# Grade 10 Mathematics Presentation Script

## Equivalent Vectors

### Pre-Class Preparation

**Materials Checklist:**

- Graph paper (one sheet per student)
- Rulers (one per student)
- Pencils and colored markers
- Large coordinate plane drawn on board or chart paper
- Prepared examples on chart paper
- Tracing paper (optional, for struggling learners)

**Room Setup:**

- Draw a large coordinate plane on the board
- Prepare graph paper and rulers for distribution
- Have colored markers ready for demonstrations
- Prepare example vectors on chart paper
- Write definition of equivalent vectors on the board for reference

### Phase 1: Problem-Solving and Discovery (15 minutes)

**Opening Hook (2 minutes)**

[DO] Draw two arrows on the board at different positions but same length and direction.

[SAY] Look at these two arrows. Are they the same?

[WAIT] Expected: They look the same but are in different places!

[SAY] Exactly! Today we will learn about equivalent vectors.

[SAY] Can two vectors be equal even if they start at different positions?

[SAY] Equivalent vectors are used in physics, engineering, and computer graphics.

**Anchor Activity Launch (3 minutes)**

[DO] Distribute graph paper, rulers, and pencils to each student.

[SAY] Here is your challenge: You will discover when two vectors are equivalent.

[SAY] Here is what you will do:

[WRITE] On the board: Step 1: Draw x and y axes.

[WRITE] Step 2: Plot A(0, 4), B(3, 4), C(0, 2), D(3, 2).

[WRITE] Step 3: Draw vector AB with arrow pointing to B.

[WRITE] Step 4: Draw vector CD with arrow pointing to D.

[WRITE] Step 5: Do they look like clones of each other?

[WRITE] Step 6: Imagine sliding AB down. Does it overlap CD?

[WRITE] Step 7: Calculate lengths and compare directions.

[WRITE] Step 8: Discuss what relationship exists between them.

[SAY] Work individually first, then discuss with your neighbor.

[SAY] You have 8 minutes.

**Student Work Time (8 minutes)**

[DO] Circulate among students.

[ASK] To a student: What is the length of AB?

[WAIT] Expected: 3 units!

[SAY] Good! What is the length of CD?

[WAIT] Expected: Also 3 units!

[SAY] Perfect! Do they point in the same direction?

[WAIT] Expected: Yes, both point to the right!

[SAY] Excellent! Can you slide AB to overlap CD?

[WAIT] Expected: Yes, without rotating!

[DO] For struggling students: Let us measure together. Use your ruler.

[DO] For early finishers: Draw another vector equivalent to AB at a different position!

**Class Discussion (2 minutes)**

[DO] Call on 2-3 students to share their findings.

[ASK] What did you discover about these vectors?

[WAIT] Expected: They have the same length and direction! They can overlap!

[SAY] Excellent! These are called equivalent vectors.

[SAY] Today we will formalize this concept.

## Phase 2: Structured Instruction (10 minutes)

**Formalizing Equivalent Vectors (10 minutes)**

[SAY] Now that you have explored equivalent vectors, let us formalize what we learned.

[WRITE] On the board: Equivalent Vectors

[SAY] Definition: Two or more vectors are equivalent if they satisfy two conditions:

[WRITE] 1. They have same magnitude (length)

[WRITE] 2. They point in the same direction

[ASK] In our activity, did AB and CD meet these conditions?

[WAIT] Expected: Yes!

[SAY] Correct!

[SAY] Important Points:

[WRITE] Equivalent vectors do NOT need to start at the same point

[WRITE] Equivalent vectors do NOT need to end at the same point

[WRITE] Equivalent vectors MUST have the same length

[WRITE] Equivalent vectors MUST point in the same direction

[ASK] Does everyone understand?

[WAIT] Check for nods or questions.

[SAY] Visual Test:

[SAY] If you can slide one vector without rotating so it perfectly overlaps another, they are equivalent.

[DO] Demonstrate with two cut-out arrows on the board.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

**Addressing Misconceptions:**

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: Equivalent vectors must start at the same point. No, they can start anywhere.

[SAY] Mistake 2: Same magnitude but opposite directions are equivalent. No, direction must also be the same.

[SAY] Mistake 3: Same direction but different magnitudes are equivalent. No, magnitude must also be the same.

[SAY] Mistake 4: Equivalent and equal mean different things. No, they mean the same for vectors.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

## Phase 3: Practice and Application (10 minutes)

**Worked Examples (10 minutes)**

[SAY] Let us work through examples together.

[WRITE] Example 1: Is it possible for two vectors to have the same direction but not be equivalent?

[SAY] Yes, if they have different magnitudes.

[SAY] Example: Vectors (2, 0) and (4, 0) point right but have different lengths.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

[WRITE] Example 2: Draw two vectors that have the same magnitude and direction but start at different points.

[DO] Draw vector from (0, 0) to (3, 2) on the board.

[DO] Draw vector from (5, 5) to (8, 7) on the board.

[SAY] Both have magnitude sqrt(13) and point in the same direction.

[WRITE] Example 3: Are vectors (3, 4) and (3, 4) equivalent?

[SAY] Yes, same magnitude (5) and same direction.

[ASK] Any questions?

[WAIT] Address questions.

## Phase 4: Assessment (5 minutes)

**Exit Ticket**

[SAY] Before we finish, I want to check your understanding. Please complete the exit ticket individually.

[DO] Display questions on the board.

[SAY] Question 1: Define equivalent vectors in your own words.

[SAY] Question 2: Draw two equivalent vectors on a coordinate plane that start at different points.

[SAY] Question 3: Are vectors from A(1, 2) to B(4, 6) and from C(0, 0) to D(3, 4) equivalent? Explain.

[SAY] Question 4: Can two vectors have the same magnitude but not be equivalent? Give an example.

[SAY] You have 5 minutes. Show your work!

**Closing (1 minute)**

[SAY] Today we learned about equivalent vectors.

[SAY] We learned that equivalent vectors have the same magnitude and direction.

[SAY] Position does not matter for equivalence.

[SAY] Equivalent vectors are used in physics, engineering, and computer graphics.

[SAY] Next lesson, we will explore vectors in real-life applications.

[SAY] Great work today!

## Differentiation Notes

**For Struggling Learners:**

- Provide pre-drawn vectors.
- Use color coding.
- Provide tracing paper.
- Start with horizontal/vertical vectors.
- Use physical arrows.

**For Advanced Learners:**

- Explore 3D equivalent vectors.
- Investigate parallel lines.
- Apply to physics problems.
- Prove component equality.
- Explore computer graphics applications.

## Post-Lesson Reflection Prompts

- Did students discover equivalence conditions?
- Were students able to identify equivalent vectors?
- What misconceptions emerged, and how were they addressed?
- Did students understand position independence?
- What adjustments would improve this lesson?