أوراق عمل تغطية



تم تحميل هذا الملف من موقع المناهج الإماراتية	
موقع المناهج ⇦ المناهج الإماراتية ⇦ رياضيات ⇦ الفصل الأول ⇦ ملفات متنوعة ⇦ الملف	
تاريخ إضافة الملف على موقع المناهج: 2026-11-15 14:20:55	
ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس	المزيد من مادة رياضيات:
إعداد: Saleh Mays	

التواصل الاجتماعي بحسب					
صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب والمادة رياضيات في الفصل الأول

تحميل تطبيق المناهج للهواتف الذكية	
تطبيق المناهج على App Store (آبل)	تطبيق المناهج على Play Google (أندرويد)

مدرسة أم القيوين الحلقة الثانية والثالثة بنات

Umm Al Quwain Girls' School – Cycle 2 & 3

GRADE 8 · ADVANCED

EOT 1

MATH COVERAGE

2026 – 2027

MODULE 1	MODULE 2	MODULE 3	MODULE 4

Name:



TEACHER

Ms. Mays Saleh

SCHOOL PRINCIPAL

Ms. Aisha Hamouda

Module 1: Exponents and Scientific Notation

L1-1: Powers and Exponents

MCQ

Remember this!

5^4

EXPONENT
how many times it repeats

BASE
the factor that repeats

$5 \cdot 5 \cdot 5 \cdot 5$
4 times

$= 625$

Order of operations: ( ) → powers → × ÷ → + −

WATCH THE SIGN!

The exponent only touches what is right before it.

$(-4)^2$ → $(-4)(-4)$ = **16**

-4^2 → $-(4 \cdot 4)$ = **−16**

EVALUATE: SUBSTITUTE IN ( )

$x^2 + 1$ if $x = -3$ → $(-3)^2 + 1 =$ **10**

Write each expression using exponents.

1. $(-7) \cdot (-7) \cdot 5 \cdot 5 \cdot 5 \cdot 5 =$ _____

2. $n \cdot n \cdot p \cdot p \cdot r \cdot r \cdot r =$ _____

Evaluate each numerical expression.

3. $3^4 - (-4)^2 =$ _____

4. $6 + 2^6 =$ _____

5. Evaluate $x^3 - y^2$ if $x = 2$ and $y = \frac{3}{4}$.

6. Evaluate $(g + h)^3$ if $g = 2$ and $h = -3$.

almanahj.com/ae

L1–2: Multiply and Divide Monomials

MCQ

Remember this!

SAME BASE × → ADD

$2^3 \cdot 2^4$

$3 + 4$

2^7

Not 4^7: the base stays the same.

MULTIPLY **ADD**

$3x^2 \cdot 5x^4$

$(3 \cdot 5)\, x^{2+4}$

$15x^6$

Numbers: multiply · **Exponents: add**
Check the sign: (+)(-) = (-)

SAME BASE ÷ → SUBTRACT

$\frac{c^9}{c^4}$ → $9 - 4 \rightarrow c^5$

Group powers with the **same base**, subtract each pair, then multiply what is left:

$$\frac{4^5 \cdot 9^3}{4^2 \cdot 9^2} = 4^3 \cdot 9^1 = 576$$

No exponent shown? It is 1: $3 = 3^1$, $m = m^1$

Simplify each expression.

1. $3^8 \cdot 3 =$ _____

2. $m^5 \cdot m^2 =$ _____

3. $3m^3n^2 \cdot 8mn^3 =$ _____

4. $9p^4 \cdot (-8p^2) =$ _____

5. Simplify $\frac{b^{12}}{b^5}$.

6. Simplify $\frac{5^5 \cdot 6^3 \cdot 8^{10}}{5^3 \cdot 6 \cdot 8^9}$.

L1–3: Powers of Monomials

MCQ

Remember this!

POWER OF A POWER
→ MULTIPLY the exponents

$(5^2)^4$

2×4

5^8

Not 5^6: multiply, don't add.

POWER OF A PRODUCT
→ the exponent goes to **every** factor

$(3x^4y)^2$

$3^2 \cdot (x^4)^2 \cdot y^2$

$9x^8y^2$

The number gets the power too: $(2m)^3 = \mathbf{8}m^3$

NEGATIVE NUMBER INSIDE?

ODD POWER → NEGATIVE
$(-2x^3)^3 = \mathbf{-8}x^9$

EVEN POWER → POSITIVE
$(-2x^3)^4 = \mathbf{16}x^{12}$

Steps: sign → number to the power → multiply each exponent.

Simplify each expression.

1. $(7^2)^3 =$ _____

2. $(8^3)^3 =$ _____

3. $(d^7)^6 =$ _____

4. $(z^7)^3 =$ _____

5. $(2m^5)^6 =$ _____

6. $(7a^5b^6)^4 =$ _____

7. $(-3w^3z^8)^5 =$ _____

8. $(-5r^4s^{10})^4 =$ _____

almanahj.com/ae

L1–4: Zero and Negative Exponents

FRQ
FREE RESPONSE

Remember this!

SEE THE PATTERN

$2^3 = 8$
$2^2 = 4$
$2^1 = 2$
$2^0 = 1$
$2^{-1} = \frac{1}{2}$
$2^{-2} = \frac{1}{4}$

÷ 2 each step

ZERO EXPONENT

$a^0 = 1$ $(a \neq 0)$

$25^0 = 1 \cdot (-3)^0 = 1 \cdot k^0 = 1$

NEGATIVE EXPONENT

$5^{-3} \rightarrow \frac{1}{5^3}$ flip it

Move the power across the fraction bar and the exponent's sign **changes**. 5^{-3} is **not** negative: it equals $\frac{1}{125}$.

SAME RULES STILL WORK

$9^4 \cdot 9^{-6} = 9^{4+(-6)} = 9^{-2} = \frac{1}{81}$

$\frac{x^{-8}}{x^{-12}} = x^{-8-(-12)} = x^4$

SIMPLIFIED MEANS

no negative or zero exponents, and each base appears only once.

Simplify each expression.

1. $46^0 =$ _____

2. w^0, where $w \neq 0$ _____

Express each using a positive exponent.

3. $8^{-4} =$ _____

4. $y^{-9} =$ _____

Express each fraction using a negative exponent.

5. $\frac{1}{d^6} =$ _____

6. $\frac{1}{10^5} =$ _____

Simplify each expression.

7. $9^4 \cdot 9^{-6} =$ _____

8. $y^{-9} \cdot y^3 =$ _____

9. $\frac{x^{-8}}{x^{-12}} =$ _____

10. $\frac{d^{-13}}{d^{-2}} =$ _____

11. Simplify $8^{-7} \cdot 8^7 \cdot 10^4 \cdot 10^{-4}$.

TEST PRACTICE

12. Multiselect Select all of the expressions that are simplified.

- ☐ n^4
- ☐ $\frac{1}{n^{-5}}$
- ☐ $n^6 \cdot n^{-8}$
- ☐ $n^7 \cdot p^8$
- ☐ $\frac{1}{n^3}$

almanahj.com/ae

L1-5: Scientific Notation

MCQ

Remember this!

SCIENTIFIC NOTATION

$$4.5 \times 10^{6}$$

- 4.5: a number from 1 up to (not including) 10; $1 \le a < 10$
- 10^{6}: a power of 10; the exponent is an integer

BIG NUMBER → POSITIVE EXPONENT

6 hops left ←

3,450,000.

Move the decimal point until **one digit** is left of it.

$= 3.45 \times 10^{6}$

The zeros at the end are dropped.

SMALL NUMBER → NEGATIVE EXPONENT

→ 4 hops right

0.00072

The number is less than 1, so the exponent is **negative**.

$= 7.2 \times 10^{-4}$

Number of hops = the exponent.

Write each number in scientific notation.

1. 2,204,000,000 = _____

2. 0.0000000642 = _____

L1-6: Compute with Scientific Notation

MCQ

Remember this!

MULTIPLY

$(2 \times 10^3)(4 \times 10^5)$

2×4 10^{3+5}

8×10^8

Numbers: × · Exponents: +
Got 12×10^8? Fix it: $\mathbf{1.2 \times 10^9}$

DIVIDE

$$\frac{8 \times 10^6}{2 \times 10^2}$$

$8 \div 2$ 10^{6-2}

4×10^4

Numbers: ÷ · Exponents: −
"How many times greater?" → divide.

ADD OR SUBTRACT

First make the exponents the **same**.

$3.2 \times 10^5 + 4 \times 10^3$

0.04×10^5

$(3.2 + 0.04) \times 10^5$

3.24×10^5

Move the decimal 2 places left → exponent goes up by 2.

1. There are about 3×10^{11} stars in our galaxy and about 100 billion galaxies in the observable universe. Suppose every galaxy has as many stars as ours. How many stars are in the observable universe? Write in scientific notation.

2. Humpback whales are known to weigh as much as 80,000 pounds. The tiny krill they eat weigh only 2.1875×10^{-3} pound. About how many times greater is the weight of a humpback whale?

Evaluate. Express each result in scientific notation.

3. $(1.28 \times 10^5) + (1.13 \times 10^3) =$

4. $(7.26 \times 10^6) - (1.3 \times 10^4) =$

5. The speed of light is about 1.86×10^5 miles per second. The star Sirius is about 5.062×10^{13} miles from Earth. About how many seconds does it take light to travel from Sirius to Earth? Write in scientific notation, rounded to the nearest hundredth.

TEST PRACTICE

6. Table Item The table shows the amount of money raised by each region. The four regions raised a total of $\$(5.38 \times 10^4)$. How much did the West raise?

Region	Amount Raised ($)
East	1.46×10^4
North	2.38×10^4
South	6.75×10^3
West	

L2-1: Terminating and Repeating Decimals

MCQ

Remember this!

FRACTION = DIVISION

$\frac{3}{8} = 3 \div 8 = 0.375$

```
      0 . 3 7 5
  8 ) 3 . 0 0 0
    - 2   4
        6 0
      - 5 6
          4 0
        - 4 0
            0   ← remainder 0
```

TERMINATING
The division **ends**.

WHEN IT NEVER ENDS

$\frac{2}{11} = 2 \div 11$

Remainders:

2 → 9 → 2 → 9 → …

same remainder again!

$0.181818\ldots = 0.\overline{18}$

bar = these digits repeat forever

REPEATING
Digits **repeat** forever.
Know: $0.\overline{3} = \frac{1}{3}$ $0.\overline{6} = \frac{2}{3}$

MIXED NUMBERS

$4\frac{3}{8} = 4 + 0.375 = 4.375$

Keep the whole number, change only the fraction.

$-2\frac{1}{6} = -2.1\overline{6}$

The negative sign stays in front.

QUICK CHECK
Simplify the fraction, then factor the **denominator**:
only 2s and 5s → **terminating**
$16 = 2 \cdot 2 \cdot 2 \cdot 2$ ✔
any other prime → **repeating**
$33 = 3 \cdot 11$ ✘

Write each rational number in decimal form. Then determine whether the decimal is a terminating decimal.

1. $-\frac{11}{16} =$ _____

2. $\frac{5}{33} =$ _____

3. $4\frac{3}{8} =$ _____

4. $-9\frac{11}{30} =$ _____

5. One pint is about $\frac{5}{9}$ liter. Write $\frac{5}{9}$ as a decimal.

6. Phoebe won $\frac{7}{16}$ of the competitions she entered. Write $\frac{7}{16}$ as a decimal.

7. Write the decimal 5.666… as a mixed number in simplest form.

TEST PRACTICE

8. Multiselect Select all of the fractions that, when converted, result in a non-terminating decimal.

- ☐ $-\frac{11}{5}$
- ☐ $\frac{1}{50}$
- ☐ $\frac{1}{225}$
- ☐ $\frac{7}{26}$
- ☐ $\frac{5}{16}$
- ☐ $-\frac{3}{32}$

almanahj.com/ae

L2-1: Terminating and Repeating Decimals (continued)

FRQ FREE RESPONSE

Remember this!

REPEATING DECIMAL → FRACTION

Write $0.\overline{4}$ as a fraction.

1. $x = 0.444\ldots$
2. $10x = 4.\overline{444\ldots}$ ← 1 digit repeats → ×10 (2 digits → ×100)
3. $-\ x = 0.\overline{444\ldots}$ ← SUBTRACT the repeating parts cancel!

$9x = 4$ ← no decimals left

4. $x = \frac{4}{9}$ ← divide both sides by 9

TWO REPEATING DIGITS

$x = 0.\overline{27}$ → $100x = 27.\overline{2727\ldots}$

$99x = 27$ → $x = \frac{27}{99} = \frac{3}{11}$ simplify!

SHORTCUT TO CHECK

$0.\overline{a} = \frac{a}{9}$ $0.\overline{ab} = \frac{ab}{99}$

$0.\overline{7} = \frac{7}{9}$ $0.\overline{36} = \frac{36}{99} = \frac{4}{11}$

WHOLE NUMBER OR SIGN?

Keep them aside and change only the decimal part:

$-2.\overline{3} \rightarrow 0.\overline{3} = \frac{1}{3} \rightarrow -2\frac{1}{3}$

ALWAYS

Write the answer in **simplest form**: divide the top and bottom by their GCF.

Write each decimal as a fraction or mixed number in simplest form.

1. $0.\overline{8}$ = _____

2. $-0.\overline{18}$ = _____

3. $-1.\overline{5}$ = _____

4. $4.\overline{45}$ = _____

L2-2: Roots

MCQ

Remember this!

SQUARE ROOT

What number times **itself** gives this?

$\sqrt{49} = 7$

$7 \cdot 7 = 49$ ✔

$\sqrt{\frac{9}{16}} = \frac{3}{4}$ $\sqrt{1.96} = 1.4$ $-\sqrt{25} = -5$

SOLVING $x^2 = 49$ → TWO ANSWERS

$x = \pm\sqrt{49} = \pm 7$ because $7^2 = 49$ and $(-7)^2 = 49$

CUBE ROOT

What number used **3 times** gives this?

$\sqrt[3]{64} = 4$

$4 \cdot 4 \cdot 4 = 64$ ✔

$\sqrt[3]{-27} = -3$

$(-3)(-3)(-3) = -27$, so a cube root of a negative **is** allowed.

$s^3 = 125 \rightarrow s = \sqrt[3]{125} = 5$

NEGATIVE UNDER √ ?

$\sqrt{-16}$ = no real number

$(4)(4) = 16$ and $(-4)(-4) = 16$. No number times itself is negative.

PERFECT SQUARES

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225 …

PERFECT CUBES

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000

Simplify using rational numbers. If the expression cannot be simplified, explain why.

1. $\sqrt{361}$ = _____

2. $\pm\sqrt{1.96}$ = _____

3. $-\sqrt{\frac{9}{16}}$ = _____

4. $\sqrt{-441}$ = _____

5. Solve $m^2 = 0.04$. _____

Simplify using rational numbers.

6. $\sqrt[3]{343}$ = _____

7. $\sqrt[3]{-512}$ = _____

8. A basin of a water fountain is cube shaped and has a volume of 91.125 cubic feet. Solve $s^3 = 91.125$ to find the length s of one side of the basin.

9. Moesha has 196 pepper plants that she wants to plant in a square formation. How many pepper plants should she plant in each row?

TEST PRACTICE

10. Equation Editor What is the value of p in the equation shown?

$p^3 = -0.027$

p=

L2-3: Real Numbers

MCQ

Remember this!

REAL NUMBERS

RATIONAL $\frac{3}{4}$ $0.\overline{3}$ -2.5

INTEGERS -5 -1

WHOLE 0

NATURAL
1, 2, 3, ...

$\frac{7}{2}$
-0.25

IRRATIONAL

$\sqrt{2}$

π

$-\sqrt{10}$

$0.1010010001...$

IS IT RATIONAL?

Can it be written as a fraction $\frac{a}{b}$ of integers?

YES → RATIONAL
terminating or repeating decimals, integers, $\sqrt{81} = 9$

NO → IRRATIONAL
never ends & never repeats, $\sqrt{7}$, π

SIMPLIFY FIRST!
$\sqrt{}$ of a perfect square → rational
$\frac{\sqrt{2}}{\sqrt{2}} = 1$ → **rational**

Identify whether each number is *rational* or *irrational*.

1. $-\sqrt{10}$ _____

2. $-\frac{3}{11}$ _____

3. $0.\overline{3}$ _____

4. $\sqrt{81}$ _____

5. 0 _____

6. $-\frac{\sqrt{2}}{2}$ _____

7. $\sqrt{7}$ _____

8. $\frac{\sqrt{2}}{\sqrt{2}}$ _____

L2-3: Real Numbers (continued)

FRQ
FREE RESPONSE

Remember this!

A NUMBER CAN BELONG TO MORE THAN ONE SET

Natural → Whole → Integer → Rational → Real

every natural number is also whole, integer, rational and real

Irrational → Real

Number	Natural	Whole	Integer	Rational	Irrational
6	✔	✔	✔	✔	–
0	–	✔	✔	✔	–
-3	–	–	✔	✔	–
2.5	–	–	–	✔	–
$\sqrt{5}$	–	–	–	–	✔

TRUE OR FALSE?

True → explain why it always works.
False → give one **counterexample**: an example that breaks the statement.
"All whole numbers are natural." → **False**: 0 is whole but not natural.

SIMPLIFY FIRST

$\sqrt[3]{8} = 2$ → natural, whole, integer & rational

Select all the sets of numbers to which each real number belongs.

1. $\sqrt[3]{343}$

(A) Rational
(B) Irrational
(C) Integer
(D) Whole
(E) Natural

2. $\frac{7}{\sqrt{2}}$

(A) Rational
(B) Irrational
(C) Integer
(D) Whole
(E) Natural

3. $-\frac{7}{1}$

(A) Rational
(B) Irrational
(C) Integer
(D) Whole
(E) Natural

Determine whether each statement is *true* or *false*. If the statement is *true*, explain your reasoning. If the statement is *false*, provide a counterexample.

4. A number cannot be irrational and an integer.

5. All integers are rational.

L2-4: Estimate Irrational Numbers

MCQ

Remember this!

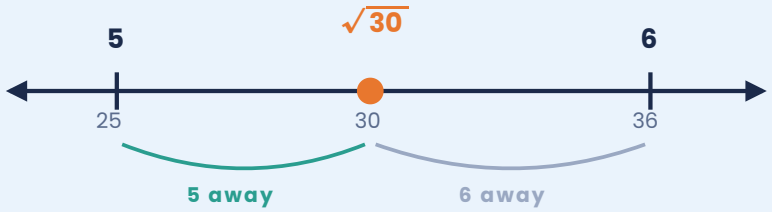
ESTIMATE $\sqrt{30}$: SANDWICH IT

Find the perfect squares just below and just above.

$$25 < 30 < 36$$

$$\sqrt{25} < \sqrt{30} < \sqrt{36}$$ ← take the $\sqrt{}$ of each

$$5 < \sqrt{30} < 6$$ ← so $\sqrt{30}$ is between 5 and 6



30 is closer to 25, so $\sqrt{30} \approx 5$

CUBE ROOT: SAME IDEA

Use perfect **cubes** instead.

$$27 < 50 < 64$$

$$3 < \sqrt[3]{50} < 4$$

64 − 50 = **14** · 50 − 27 = **23**
closer to 64, so $\sqrt[3]{50} \approx 4$

PERFECT SQUARES

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169

PERFECT CUBES

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000

≈ means "about equal to".

Estimate each square root or cube root to the nearest integer.

1. $\sqrt{125} \approx$ _____

2. $\sqrt{55} \approx$ _____

3. $\sqrt[3]{70} \approx$ _____

4. $\sqrt[3]{923} \approx$ _____

almanahj.com/ae

L2-5: Compare and Order Real Numbers

FRQ
FREE RESPONSE

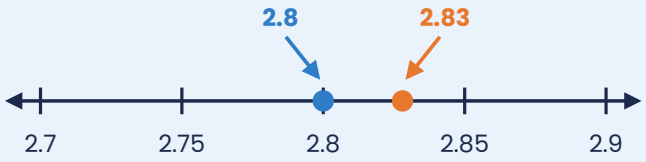
Remember this!

COMPARE $\sqrt{8}$ ___ $2\frac{4}{5}$

1. **Change each number to a decimal.**

   $\sqrt{8} \approx 2.83$ $\quad 2\frac{4}{5} = 2.8$

2. **Graph them.** The number on the **right** is greater.



3. **Write the symbol:** $\sqrt{8} > 2\frac{4}{5}$

USEFUL VALUES

$\pi \approx 3.14$ $\quad \pi^2 \approx 9.87$

$\sqrt{2} \approx 1.41$ $\quad \sqrt{3} \approx 1.73$ $\quad \sqrt{5} \approx 2.24$

Percent → ÷ 100: 150% = 1.5

NEGATIVES: CAREFUL!

Farther left = smaller.

$-3.5 < -3.2$ (-3.5 is farther from 0)

ORDER A SET

Change all to decimals, then list from **least** (left) to **greatest** (right).

Complete each statement using <, >, or =. Then graph the numbers on the number line.

1. $\sqrt{11}$ _____ $3\frac{2}{3}$



2. $\sqrt{3}$ _____ $\frac{\sqrt{10}}{2}$



3. $-\pi^2$ _____ $-\sqrt{93}$



4. $-\sqrt{12}$ _____ -320%



5. Order the set $\{3\frac{1}{2}, \frac{10}{3}, \pi, \sqrt{13}\}$ from least to greatest. Then graph the set on the number line.



L3-2: Write and Solve Equations with Variables on Each Side

MCQ

Remember this!

Ali has **$30** and saves **$5 each week**. Sara has **$50** and saves **$3 each week**. After how many weeks will they have **the same amount**?

Let w = number of weeks. Translate each part:

$30	$5 each week	the same	$50	$3 each week
↓	↓	↓	↓	↓
30	+ 5w	=	50	+ 3w

start / fee → the number alone **each / per** → number × variable
the same → = **drained / spent / costs per game** → **subtract** (-)

SOLVE: VARIABLES TO ONE SIDE

$30 + 5w = 50 + 3w$

$-3w \quad -3w$ — do the same to both sides

$30 + 2w = 50$

$-30 \quad -30$

$2w = 20$

$\div 2 \quad \div 2$

$w = 10$ weeks

CHECK ✔
$30 + 5(10) = \mathbf{80}$ and $50 + 3(10) = \mathbf{80}$

1. Marko has 45 comic books in his collection, and Tamara has 61 comic books. Marko buys 4 new comic books each month and Tamara buys 2 comic books each month. After how many months will Marko and Tamara have the same number of comic books?

2. A fish tank has 150 gallons of water and is being drained at a rate of $\frac{1}{2}$ gallon each second. A second fish tank has 120 gallons of water and is being filled at a rate of $\frac{1}{4}$ gallon each second. After how many seconds will the two fish tanks have the same amount of water?

3. Shipping Company A charges $14 plus $2.25 a pound to ship overnight packages. Shipping Company B charges $20 plus $1.50 a pound to ship an overnight package. For what weight is the charge the same for the two companies?

4. A bicycle rental company charges a $20 fee plus $5.50 per hour to rent a bicycle. Another bicycle rental company charges a $15 fee plus $6.50 per hour to rent a bicycle. For what number of hours is the cost for the rental the same?

TEST PRACTICE

5. Open Response Deanna and Lulu are playing games at the arcade. Deanna starts with $15, and the machine she is playing costs $0.75 per game. Lulu starts with $13, and her machine costs $0.50 per game. After how many games will the two friends have the same amount of money remaining? Let g represent the number of games.

Equation: _____ Number of Games: _____

L3-3: Solve Multi-Step Equations

MCQ

Remember this!

SOLVE STEP BY STEP

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

1	$3x - 6 + x = 2x + 10$	Distribute
2	$4x - 6 = 2x + 10$	Combine like terms
3	$2x - 6 = 10$	Variables one side ($-2x$)
4	$2x = 16$	Constants other side ($+6$)
5	$x = 8$	Divide by 2

Check ✔ $3(8 - 2) + 8 = \mathbf{26}$ and $2(8 + 5) = \mathbf{26}$

MINUS BEFORE ( )

Change **every** sign inside:
$20.5 - (3x + 10) = 20.5 - 3x - 10$

FRACTIONS

Distribute the fraction:
$\frac{1}{2}(4x + 6) = 2x + 3$
or multiply both sides by the **LCD** to clear them.

DECIMALS

Distribute as usual:
$0.6(4 - 2x) = 2.4 - 1.2x$

Solve each equation. Check your solution.

1. $-g + 2(3 + g) = -4(g + 1)$

2. $-8 - x = -3(2x - 4) + 3x$

3. $0.6(4 - 2x) = 20.5 - (3x + 10)$

4. $12 - (4y + 8) = 0.5(8y - 16)$

5. $\frac{1}{2}(-4 + 6n) = \frac{1}{3}n + \frac{2}{3}(n + 9)$

6. $\frac{1}{5}(5x - 5) + 3x = -9\left(\frac{1}{3}x + 4\right)$

TEST PRACTICE

7. Equation Editor Solve the equation shown for q.

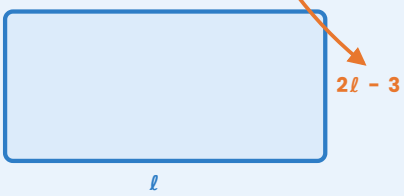
$2\left(\frac{1}{2}q + 1\right) = -3(2q - 1) + 8q + 4$ **q =**

L3-4: Write and Solve Multi-Step Equations

FRQ
FREE RESPONSE

Remember this!

The **width is 3 ft shorter than twice the length**. The **perimeter is 54 ft**. Find the length.



Perimeter = 2 lengths + 2 widths
$P = 2\ell + 2w$

$2\ell + 2(2\ell - 3) = 54$

$6\ell - 6 = 54 \rightarrow 6\ell = 60 \rightarrow \ell = 10$ ft

GROUPS: EACH PERSON PAYS...

12 members each pay **admission x** + **$2 parking**
Total = $12(x + 2)$ people × cost per person

KEY PHRASES

3 shorter / less than twice $\ell \rightarrow 2\ell - 3$ (order flips!)
1.5 times $x \rightarrow 1.5x$ · **twice as much** $\rightarrow 2\times$
spent the same / equal $\rightarrow =$

4 STEPS

Choose a variable → write the equation → solve → **check** in the story.

Write and solve an equation for each exercise. Check your solution.

1. Mr. Reed is drawing a blueprint of a rectangular patio. The width of the patio is $40\frac{3}{4}$ feet shorter than twice its length. The perimeter of the patio is $86\frac{1}{2}$ feet. What is the length of the patio?

2. The Yearbook Club is going to an amusement park, and each of their 12 members will pay for admission and will also help pay for parking. The Robotics Club is going to a waterpark, and each of their 14 members will pay for admission and will also purchase a meal ticket. Admission to the amusement park is 1.5 times that of the waterpark's admission, as shown in the table. If the total cost is the same at both the amusement park and the waterpark, what is the admission per student to the waterpark?

Amusement Park	Waterpark
Admission: $\$1.5x$ per student	Admission: $\$x$ per student
Parking: $2 per student	Meal Ticket: $10.50 per student

TEST PRACTICE

3. Open Response Arjun purchased 5 tickets to a play, each with the same price. He was also charged an online service fee of $3.50 per ticket. Emilia purchased 3 tickets to the same play and paid twice as much for her tickets as Arjun. Emilia was also charged a service fee of $2.75 per ticket. If they spent the same amount, what is the cost of each of the tickets Arjun purchased? Let t represent the cost of each of Arjun's tickets.

Equation: _____ Cost of a Ticket: _____

L3-5: Determine the Number of Solutions

MCQ

Remember this! **First simplify each side** to the form $ax + b$, then compare.

ONE SOLUTION

coefficients

$3x + 2 = x + 8$

constants

$x = 3$

different x-coefficients

NO SOLUTION

coefficients

$2x + 5 = 2x + 1$

constants

$5 = 1$ ✗ false

same coefficients, **different** constants

INFINITELY MANY

coefficients

$2x + 6 = 2x + 6$

constants

$6 = 6$ ✓ always true

same coefficients, **same** constants

Solve each equation. Determine whether the equation has one solution, no solution, or infinitely many solutions.

1. $4(x - 8) + 12 = 2(2x - 9)$

2. $3(2k - 5) = 6(k - 4) + 9$

3. $-4y - 3 = \frac{1}{3}(12y - 9) - 8y$

4. $6(3 - 5w) = 5(4 - 2w) - 20w$

Complete each equation so that it has infinitely many solutions.

5. $2x - 7(x + 10) = \square x - \square$

6. $12x - x + 8 + 3x = \square x + \square$

Complete each equation so that it has no solution.

7. $-15x + 4x + 2 - x = \square x + \square$

8. $9(x - 4) - 5x = \square x - \square$

TEST PRACTICE

9. Multiple Choice Which of the following explains why $\frac{2}{3}(x + 3) = \frac{2}{3}(x - 6)$ has no solution?

(A) The coefficients are different, and the constants are different.

(B) The coefficients are the same, and the constants are the same.

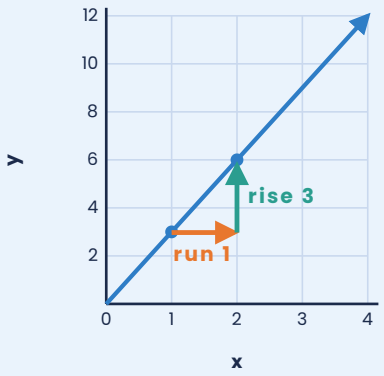
(C) The coefficients are different, and the constants are the same.

(D) The coefficients are the same, and the constants are different.

L4-1: Proportional Relationships and Slope

MCQ

Remember this!



PROPORTIONAL RELATIONSHIP

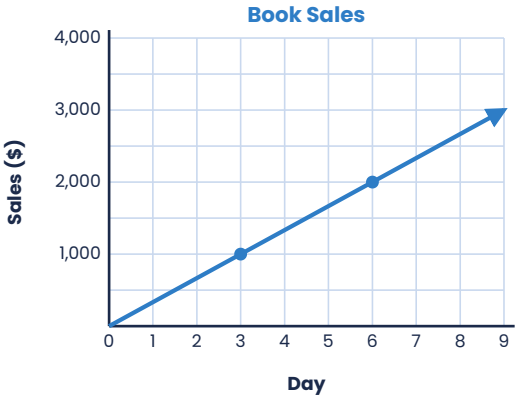
A **straight line** through the **origin (0, 0)**. Equation: $y = kx$

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{3}{1} = 3$$

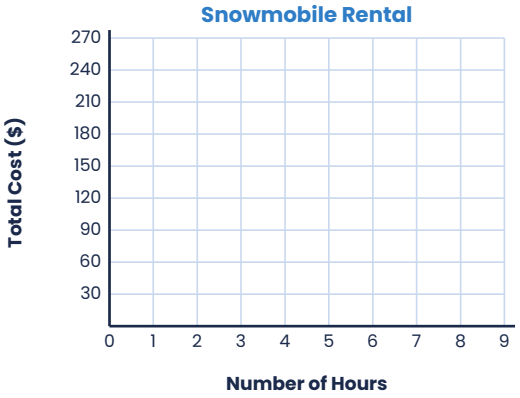
SLOPE = UNIT RATE = k

Interpret: for every **1** unit of x, y goes up by the slope.
Compare: the **steeper** line has the greater slope (rate).

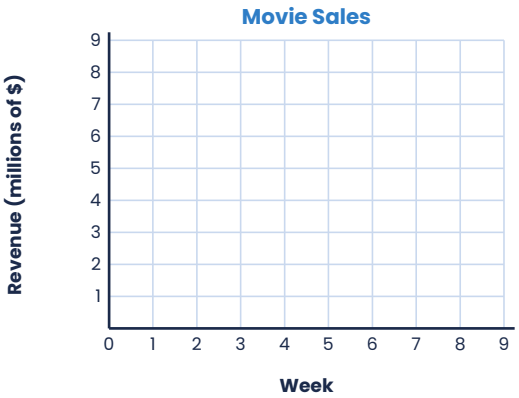
1. The graph shows the amount of book sales over several days. Find and interpret the slope. Then find the unit rate and compare it to the slope.



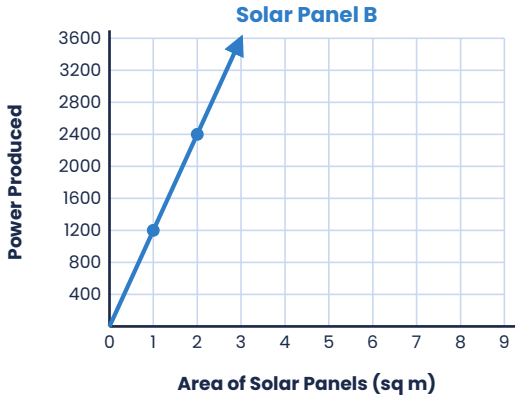
2. The cost y of renting a snowmobile for x hours is a proportional relationship. This can be represented by the equation $y = 33.75x$. Graph the equation. Then find and interpret the slope.



3. 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.



4. 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.



L4-2: Slope of a Line

MCQ

Remember this!

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$$ between **any two points** on the line.

EXAMPLE 1 · FROM A GRAPH

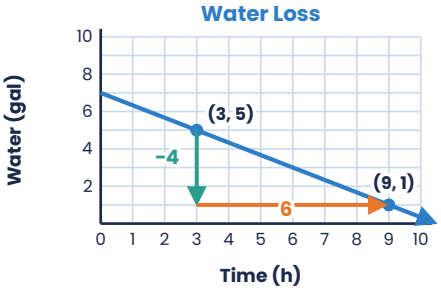
The graph shows the cost of muffins at a bake sale. Find the slope.



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

EXAMPLE 2 · FROM A GRAPH

The graph shows the water in a leaking bucket. Find the slope.



$$\text{slope} = \frac{-4}{6} = -\frac{2}{3}$$

Line goes **down** → slope is **negative**.

EXAMPLE 3 · FROM A TABLE

The points in the table lie on a line. Find the slope. Check your solution.

x	-6	-2	2	6
y	-2	-1	0	1

Use (-6, -2) and (-2, -1):

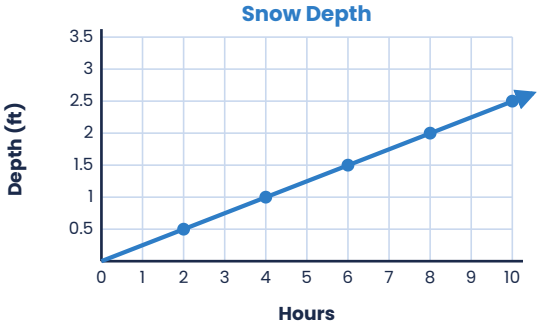
$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{-1-(-2)}{-2-(-6)} = \frac{1}{4}$$

Check ✔ with (6, 1) and (2, 0):

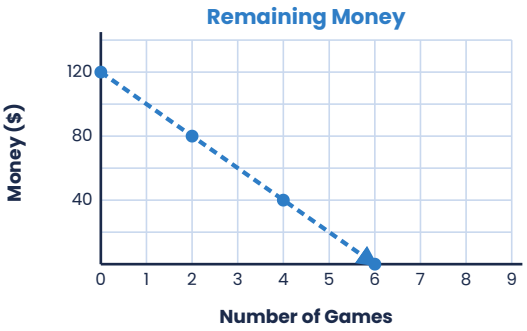
$$\frac{0-1}{2-6} = \frac{-1}{-4} = \frac{1}{4}$$

Same order on top and bottom.

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



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



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

x	-1	2	5	8
y	3	-1	-5	-9

Find the slope of the line that passes through each pair of points.

4. $M(3, 5)$, $N(2, 6)$

5. $G(-3, 2)$, $H(7, 2)$

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

TEST PRACTICE

7. Multiple Choice The points given in each table lie on lines. Which table, when graphed, would show a negative slope?

Ⓐ

x	-2	3	8	13
y	-2	-1	0	1

Ⓑ

x	-1	1	3	5
y	-2	0	2	4

Ⓒ

x	3	5	6	8
y	8	0	-4	-12

Ⓓ

x	-13	-9	-5	-1
y	-4	-2	0	2

L4-4: Direct Variation

MCQ

Remember this!

constant of variation
same as the slope and the unit rate

$$y = kx$$

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

Straight line **through (0, 0)**. Interpret k: for every **1** of x, y goes up by k.

FROM A TABLE OR GRAPH

x	y	$\frac{y}{x}$
1	5	5
2	10	5
4	20	5

divide y by x: always 5
so $y = 5x$

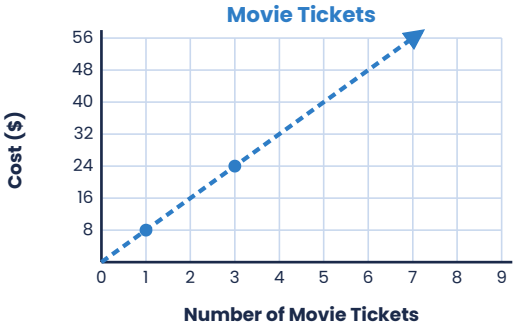
Graph: pick a point like (2, 10)
→ $k = \frac{10}{2} = 5$

FROM A STORY

4 notebooks cost $10.

1. $k = \frac{\text{cost}}{\text{number}} = \frac{10}{4} = 2.5$
2. Equation: $y = 2.5x$
3. Meaning: each notebook costs **$2.50**.

1. 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.



2. 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.



3. 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.

4. 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.

TEST PRACTICE

5. 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.

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

L4-5: Slope-Intercept Form

MCQ

Remember this!

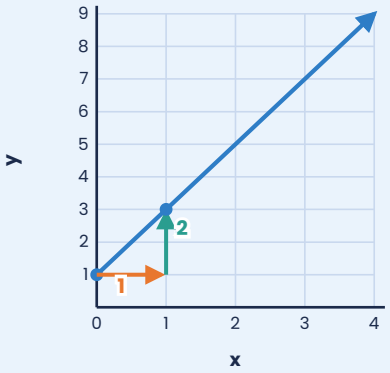
SLOPE
rise ÷ run

$$y = mx + b$$

Y-INTERCEPT
where the line crosses the y-axis

$y = 3x - 1 \rightarrow m = 3, b = -1$
$y = -x + 6 \rightarrow m = -1, b = 6$
Keep the sign with the number!

$y = 2x + 1$



Start at **(0, 1)**, then go **up 2**, **right 1**.

WRITE THE EQUATION
slope = $-\frac{2}{3}$, y-int = 5
Put them in place:
$y = -\frac{2}{3}x + 5$

NEGATIVE b?
slope = 4, y-int = -2
$y = 4x + (-2) \rightarrow y = 4x - 2$

Identify the slope and y-intercept of the graph of each equation.

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

2. $y = 3x - 1$

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

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

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

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

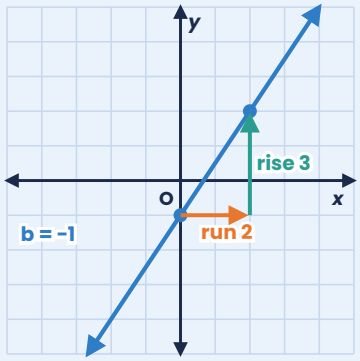
6. slope = -1, y-intercept = 6

L4-5: Slope-Intercept Form (continued)

FRQ
FREE RESPONSE

Remember this!

FROM A GRAPH



$m = \frac{3}{2}$, $b = -1 \rightarrow y = \frac{3}{2}x - 1$

FROM A STORY

A tank has ***50 L*** *and loses* ***4 L each hour****.*

b = the starting amount = **50**

m = the rate = **-4** (loses → negative)

***y* = -4*x* + 50**

Remaining / left / drains → slope is **negative**.

FROM A TABLE

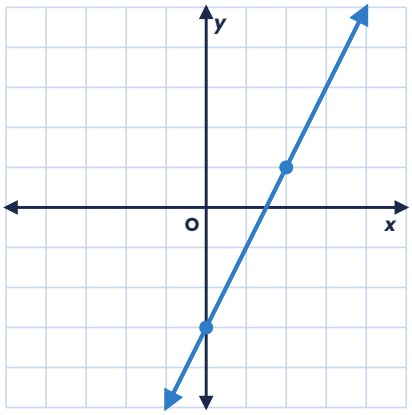
b = the *y*-value when ***x* = 0**

$m = \frac{\text{change in } y}{\text{change in } x}$

(0, 10), (1, 15), (2, 20)

$b = 10, m = \frac{5}{1} = 5 \rightarrow y = 5x + 10$

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



2. 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.

3. 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.

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

TEST PRACTICE

4. Multiselect Select all of the statements that are true about the equation $y = -\frac{3}{5}x + 8$.

- ☐ The slope of the line is negative.
- ☐ The slope of the line is 8.
- ☐ The *y*-intercept of the line is 8.
- ☐ The *y*-intercept of the line is $-\frac{3}{5}$.
- ☐ The slope of the line is $-\frac{3}{5}$.

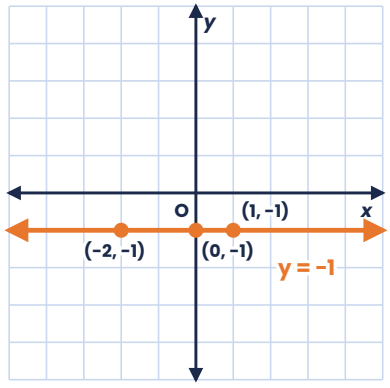
L4-6: Graph Linear Equations

MCQ

Remember this!

EXAMPLE 3 · GRAPH HORIZONTAL LINES

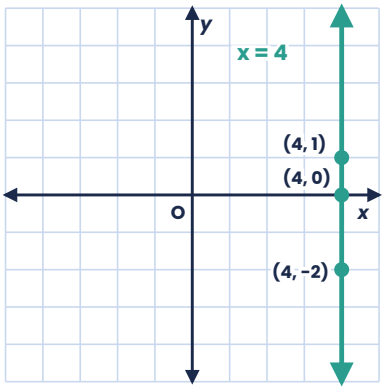
Graph $y = -1$. No matter what x is, y is **always -1**. All points look like $(x, -1)$.
Points: (-2, -1), (0, -1), (1, -1)



y = number → **horizontal** line ↔ (slope = 0)

EXAMPLE 4 · GRAPH VERTICAL LINES

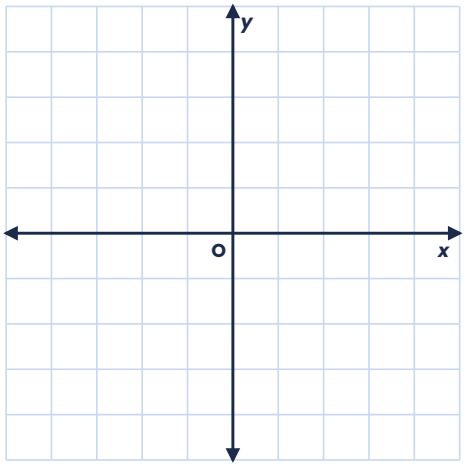
Graph $x = 4$. No matter what y is, x is **always 4**. All points look like $(4, y)$.
Points: (4, -2), (4, 0), (4, 1)



x = number → **vertical** line ↕ (slope undefined)

Graph each equation.

1. $y = -3$



2. $x = 2$

