

FIND THE DISTANCE BETWEEN THE POINTS (7,9) AND (2,4).

FIND THE DISTANCE BETWEEN THE POINTS (7,9) AND (2,4). UNDERSTANDING HOW TO CALCULATE THE DISTANCE BETWEEN TWO POINTS ON A COORDINATE PLANE IS A FUNDAMENTAL SKILL IN MATHEMATICS, ESPECIALLY IN GEOMETRY AND ALGEBRA. THIS PROCESS NOT ONLY HELPS IN SOLVING VARIOUS MATHEMATICAL PROBLEMS BUT ALSO HAS PRACTICAL APPLICATIONS IN FIELDS SUCH AS PHYSICS, ENGINEERING, COMPUTER GRAPHICS, AND NAVIGATION. IN THIS ARTICLE, WE WILL EXPLORE THE STEP-BY-STEP PROCESS OF FINDING THE DISTANCE BETWEEN THE POINTS (7, 9) AND (2, 4), ALONG WITH AN IN-DEPTH DISCUSSION OF THE CONCEPTS INVOLVED, THE FORMULA USED, AND REAL-WORLD APPLICATIONS.

UNDERSTANDING COORDINATES AND THE COORDINATE PLANE

BEFORE DIVING INTO THE CALCULATION, IT'S ESSENTIAL TO UNDERSTAND THE BASICS OF THE COORDINATE PLANE AND HOW POINTS ARE REPRESENTED.

WHAT ARE COORDINATES?

COORDINATES ARE PAIRS OF NUMBERS THAT DEFINE THE POSITION OF A POINT IN A TWO-DIMENSIONAL SPACE. THEY ARE WRITTEN IN THE FORMAT (x, y) , WHERE:

- X-COORDINATE: INDICATES THE POSITION ALONG THE HORIZONTAL AXIS (THE X-AXIS).
- Y-COORDINATE: INDICATES THE POSITION ALONG THE VERTICAL AXIS (THE Y-AXIS).

THE COORDINATE PLANE

THE COORDINATE PLANE CONSISTS OF TWO PERPENDICULAR AXES:

- THE X-AXIS RUNS HORIZONTALLY.
- THE Y-AXIS RUNS VERTICALLY.

THESE AXES INTERSECT AT A POINT CALLED THE ORIGIN $(0, 0)$.

WHEN PLOTTING POINTS SUCH AS $(7, 9)$ AND $(2, 4)$, EACH COORDINATE PAIR INDICATES A SPECIFIC LOCATION RELATIVE TO THE ORIGIN.

THE DISTANCE FORMULA

THE KEY TO CALCULATING THE DISTANCE BETWEEN TWO POINTS IN A PLANE IS THE DISTANCE FORMULA, WHICH IS DERIVED FROM

APPLYING THE DISTANCE FORMULA TO OUR POINTS

GIVEN:

- POINT A: (7, 9)
- POINT B: (2, 4)

PLUGGING INTO THE FORMULA:

$$\sqrt{D = \sqrt{(2 - 7)^2 + (4 - 9)^2}}$$

CALCULATING STEP-BY-STEP:

1. HORIZONTAL DIFFERENCE: $\sqrt{2 - 7 = -5}$
2. VERTICAL DIFFERENCE: $\sqrt{4 - 9 = -5}$
3. SQUARE BOTH DIFFERENCES:
 - $\sqrt{(-5)^2 = 25}$
 - $\sqrt{(-5)^2 = 25}$
4. SUM THE SQUARES:
 - $\sqrt{25 + 25 = 50}$
5. TAKE THE SQUARE ROOT:
 - $\sqrt{D = \sqrt{50}}$

SIMPLIFY:

$$\sqrt{D = \sqrt{50} = \sqrt{25 \times 2} = 5 \sqrt{2}}$$

THUS, THE EXACT DISTANCE BETWEEN THE POINTS IS $5 \sqrt{2}$ UNITS.

CALCULATING THE NUMERIC VALUE

WHILE THE EXACT FORM IS $5 \sqrt{2}$, IT'S OFTEN USEFUL TO HAVE A DECIMAL APPROXIMATION.

- SINCE $\sqrt{2} \approx 1.4142$,
- THE DISTANCE IS APPROXIMATELY:
 $5 \times 1.4142 \approx 7.071$

THEREFORE, THE APPROXIMATE DISTANCE BETWEEN THE POINTS (7, 9) AND (2, 4) IS 7.07 UNITS.

VISUALIZING THE POINTS AND THE DISTANCE

PLOTTING THE TWO POINTS ON A COORD

PRACTICAL APPLICATIONS OF DISTANCE CALCULATION

UNDERSTANDING HOW TO COMPUTE THE DISTANCE BETWEEN TWO POINTS IS VITAL ACROSS VARIOUS DISCIPLINES AND REAL-WORLD SCENARIOS:

NAVIGATION AND GPS

GPS DEVICES USE COORDINATE SYSTEMS TO DETERMINE THE SHORTEST PATH BETWEEN TWO LOCATIONS, WHICH INVOLVES CALCULATING STRAIGHT-LINE DISTANCES.

ENGINEERING AND DESIGN

ENGINEERS OFTEN NEED TO MEASURE DISTANCES BETWEEN POINTS IN A DESIGN OR BLUEPRINT TO ENSURE ACCURACY.

COMPUTER GRAPHICS

RENDERING IMAGES AND ANIMATIONS OFTEN INVOLVES CALCULATING DISTANCES BETWEEN PIXELS OR OBJECTS.

PHYSICS

DETERMINING THE DISPLACEMENT OF OBJECTS MOVING IN A PLANE INVOLVES SIMILAR CALCULATIONS.

DATA ANALYSIS AND MACHINE LEARNING

MANY ALGORITHMS RELY ON DISTANCE METRICS TO EVALUATE SIMILARITIES OR DIFFERENCES BETWEEN DATA POINTS.

EXTENSIONS AND RELATED CONCEPTS

BEYOND CALCULATING THE DISTANCE BETWEEN TWO POINTS, THERE ARE RELATED CONCEPTS AND EXTENSIONS WORTH EXPLORING:

DISTANCE IN 3D SPACE

THE FORMULA EXTENDS TO THREE DIMENSIONS AS:

$$\sqrt{D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}}$$

WHERE POINTS ARE IN THE FORM (x, y, z).

MANHATTAN DISTANCE

SUMMARY AND KEY TAKEAWAYS

- THE DISTANCE BETWEEN TWO POINTS IN A PLANE CAN BE CALCULATED USING THE EUCLIDEAN DISTANCE FORMULA:
$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
- FOR THE POINTS (7, 9) AND (2, 4), THE EXACT DISTANCE IS $5\sqrt{2}$, APPROXIMATELY 7.07 UNITS.
- VISUALIZING POINTS AND THEIR CONNECTING SEGMENT HELPS IN UNDERSTANDING THE CONCEPT.
- DISTANCE CALCULATION IS FUNDAMENTAL IN VARIOUS FIELDS, FROM NAVIGATION TO COMPUTER GRAPHICS.

FINAL THOUGHTS

MASTERING THE PROCESS OF FINDING THE DISTANCE BETWEEN TWO POINTS IS AN ESSENTIAL STEP IN DEVELOPING MATHEMATICAL LITERACY AND PRACTICAL PROBLEM-SOLVING SKILLS. IT ENHANCES SPATIAL REASONING AND PROVIDES A FOUNDATION FOR MORE ADVANCED TOPICS LIKE VECTOR ANALYSIS, COORDINATE GEOMETRY, AND SPATIAL DATA ANALYSIS. WHETHER YOU'RE A STUDENT, EDUCATOR, ENGINEER, OR DATA SCIENTIST, UNDERSTANDING AND APPLYING THE DISTANCE FORMULA OPENS DOORS TO NUMEROUS APPLICATIONS AND DEEPER MATHEMATICAL INSIGHTS.

IF YOU WANT TO PRACTICE FURTHER, TRY CALCULATING DISTANCES BETWEEN DIFFERENT POINTS, OR EXPLORE HOW THESE CONCEPTS EXTEND INTO 3D SPACE AND BEYOND.

FREQUENTLY ASKED QUESTIONS

HOW DO YOU FIND THE DISTANCE BETWEEN THE POINTS (7, 9) AND (2, 4)?

USE THE DISTANCE FORMULA: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. SUBSTITUTE THE COORDINATES TO GET $\sqrt{(2 - 7)^2 + (4 - 9)^2} = \sqrt{(-5)^2 + (-5)^2} = \sqrt{25 + 25} = \sqrt{50} \approx 7.07$.

WHAT IS THE DISTANCE BETWEEN THE POINTS (7, 9) AND (2, 4)?

THE DISTANCE IS APPROXIMATELY 7.07 UNITS.

CAN YOU EXPLAIN THE STEPS TO CALCULATE THE DISTANCE BETWEEN (7, 9) AND (2, 4)?

SPACE?

IN 3D SPACE, THE DISTANCE FORMULA EXTENDS TO INCLUDE THE Z-COORDINATES. SINCE ONLY 2D POINTS ARE GIVEN, THE 3D DISTANCE WOULD REQUIRE Z-VALUES. FOR THE CURRENT POINTS, THE DISTANCE REMAINS APPROXIMATELY 7.07 IN 2D.

HOW CAN I VERIFY MY CALCULATION OF THE DISTANCE BETWEEN (7, 9) AND (2, 4)?

YOU CAN DOUBLE-CHECK BY CAREFULLY REAPPLYING THE DISTANCE FORMULA STEP-BY-STEP OR USE A GRAPHING TOOL TO MEASURE THE STRAIGHT-LINE DISTANCE BETWEEN THE POINTS VISUALLY.

WHAT IS THE IMPORTANCE OF UNDERSTANDING HOW TO FIND THE DISTANCE BETWEEN TWO POINTS?

IT IS FUNDAMENTAL IN COORDINATE GEOMETRY, PHYSICS, AND ENGINEERING FOR CALCULATING LENGTHS, DISTANCES, AND DESIGNING SPATIAL RELATIONSHIPS.

CAN I USE A CALCULATOR TO FIND THE DISTANCE BETWEEN (7, 9) AND (2, 4)?

YES. INPUT THE DIFFERENCES IN COORDINATES INTO THE CALCULATOR: $\sqrt{[(2 - 7)^2 + (4 - 9)^2]}$ TO GET THE APPROXIMATE DISTANCE, WHICH IS ABOUT 7.07.

ADDITIONAL RESOURCES

DISTANCE CALCULATION: THE ESSENTIAL GUIDE TO FINDING THE DISTANCE BETWEEN TWO POINTS (7,9) AND (2,4)

WHEN EXPLORING THE FASCINATING WORLD OF COORDINATE GEOMETRY, ONE FUNDAMENTAL CONCEPT STANDS OUT AS BOTH PRACTICAL AND INTELLECTUALLY STIMULATING: DETERMINING THE DISTANCE BETWEEN TWO POINTS ON A PLANE. WHETHER YOU'RE A STUDENT TACKLING YOUR FIRST MATH PROBLEMS, A TEACHER GUIDING LEARNERS THROUGH THE BASICS, OR A PROFESSIONAL APPLYING GEOMETRY IN REAL-WORLD SCENARIOS, UNDERSTANDING HOW TO ACCURATELY COMPUTE THIS DISTANCE IS INDISPENSABLE. IN THIS COMPREHENSIVE GUIDE, WE'LL DISSECT THE PROCESS STEP-BY-STEP, FOCUSING SPECIFICALLY ON THE POINTS (7,9) AND (2,4), AND EXPLORE THE UNDERLYING PRINCIPLES, FORMULAS, AND APPLICATIONS THAT MAKE THIS TASK BOTH STRAIGHTFORWARD AND POWERFUL.

PLOTTING THE POINTS

- THE POINT $(7,9)$ IS LOCATED 7 UNITS ALONG THE X-AXIS AND 9 UNITS UP ALONG THE Y-AXIS.
- THE POINT $(2,4)$ IS LOCATED 2 UNITS ALONG THE X-AXIS AND 4 UNITS UP ALONG THE Y-AXIS.

VISUALIZING THESE POINTS ON THE PLANE HELPS IN UNDERSTANDING THEIR RELATIVE POSITION AND THE PATH TO MEASURE THE DISTANCE.

THE DISTANCE FORMULA: DERIVATION AND EXPLANATION

THE CORE OF OUR DISCUSSION IS THE DISTANCE FORMULA, A DIRECT CONSEQUENCE OF THE PYTHAGOREAN THEOREM. THIS FORMULA ENABLES US TO COMPUTE THE STRAIGHT-LINE (EUCLIDEAN) DISTANCE BETWEEN ANY TWO POINTS IN A PLANE.

ORIGINS OF THE DISTANCE FORMULA

- THE DISTANCE FORMULA STEMS FROM THE PYTHAGOREAN THEOREM, WHICH RELATES THE LENGTHS OF THE SIDES IN A RIGHT-ANGLED TRIANGLE.
- WHEN TWO POINTS ARE CONNECTED, THE DIFFERENCE IN THEIR X-COORDINATES AND Y-COORDINATES CAN BE SEEN AS THE LEGS OF A RIGHT TRIANGLE, WITH THE DISTANCE BETWEEN THE POINTS AS THE HYPOTENUSE.

THE DISTANCE FORMULA

GIVEN TWO POINTS $((x_1, y_1))$ AND $((x_2, y_2))$, THE DISTANCE (d) BETWEEN THEM IS:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

THIS ELEGANT FORMULA ENCAPSULATES THE ESSENCE OF THE PYTHAGOREAN THEOREM IN A SIMPLE, EASY-TO-APPLY EXPRESSION.

APPLYING THE FORMULA TO SPECIFIC POINTS $(7,9)$ AND $(2,4)$

NOW THAT WE UNDERSTAND THE FOUNDATION, LET'S APPLY THE FORMULA TO OUR SPECIFIC POINT

$$- \left((\Delta y)^2 = (-5)^2 = 25 \right)$$

4. SUM THE SQUARES:

$$- \left(25 + 25 = 50 \right)$$

5. TAKE THE SQUARE ROOT TO FIND THE DISTANCE:

$$\begin{aligned} & \left[\right. \\ D &= \sqrt{50} = \sqrt{25 \times 2} = 5 \sqrt{2} \\ & \left. \right] \end{aligned}$$

RESULT:

$$\begin{aligned} & \left[\right. \\ & \boxed{ \\ D &= 5 \sqrt{2} \approx 7.07 \\ & } \\ & \left. \right] \end{aligned}$$

THIS PRECISE AND EXACT VALUE—EXPRESSED AS $(5\sqrt{2})$ —PROVIDES BOTH A CLEAN ALGEBRAIC FORM AND AN APPROXIMATE DECIMAL FOR PRACTICAL PURPOSES.

UNDERSTANDING THE RESULT: INSIGHTS AND IMPLICATIONS

THE COMPUTED DISTANCE, APPROXIMATELY 7.07 UNITS, OFFERS MORE THAN A MERE NUMBER; IT EMBODIES SPATIAL RELATIONSHIPS AND GEOMETRIC PRINCIPLES.

SIGNIFICANCE OF THE RESULT

- EUCLIDEAN DISTANCE: THIS IS THE "AS-THE-CROW-FLIES" DISTANCE, THE SHORTEST PATH CONNECTING THE TWO POINTS.
- APPLICATIONS:
 - IN NAVIGATION AND GPS TECHNOLOGY FOR DETERMINING SHORTEST ROUTES.
 - IN ROBOTICS FOR OBSTACLE AVOIDANCE.
 - IN DATA ANALYSIS FOR MEASURING SIMILARITY OR PROXIMITY.

PROPERTIES HIGHLIGHTED BY THE CALCULATION

$$D_{\{\text{MANHATTAN}\}} = |x_2 - x_1| + |y_2 - y_1| = 5 + 5 = 10$$

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- USED IN GRID-BASED PATHFINDING, SUCH AS CITY BLOCK NAVIGATION.

Chebyshev Distance

- THE MAXIMUM OF THE ABSOLUTE DIFFERENCES:

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$$D_{\{\text{CHEBYSHEV}\}} = \max(|x_2 - x_1|, |y_2 - y_1|) = 5$$

\]

- RELEVANT IN CONTEXTS WHERE MOVEMENT IS ALLOWED IN ALL DIRECTIONS AT THE SAME COST.

3D AND HIGHER DIMENSIONS

- THE FORMULA EXTENDS NATURALLY TO THREE OR MORE DIMENSIONS, ADDING ADDITIONAL SQUARED DIFFERENCES FOR EACH COORDINATE.

PRACTICAL APPLICATIONS AND REAL-WORLD SCENARIOS

UNDERSTANDING HOW TO FIND THE DISTANCE BETWEEN POINTS IS FUNDAMENTAL ACROSS MANY FIELDS. HERE ARE SOME PRACTICAL EXAMPLES:

- GEOGRAPHY AND MAPPING: CALCULATING STRAIGHT-LINE DISTANCES BETWEEN LOCATIONS.
- COMPUTER GRAPHICS: DETERMINING THE PROXIMITY OF OBJECTS OR PIXELS.
- ENGINEERING: MEASURING THE LENGTH OF COMPONENTS IN DESIGNS.
- DATA SCIENCE: COMPUTING SIMILARITY METRICS IN HIGH-DIMENSIONAL DATA SPACES.
- NAVIGATION SYSTEMS: ESTIMATING SHORTEST PATHS AND TRAVEL DISTANCES.

Find The Distance Between The Points 7 9 And 2 4

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