

FIND THE EQUATION OF A LINE PASSING THROUGH $(-7, 9)$ WITH A SLOPE OF -5 .

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UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE GIVEN A POINT AND A SLOPE IS A FUNDAMENTAL SKILL IN COORDINATE GEOMETRY. THIS PROCESS INVOLVES APPLYING THE POINT-SLOPE FORM OF A LINEAR EQUATION, WHICH PROVIDES AN EFFICIENT WAY TO DETERMINE THE PRECISE EQUATION OF THE LINE THAT PASSES THROUGH A SPECIFIC POINT WITH A KNOWN SLOPE. IN THIS ARTICLE, WE WILL EXPLORE THE STEP-BY-STEP METHOD TO FIND THE EQUATION OF A LINE PASSING THROUGH THE POINT $(-7, 9)$ WITH A SLOPE OF -5 , AND DELVE INTO RELATED CONCEPTS TO DEEPEN YOUR UNDERSTANDING OF LINES IN THE COORDINATE PLANE.

UNDERSTANDING THE BASICS OF A LINE IN COORDINATE GEOMETRY

BEFORE WE DELVE INTO THE PROCESS OF FINDING THE EQUATION, IT'S ESSENTIAL TO GRASP SOME FUNDAMENTAL CONCEPTS RELATED TO LINES IN THE COORDINATE PLANE.

WHAT IS A LINE IN THE COORDINATE PLANE?

A LINE IN THE COORDINATE PLANE IS A STRAIGHT, INFINITELY EXTENDING FIGURE THAT CONNECTS TWO POINTS WITH A CONSTANT SLOPE. IT IS DEFINED MATHEMATICALLY BY AN EQUATION THAT RELATES THE X-COORDINATE AND Y-COORDINATE OF ANY POINT LYING ON IT.

KEY COMPONENTS OF A LINE EQUATION

- SLOPE (m): THE MEASURE OF THE STEEPNESS OF THE LINE, INDICATING HOW MUCH y CHANGES FOR A UNIT CHANGE IN x .
- POINT (x_1, y_1): A SPECIFIC POINT THROUGH WHICH THE LINE PASSES.
- LINE EQUATION: THE MATHEMATICAL EXPRESSION THAT DESCRIBES THE LINE, TYPICALLY IN POINT-SLOPE, SLOPE-INTERCEPT, OR GENERAL FORM.

UNDERSTANDING THE SLOPE-POINT FORM OF A LINE EQUATION

THE MOST STRAIGHTFORWARD APPROACH TO FIND THE EQUATION OF A LINE GIVEN A POINT AND A SLOPE IS USING THE POINT-SLOPE FORM.

POINT-SLOPE FORM EQUATION

$$\boxed{y - y_1 = m(x - x_1)}$$

WHERE:

- $((x_1, y_1))$ IS A POINT ON THE LINE.
- (m) IS THE SLOPE OF THE LINE.

THIS FORM IS PARTICULARLY USEFUL BECAUSE IT DIRECTLY INCORPORATES THE KNOWN POINT AND SLOPE, MAKING IT EASY TO DERIVE THE SPECIFIC EQUATION QUICKLY.

STEP-BY-STEP: FINDING THE EQUATION OF THE LINE

NOW, LET'S APPLY THIS KNOWLEDGE TO FIND THE LINE PASSING THROUGH $(-7, 9)$ WITH A SLOPE OF -5 .

STEP 1: IDENTIFY THE KNOWN VALUES

- POINT: $((-7, 9))$
- SLOPE: $(m = -5)$

STEP 2: WRITE THE POINT-SLOPE EQUATION

SUBSTITUTE THE KNOWN VALUES INTO THE POINT-SLOPE FORM:

$$y - 9 = -5(x - (-7))$$

SIMPLIFY THE EXPRESSION INSIDE THE PARENTHESES:

$$y - 9 = -5(x + 7)$$

STEP 3: SIMPLIFY AND CONVERT TO SLOPE-INTERCEPT FORM

DISTRIBUTE THE SLOPE:

$$y - 9 = -5x - 35$$

ADD 9 TO BOTH SIDES TO SOLVE FOR Y:

$$y = -5x - 35 + 9$$

$$y = -5x - 26$$

THIS IS THE SLOPE-INTERCEPT FORM OF THE LINE EQUATION:

$$\boxed{y = -5x - 26}$$

UNDERSTANDING THE COMPONENTS OF THE FINAL EQUATION

THE EQUATION $(y = -5x - 26)$ PROVIDES A COMPLETE DESCRIPTION OF THE LINE PASSING THROUGH THE POINT $(-7, 9)$ WITH A SLOPE OF -5 .

SLOPE (M): -5

- INDICATES THE LINE DECREASES BY 5 UNITS IN Y FOR EACH INCREASE OF 1 UNIT IN X.
- THE NEGATIVE SIGN CONFIRMS THE LINE IS DECREASING OR SLOPING DOWNWARD FROM LEFT TO RIGHT.

Y-INTERCEPT (B): -26

- THE POINT WHERE THE LINE CROSSES THE Y-AXIS.
- FOUND DIRECTLY FROM THE SLOPE-INTERCEPT FORM, WHERE $(b = -26)$.

GRAPHICAL INTERPRETATION

- THE LINE CROSSES THE Y-AXIS AT $((0, -26))$.
- PASSES THROUGH THE POINT $((-7, 9))$, CONFIRMING THE ACCURACY OF THE EQUATION.

ALTERNATIVE FORMS OF THE LINE EQUATION

WHILE THE SLOPE-INTERCEPT FORM IS OFTEN PREFERRED FOR GRAPHING AND INTERPRETATION, OTHER FORMS ARE USEFUL DEPENDING ON THE CONTEXT.

STANDARD FORM

$$Ax + By = C$$

TO CONVERT $(y = -5x - 26)$ INTO STANDARD FORM:

$$5x + y = -26$$

THIS FORM IS BENEFICIAL FOR CERTAIN ALGEBRAIC OPERATIONS, SUCH AS SOLVING SYSTEMS OF EQUATIONS.

GENERAL FORM

$$Ax + By + C = 0$$

REARRANGED FROM THE STANDARD FORM:

$$5x + y + 26 = 0$$

VISUALIZING THE LINE

GRAPHING THE LINE PROVIDES A VISUAL CONFIRMATION OF THE EQUATION AND HELPS IN UNDERSTANDING ITS BEHAVIOR.

STEPS TO GRAPH THE LINE

1. PLOT THE Y-INTERCEPT $((0, -26))$.
2. USE THE SLOPE (-5) TO FIND A SECOND POINT:
 - FROM $((0, -26))$, MOVE 1 UNIT RIGHT (X INCREASES BY 1) AND 5 UNITS DOWN (Y DECREASES BY 5), LANDING AT $((1, -31))$.
3. DRAW A STRAIGHT LINE THROUGH THESE POINTS, EXTENDING IN BOTH DIRECTIONS.

PRACTICAL APPLICATIONS OF FINDING A LINE EQUATION

KNOWING HOW TO FIND THE EQUATION OF A LINE THROUGH A POINT WITH A GIVEN SLOPE HAS NUMEROUS REAL-WORLD APPLICATIONS:

- ENGINEERING: DESIGNING INCLINED PLANES OR RAMPS.
- PHYSICS: DESCRIBING THE MOTION OF OBJECTS WITH CONSTANT VELOCITY.
- ECONOMICS: MODELING TRENDS OVER TIME.
- DATA ANALYSIS: FITTING LINES TO DATA POINTS FOR PREDICTIONS.

COMMON MISTAKES AND TIPS

TO ENSURE ACCURACY, WATCH OUT FOR THE FOLLOWING COMMON ERRORS:

- MISPLACING SIGNS: REMEMBER THAT THE SLOPE AND INTERCEPT SIGNS ARE CRITICAL.
- INCORRECT SUBSTITUTION: DOUBLE-CHECK THE POINT COORDINATES WHEN PLUGGING INTO THE FORMULA.
- FORGETTING TO SIMPLIFY: ALWAYS SIMPLIFY THE FINAL EQUATION TO THE PREFERRED FORM FOR CLARITY.

TIPS:

- ALWAYS VERIFY YOUR FINAL EQUATION BY SUBSTITUTING THE KNOWN POINT INTO IT.
- PRACTICE CONVERTING BETWEEN DIFFERENT FORMS OF LINE EQUATIONS FOR VERSATILITY.

SUMMARY

FINDING THE EQUATION OF A LINE PASSING THROUGH A SPECIFIC POINT WITH A KNOWN SLOPE IS A STRAIGHTFORWARD PROCESS ROOTED IN THE POINT-SLOPE FORM. GIVEN THE POINT $(-7, 9)$ AND THE SLOPE OF -5 , THE EQUATION IN SLOPE-INTERCEPT FORM IS:

$$\boxed{y = -5x - 26}$$

THIS EQUATION PRECISELY DESCRIBES THE LINE'S BEHAVIOR, INCLUDING ITS STEEPNESS AND WHERE IT CROSSES THE Y-AXIS. MASTERING THIS TECHNIQUE ENHANCES YOUR UNDERSTANDING OF LINEAR FUNCTIONS AND PREPARES YOU TO ANALYZE MORE COMPLEX GEOMETRIC AND ALGEBRAIC PROBLEMS.

FAQs ABOUT FINDING LINE EQUATIONS

Q1: CAN I FIND THE EQUATION OF A LINE IF I ONLY KNOW TWO POINTS?

A1: YES. YOU CAN CALCULATE THE SLOPE USING THE TWO POINTS, THEN USE EITHER POINT IN THE POINT-SLOPE FORM TO DERIVE THE EQUATION.

Q2: HOW DO I FIND THE EQUATION OF A LINE PARALLEL OR PERPENDICULAR TO A GIVEN LINE?

A2: FOR PARALLEL LINES, USE THE SAME SLOPE. FOR PERPENDICULAR LINES, USE THE NEGATIVE RECIPROCAL OF THE ORIGINAL SLOPE.

Q3: WHAT IF THE POINT GIVEN IS NOT ON THE LINE I WANT TO FIND?

A3: YOU NEED ADDITIONAL INFORMATION, SUCH AS THE SLOPE OR ANOTHER POINT, TO DETERMINE THE SPECIFIC LINE.

CONCLUSION:

ACCURATELY FINDING THE EQUATION OF A LINE THROUGH A GIVEN POINT WITH A SPECIFIED SLOPE IS A FOUNDATIONAL SKILL IN ALGEBRA AND COORDINATE GEOMETRY. BY UNDERSTANDING THE UNDERLYING CONCEPTS AND PRACTICING THE STEP-BY-STEP PROCESS, YOU CAN CONFIDENTLY TACKLE VARIOUS PROBLEMS INVOLVING LINEAR EQUATIONS, GRAPHING, AND THEIR APPLICATIONS ACROSS MULTIPLE DISCIPLINES.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE GENERAL FORM OF THE EQUATION OF A LINE PASSING THROUGH A POINT

WITH A GIVEN SLOPE?

THE GENERAL FORM IS $y - y_1 = m(x - x_1)$, WHERE (x_1, y_1) IS THE POINT AND m IS THE SLOPE.

HOW DO YOU FIND THE EQUATION OF A LINE PASSING THROUGH $(-7, 9)$ WITH A SLOPE OF -5 ?

USE POINT-SLOPE FORM: $y - 9 = -5(x + 7)$.

WHAT IS THE EQUATION OF THE LINE IN SLOPE-INTERCEPT FORM FOR THE GIVEN POINT AND SLOPE?

FIRST, WRITE THE POINT-SLOPE FORM: $y - 9 = -5(x + 7)$, THEN SIMPLIFY TO $y = -5x - 26$.

DOES THE LINE PASS THROUGH THE POINT $(-7, 9)$ IF THE EQUATION IS $y = -5x - 26$?

YES, SUBSTITUTING $x = -7$: $y = -5(-7) - 26 = 35 - 26 = 9$, CONFIRMING THE POINT LIES ON THE LINE.

CAN YOU VERIFY THE SLOPE OF THE LINE FROM THE EQUATION $y = -5x - 26$?

YES, THE COEFFICIENT OF x IS -5 , WHICH IS THE SLOPE OF THE LINE.

WHAT IS THE IMPORTANCE OF THE POINT $(-7, 9)$ IN DERIVING THE LINE'S EQUATION?

IT PROVIDES A SPECIFIC POINT THE LINE PASSES THROUGH, ALLOWING US TO DETERMINE THE EXACT EQUATION USING THE SLOPE.

HOW DO YOU CONVERT THE POINT-SLOPE FORM TO SLOPE-INTERCEPT FORM?

EXPAND AND SIMPLIFY THE POINT-SLOPE FORM $y - y_1 = m(x - x_1)$ TO GET $y = mx + b$.

WHAT IS THE SIGNIFICANCE OF THE SLOPE BEING NEGATIVE IN THIS LINE?

A NEGATIVE SLOPE INDICATES THE LINE IS DECREASING, MEANING IT SLOPES DOWNWARD AS x INCREASES.

ARE THERE OTHER FORMS TO EXPRESS THE EQUATION OF THIS LINE?

YES, BESIDES SLOPE-INTERCEPT AND POINT-SLOPE FORMS, IT CAN ALSO BE WRITTEN IN STANDARD FORM: $5x + y = -26$.

ADDITIONAL RESOURCES

FIND THE EQUATION OF A LINE PASSING THROUGH $(-7, 9)$ WITH A SLOPE OF -5

IN THE REALM OF COORDINATE GEOMETRY, UNDERSTANDING HOW TO DERIVE THE EQUATION OF A LINE GIVEN SPECIFIC INFORMATION IS A FUNDAMENTAL SKILL. WHETHER YOU'RE A STUDENT PREPARING FOR EXAMS, A TEACHER DESIGNING LESSONS, OR AN ENTHUSIAST EXPLORING MATHEMATICAL CONCEPTS, MASTERING THIS PROCESS ENABLES YOU TO ANALYZE AND INTERPRET LINEAR RELATIONSHIPS EFFECTIVELY. TODAY, WE FOCUS ON A PRACTICAL EXAMPLE: FINDING THE EQUATION OF A LINE THAT PASSES THROUGH THE POINT $(-7, 9)$ AND HAS A SLOPE OF -5 . THIS TASK COMBINES CORE PRINCIPLES OF ALGEBRA AND GEOMETRY, OFFERING BOTH THEORETICAL INSIGHT AND REAL-WORLD APPLICATIONS.

UNDERSTANDING THE BASICS: THE EQUATION OF A LINE

BEFORE DIVING INTO THE SPECIFIC PROBLEM, IT'S ESSENTIAL TO GRASP THE FOUNDATIONAL CONCEPTS THAT UNDERPIN LINE EQUATIONS.

THE SLOPE-INTERCEPT FORM

THE MOST COMMON FORM USED TO REPRESENT A LINE IN THE COORDINATE PLANE IS THE SLOPE-INTERCEPT FORM:

$$[Y = MX + B]$$

WHERE:

- (Y) AND (X) ARE VARIABLES REPRESENTING POINTS ON THE LINE,
- (M) IS THE SLOPE OF THE LINE, INDICATING ITS STEEPNESS AND DIRECTION,
- (B) IS THE Y-INTERCEPT, THE POINT WHERE THE LINE CROSSES THE Y-AXIS.

THIS FORM IS STRAIGHTFORWARD WHEN THE SLOPE AND Y-INTERCEPT ARE KNOWN, BUT IN MANY SCENARIOS, ONLY A POINT AND SLOPE ARE PROVIDED.

THE POINT-SLOPE FORM

WHEN A SPECIFIC POINT $((x_1, y_1))$ AND SLOPE (M) ARE GIVEN, THE POINT-SLOPE FORM OFFERS A DIRECT APPROACH:

$$[Y - y_1 = M(x - x_1)]$$

THIS EQUATION IS FLEXIBLE AND CAN BE EASILY TRANSFORMED INTO SLOPE-INTERCEPT FORM ONCE NEEDED.

STEP-BY-STEP DERIVATION OF THE LINE EQUATION

GIVEN OUR SPECIFIC PROBLEM: A LINE PASSING THROUGH $((-7, 9))$ WITH A SLOPE OF (-5) , THE POINT-SLOPE FORM SERVES AS THE IDEAL STARTING POINT.

STEP 1: IDENTIFY KNOWN VALUES

- POINT: $((-7, 9))$
- SLOPE: $(M = -5)$

STEP 2: WRITE THE POINT-SLOPE EQUATION

PLUG THESE VALUES INTO THE FORMULA:

$$[Y - 9 = -5(x - (-7))]$$

SIMPLIFY THE DOUBLE NEGATIVE:

$$[Y - 9 = -5(x + 7)]$$

STEP 3: EXPAND AND SIMPLIFY

DISTRIBUTE (-5) :

$$[Y - 9 = -5x - 35]$$

ADD 9 TO BOTH SIDES TO SOLVE FOR (Y) :

$$[Y = -5x - 35 + 9]$$
$$[Y = -5x - 26]$$

THIS IS THE SLOPE-INTERCEPT FORM OF THE LINE.

CONFIRMING THE EQUATION AND ITS COMPONENTS

THE DERIVED EQUATION:

$$[y = -5x - 26]$$

CONTAINS TWO CRITICAL COMPONENTS:

- SLOPE (m): -5 , INDICATING THE LINE SLOPES DOWNWARD AS x INCREASES.
- Y-INTERCEPT (b): -26 , THE POINT WHERE THE LINE CROSSES THE Y-AXIS.

THE EQUATION CONFIRMS THAT AT $(x=0)$, $(y = -26)$. THIS ALIGNS WITH THE LINE'S NEGATIVE SLOPE, ENSURING THE LINE DESCENDS FROM LEFT TO RIGHT.

VISUALIZING THE LINE

UNDERSTANDING THE GEOMETRIC INTERPRETATION ENHANCES COMPREHENSION:

- THE POINT $(-7, 9)$ LIES ON THE LINE.
- THE SLOPE OF -5 MEANS FOR EVERY 1 UNIT INCREASE IN x , y DECREASES BY 5 UNITS.
- THE Y-INTERCEPT AT (-26) INDICATES THE LINE CROSSES THE Y-AXIS BELOW THE ORIGIN.

PLOTTING THESE POINTS AND THE LINE HELPS VISUALIZE THE RELATIONSHIP, CONFIRMING THE ACCURACY OF THE ALGEBRAIC DERIVATION.

ALTERNATIVE FORMS AND THEIR UTILITY

WHILE THE SLOPE-INTERCEPT FORM IS MOST STRAIGHTFORWARD FOR VISUALIZATION AND QUICK GRAPHING, OTHER FORMS CAN BE USEFUL IN DIFFERENT CONTEXTS.

STANDARD FORM

THE STANDARD FORM OF A LINE:

$$[Ax + By + C = 0]$$

CAN BE DERIVED FROM THE SLOPE-INTERCEPT FORM:

$$[y = -5x - 26]$$

REARRANGED:

$$[5x + y + 26 = 0]$$

THIS FORM IS BENEFICIAL FOR CERTAIN ALGEBRAIC OPERATIONS, SUCH AS FINDING INTERSECTIONS.

APPLICATIONS OF DIFFERENT FORMS

- GRAPHING: SLOPE-INTERCEPT FORM PROVIDES AN IMMEDIATE VISUAL CUE.
- ALGEBRAIC OPERATIONS: STANDARD FORM FACILITATES ADDITION, SUBTRACTION, AND ELIMINATION TECHNIQUES.
- ANALYZING PARALLEL AND PERPENDICULAR LINES: SLOPE FORMS ARE CRUCIAL FOR DETERMINING RELATIONSHIPS BETWEEN LINES.

PRACTICAL IMPLICATIONS AND APPLICATIONS

UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE GIVEN A POINT AND SLOPE EXTENDS BEYOND CLASSROOM EXERCISES. HERE ARE SOME REAL-WORLD SCENARIOS WHERE THIS KNOWLEDGE PROVES INVALUABLE:

- ENGINEERING AND CONSTRUCTION: DESIGNING STRUCTURES THAT ALIGN ALONG SPECIFIC SLOPES AND PASS THROUGH DESIGNATED POINTS.
- ECONOMICS: MODELING COST OR REVENUE FUNCTIONS BASED ON DATA POINTS AND GROWTH RATES.
- NAVIGATION AND GPS: PLANNING ROUTES THAT FOLLOW LINEAR PATHS WITH KNOWN DIRECTIONS.
- DATA ANALYSIS: FITTING LINEAR MODELS TO DATA POINTS FOR TREND ANALYSIS.

IN EACH CASE, ACCURATELY DERIVING THE LINE EQUATION ENABLES PRECISE PREDICTIONS, OPTIMIZATIONS, AND STRATEGIC PLANNING.

COMMON MISTAKES AND HOW TO AVOID THEM

WHILE THE PROCESS APPEARS STRAIGHTFORWARD, CERTAIN PITFALLS CAN LEAD TO ERRORS:

- MISREADING THE POINT COORDINATES: ALWAYS DOUBLE-CHECK THE $((x, y))$ VALUES.
- INCORRECTLY APPLYING THE NEGATIVE SIGNS: BE CAUTIOUS WITH NEGATIVES, ESPECIALLY WHEN SUBSTITUTING $((-7))$.
- FORGETTING TO EXPAND OR SIMPLIFY: ENSURE ALGEBRAIC EXPANSIONS ARE CORRECTLY PERFORMED.
- CONFUSING FORMS: KNOW WHEN TO USE POINT-SLOPE VERSUS SLOPE-INTERCEPT OR STANDARD FORM.

TO MINIMIZE MISTAKES:

- WRITE DOWN EACH STEP CLEARLY.
- VERIFY CALCULATIONS AT EACH STAGE.
- USE GRAPHING TOOLS OR PLOTTING SOFTWARE TO VISUALIZE THE LINE AND CONFIRM THE ALGEBRAIC RESULT.

SUMMARY AND FINAL REMARKS

DERIVING THE EQUATION OF A LINE PASSING THROUGH A SPECIFIC POINT WITH A GIVEN SLOPE IS A FUNDAMENTAL SKILL IN COORDINATE GEOMETRY. BY APPLYING THE POINT-SLOPE FORM AND SIMPLIFYING, WE'VE DETERMINED THAT THE LINE PASSING THROUGH $((-7, 9))$ WITH A SLOPE OF $((-5))$ IS REPRESENTED BY:

$$[y = -5x - 26]$$

THIS EQUATION ENCAPSULATES THE GEOMETRIC ESSENCE OF THE LINE, ALLOWING FOR VISUALIZATION, FURTHER ANALYSIS, AND PRACTICAL APPLICATION. MASTERY OF THESE TECHNIQUES ENHANCES MATHEMATICAL LITERACY AND PROBLEM-SOLVING CAPABILITIES ACROSS VARIOUS DISCIPLINES.

UNDERSTANDING THESE PRINCIPLES NOT ONLY EMPOWERS STUDENTS TO TACKLE EXAMS CONFIDENTLY BUT ALSO PROVIDES A TOOLKIT FOR INTERPRETING AND MODELING LINEAR RELATIONSHIPS IN REAL-WORLD CONTEXTS, FROM ENGINEERING PROJECTS TO ECONOMIC FORECASTS. AS WITH MANY MATHEMATICAL CONCEPTS, PRACTICE AND VISUALIZATION REINFORCE LEARNING, MAKING THE ABSTRACT TANGIBLE AND THE COMPLEX MANAGEABLE.

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