Review: Matrices and Their Properties Day1
E-Learning

https://www.youtube.com/watch?v=OYKHpPZ37Os

Standards PC.NR.1.1

- Identify identity and zero matrices for any dimension.
- Add, subtract, and multiply matrices.
- Recognize that matrix multiplication is **not commutative**.
- Perform matrix operations (addition, subtraction, scalar multiplication) for matrices greater than 2×22 \times 22×2.

PC.NR.1.2

- Find additive and multiplicative inverses of square matrices.
- Use technology as appropriate.

PC.NR.1.3

- Explain the role of the determinant in determining whether a square matrix has a multiplicative inverse.

- **Learning Objectives**

By the end of this unit, I will be able to:

1. Identify and construct identity and zero matrices of any dimension.
2. Perform matrix addition, subtraction, scalar multiplication, and matrix multiplication when dimensions are appropriate.
3. Explain why matrix multiplication is not commutative.
4. Find the additive inverse of a matrix.
5. Determine whether a square matrix has a multiplicative inverse.
6. Explain how the determinant determines invertibility.

Lesson 1: Identity and Zero Matrices (PC.NR.1.1)

What happens when you add 0 to a number? What happens when you multiply a number by 1?

Zero Matrix (O): A matrix with all entries equal to 0

- Adding a zero matrix does not change a matrix

- **Identity Matrix (I):** A square matrix with 1s on the main diagonal and 0s elsewhere
  - Multiplying a matrix by the identity matrix leaves it unchanged

Write one sentence explaining why an identity matrix must be square.

Lesson 2: Matrix Operations & Non-Commutativity (PC.NR.1.1)

- **Addition & Subtraction:**
  - Only possible when matrices have the same dimensions
- **Scalar Multiplication:**
  - Multiply every entry by a constant
- **Matrix Multiplication:**
  - Columns of first matrix must match rows of second matrix

In general, $AB \neq BA$

Lesson 3: Matrix Inverses (PC.NR.1.2)

Review: What is the inverse of a number?

- **Additive Inverse:**

  $A+(-A)=O$

- **Multiplicative Inverse:**

  $A.A-1=I$

Conditions:

- Only **square matrices** can have multiplicative inverses
- Find additive inverses
- Identify whether a matrix has a multiplicative inverse

Lesson 4: Determinants and Invertibility (PC.NR.1.3)

True or False:

Every square matrix has an inverse.

- **Determinant:** A number associated with a square matrix
-

Key Concept: A square matrix has a multiplicative inverse **if and only if** its determinant is **not zero**.

Determinant = 0 → rows/columns are linearly dependent → no inverse

Quiz: Review – Matrices and Their Properties (Day 1)

Part A: Multiple Choice Questions (20 MCQs)

Choose the correct answer.

1. Which matrix is a zero matrix?
A. A matrix with 1s on the diagonal
B. A matrix with all entries equal to 0
C. Any square matrix
D. Any matrix with equal rows

2. Adding a zero matrix to a matrix A results in:
A. A zero matrix
B. The identity matrix
C. Matrix A
D. An undefined matrix

3. Which of the following best describes an identity matrix?
A. All entries are 1
B. All entries are 0
C. Square matrix with 1s on the diagonal and 0s elsewhere
D. A rectangular matrix

4. Why must an identity matrix be square?
A. To allow subtraction
B. To match dimensions during multiplication
C. To allow scalar multiplication
D. To find determinants

5. If A is a 3×2 matrix and B is a 2×4 matrix, what is the dimension of AB?
A. 2×2
B. 3×4

C. 4×3
D. Not defined

6. Matrix addition is possible only when:
A. Matrices are square
B. Matrices have the same dimensions
C. Determinants are equal
D. Matrices are invertible

7. Scalar multiplication means:
A. Adding a scalar to a matrix
B. Multiplying every entry by a constant
C. Multiplying two matrices
D. Finding the determinant

8. Which operation is **not** always defined for matrices?
A. Addition
B. Scalar multiplication
C. Matrix multiplication
D. Transposition

9. If A is a matrix, the additive inverse of A is:
A. A^{-1}
B. $-A$
C. I
D. 0

10. $A + (-A)$ equals:
A. I
B. $-I$
C. O
D. A

11. Matrix multiplication is **not commutative**, meaning:
A. $AB = BA$ always
B. $AB \neq BA$ in general
C. AB is undefined
D. BA is always zero

12. Which statement about matrix multiplication is true?
A. Rows of first must match rows of second
B. Columns of first must match columns of second
C. Columns of first must match rows of second
D. Both matrices must be square

13. Which matrices can have a multiplicative inverse?
A. All matrices
B. Only rectangular matrices
C. Only square matrices
D. Only zero matrices

14. If $AA^{-1} = I$, then A^{-1} is called the:
A. Additive inverse
B. Scalar inverse
C. Multiplicative inverse
D. Zero inverse

15. Which matrix has no multiplicative inverse?
A. Identity matrix
B. Matrix with determinant 1
C. Matrix with determinant -5
D. Matrix with determinant 0

16. The determinant is associated with:
A. Any matrix
B. Only rectangular matrices
C. Only square matrices
D. Only identity matrices

17. If $\det(A) \neq 0$, then matrix A:
A. Has no inverse
B. Is linearly dependent
C. Has a multiplicative inverse
D. Is a zero matrix

18. A determinant of zero indicates that the rows or columns are:
A. Independent
B. Invertible
C. Linearly dependent
D. Identity rows

19. True or False: Every square matrix has an inverse.
A. True
B. False

20. Which matrix leaves another matrix unchanged when multiplied?
A. Zero matrix
B. Identity matrix
C. Additive inverse
D. Transpose

Part B: Descriptive Questions (5 Questions)

1. Write one sentence explaining why an **identity matrix must be square**.

2. Explain why **matrix multiplication is not commutative**, using words or an example.

3. Define the **additive inverse of a matrix** and explain its purpose

4. What conditions must be satisfied for a matrix to have a **multiplicative inverse**?

5. Explain the **role of the determinant** in determining whether a square matrix is invertible.

E-Learning: Review Vectors Day 2

https://www.youtube.com/watch?v=iXdMpXMuEGI

https://www.youtube.com/watch?v=Ej3ZVxljJfo

Learning Objectives

I will be able to:

- Represent vector quantities as **directed line segments**
- Identify **magnitude and direction** of vectors
- Write vectors in **component form**
- Add, subtract, and scale vectors **graphically and algebraically**
- Apply vectors to **real-life contexts** (velocity, force, displacement)

Prior Knowledge Required

- Coordinate plane
- Distance formula
- Basic trigonometry (optional but helpful)

Digital Tools

- Desmos Graphing Calculator
- GeoGebra
- Interactive slides / LMS
- Online whiteboard

PC.NR.2.1: Vector Representation
Key Concepts

- **Vector:** Quantity with **magnitude and direction**
- **Scalar:** Quantity with magnitude only (speed, mass)
- Vectors shown as **directed line segments**

Representation	Example
Bold face	**v**
Arrow notation	$\rightarrow v$
Component form	$\langle 3, 4 \rangle$

Magnitude Formula

- Arrow starting at (0,0) and ending at (3,4)
- Length represents magnitude
- Arrowhead shows direction

Practice

1. Draw vector $\langle -2, 5 \rangle$ on a coordinate plane
2. Find its magnitude

🔷 PC.NR.2.2: Components & Vector Addition

🧩 Methods of Vector Addition

1 Tail-to-Head Method

- Place tail of vector B at head of vector A
- Resultant goes from tail of A to head of B

2 Component-Wise Method

3 Parallelogram Law

- Place vectors tail-to-tail
- Diagonal of parallelogram is resultant

Diagram Description

- Two arrows from origin
- Parallelogram formed
- Diagonal labeled resultant

Practice

Add $\langle 4, -1 \rangle$ and $\langle -2, 3 \rangle$ using:

- Graphical method
- Component method

🔷 PC.NR.2.3: Real-Life Vector Vocabulary

- Velocity
- Force
- Displacement
- Resultant

Example 1: Velocity

A boat moves:

- 6 km/h east → $\langle 6, 0 \rangle$
- 4 km/h north → $\langle 0, 4 \rangle$

Example 2: Force

Two forces act on an object:

- $\langle 10, 0 \rangle$ N
- $\langle -3, 6 \rangle$ N

Find the net force.

- Why is direction important in forces?
- Can two large forces cancel each other?

◆ PC.NR.2.4: Vector Operations (Algebraic & Graphical)

Vector Addition & Subtraction

Subtraction Rule

$\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$

Example

$\langle 5,2 \rangle - \langle 1,4 \rangle = \langle 4,-2 \rangle$

Scalar Multiplication

Rule

$k\langle x,y \rangle = \langle kx,ky \rangle$

Example

$3\langle -2,1 \rangle = \langle -6,3 \rangle$

Diagram Description

- Original vector
- Scaled vector (longer or reversed if negative)

Independent Practice

1. Graph $\langle -3, 2 \rangle$ and $\langle 4, -1 \rangle$
2. Find:
   - Their sum
   - Their difference
   - 2 × first vector

why vector addition is **not commutative graphically**

PART A: Multiple Choice Questions (20 Questions)

PC.NR.2.1 – Vector Representation

1. Which of the following quantities is a vector?
A. Speed
B. Distance
C. Temperature
D. Velocity

2. A vector is best represented as:
A. A number line
B. A point on a plane
C. A directed line segment
D. A curve

3. The magnitude of vector ⟨3, 4⟩ is:
A. 5
B. 7
C. √7
D. 25

4. Which notation correctly represents a vector?
A. |v|
B. v^2
C. **v**
D. $\bar{v}$

5. A vector with zero magnitude is called:
A. Unit vector
B. Zero vector
C. Scalar
D. Direction vector

PC.NR.2.2 – Components & Vector Addition

6. The component form of a vector from (1, 2) to (5, 6) is:
A. ⟨4, 4⟩
B. ⟨–4, –4⟩
C. ⟨6, 8⟩
D. ⟨5, 6⟩

7. If A = ⟨2, –1⟩ and B = ⟨–3, 4⟩, then A + B equals:
A. ⟨–1, 3⟩
B. ⟨5, –5⟩

C. ⟨–6, –4⟩
D. ⟨1, 3⟩

8. Which method places the tail of one vector at the head of another?
A. Parallelogram law
B. Component method
C. Tail-to-head method
D. Scalar method

9. The parallelogram law of vector addition results in:
A. A scalar
B. A diagonal vector
C. Two vectors
D. A zero vector

10. Vector addition is:
A. Always commutative
B. Never commutative
C. Only graphical
D. Only algebraic

PC.NR.2.3 – Real-Life Applications

11. Which situation best represents a vector quantity?
A. Temperature change
B. Speed of a car
C. Wind blowing east at 20 km/h
D. Time taken to travel

12. Velocity is different from speed because it includes:
A. Distance
B. Time
C. Direction
D. Mass

13. Two forces acting on an object are best combined using:
A. Scalar addition
B. Vector addition
C. Multiplication
D. Averaging

14. A plane flying north at 300 km/h and east at 400 km/h has a resultant velocity of:
A. ⟨700, 0⟩
B. ⟨300, 400⟩

C. ⟨–300, 400⟩
D. ⟨400, 300⟩

PC.NR.2.4 – Vector Operations

15. Which expression represents vector subtraction?
A. A + B
B. A – B
C. A + (–B)
D. B – A

16. If A = ⟨4, –2⟩, then –A equals:
A. ⟨–4, 2⟩
B. ⟨4, 2⟩
C. ⟨–2, 4⟩
D. ⟨2, –4⟩

17. What happens when a vector is multiplied by 3?
A. Direction changes
B. Magnitude triples
C. Vector becomes scalar
D. Vector reverses

18. Which of the following is a scalar multiple of ⟨2, –3⟩?
A. ⟨4, –6⟩
B. ⟨–3, 2⟩
C. ⟨2, 3⟩
D. ⟨6, –2⟩

19. Graphically, vector subtraction is done by:
A. Removing the arrow
B. Adding the opposite vector
C. Drawing only one vector
D. Using magnitude only

20. Which method uses both algebra and geometry?
A. Scalar method
B. Component method
C. Parallelogram method
D. Guess-and-check

🟨 PART B: Graphic Organizer–Based Questions

1️⃣ Vector Representation Organizer

Complete the table:

Vector	Component Form	Magnitude	Direction
From (0,0) to (3,4)	_____	_____	_____

2️⃣ Tail-to-Head Diagram Organizer

- Draw vector A = ⟨2, 1⟩
- Draw vector B = ⟨3, –2⟩ using the **tail-to-head method**
- Draw and label the resultant vector

3️⃣ Parallelogram Law Organizer

- Sketch two vectors from the origin
- Complete the parallelogram
- Identify and label the resultant vector

4️⃣ Component Method Flow Chart

Fill in the steps:

1. Write vectors in _____ form
2. Add/Subtract _____ components
3. Combine results to get _____ vector

5️⃣ Real-Life Vector Organizer

Complete the concept map:

Situation: Boat crossing a river

- Velocity of boat → _____
- Velocity of river → _____

- Resultant velocity → _____

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6 $calar Multiplication Organizer

Draw and compare:

- Vector A
- 2A
- –A

Describe changes in:

- Magnitude
- Direction

E Learning PC.NR.3.1 – Complex Numbers in Rectangular and Polar Form Day 3

https://youtu.be/CLfX2UEeU0E

Learning Objectives

- Represent complex numbers on the complex plane.
- Write complex numbers in rectangular and polar form.
- Convert between rectangular and polar forms.
- Explain why both forms represent the same complex number.

Key Concepts & Definitions

Complex Number: A number of the form $z = a + bi$, where $i = \sqrt{-1}$.

Real Part: a

Imaginary Part: b

Rectangular Form: $a + bi$

Polar Form: $r(\cos\theta + i \sin\theta)$

Modulus: $r = \sqrt{(a^2 + b^2)}$

Argument: $\theta = \tan^{-1}(b/a)$

Solved Examples

Example 1:

Convert $z = 3 + 4i$ to polar form.

$r = \sqrt{(3^2 + 4^2)} = 5$

$\theta = \tan^{-1}(4/3)$

$z = 5(\cos\theta + i \sin\theta)$

Example 2:

Convert $z = 4(\cos 30° + i \sin 30°)$ to rectangular form.

$z = 4(\sqrt{3}/2 + i \cdot 1/2) = 2\sqrt{3} + 2i$

Practice: Multiple Choice Questions, (Show your work: 10 points)

1. Imaginary unit i equals:
A) $\sqrt{1}$ B) $\sqrt{-1}$ C) -1 D) 0

2. Real part of $5 - 3i$ is:
A) -3 B) i C) 5 D) 3

3. Modulus of $3 + 4i$ is:
A) 7 B) 25 C) 5 D) 1

4. Which axis represents imaginary numbers?
A) x-axis B) y-axis C) z-axis D) origin

5. Polar form uses:
A) Coordinates B) Distance & angle C) Scalars D) Matrices

6. Argument of $1 + 0i$ is:
A) 90° B) 45° C) 0° D) 180°

7. Modulus of $-6 + 8i$ is:
A) 10 B) 14 C) 2 D) 100

8. Rectangular form is:
A) $r(\cos\theta + i \sin\theta)$ B) $a + bi$ C) $\sqrt{(a^2+b^2)}$ D) (r,θ)

9. Complex plane is similar to:
A) Number line B) Coordinate plane C) Matrix D) Graph only

10. Polar form represents:
A) x & y B) r & θ C) slope D) vector only

11. Value of r for 1 + i is:
A) 1 B) √2 C) 2 D) 0

12. Imaginary part of −2 − 5i is:
A) −2 B) −5 C) 5 D) i

13. Point (0,4) represents:
A) 4 B) 4i C) −4i D) 0

14. Argument is measured from:
A) y-axis B) x-axis C) origin D) imaginary axis

15. Modulus is always:
A) negative B) zero C) positive or zero D) imaginary

16. Polar and rectangular forms represent:
A) different numbers B) same number C) inverse D) conjugate

17. Which is purely imaginary?
A) 5 B) 3 + i C) 4i D) −2

18. Which is real?
A) 0 + 7i B) 6 + 0i C) i D) −3i

19. tanθ equals:
A) a/b B) b/a C) r/a D) a/r

20. r represents:
A) angle B) imaginary part C) distance from origin D) slope

Descriptive Questions

1. Define a complex number and explain its parts.

2. Explain representation of complex numbers on the complex plane.

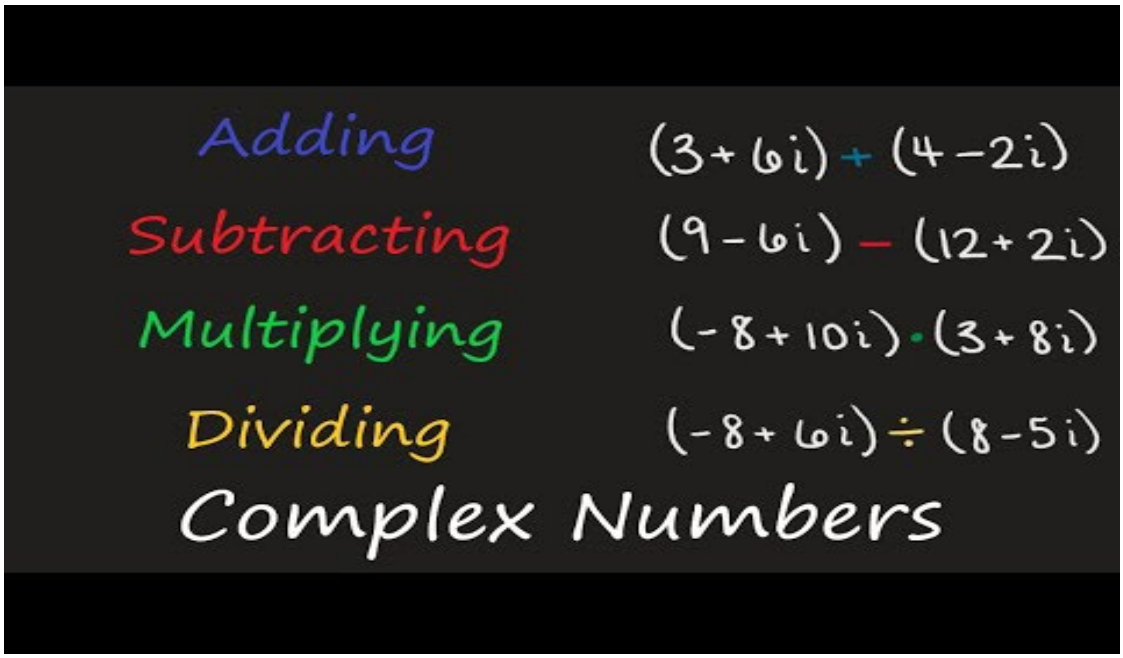
3. Convert $z = -4 + 4i$ to polar form.

4. Convert $z = 6(\cos 60° + i \sin 60°)$ to rectangular form.

5. Explain why rectangular and polar forms represent the same number.

E-Learning: Complex Numbers (PC.NR.3.2) Day 4

https://youtu.be/wQnXN0xljR0



Standard: PC.NR.3.2

Learning Objectives:
Students will be able to:
• Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane.
• Use geometric properties for computation.
• Interpret results of operations using vector and polar representations.

Prerequisite Knowledge:

- Rectangular form of complex numbers (a + bi)
- Complex plane and plotting points

Concept Explanation with Examples

1. Addition of Complex Numbers (Geometric):

Addition corresponds to vector addition on the complex plane.

Example:

$z1 = 2 + 3i, \quad z2 = 1 - i$

$z1 + z2 = (2+1) + (3-1)i = 3 + 2i$

Geometrically, place vectors head-to-tail.

2. Subtraction of Complex Numbers:

Subtraction corresponds to adding the negative vector.

Example:

$z1 - z2 = (2 - 1) + (3 + 1)i = 1 + 4i$

3. Multiplication of Complex Numbers:

Multiplication involves rotation and scaling.

Example:

$z1 = 1 + i, z2 = 1 - i$

$z1 \times z2 = (1 + i)(1 - i) = 1 - i^2 = 2$

4. Conjugation of Complex Numbers:

The conjugate reflects the point across the real axis.

Example:

$z = 3 - 4i$

Conjugate $= 3 + 4i$

Multiple Choice Questions (20)

(Show your work: 10 points)

1. What is the geometric meaning of adding two complex numbers?

A. Rotation

B. Reflection

C. Vector addition

D. Scaling

2. The conjugate of $5 - 2i$ is:

A. $-5 + 2i$

B. $5 + 2i$

C. $-5 - 2i$

D. $2 - 5i$

3. If $z = 2 + 3i$, then $\overline{z}$ equals:

A. $2 - 3i$

B. $-2 + 3i$

C. $3 + 2i$

D. $-2 - 3i$

4. Which operation reflects a complex number across the real axis?

A. Addition

B. Subtraction

C. Multiplication

D. Conjugation

5. The product of (1 + i)(1 + i) is:

A. 1 + i

B. 2i

C. 2

D. 0

Multiple Choice Questions (20)

1. Geometrically, a complex number is represented on the complex plane as a
A. Line
B. Vector from the origin
C. Circle
D. Triangle

---

2. The geometric representation of addition of two complex numbers corresponds to
A. Rotation
B. Reflection
C. Vector addition
D. Scalin

---

3. If $z_1 = 2 + 3i$ and $z_2 = 1 - i$, then $z_1 + z_2$ equals
A. 3 + 2i
B. 1 + 4i
C. 3 − 2i
D. 1 − 4i

---

4. Subtraction of a complex number z_2 from z_1 is geometrically equivalent to
A. Reflecting z_1
B. Adding the conjugate of z_2
C. Adding the negative of z_2
D. Rotating z_1

---

5. The point representing the conjugate of a complex number is obtained by
A. Reflecting across the imaginary axis
B. Reflecting across the real axis
C. Rotating 90° clockwise
D. Translating left

---

6. The conjugate of $-3 + 5i$ is
A. $3 - 5i$
B. $-3 - 5i$
C. $5 - 3i$
D

---

7. Multiplication of complex numbers geometrically represents
A. Only reflection
B. Only translation
C. Rotation and scaling
D. Vector addition

---

8. Multiplying any complex number by i results in
A. Reflection across real axis
B. Rotation of 90° anticlockwise
C. Rotation of 180°
D. Scaling only

---

9. If z = 1 + i, then iz equals
A. 1 − i
B. −1 + i
C. −1 − i
D. i − 1

---

10. The product (1 + i)(1 − i) equals

---

11. The magnitude of a complex number remains unchanged under
A. Addition
B. Subtraction
C. Conjugation
D Multiplication

---

12. Which of the following represents subtraction geometrically?
A. Head-to-tail vectors
B. Reflection
C. Rotation
D. Adding the opposite vect

---

13. The complex number z and its conjugate $\bar{z}$ are always
A. Perpendicular
B. On opposite sides of imaginary axis
C. Symmetric about the real axis
D. Equal

---

14. The result of multiplying a complex number by −1 is
A. Reflection across real axis
B. Reflection across imaginary axis

C. Rotation by 180°
D. Scaling by 2

---

15. If z = 4 − 3i, the point lies in which quadrant?
A. First
B. Second
C. Third
D. Fourth

---

16. The sum of two complex numbers corresponds to
A. Diagonal of a parallelogram
B. Radius of a circle
C. Tangent of an angle
D. Reflection line

Answer: A

---

17. Which operation changes the argument but not the modulus?
A. Addition
B. Subtraction
C. Conjugation
D. Multiplication

Answer: C

---

18. The geometric effect of multiplying two complex numbers depends on
A. Only their real parts
B. Only their imaginary parts
C. Their magnitudes and arguments
D. Their sign

---

19. If $z = a + bi$, then $z + \bar{z}$ equals
A. 2bi
B. 2a
C. $a^2 + b^2$

---

20. Which of the following is true for complex number addition?
A. It changes magnitude only
B. It represents rotation
C. It follows vector addition laws
D. It reflects points

Descriptive Questions (5)

1. Explain geometrically how complex number addition works on the complex plane with an example

2. Describe the geometric effect of multiplying a complex number by i.

3. Explain how subtraction of complex numbers can be represented geometrically.

4. Show step by step how to find the conjugate of a complex number and explain its geometric meaning.

5. Solve and represent geometrically:
$(2 + i)(1 - i)$

-Learning Lesson: Law of Sines & Law of Cosines

Standard: PC.MGSR.2.2

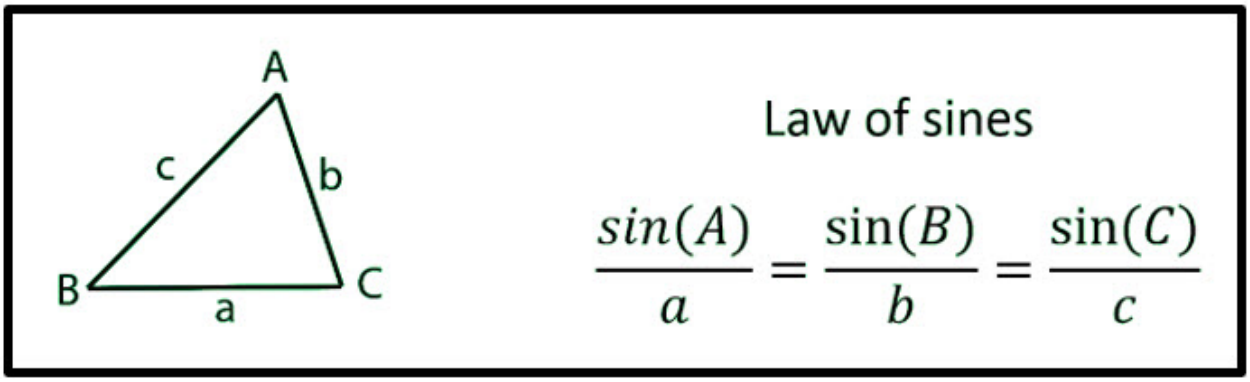
🎯 Learning Objectives

Students will be able to:

- Prove the **Law of Sines** and **Law of Cosines**
- Apply both laws to **right and non-right triangles**
- Identify appropriate situations to use each law
- Solve real-world triangle measurement problems

🔷 1. Law of Sines

AAS, ASA	Law of Sines
SSA	Law of Sines (Ambiguous Case)
SAS, SSS	Law of Cosines

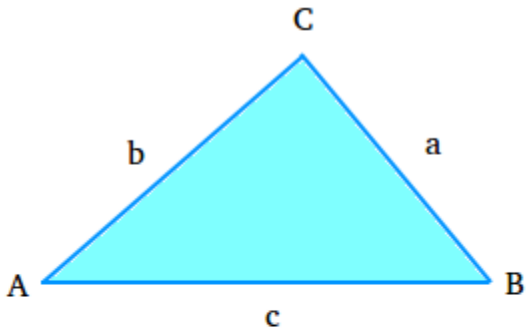


Used when:

- ASA, AAS, or SSA cases

🔷 Proof of Law of Sines

🔷 2. Law of Cosines



$a^2 = b^2 + c^2 - 2bc\ \cos(A)$

$b^2 = a^2 + c^2 - 2ac\ \cos(B)$

$c^2 = a^2 + b^2 - 2ab\ \cos(C)$

Law of cosines

Used when:

- SAS or SSS cases
- Non-right triangles

If a, b, and c are the lengths of the sides of a triangle, and A, B, and C are the measures of the angles opposite these sides, then

$a^2 = b^2 + c^2 - 2bc\ \cos(A)$

$b^2 = a^2 + c^2 - 2ac\ \cos(B)$

$c^2 = a^2 + b^2 - 2ab\ \cos(C)$

Notice what happens when C = 90 degrees

$c^2 = a^2 + b^2 - 2ab\ \cos(90)$

$c^2 = a^2 + b^2$ since $\cos(90) = 0$

The Cosine Rule is a generalization of the Pythagorean theorem so that the formula works for any triangle.

When should you use the Law of Cosines?

We use the Law of Cosines to solve an oblique triangle or any triangle that is not a right triangle. When solving an oblique triangle, you are trying to find the lengths of the three sides and the measures of the three angles of the oblique triangle.

Solving an SAS triangle or Side-Angle-Side triangle

If two sides and the included angle (**SAS**) of an oblique triangle are known, then none of the three ratios in the Law of Sines is known. Therefore you must first use the law of cosines to find the third side or the side opposite the given angle. Follow the three steps below to solve an oblique triangle.

1. Use the Law of Cosines to find the side opposite the given angle
2. Use either the Law of Sines or the Law of Cosines again to find another angle
3. Find the third angle by subtracting the measure of the given angle and the angle found in step 2 from 180 degrees.

Solving an SSS triangle or Side-Side-Side triangle

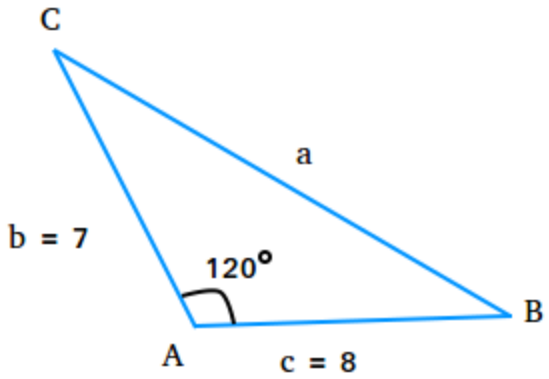
If three sides (**SSS**) are known, solving the triangle means finding the three angles. Follow the following three steps to solve the oblique triangle.

1. Use the law of cosines to find the largest angle opposite the longest side
2. Use either the Law of Sines or the Law of Cosines again to find another angle
3. Find the third angle by subtracting the measure of the angles found in step 1 and step 2 from 180 degrees.

Examples showing how to use the Law of Cosines

Example #1:

Solve the triangle shown below with A = 120 degrees, b = 7, and c = 8.



$a^2 = b^2 + c^2 - 2bc \cos(A)$

$a^2 = 7^2 + 8^2 - 2(7)(8) \cos(120)$

$a^2 = 49 + 64 - 2(56)(-0.5)$

$a^2 = 113 + 1(56)$

$a^2 = 113 + 56$

$a^2 = 169$

$a = \sqrt{169} = 13$

Use the Law of Sines to find angle C

$\sin C / c = \sin A / a$

$\sin C / 8 = \sin 120 / 13$

$\sin C / 8 = 0.866 / 13$

$\sin C / 8 = 0.0666$

Example: https://youtu.be/ckx8V6tfaOk

Example 1 (Law of Sines)

In ΔABC, A = 30°, B = 60°, a = 10 cm. Find b.

Example 2 (Law of Cosines)

Find side c if a = 6 cm, b = 8 cm, C = 60°.

📝 20 Multiple Choice Questions (MCQs)

1. The Law of Sines is best used when triangle data is
A) SSS
B) SAS
C) ASA
D) RHS

2. Formula of Law of Cosines is
A

3. Law of Cosines reduces to Pythagoras theorem when
A) Angle = 45°
B) Angle = 60°
C) Angle = 90°
D) Angle = 30°

4. Which case may give two solutions using Law of Sines?
A) SAS
B) ASA
C) SSA
D) SSS

5. If a = b in a triangle, then
A) A = B
B) B = C
C) A = C
D) Triangle is right-angled

6–20: (Cover applications, choosing correct law, calculation-based MCQs)
✔

✍ 5 Descriptive Questions (With Solutions)

Q1. Prove the Law of Sines.

Q2. Prove the Law of Cosines

Q3. Find the third side of a triangle with sides 7 cm, 9 cm and included angle 120°.

Q4

Q5. A surveyor measures two sides of a triangular field as 50 m and 70 m with included angle 40°. Find the third side.