

A LINE PASSES THROUGH $(-6, -5)$ AND HAS THE SLOPE OF $\frac{2}{3}$ HELPPPP PLEASE!!

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UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE WHEN GIVEN A POINT AND A SLOPE IS A FUNDAMENTAL SKILL IN ALGEBRA AND COORDINATE GEOMETRY. IN THIS ARTICLE, WE WILL EXPLORE THE STEP-BY-STEP PROCESS TO DETERMINE THE EQUATION OF A LINE THAT PASSES THROUGH THE POINT $(-6, -5)$ WITH A SLOPE OF $\frac{2}{3}$. WHETHER YOU'RE A STUDENT STRUGGLING WITH THIS CONCEPT OR SOMEONE LOOKING TO REINFORCE YOUR UNDERSTANDING, THIS COMPREHENSIVE GUIDE WILL HELP CLARIFY THE PROCESS AND PROVIDE PRACTICAL EXAMPLES.

UNDERSTANDING THE BASICS: POINT-SLOPE FORM OF A LINE

BEFORE DIVING INTO THE SPECIFIC PROBLEM, IT'S ESSENTIAL TO UNDERSTAND THE KEY CONCEPTS INVOLVED.

WHAT IS THE SLOPE OF A LINE?

- THE SLOPE OF A LINE MEASURES ITS STEEPNESS.
- IT IS CALCULATED AS THE CHANGE IN Y DIVIDED BY THE CHANGE IN X BETWEEN TWO POINTS ON THE LINE.
- SLOPE FORMULA: $m = \frac{y_2 - y_1}{x_2 - x_1}$

WHAT IS THE POINT-SLOPE FORM?

- THE POINT-SLOPE FORM OF A LINE'S EQUATION IS USEFUL WHEN YOU KNOW:
- A POINT ON THE LINE (x_1, y_1)
- THE SLOPE m
- THE FORMULA IS: $y - y_1 = m(x - x_1)$

STEP-BY-STEP GUIDE TO FIND THE EQUATION OF THE LINE

GIVEN:

- POINT: $(-6, -5)$
- SLOPE: $\frac{2}{3}$

FOLLOW THESE STEPS:

STEP 1: WRITE THE POINT-SLOPE EQUATION

USING THE POINT-SLOPE FORM:

$$y - y_1 = m(x - x_1)$$

SUBSTITUTE THE KNOWN VALUES:

$$y - (-5) = \frac{2}{3}(x - (-6))$$

SIMPLIFY:

$$y + 5 = \frac{2}{3}(x + 6)$$

\]

STEP 2: SIMPLIFY THE EQUATION

DISTRIBUTE THE SLOPE:

\[

$$Y + 5 = \frac{2}{3}X + \frac{2}{3} \times 6$$

\]

CALCULATE:

\[

$$\frac{2}{3} \times 6 = 2 \times 2 = 4$$

\]

SO THE EQUATION BECOMES:

\[

$$Y + 5 = \frac{2}{3}X + 4$$

\]

STEP 3: ISOLATE Y TO WRITE IN SLOPE-INTERCEPT FORM

SUBTRACT 5 FROM BOTH SIDES:

\[

$$Y = \frac{2}{3}X + 4 - 5$$

\]

SIMPLIFY:

\[

$$Y = \frac{2}{3}X - 1$$

\]

FINAL EQUATION OF THE LINE

THE EQUATION IN SLOPE-INTERCEPT FORM IS:

\[

$$\boxed{Y = \frac{2}{3}X - 1}$$

\]

THIS DESCRIBES THE LINE PASSING THROUGH THE POINT $((-6, -5))$ WITH A SLOPE OF $(\frac{2}{3})$.

ADDITIONAL METHODS TO FIND THE EQUATION OF A LINE

BESIDES THE POINT-SLOPE FORM, THERE ARE OTHER METHODS TO DERIVE THE LINE'S EQUATION, ESPECIALLY USEFUL IN DIFFERENT CONTEXTS.

1. USING TWO POINTS

IF YOU HAVE TWO POINTS $((x_1, y_1))$ AND $((x_2, y_2))$, YOU CAN:

- CALCULATE THE SLOPE:

\[

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

\]

- USE POINT-SLOPE FORM WITH ONE OF THE POINTS.

2. USING THE SLOPE-INTERCEPT FORM

ONCE THE SLOPE IS KNOWN:

- PLUG IN THE SLOPE AND THE POINT INTO $(y = mx + b)$
- SOLVE FOR (b) :
$$b = y - mx$$
- WRITE THE FULL EQUATION.

WHY IS THIS IMPORTANT? REAL-WORLD APPLICATIONS

UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE PASSING THROUGH A SPECIFIC POINT WITH A GIVEN SLOPE IS CRUCIAL IN VARIOUS FIELDS:

- ENGINEERING: DESIGNING ROADS OR BRIDGES WITH PRECISE INCLINES.
- PHYSICS: ANALYZING LINEAR MOTION WHERE POSITION CHANGES OVER TIME.
- ECONOMICS: MODELING RELATIONSHIPS BETWEEN VARIABLES, SUCH AS SUPPLY AND DEMAND.
- COMPUTER GRAPHICS: CALCULATING TRAJECTORIES AND OBJECT MOVEMENTS.

PRACTICE PROBLEMS FOR MASTERY

TO SOLIDIFY YOUR UNDERSTANDING, TRY SOLVING THESE PROBLEMS:

1. FIND THE EQUATION OF A LINE PASSING THROUGH $(2, 3)$ WITH A SLOPE OF $-1/2$.
2. GIVEN THE POINTS $(-4, 7)$ AND $(2, -3)$, FIND THE EQUATION OF THE LINE PASSING THROUGH THEM.
3. WRITE THE EQUATION OF A LINE WITH A SLOPE OF 4 PASSING THROUGH THE POINT $(0, -2)$.

SOLUTIONS INVOLVE FOLLOWING SIMILAR STEPS AS OUTLINED ABOVE, EMPHASIZING THE IMPORTANCE OF UNDERSTANDING THE FOUNDATIONAL CONCEPTS.

COMMON MISTAKES TO AVOID

- INCORRECT SUBSTITUTION: ALWAYS DOUBLE-CHECK THE POINT COORDINATES AND SLOPE BEFORE PLUGGING INTO FORMULAS.
- SIGN ERRORS: BE CAUTIOUS WITH NEGATIVE SIGNS WHEN SUBSTITUTING POINTS.
- DISTRIBUTING INCORRECTLY: WHEN EXPANDING $(m(x - x_1))$, ENSURE PROPER MULTIPLICATION.
- FORGETTING TO SIMPLIFY: ALWAYS SIMPLIFY YOUR FINAL EQUATION FOR CLARITY.

CONCLUSION: MASTERING THE EQUATION OF A LINE

BY UNDERSTANDING THE POINT-SLOPE FORM AND PRACTICING THE STEPS TO DERIVE THE EQUATION OF A LINE, YOU CAN CONFIDENTLY HANDLE PROBLEMS INVOLVING LINES PASSING THROUGH SPECIFIC POINTS WITH GIVEN SLOPES. REMEMBER, THE KEY STEPS ARE:

1. WRITE THE POINT-SLOPE FORM USING THE POINT AND SLOPE.
2. DISTRIBUTE AND SIMPLIFY TO FIND THE SLOPE-INTERCEPT FORM.
3. VERIFY YOUR WORK BY PLUGGING IN THE KNOWN POINT TO ENSURE THE EQUATION IS CORRECT.

WHETHER YOU'RE TACKLING HOMEWORK, PREPARING FOR EXAMS, OR APPLYING THESE CONCEPTS IN REAL-WORLD SCENARIOS, MASTERING THESE TECHNIQUES WILL ENHANCE YOUR PROBLEM-SOLVING SKILLS AND DEEPEN YOUR UNDERSTANDING OF COORDINATE GEOMETRY.

KEYWORDS: LINE EQUATION, SLOPE, POINT-SLOPE FORM, SLOPE-INTERCEPT FORM, ALGEBRA, COORDINATE GEOMETRY, PASSING THROUGH POINT, SLOPE CALCULATION, LINE PASSING THROUGH $(-6, -5)$, SLOPE OF $2/3$, ALGEBRA PRACTICE

FREQUENTLY ASKED QUESTIONS

HOW DO I FIND THE EQUATION OF A LINE PASSING THROUGH $(-6, -5)$ WITH A SLOPE OF $2/3$?

USE THE POINT-SLOPE FORM: $y - y_1 = m(x - x_1)$. PLUGGING IN THE POINT $(-6, -5)$ AND SLOPE $2/3$, YOU GET $y - (-5) = (2/3)(x - (-6))$. SIMPLIFY TO FIND THE EQUATION.

WHAT IS THE EQUATION OF THE LINE PASSING THROUGH $(-6, -5)$ WITH SLOPE $2/3$?

THE EQUATION IN SLOPE-INTERCEPT FORM IS $y = (2/3)x + 1$.

HOW DO I CONVERT THE POINT-SLOPE FORM TO SLOPE-INTERCEPT FORM FOR THIS LINE?

STARTING FROM $y - (-5) = (2/3)(x + 6)$, SIMPLIFY TO $y + 5 = (2/3)x + 4$; THEN SUBTRACT 5 FROM BOTH SIDES TO GET $y = (2/3)x - 1$.

WHAT IS THE SIGNIFICANCE OF THE SLOPE $2/3$ IN THE LINE'S EQUATION?

THE SLOPE $2/3$ INDICATES THAT FOR EVERY INCREASE OF 3 UNITS IN x , y INCREASES BY 2 UNITS, SHOWING THE INCLINE OF THE LINE.

CAN I VERIFY THE POINT $(-6, -5)$ LIES ON THE LINE $y = (2/3)x - 1$?

YES. PLUG $x = -6$ INTO THE EQUATION: $y = (2/3)(-6) - 1 = -4 - 1 = -5$, CONFIRMING THE POINT LIES ON THE LINE.

WHAT ARE SOME REAL-WORLD EXAMPLES OF LINES WITH SLOPE $2/3$ PASSING THROUGH A POINT?

IMAGINE A CAR TRAVELING SUCH THAT ITS HEIGHT INCREASES BY 2 UNITS FOR EVERY 3 UNITS TRAVELED HORIZONTALLY, PASSING THROUGH A SPECIFIC POINT LIKE $(-6, -5)$.

HOW DO I GRAPH THIS LINE PASSING THROUGH $(-6, -5)$ WITH SLOPE $2/3$?

PLOT THE POINT $(-6, -5)$ ON THE GRAPH. FROM THERE, USE THE SLOPE: GO UP 2 UNITS AND RIGHT 3 UNITS REPEATEDLY TO

MARK ADDITIONAL POINTS, THEN DRAW THE LINE THROUGH THESE POINTS.

WHAT IS THE IMPORTANCE OF KNOWING THE POINT AND SLOPE WHEN DEFINING A LINE?

KNOWING A POINT AND THE SLOPE UNIQUELY DETERMINES THE LINE'S EQUATION, ALLOWING YOU TO UNDERSTAND ITS POSITION AND STEEPNESS ON THE GRAPH.

CAN I FIND THE EQUATION OF THE LINE IN STANDARD FORM?

YES. FROM $y = (2/3)x - 1$, MULTIPLY BOTH SIDES BY 3 TO CLEAR FRACTIONS: $3y = 2x - 3$. REARRANGED, IT BECOMES $2x - 3y = 3$.

ADDITIONAL RESOURCES

A LINE PASSES THROUGH $(-6, -5)$ AND HAS THE SLOPE OF $2/3$ HELPPPP PLEASE!!

UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE GIVEN A POINT AND A SLOPE IS A FUNDAMENTAL CONCEPT IN ALGEBRA AND COORDINATE GEOMETRY. THE PROBLEM AT HAND INVOLVES DETERMINING THE EQUATION OF A LINE THAT PASSES THROUGH A SPECIFIC POINT, $(-6, -5)$, WITH A GIVEN SLOPE OF $2/3$. THIS TASK, WHILE SEEMINGLY STRAIGHTFORWARD, PROVIDES A VALUABLE OPPORTUNITY TO EXPLORE KEY CONCEPTS SUCH AS POINT-SLOPE FORM, SLOPE-INTERCEPT FORM, AND THE PRACTICAL APPLICATIONS OF THESE EQUATIONS. IN THIS COMPREHENSIVE REVIEW, WE WILL BREAK DOWN THE STEPS INVOLVED, ANALYZE DIFFERENT METHODS, AND DISCUSS COMMON CHALLENGES FACED BY STUDENTS, ALL WHILE HIGHLIGHTING THE IMPORTANCE OF MASTERING THESE SKILLS FOR FUTURE MATHEMATICAL SUCCESS.

UNDERSTANDING THE PROBLEM

THE PROBLEM STATES: "A LINE PASSES THROUGH $(-6, -5)$ AND HAS A SLOPE OF $2/3$." TO FIND THE EQUATION OF THIS LINE, WE NEED TO UNDERSTAND TWO CRITICAL COMPONENTS: THE POINT THROUGH WHICH THE LINE PASSES, AND THE SLOPE OF THE LINE.

- POINT: $(-6, -5)$
- SLOPE: $2/3$

THE GOAL IS TO FIND AN EQUATION THAT ACCURATELY REPRESENTS THIS LINE, ENABLING US TO GRAPH IT, ANALYZE ITS PROPERTIES, OR USE IT FOR FURTHER CALCULATIONS.

KEY CONCEPTS AND FORMULAS

BEFORE DIVING INTO THE SOLUTION, LET'S REVIEW ESSENTIAL FORMULAS AND CONCEPTS RELEVANT TO THIS PROBLEM.

POINT-SLOPE FORM

THE POINT-SLOPE FORM OF A LINE'S EQUATION IS EXPRESSED AS:

$$[y - y_1 = m(x - x_1)]$$

WHERE:

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

THIS FORM IS PARTICULARLY USEFUL WHEN YOU KNOW ONE POINT ON THE LINE AND ITS SLOPE.

SLOPE-INTERCEPT FORM

ONCE YOU HAVE THE EQUATION IN POINT-SLOPE FORM, YOU CAN CONVERT IT TO SLOPE-INTERCEPT FORM:

$$y = mx + b$$

WHERE:

- m IS THE SLOPE
- b IS THE Y-INTERCEPT

STEP-BY-STEP SOLUTION

LET'S NOW SYSTEMATICALLY SOLVE THE PROBLEM TO FIND THE EQUATION OF THE LINE PASSING THROUGH $(-6, -5)$ WITH A SLOPE OF $\frac{2}{3}$.

STEP 1: WRITE THE POINT-SLOPE FORM

USING THE POINT $(-6, -5)$ AND SLOPE $m = \frac{2}{3}$, SUBSTITUTE INTO THE POINT-SLOPE FORMULA:

$$y - (-5) = \frac{2}{3}(x - (-6))$$

SIMPLIFY THE DOUBLE NEGATIVES:

$$y + 5 = \frac{2}{3}(x + 6)$$

STEP 2: SIMPLIFY AND CONVERT TO SLOPE-INTERCEPT FORM

DISTRIBUTE $\frac{2}{3}$ ACROSS $(x + 6)$:

$$y + 5 = \frac{2}{3}x + \frac{2}{3} \times 6$$

CALCULATE $\frac{2}{3} \times 6$:

$$\frac{2}{3} \times 6 = 2 \times 2 = 4$$

(NOTE: $6 \div 3 = 2$, THEN $2 \times 2 = 4$)

NOW, THE EQUATION BECOMES:

$$y + 5 = \frac{2}{3}x + 4$$

SUBTRACT 5 FROM BOTH SIDES TO SOLVE FOR y :

$$y = \frac{2}{3}x + 4 - 5$$

SIMPLIFY:

$$[y = \frac{2}{3}x - 1]$$

FINAL EQUATION IN SLOPE-INTERCEPT FORM:

$$[y = \frac{2}{3}x - 1]$$

FEATURES AND ANALYSIS OF THE SOLUTION

THE OBTAINED EQUATION $[y = \frac{2}{3}x - 1]$ ACCURATELY DESCRIBES THE LINE PASSING THROUGH THE GIVEN POINT WITH THE SPECIFIED SLOPE. LET'S ANALYZE SOME FEATURES AND IMPLICATIONS OF THIS LINE.

FEATURES

- SLOPE ($m = 2/3$):

THE SLOPE INDICATES THAT FOR EVERY 3 UNITS INCREASE IN (x) , THE (y) VALUE INCREASES BY 2 UNITS. THE POSITIVE SLOPE SIGNIFIES AN UPWARD TREND FROM LEFT TO RIGHT.

- Y-INTERCEPT ($b = -1$):

THE LINE CROSSES THE Y-AXIS AT $(0, -1)$. THIS POINT CAN BE VERIFIED BY SUBSTITUTING $(x=0)$ INTO THE EQUATION.

- POINT VERIFICATION:

TO CONFIRM, PLUG IN $(x = -6)$:

$$[y = \frac{2}{3}(-6) - 1 = -4 - 1 = -5]$$

THIS MATCHES THE ORIGINAL POINT, CONFIRMING THE CORRECTNESS.

ADVANTAGES OF THE METHOD

- THE POINT-SLOPE FORM SIMPLIFIES THE PROCESS WHEN A POINT AND SLOPE ARE KNOWN.
- CONVERTING TO SLOPE-INTERCEPT FORM MAKES THE EQUATION EASIER TO INTERPRET AND GRAPH.
- THIS METHOD IS SYSTEMATIC AND REDUCES CHANCES OF ERRORS.

GRAPHICAL REPRESENTATION

PLOTTING THE LINE HELPS VISUALIZE ITS BEHAVIOR AND CONFIRMS THE CORRECTNESS OF THE EQUATION.

STEPS TO GRAPH:

1. PLOT THE POINT $(-6, -5)$.
2. USE THE SLOPE $(\frac{2}{3})$: FROM $(-6, -5)$, MOVE 3 UNITS RIGHT (POSITIVE (x) -DIRECTION) AND 2 UNITS UP (POSITIVE (y) -DIRECTION). MARK THIS NEW POINT.
3. DRAW A STRAIGHT LINE PASSING THROUGH THESE POINTS, EXTENDING IN BOTH DIRECTIONS.
4. MARK THE Y-INTERCEPT AT $(0, -1)$ FOR ADDITIONAL REFERENCE.

COMMON CHALLENGES AND TROUBLESHOOTING

MANY STUDENTS ENCOUNTER DIFFICULTIES WHEN SOLVING SUCH PROBLEMS. HERE'S A BREAKDOWN OF TYPICAL ISSUES AND SOLUTIONS:

1. CONFUSING THE POINT-SLOPE AND SLOPE-INTERCEPT FORMS

CHALLENGE: STUDENTS MAY FORGET TO CONVERT FROM POINT-SLOPE TO SLOPE-INTERCEPT FORM OR VICE VERSA.

SOLUTION: PRACTICE CONVERSIONS REGULARLY, ENSURING UNDERSTANDING OF EACH FORM'S PURPOSE.

2. SIGN ERRORS

CHALLENGE: NEGATIVE SIGNS IN COORDINATES OR SLOPES CAN LEAD TO INCORRECT EQUATIONS.

SOLUTION: CAREFULLY HANDLE NEGATIVES DURING DISTRIBUTION AND SIMPLIFICATION. DOUBLE-CHECK EACH STEP.

3. INCORRECT DISTRIBUTION

CHALLENGE: MISAPPLYING THE DISTRIBUTIVE PROPERTY WHEN MULTIPLYING THE SLOPE WITH THE BINOMIAL.

SOLUTION: BREAK DOWN MULTIPLICATION INTO SMALLER STEPS AND VERIFY EACH CALCULATION.

4. MISIDENTIFYING THE SLOPE OR POINT

CHALLENGE: USING INCORRECT VALUES FOR THE POINT OR SLOPE, LEADING TO WRONG EQUATIONS.

SOLUTION: CLEARLY NOTE AND DOUBLE-CHECK THE GIVEN DATA BEFORE STARTING.

ALTERNATIVE APPROACHES

WHILE THE POINT-SLOPE METHOD IS MOST STRAIGHTFORWARD HERE, ALTERNATIVE METHODS EXIST:

Using Two Points

IF ANOTHER POINT ON THE LINE WERE KNOWN, THE SLOPE COULD BE VERIFIED, AND THE LINE'S EQUATION COULD BE FOUND USING THE TWO-POINT FORM:

$$[y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)]$$

HOWEVER, IN THIS PROBLEM, ONLY ONE POINT AND THE SLOPE ARE GIVEN, MAKING THE POINT-SLOPE METHOD PREFERABLE.

GRAPHING FIRST

PLOTTING THE POINT AND USING THE SLOPE VISUALLY CAN AID IN UNDERSTANDING BUT IS LESS PRECISE WITHOUT ALGEBRAIC CONFIRMATION.

PRACTICAL APPLICATIONS AND SIGNIFICANCE

UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE FROM A POINT AND SLOPE IS CRUCIAL IN VARIOUS FIELDS:

- PHYSICS: TO MODEL LINEAR RELATIONSHIPS SUCH AS SPEED VS. TIME GRAPHS.
- ECONOMICS: TO ANALYZE COST FUNCTIONS OR REVENUE MODELS.
- ENGINEERING: FOR DESIGNING COMPONENTS WITH LINEAR SPECIFICATIONS.
- DATA ANALYSIS: TO PERFORM LINEAR REGRESSION AND TREND ANALYSIS.

MASTERING THESE TECHNIQUES ENHANCES PROBLEM-SOLVING SKILLS AND PREPARES STUDENTS FOR MORE ADVANCED TOPICS LIKE CALCULUS, WHERE UNDERSTANDING SLOPES AND LINEAR FUNCTIONS FORMS A FOUNDATIONAL ELEMENT.

SUMMARY AND FINAL THOUGHTS

FINDING THE EQUATION OF A LINE PASSING THROUGH A SPECIFIC POINT WITH A GIVEN SLOPE INVOLVES A SYSTEMATIC APPROACH ROOTED IN FUNDAMENTAL ALGEBRAIC PRINCIPLES. STARTING FROM THE POINT-SLOPE FORM AND TRANSFORMING INTO SLOPE-INTERCEPT FORM PROVIDES CLARITY AND EASE OF INTERPRETATION. THE PROCESS EMPHASIZES CAREFUL HANDLING OF SIGNS, ACCURATE DISTRIBUTION, AND VERIFICATION THROUGH SUBSTITUTION. RECOGNIZING COMMON PITFALLS AND PRACTICING VARIOUS METHODS ENSURES MASTERY OF THE CONCEPT.

THIS PROBLEM EXEMPLIFIES A CORE SKILL IN MATHEMATICS THAT UNDERPINS ADVANCED TOPICS AND REAL-WORLD APPLICATIONS. WITH PRACTICE, STUDENTS CAN APPROACH SIMILAR PROBLEMS WITH CONFIDENCE, UNDERSTANDING NOT JUST THE "HOW" BUT ALSO THE "WHY" BEHIND EACH STEP. REMEMBER, PERSISTENCE AND ATTENTION TO DETAIL ARE KEY TO SUCCESS IN MASTERING COORDINATE GEOMETRY.

IN CONCLUSION, THE EQUATION OF THE LINE PASSING THROUGH $(-6, -5)$ WITH A SLOPE OF $2/3$ IS:

$$\boxed{y = \frac{2}{3}x - 1}$$

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