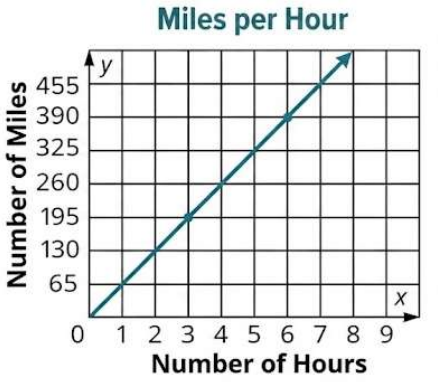
5. The cost y of movie tickets varies directly with the number of tickets x as shown in the graph. Write a direct variation equation to represent this relationship. Then identify the constant of variation and interpret its meaning. (Example 1)

A	y = 8x, costs= 8$
B	y = 4x, costs= 4$
C	y = 6x, costs= 8$
D	y = 8x, costs= 6$



6. The number of miles y varies directly with the number of hours x as shown in the graph. Write a direct variation equation to represent this relationship. Then identify the constant of variation and interpret its meaning. (Example 1)

A	y = 1x; constant = 1; every 1 hour, the number of miles is 65 miles.
B	y = 130x; constant = 130; every 1 hour, the number of miles is 130 miles.
C	y = 65x; constant = 1; every 65 hours, the number of miles is 1 mile.
D	y = 65x; constant = 65; every 1 hour, the number of miles is 65 miles.



7. The cost of paper varies directly with the number of reams bought. Suppose two reams cost $5.10. Write a direct variation equation to represent this relationship. Then identify the constant of variation and interpret its meaning. (Example 2)

A	y = 5.10x; constant = 5.10; 1 ream costs $5.10.
B	y = 2.55x; constant = 2.55; 1 ream costs $2.55.
C	y = 2.55x$; constant = 1; 2.55 reams cost $1.
D	$y = 10.20x$; constant = 10.20; 1 ream costs $10.20.

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8. The amount of flour needed for a recipe varies directly with the number of servings planned. Three servings require $4\frac{1}{2}$ cups of flour. Write a direct variation equation to represent this relationship. Then identify the constant of variation and interpret its meaning. (Example 2)

A	y = 1.5x, constant = 1.5; every serving requires 1.5 cups of flour.
B	y = 0.5x, constant = 0.5; every serving requires 0.5 cups of flour.
C	y = 1.5x, constant = 1; 1.5 servings require 1 cup of flour.
D	y = 3x, constant = 3; every 2 servings require 1.5 cups of flour.

9. Open Response The distance a bus travels varies directly with time as shown in the table. Write a direct variation equation to represent this relationship. Then identify the constant of variation and interpret its meaning. (Example 3)

A	y = 62.5x, constant = 62.5; every 1 hour, the bus travels 62.5 miles.
B	y = 93.75x, constant = 93.75; every 1 hour, the bus travels 93.75 miles.
C	y = 62.5x, constant = 1; every 62.5 hours, the bus travels 1 mile.
D	y = 125x, constant = 125; every 2 hours, the bus travels 62.5 miles.

Time (h), x	Distance (mi), y
1.5	93.75
3	187.5
4.5	281.25
6	375

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Lesson 4-5 Slope-Intercept Form

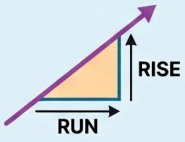
Mastering the Slope-Intercept Form: y = mx + b

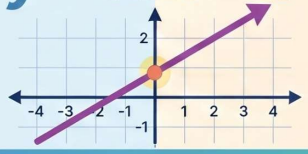
ANATOMY OF THE EQUATION

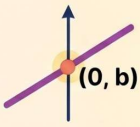
A standard way to write linear equations where x and y represent coordinates.

$$y = mx + b$$

m = The Slope
Represents the **rate of change** or the ratio of **"rise over run."**



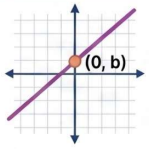




b = The y-intercept
The initial **value** or the **y-coordinate** where the line crosses the y-axis.

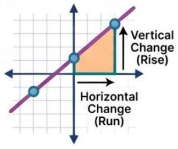
3 STEPS TO WRITE AN EQUATION

1 STEP 1: Find the y-intercept (b)



Locate where the line crosses the y-axis; this occurs at the point (0, b).

2 STEP 2: Calculate the Slope (m)



Determine the ratio of vertical change (rise) to horizontal change (run).

$$m = \frac{\text{Rise}}{\text{Run}}$$

3 STEP 3: Substitute into the Formula

$y = \square x + \square$

Replace m and b in y = mx + b with your calculated values.

REAL-WORLD SCENARIOS: EXAMPLES



Bamboo Growth
Slope (m): 6.5 (rate/day)
y-intercept (b): 5 (starting height)
Equation: y = 6.5x + 5



T-shirt Printing
Slope (m): $5 (cost/shirt)
y-intercept (b): $20 (setup fee)
Equation: y = 5x + 20



Distance Travel
Slope (m): 65 (miles/hour)
y-intercept (b): 0 (starting point)
Equation: y = 65x

دليل صيغة الميل والمقطع $(y = mx + b)$

يتناول هذا المحتوى التعليمي أساسيات العلاقات الخطية غير المتناسبة، مركزاً على "صيغة الميل والمقطع".

القسم الأول: فهم مكونات المعادلة

$$y = mx + b$$

الصيغة العامة: $y = mx + b$
هي الطريقة القياسية لتمثيل الخط المستقيم برمجياً ورياضياً.



الميل (m) هو معدل التغير
يعبر عن نسبة الارتفاع إلى الامتداد (Rise/Run) في الرسم البياني.

المقطع الصادي (b) هو القيمة الأولية
يمثل النقطة التي يتقاطع فيها الخط المستقيم مع المستقيم مع المحور الصادي (y).



Data Table

العنصر في المسألة	الرمز في المعادلة	الوظيفة
المقطع الصادي (القيمة الثابتة)	b	رسوم التصميم (مرة واحدة)
الميل (معدل التغير لكل وحدة)	m	تكلفة طباعة القميص الواحد
المخرج النهائي للمعادلة	y	التكلفة الإجمالية

القسم الثاني: خطوات الحل (كتابة المعادلة من الرسم البياني)

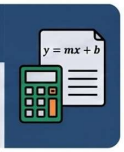
الخطوة 1: حدد موقع المقطع الصادي (b)
أوجد النقطة التي يقطع فيها الخط المحور y لتحديد قيمة b.



الخطوة 2: احسب الميل (m)
اختر نقطتين على الخط واحسب نسبة التغير الرأسي إلى التغير الأفقي.



الخطوة 3: عوّض بالقيم في المعادلة
ضع قيم m و b المحسوبة في صيغة $y = mx + b$ النهائية.



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❖ **Example 1 check**

1. Identify the slope and y-intercept of the graph of the equation $y = \frac{2}{5}x - 1$

A	Slope is $\frac{2}{5}$, y-intercept = -1
B	Slope is $\frac{5}{2}$, y-intercept = -1
C	Slope is $\frac{2}{5}$, y-intercept = 1
D	Slope is $-\frac{2}{5}$, y-intercept = -1

❖ **Example 2 check**

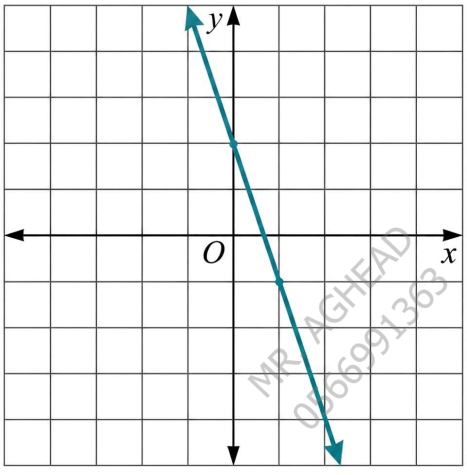
2. Write the equation of a line in slope-intercept form with a slope of 5 and a y-intercept of -7.

A	y= 7x - 7
B	y= 5x - 7
C	y= 7x – 5
D	y= 5x + 7

❖ **Example 3 check**

3. Write an equation in slope-intercept form for the graph shown.

A	y= 3x - 7
B	y= 5x – 2
C	y= -3x + 2
D	y= 3x + 2



❖ **Example 4 check**

4. Faith is saving money in order to purchase a new smartphone. She started out with $30 in her savings account and is able to save an additional $15 a week. Write an equation in slope-intercept form to represent Faith's total savings y for x weeks she puts money toward the purchase of a new smartphone.

A	y= 3x - 7
B	y= -15x + 30
C	y= 30x + 15
D	y= 15x + 30

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❖ **Example 5 check**

5. The relationship between the data in the table is linear. Write an equation in slope-intercept form that represents the data in the table.

A	y= 3x - 1
B	y= -3x + 3
C	y= -3x - 3
D	y= 3x + 2

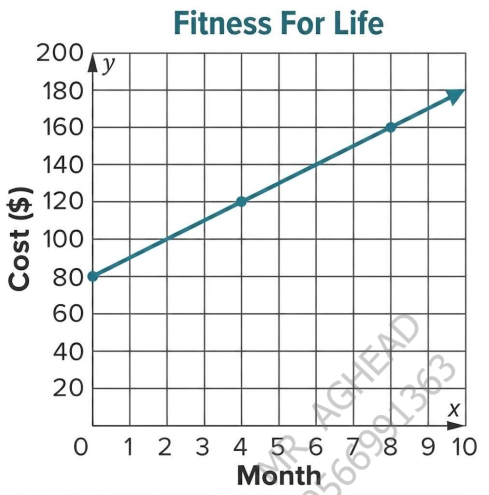
x	y
−1	6
0	3
1	0
2	−3

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❖ Apply Check

6. Katie wants to attend fitness classes at a local gym. The costs of attending Fitness For Life are represented in the graph shown. Fitness World charges a registration fee of $90 plus $8 per month. Katie wants a membership for 18 months. Which gym charges less for 18 months? How much less?

A	Fitness For Life charges $26 less.
B	Fitness World charges $26 less.
C	Fitness World charges $50 less.
D	Fitness For Life charges $50 less.



❖ Practice

Identify the slope and y-intercept of the graph of each equation (Example 1)

7. $y = \frac{1}{2}x - 5$

A	$m = \frac{1}{2}$, b = -5
B	m = 3, b = -1
C	$m = \frac{1}{2}$, b = -3
D	$m = \frac{1}{2}$, b = -1

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8. $y = 3x - 1$

A	$m = \frac{1}{2}, b = -5$
B	$m = 3, b = -1$
C	$m = \frac{1}{2}, b = -3$
D	$m = \frac{1}{2}, b = -1$

Write the equation of a line in slope-intercept form with each slope and y-intercept. (Example 2).

9. slope $= \frac{1}{3}$, y-intercept $= 4$

A	$y = \frac{1}{3}x + 4$
B	$y = \frac{3}{1}x - 4$
C	$y = \frac{2}{3}x + 4$
D	$y = \frac{3}{5}x - 4$

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10. slope = $\frac{3}{2}$ .y-intercept = -3

A	$y = \frac{1}{3}x + 3$
B	$y = \frac{2}{3}x - 3$
C	$y = \frac{3}{2}x - 3$
D	$y = \frac{3}{5}x - 3$

11. slope = 4, y-intercept = -2

A	y = -x +6
B	y = 4x -2
C	y = 2x – 3
D	y = -65x +420

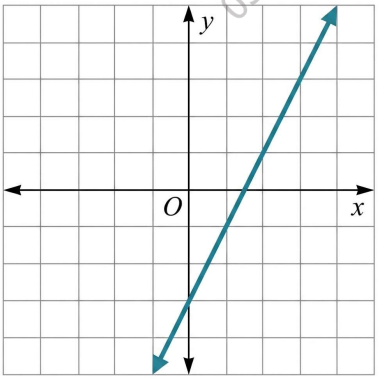
12. slope = -1, y-intercept = 6

A	y = -x +6
B	y = 4x -2
C	y = 2x – 3
D	y = -65x +420

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13. Write an equation in slope-intercept form for the graph shown. (Example 3)

A	y = -x +6
B	y = 4x -2
C	y = 2x – 3
D	y = -65x +420



14. The Augello family is driving from Columbus to St. Louis at a constant rate of 65 miles per hour. The distance between the two cities is 420 miles. Write an equation in slope-intercept form to represent the distance y in miles remaining after driving x hours. (Example 4)

A	y = -x +6
B	y = 4x -2
C	y = 2x – 3
D	y = -65x +420

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15. The table shows the costs for art show participants, including the 30$ registration fee. Write an equation in slope-intercept form that represents the data in the table. (Example 5)

A	y = 45x - 30
B	y = 45x + 10
C	y = 45x + 30
D	y = -45x + 30

Number of Pieces of Art	Cost ($)
0	30
2	90
4	150
6	210
8	270

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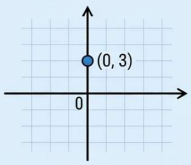
Lesson 4-6 Graph Linear Equations

Mastering the Graph: A Step-by-Step Guide to Linear Equations

This guide breaks down the essential steps for interpreting and graphing linear equations from the slope-intercept form ($y = mx + b$). It also distinguishes the unique characteristics of horizontal and vertical lines.

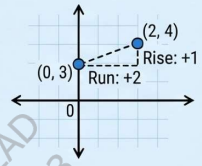
4 Steps to Graph $y = mx + b$

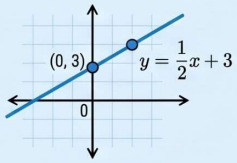
$$y = \frac{1}{2}x + 3$$



Step 1: Identify Slope and Y-Intercept
Extract the slope (m) and the y-intercept (b) from the equation.

Step 2: Plot the Y-Intercept
Place the first point on the y-axis at the value of b.



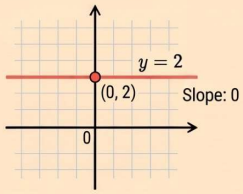


Step 3: Locate a Second Point
Use the slope (rise over run) to move from the y-intercept to another point.

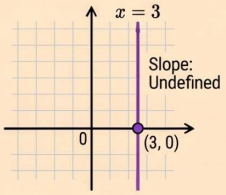
Step 4: Draw and Extend the Line
Connect the points with a straight line across the coordinate plane.

Special Case Lines

Horizontal Lines ($y = b$)



Vertical Lines ($x = a$)



Horizontal Lines ($y = b$)
These lines have a slope of 0 and all points share the same y-coordinate.

Vertical Lines ($x = a$)
These lines have an undefined slope and all points share the same x-coordinate.

Quick Reference: Linear Forms & Slopes

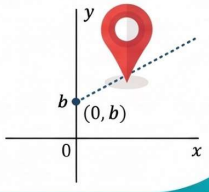
Equation Form	Line Type	Slope (m)
$y = mx + b$	Slanted / Diagonal	Positive or Negative
$y = b$	Horizontal	Zero (0)
$x = a$	Vertical	Undefined

دليل تمثيل المعادلات الخطية بيانياً

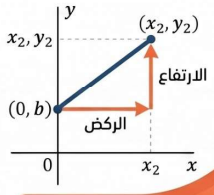
خطوات الحل: تمثيل المعادلة بصيغة الميل والمقطع

الخطوة 1: تحديد الميل والمقطع الصادي.
استخرج قيمة الميل (m) والمقطع الصادي (b) مباشرة من المعادلة المعطاة.

الخطوة 2: تمثيل المقطع الصادي بيانياً.
ابدأ بتحديد نقطة المقطع الصادي عند الإحداثيات $(0, b)$ على المحور y.



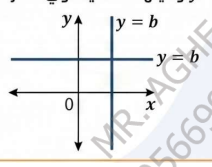
الخطوة 3: تحديد النقطة الثانية ورسم الخط.
استخدم الميل (الارتفاع/الركض) للتحرك من نقطة المقطع الصادي وتحديد نقطة أخرى، ثم صل بينهما.



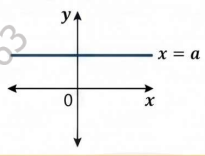
نوع الخط	صيغة المعادلة	قيمة الميل
خط مائل	$y = mx + b$	قيمة m
خط أفقي	$y = b$	صفر
خط رأسي	$x = a$	غير معرّف

حالات خاصة: الخطوط الأفقية والرأسية

الخطوط الأفقية ($y = b$)
تمر بجميع النقاط التي لها نفس الإحداثي y وميلها دائماً يساوي صفراً.



الخطوط الرأسية ($x = a$)
تمر بجميع النقاط التي لها نفس الإحداثي x وميلها غير معرّف.

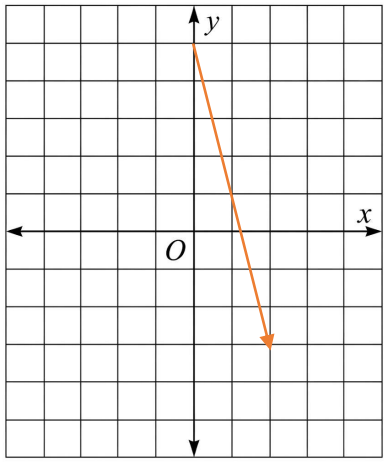


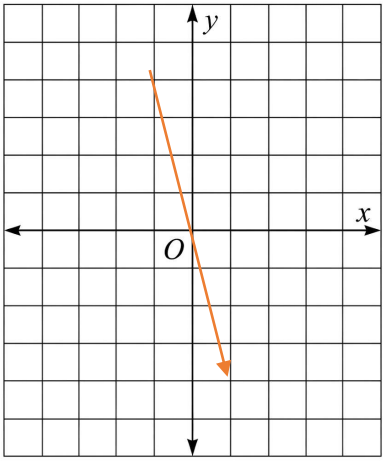
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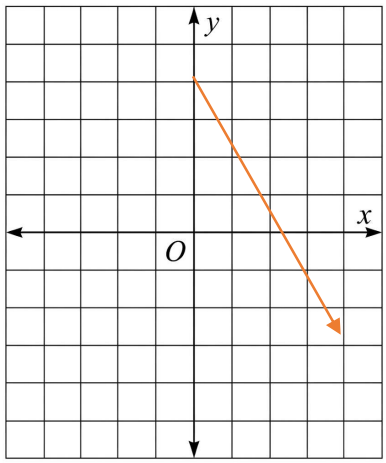
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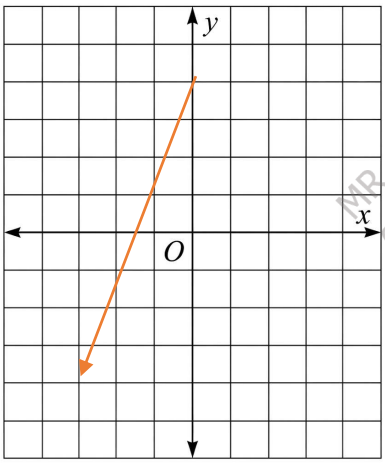
❖ **Example 1 check**

1. Graph y = -4x + 5 using the slope and y-intercept





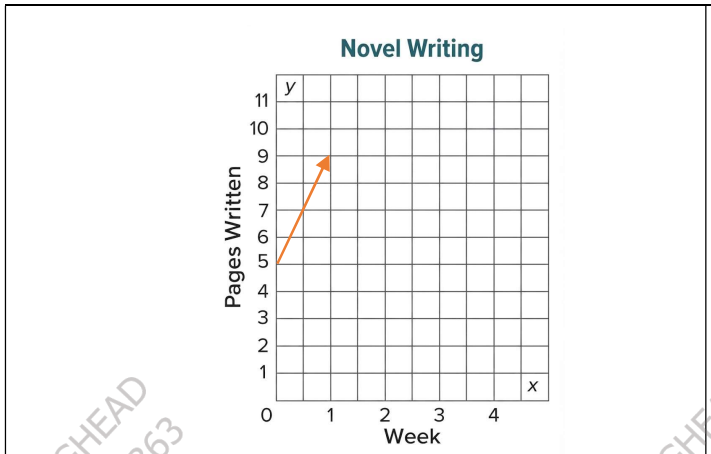


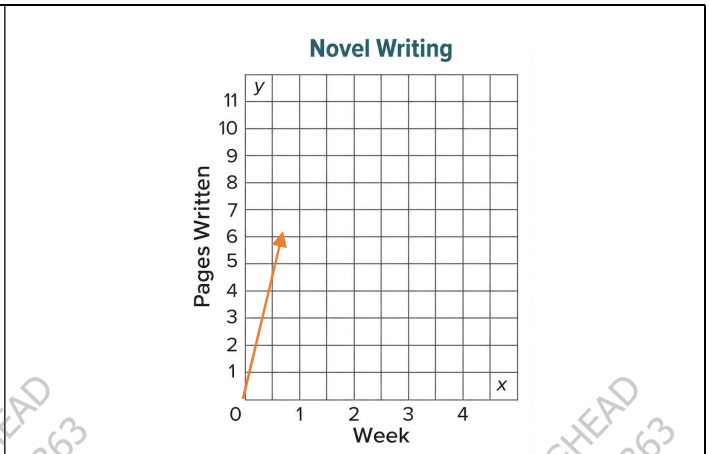


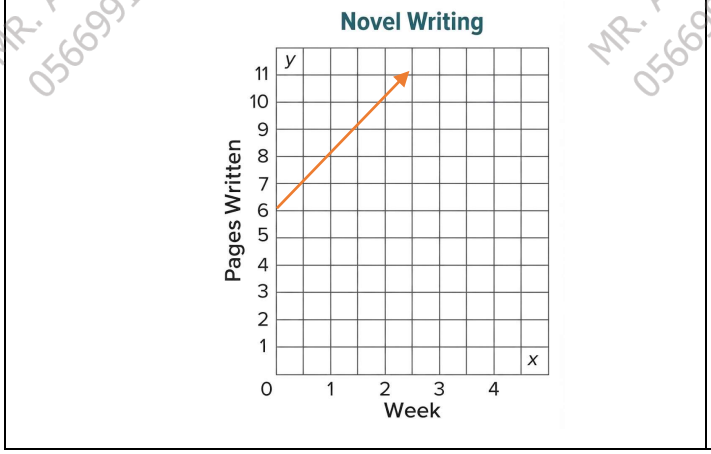
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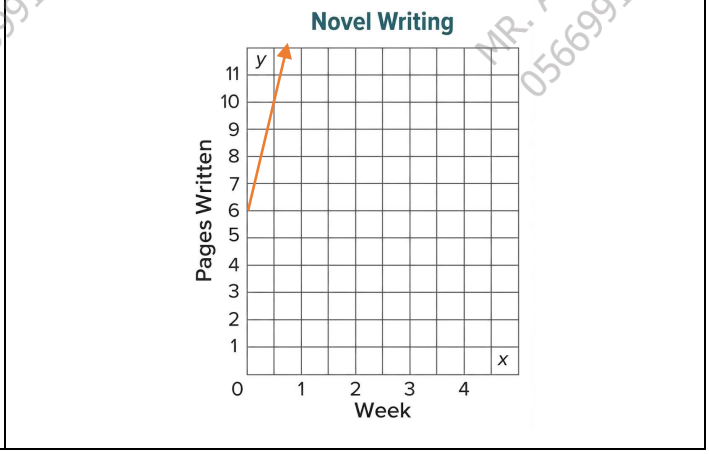
❖ **Example 2 check**

2. Jayden has written 6 pages of his novel. He plans to write 4 pages per week until he has completed his novel. Graph the equation $y = 4x + 6$ that represents the total number of pages written y in x number of weeks.





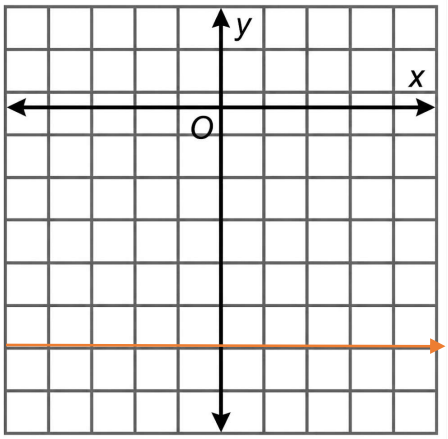


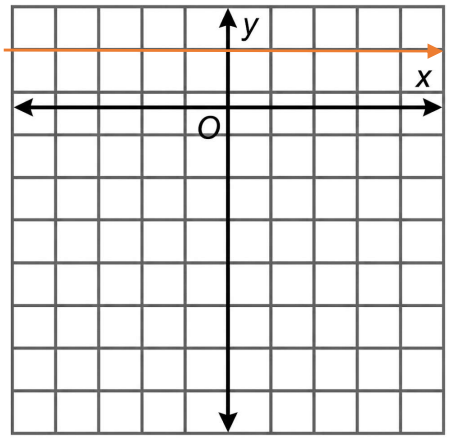


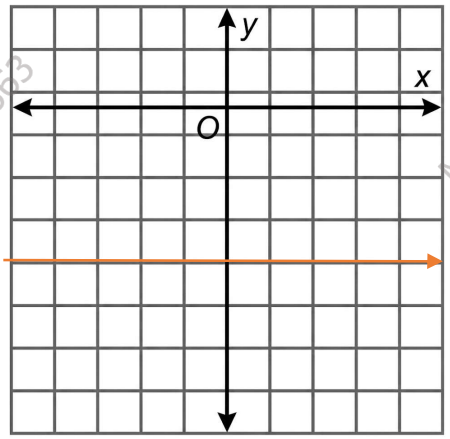
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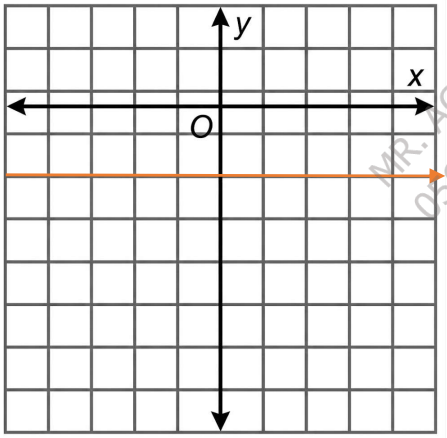
❖ **Example 3 check**

3. Graph y = -6





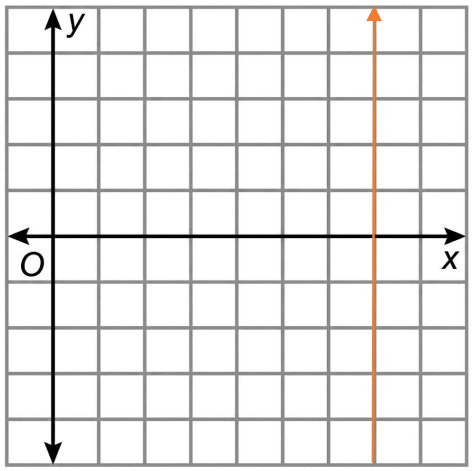


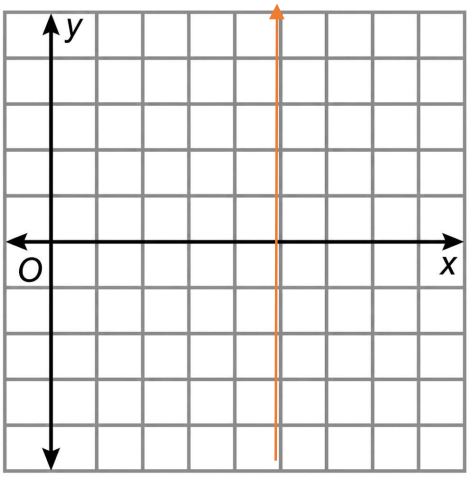


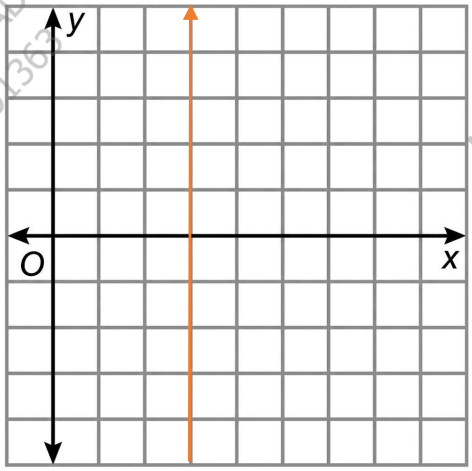
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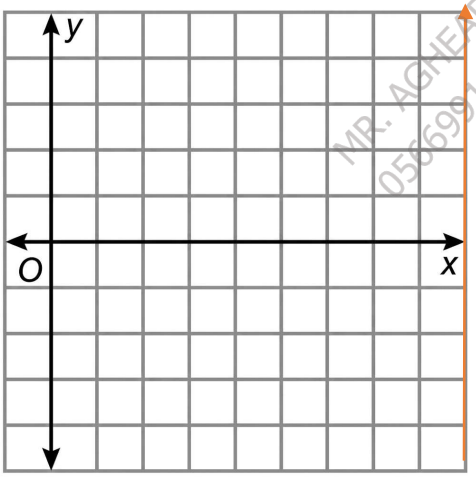
❖ **Example 4 check**

4. Graph x = 7









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❖ **Apply check**

5. Sefina is tracking the growth of two different plants for an experiment. The growth of Plant A can be represented with the equation $y = \frac{1}{2}x + 1$, where y is the height of the plant after x number of days. The growth of Plant B can be represented with the equation, $y = \frac{1}{4}x + 2$. Which plant is taller after 12 days? How much taller?

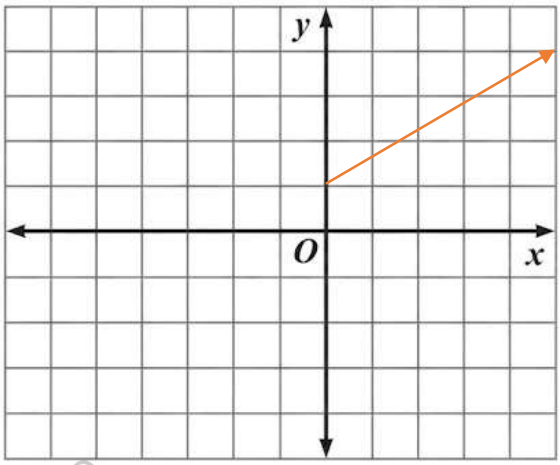
A	plant A, taller by 2
B	plant B, taller by 2
C	plant A, taller by 7
D	plant B, taller by 5

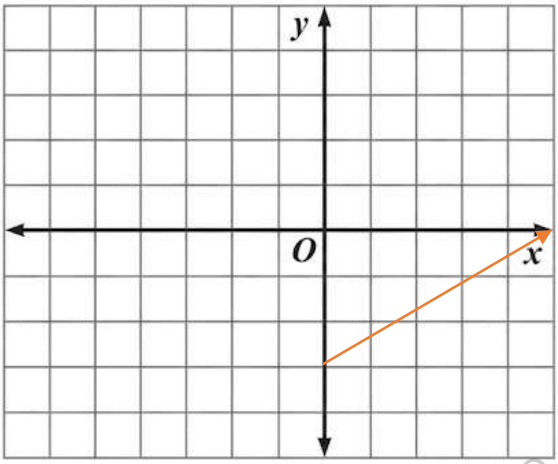
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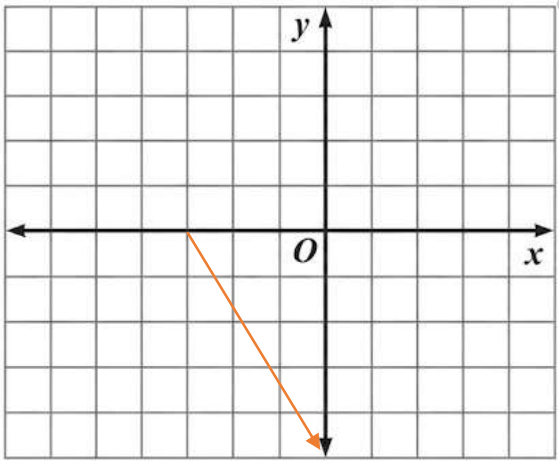
❖ Practice

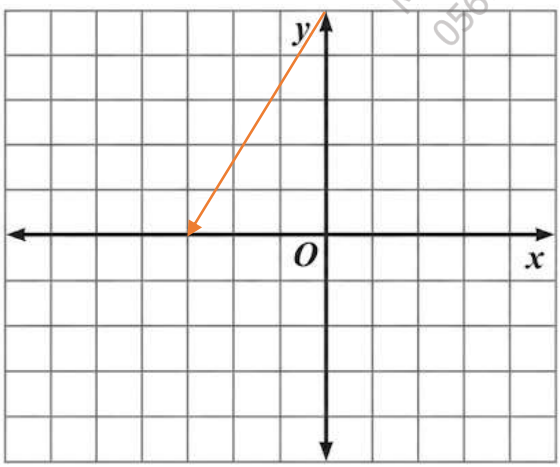
Graph each equation using the slope and y-intercept. (Example 1)

6. $y = \frac{3}{5}x - 3$



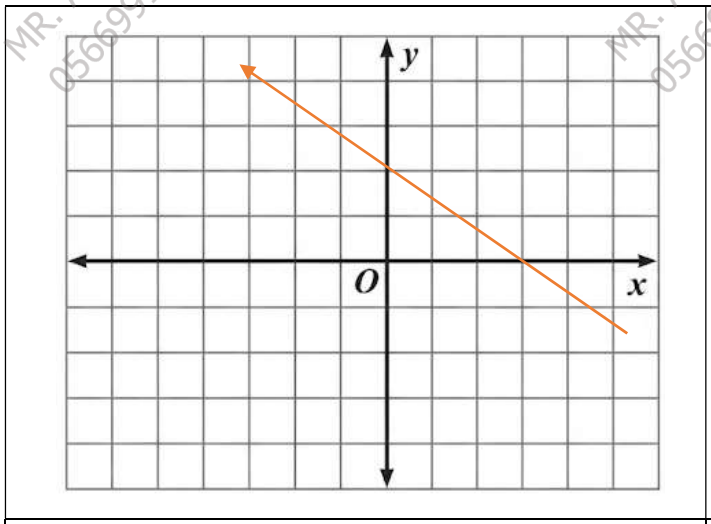


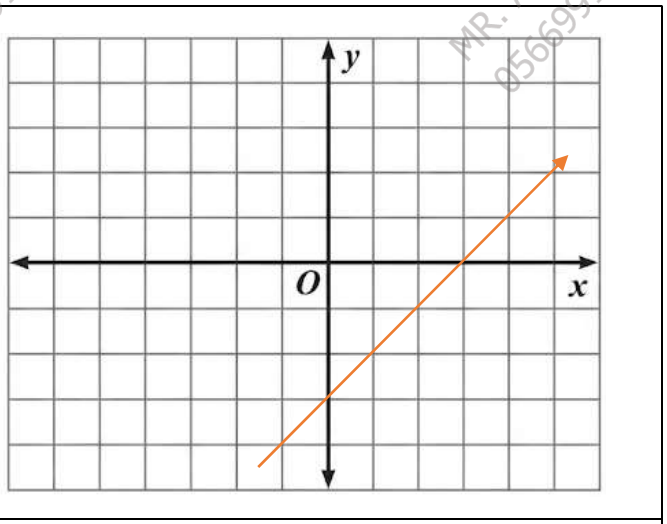


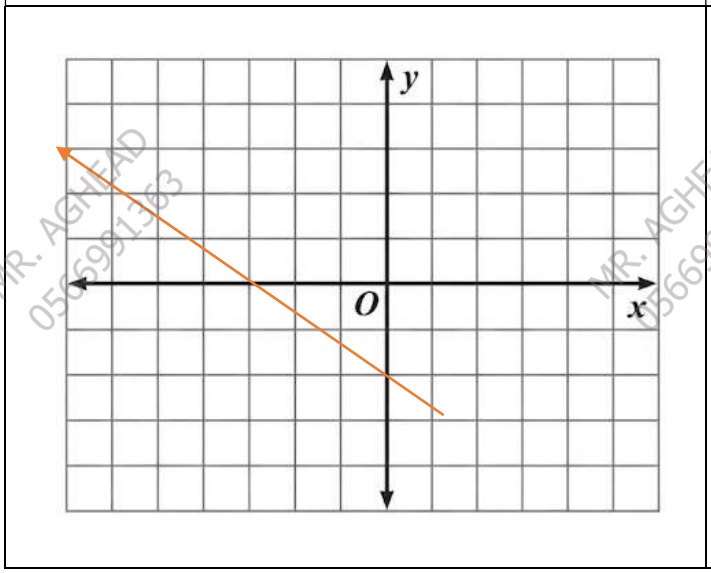


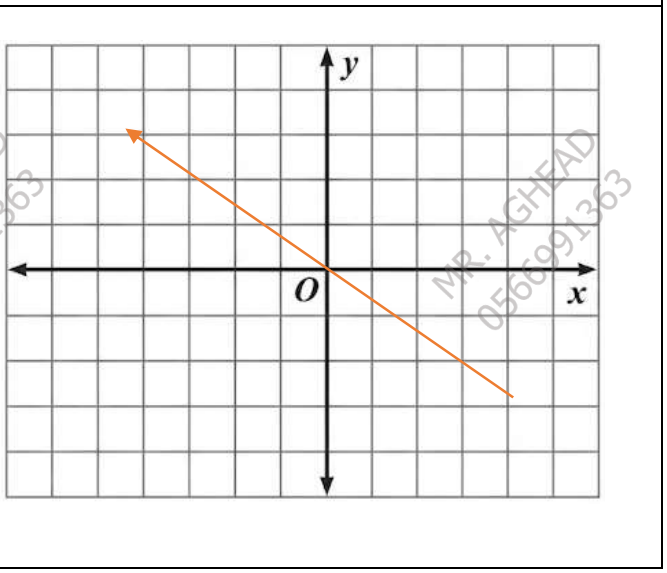
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7. $y = -\frac{2}{3}x - 2$



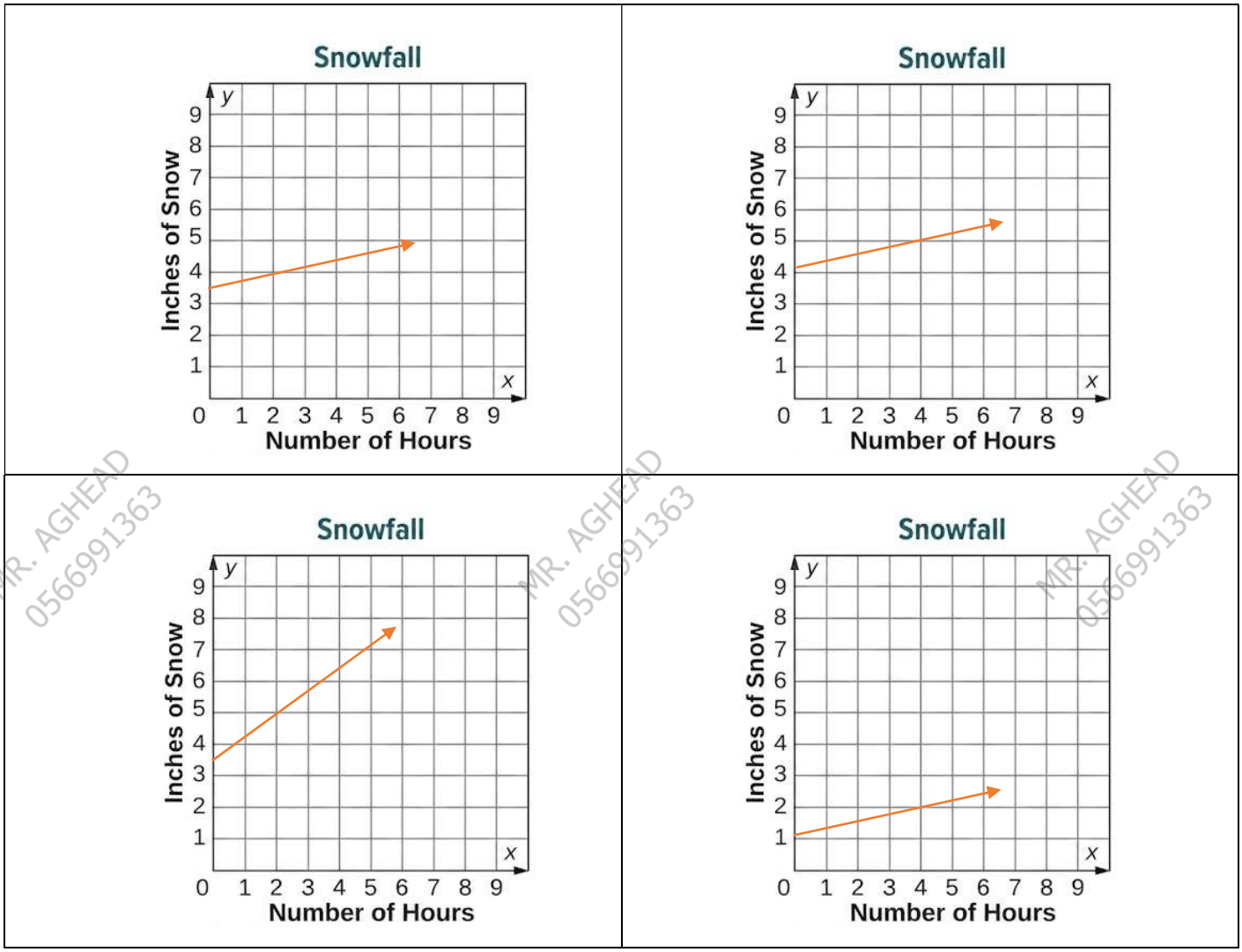






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8. The equation $y = \frac{1}{5}x + 3.5$ can be used to find the amount of accumulated snow y in inches x hours after 5 P.M. on a certain day. Graph this equation. (Example 2)

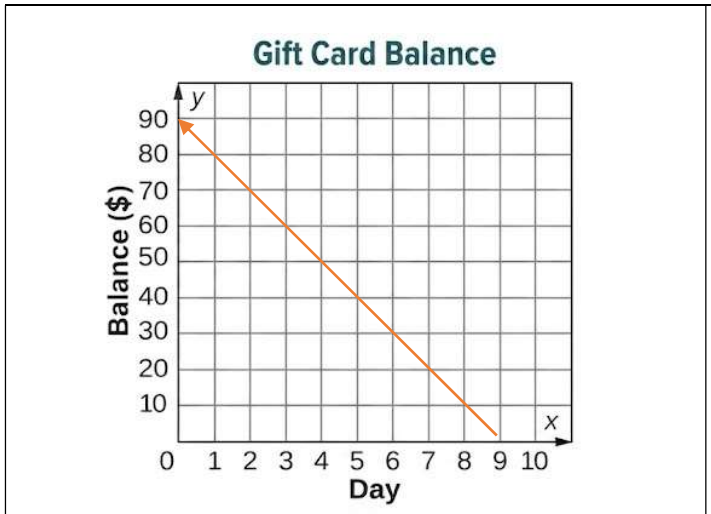


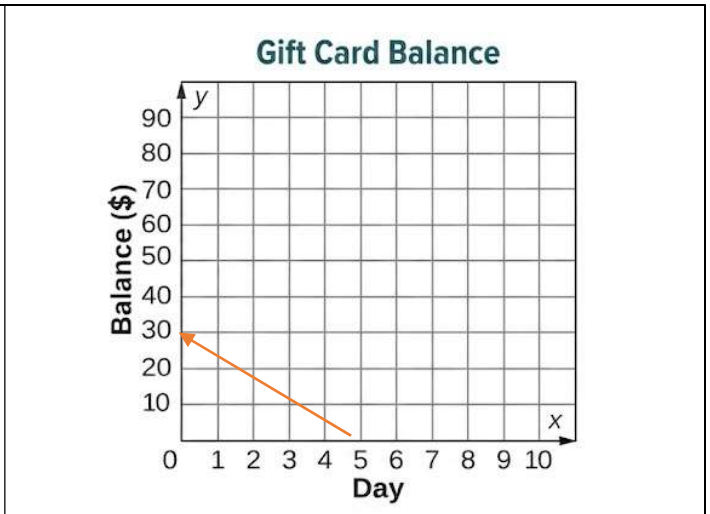
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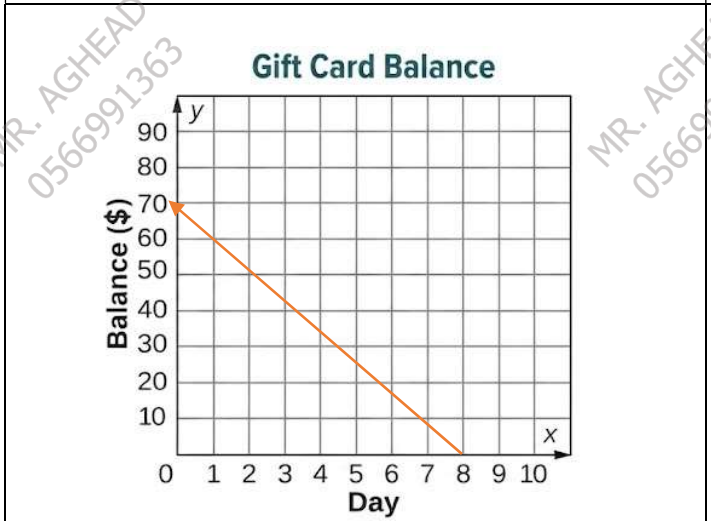
احصل على الشرح كاملاً بـ 99 درهم فقط

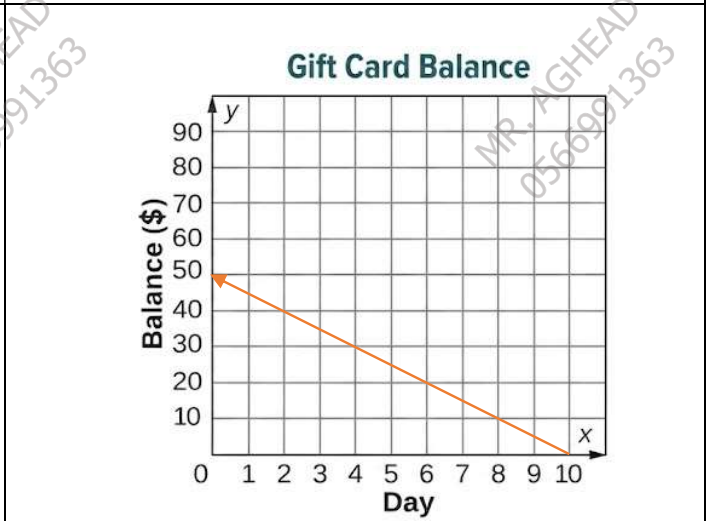
للتواصل اضغط الرقم: 0566991363

9. Alliyah's gift card balance can be represented by the equation $y = -5x + 50$, where y represents the gift card balance after x number of days. Graph this equation. (Example 2)









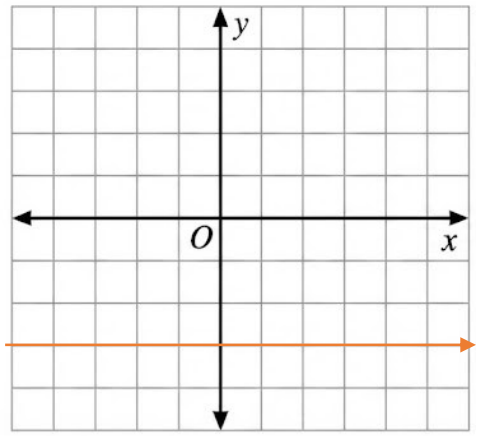
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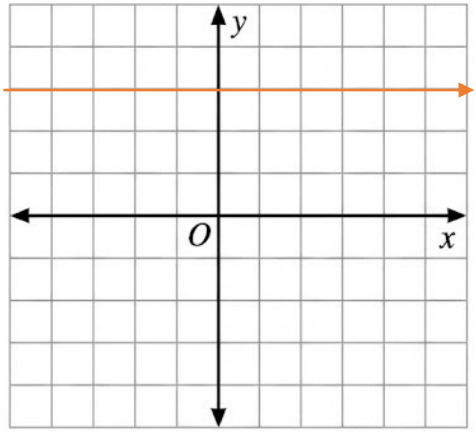
للتواصل اضغط الرقم: 0566991363

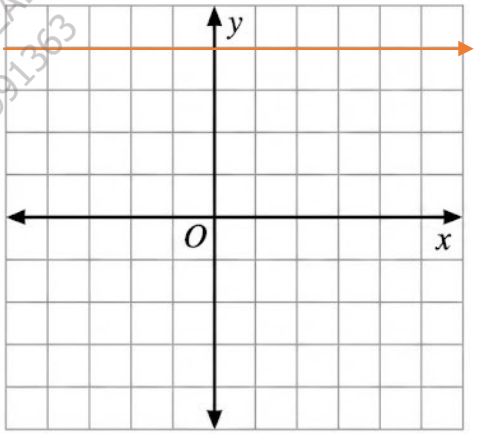
احصل على الشرح كاملاً بـ 99 درهم فقط

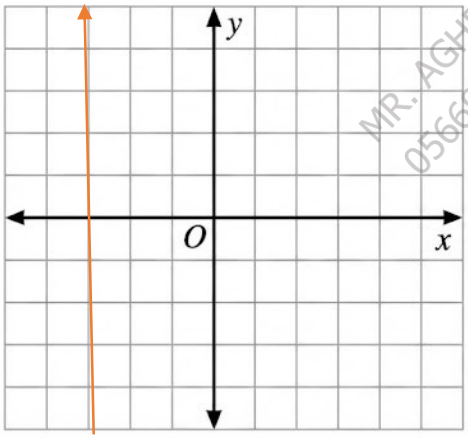
Graph each equation. (Examples 3 and 4)

10. y = -3



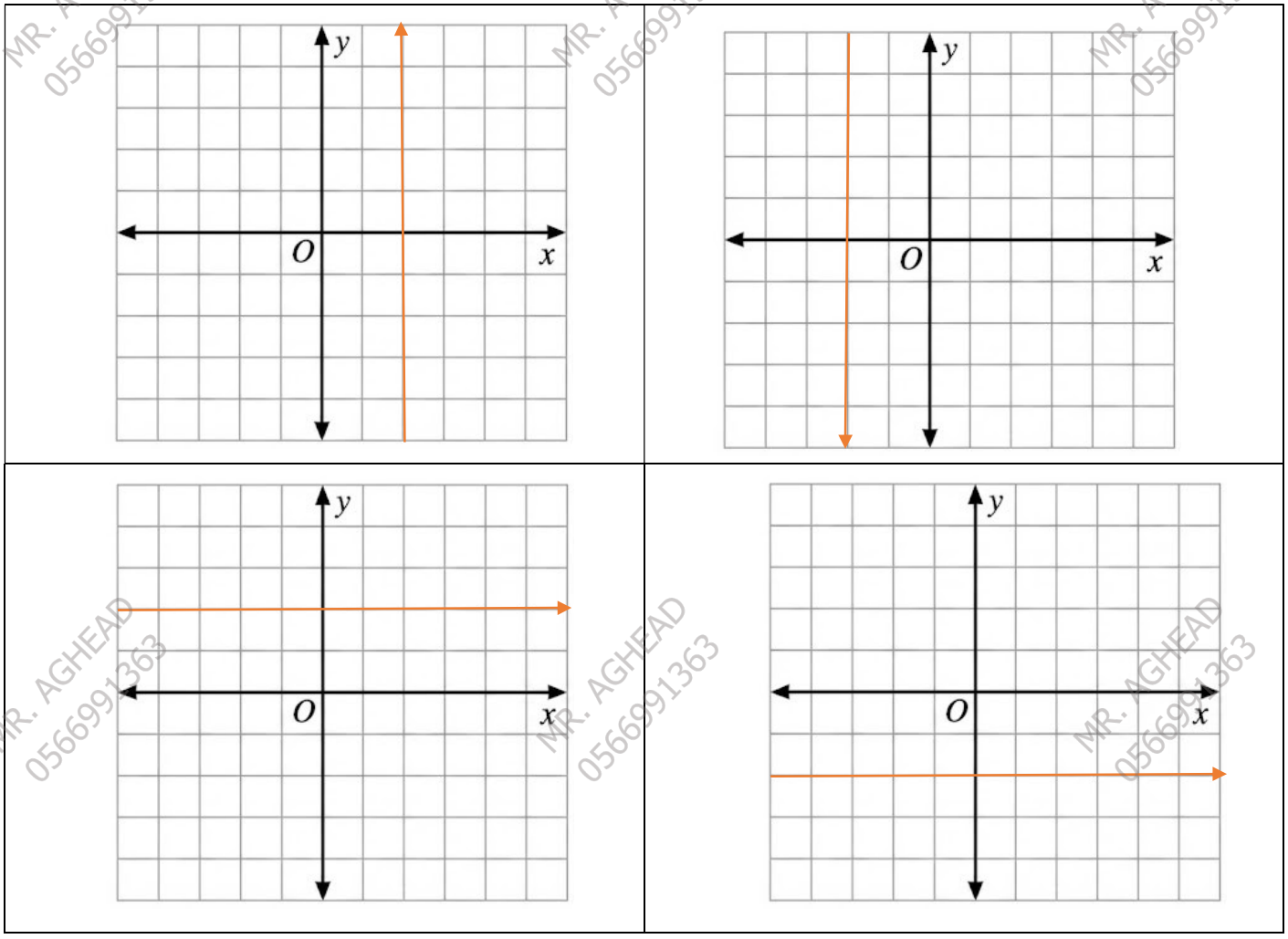




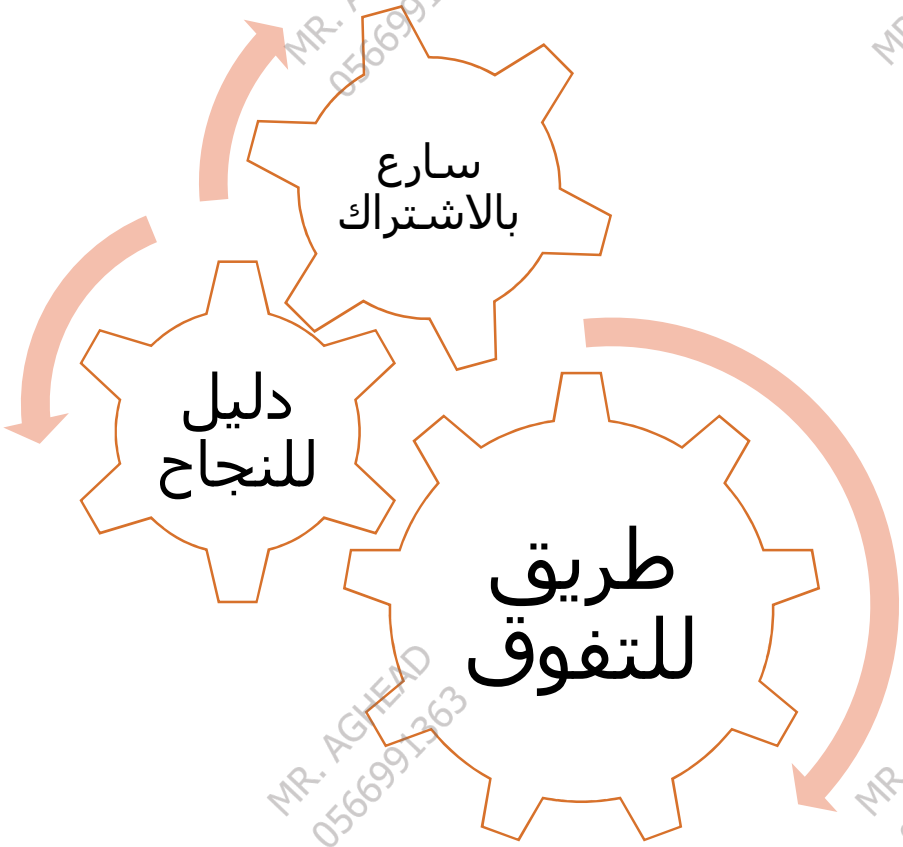


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11. $x = 2$



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النهاية...