

FIND AN EQUATION OF A LINE PARALLEL TO $Y=4x+4$ AND PASSING THROUGH THE POINT $(5,4)$. $Y=$

FIND AN EQUATION OF A LINE PARALLEL TO $Y=4x+4$ AND PASSING THROUGH THE POINT $(5,4)$. $Y=$ IF YOU'RE STUDYING ALGEBRA OR COORDINATE GEOMETRY, UNDERSTANDING HOW TO FIND THE EQUATION OF A LINE THAT IS PARALLEL TO A GIVEN LINE AND PASSES THROUGH A SPECIFIC POINT IS A FUNDAMENTAL SKILL. THIS PROCESS INVOLVES ANALYZING THE SLOPE OF THE GIVEN LINE, RECOGNIZING THE PROPERTIES OF PARALLEL LINES, AND APPLYING THE POINT-SLOPE OR SLOPE-INTERCEPT FORM OF A LINE'S EQUATION. IN THIS COMPREHENSIVE GUIDE, WE WILL WALK THROUGH EACH STEP TO FIND THE EQUATION OF THE DESIRED LINE, EXPLAIN KEY CONCEPTS, AND PROVIDE PRACTICAL EXAMPLES TO ENHANCE YOUR UNDERSTANDING.

UNDERSTANDING THE BASICS: LINES AND THEIR EQUATIONS

BEFORE DIVING INTO THE PROBLEM, IT'S ESSENTIAL TO REVIEW SOME KEY CONCEPTS RELATED TO LINES IN THE COORDINATE PLANE.

WHAT IS AN EQUATION OF A LINE?

AN EQUATION OF A LINE IS A MATHEMATICAL STATEMENT THAT DESCRIBES ALL THE POINTS (x, y) THAT LIE ON THAT LINE. THE MOST COMMON FORMS ARE:

- SLOPE-INTERCEPT FORM: $y = mx + b$

WHERE m IS THE SLOPE AND b IS THE y -INTERCEPT.

- POINT-SLOPE FORM: $y - y_1 = m(x - x_1)$

USEFUL WHEN YOU KNOW THE SLOPE AND A SPECIFIC POINT ON THE LINE.

- STANDARD FORM: $Ax + By = C$

WHAT DOES IT MEAN FOR LINES TO BE PARALLEL?

TWO LINES ARE PARALLEL IF THEY HAVE THE SAME SLOPE BUT DIFFERENT y -INTERCEPTS. PARALLEL LINES NEVER INTERSECT, REGARDLESS OF HOW FAR THEY ARE EXTENDED.

ANALYZING THE GIVEN LINE: $Y=4x+4$

THE GIVEN LINE IS EXPRESSED IN SLOPE-INTERCEPT FORM:

- EQUATION: $y = 4x + 4$

- SLOPE (m): 4

- y -INTERCEPT: 4

KNOWING THE SLOPE IS CRITICAL BECAUSE THE SLOPE DETERMINES THE "TILT" OF THE LINE. FOR THE LINE TO BE PARALLEL TO THIS ONE, THE NEW LINE MUST HAVE THE SAME SLOPE (I.E., 4).

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

FINDING THE EQUATION INVOLVES SEVERAL STRAIGHTFORWARD STEPS:

STEP 1: IDENTIFY THE SLOPE OF THE GIVEN LINE

SINCE THE LINE IS $y = 4x + 4$, THE SLOPE m IS 4.

STEP 2: USE THE POINT (5, 4) THAT THE NEW LINE PASSES THROUGH

THIS POINT PROVIDES THE SPECIFIC LOCATION THE NEW LINE MUST PASS THROUGH.

STEP 3: APPLY THE POINT-SLOPE FORM

THE POINT-SLOPE FORM IS IDEAL WHEN A POINT AND SLOPE ARE KNOWN:

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

PLUGGING IN THE POINT (5, 4) AND THE SLOPE $m=4$:

$$y - 4 = 4(x - 5)$$

STEP 4: SIMPLIFY TO SLOPE-INTERCEPT FORM (OPTIONAL)

DISTRIBUTE AND SOLVE FOR y :

$$y - 4 = 4x - 20$$

ADD 4 TO BOTH SIDES:

$$y = 4x - 20 + 4$$

$$y = 4x - 16$$

THIS IS THE EQUATION OF THE LINE IN SLOPE-INTERCEPT FORM THAT IS PARALLEL TO $y=4x+4$ AND PASSES THROUGH THE POINT (5, 4).

FINAL EQUATION AND INTERPRETATION

THE EQUATION OF THE LINE PARALLEL TO $y=4x+4$ AND PASSING THROUGH (5, 4) IS:

$$y = 4x - 16$$

THIS LINE HAS THE SAME SLOPE (4) AS THE ORIGINAL LINE, WHICH CONFIRMS ITS PARALLELISM, AND IT PASSES THROUGH THE SPECIFIED POINT.

KEY POINTS TO REMEMBER

- PARALLEL LINES SHARE THE SAME SLOPE.
- THE POINT-SLOPE FORM IS A FLEXIBLE WAY TO FIND A LINE'S EQUATION GIVEN A POINT AND SLOPE.
- CONVERTING BETWEEN POINT-SLOPE AND SLOPE-INTERCEPT FORMS HELPS IN UNDERSTANDING AND GRAPHING LINES.

ADDITIONAL EXAMPLES AND PRACTICE PROBLEMS

TO REINFORCE YOUR UNDERSTANDING, HERE ARE SOME ADDITIONAL PROBLEMS:

EXAMPLE 1:

FIND THE EQUATION OF A LINE PARALLEL TO $y = 2x + 3$ PASSING THROUGH THE POINT $(1, 2)$.

SOLUTION:

- SLOPE: 2
- USE POINT-SLOPE FORM:

$$y - 2 = 2(x - 1)$$

- SIMPLIFY:

$$y - 2 = 2x - 2$$

$$y = 2x$$

ANSWER: $y = 2x$

EXAMPLE 2:

FIND THE EQUATION OF A LINE PARALLEL TO $y = -3x + 5$ PASSING THROUGH THE POINT $(0, 0)$.

SOLUTION:

- SLOPE: -3
- USE POINT-SLOPE FORM:

$$y - 0 = -3(x - 0)$$

$$y = -3x$$

ANSWER: $y = -3x$

COMMON MISTAKES TO AVOID

- USING THE WRONG SLOPE: REMEMBER, PARALLEL LINES MUST HAVE IDENTICAL SLOPES.
- INCORRECT POINT SUBSTITUTION: ENSURE YOU CORRECTLY SUBSTITUTE THE GIVEN POINT INTO THE POINT-SLOPE FORMULA.

- FORGETTING TO SIMPLIFY: ALWAYS SIMPLIFY YOUR EQUATION TO THE PREFERRED FORM FOR CLARITY.

PRACTICAL APPLICATIONS OF FINDING LINE EQUATIONS

UNDERSTANDING HOW TO FIND THE EQUATION OF LINES HAS REAL-WORLD APPLICATIONS:

- ENGINEERING: DESIGNING PARALLEL COMPONENTS OR PATHWAYS.
- NAVIGATION: CALCULATING ROUTES THAT MAINTAIN A CONSTANT BEARING.
- ECONOMICS: MODELING PARALLEL COST OR REVENUE LINES.
- PHYSICS: ANALYZING TRAJECTORIES WITH PARALLEL INITIAL CONDITIONS.

CONCLUSION

FINDING AN EQUATION OF A LINE PARALLEL TO A GIVEN LINE AND PASSING THROUGH A SPECIFIC POINT IS A FUNDAMENTAL SKILL IN ALGEBRA AND COORDINATE GEOMETRY. BY RECOGNIZING THE IMPORTANCE OF THE SLOPE, APPLYING THE POINT-SLOPE FORM, AND SIMPLIFYING EQUATIONS, YOU CAN EASILY DERIVE THE REQUIRED LINE EQUATION. WHETHER YOU'RE SOLVING HOMEWORK PROBLEMS OR APPLYING THESE CONCEPTS TO REAL-WORLD SCENARIOS, MASTERING THIS TECHNIQUE WILL ENHANCE YOUR MATHEMATICAL TOOLKIT AND DEEPEN YOUR UNDERSTANDING OF LINEAR RELATIONSHIPS.

SUMMARY

- THE SLOPE OF THE GIVEN LINE $y=4x+4$ IS 4.
- PARALLEL LINES SHARE THE SAME SLOPE.
- USING THE POINT $(5, 4)$ AND SLOPE 4, THE LINE'S EQUATION IN POINT-SLOPE FORM IS $y - 4 = 4(x - 5)$.
- SIMPLIFYING YIELDS THE FINAL EQUATION: $y = 4x - 16$.
- PRACTICE WITH ADDITIONAL EXAMPLES TO BECOME PROFICIENT.

OPTIMIZE YOUR UNDERSTANDING OF LINEAR EQUATIONS TODAY BY PRACTICING THESE STEPS AND EXPLORING THEIR APPLICATIONS IN VARIOUS FIELDS.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE SLOPE OF THE LINE PARALLEL TO $y=4x+4$?

THE SLOPE IS 4 SINCE PARALLEL LINES HAVE THE SAME SLOPE.

HOW DO YOU FIND THE EQUATION OF A LINE PARALLEL TO $y=4x+4$ PASSING THROUGH $(5,4)$?

USE THE POINT-SLOPE FORM WITH THE SLOPE 4 AND POINT $(5,4)$: $y - 4 = 4(x - 5)$.

WHAT IS THE EQUATION OF THE LINE PARALLEL TO $y=4x+4$ PASSING THROUGH $(5,4)$?

THE EQUATION IS $y = 4x - 16$.

HOW DO I VERIFY THAT THE LINE $y=4x-16$ PASSES THROUGH $(5,4)$?

SUBSTITUTE $x=5$ INTO $y=4x-16$: $y=4(5)-16=20-16=4$, WHICH MATCHES THE y -COORDINATE OF THE POINT.

CAN THE EQUATION OF THE LINE BE WRITTEN IN SLOPE-INTERCEPT FORM?

YES, THE LINE'S EQUATION IS $y=4x-16$ IN SLOPE-INTERCEPT FORM.

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

YES, IT CAN ALSO BE WRITTEN IN POINT-SLOPE FORM: $y - 4 = 4(x - 5)$.

WHAT IS THE SIGNIFICANCE OF THE SLOPE IN THE EQUATION $y=4x-16$?

THE SLOPE INDICATES THE RATE OF CHANGE OF y WITH RESPECT TO x , AND HERE IT IS 4 , MEANING y INCREASES BY 4 FOR EACH INCREASE OF 1 IN x .

ADDITIONAL RESOURCES

FIND AN EQUATION OF A LINE PARALLEL TO $y=4x+4$ AND PASSING THROUGH THE POINT $(5,4)$. $y=$

WHEN IT COMES TO UNDERSTANDING THE FUNDAMENTALS OF ALGEBRA AND COORDINATE GEOMETRY, THE CONCEPT OF LINES AND THEIR EQUATIONS PLAYS A PIVOTAL ROLE. WHETHER YOU'RE A STUDENT TRYING TO GRASP THE BASICS OR A PROFESSIONAL APPLYING THESE PRINCIPLES IN REAL-WORLD SCENARIOS, MASTERING HOW TO FIND EQUATIONS OF LINES — ESPECIALLY THOSE PARALLEL TO A GIVEN LINE — IS ESSENTIAL. IN THIS ARTICLE, WE'LL DELVE INTO THE PROCESS OF DERIVING THE EQUATION OF A LINE THAT IS PARALLEL TO A GIVEN LINE, SPECIFICALLY $y=4x+4$, AND PASSES THROUGH A PARTICULAR POINT, $(5,4)$. THIS EXPLORATION COMBINES CLEAR EXPLANATIONS WITH DETAILED STEPS, ENSURING THAT READERS OF VARYING BACKGROUNDS CAN FOLLOW ALONG AND GAIN A COMPREHENSIVE UNDERSTANDING.

UNDERSTANDING LINES AND THEIR EQUATIONS

BEFORE JUMPING INTO THE SPECIFICS OF PARALLEL LINES AND POINT-SPECIFIC EQUATIONS, IT'S IMPORTANT TO ESTABLISH A FOUNDATIONAL UNDERSTANDING OF WHAT LINES ARE IN THE CONTEXT OF COORDINATE GEOMETRY.

THE SLOPE-INTERCEPT FORM

MOST LINEAR EQUATIONS ARE EXPRESSED IN THE SLOPE-INTERCEPT FORM:

$$y = mx + b$$

WHERE:

- m IS THE SLOPE OF THE LINE, INDICATING ITS STEEPNESS.
- b IS THE y -INTERCEPT, THE POINT WHERE THE LINE CROSSES THE y -AXIS.

IN OUR INITIAL LINE, $y=4x+4$, THE SLOPE (m) IS 4, AND THE y -INTERCEPT (b) IS 4.

THE SIGNIFICANCE OF THE SLOPE

THE SLOPE DESCRIBES HOW MUCH y CHANGES FOR A UNIT CHANGE IN x :

- A POSITIVE SLOPE (LIKE 4) INDICATES THE LINE RISES AS x INCREASES.
- A NEGATIVE SLOPE INDICATES THE LINE FALLS.
- A SLOPE OF ZERO REPRESENTS A HORIZONTAL LINE.
- AN UNDEFINED SLOPE INDICATES A VERTICAL LINE.

IN OUR CASE, THE SLOPE IS 4, WHICH MEANS THE LINE IS INCLINED AND ASCENDS AT A RATE OF 4 UNITS VERTICALLY FOR EVERY 1 UNIT HORIZONTALLY.

WHAT DOES IT MEAN FOR LINES TO BE PARALLEL?

UNDERSTANDING PARALLEL LINES IS CRUCIAL TO SOLVING THE PROBLEM AT HAND.

CHARACTERISTICS OF PARALLEL LINES

- PARALLEL LINES ARE LINES IN THE SAME PLANE THAT NEVER INTERSECT, NO MATTER HOW FAR THEY EXTEND.
- THEY ALWAYS HAVE THE SAME SLOPE BUT DIFFERENT y -INTERCEPTS.
- BECAUSE THEY HAVE IDENTICAL SLOPES, THEY MAINTAIN A CONSTANT DISTANCE APART.

MATHEMATICAL IMPLICATION

GIVEN A LINE WITH THE EQUATION $y=mx + b$, ANY LINE PARALLEL TO IT WILL HAVE THE FORM:

$$y=mx + c$$

WHERE c IS A DIFFERENT y -INTERCEPT, BUT THE SLOPE (m) REMAINS UNCHANGED.

IN OUR CASE, SINCE THE ORIGINAL LINE HAS A SLOPE OF 4, ANY PARALLEL LINE MUST ALSO HAVE A SLOPE OF 4.

FINDING THE EQUATION OF THE PARALLEL LINE PASSING THROUGH (5,4)

NOW, WITH THE UNDERSTANDING THAT THE NEW LINE MUST HAVE THE SAME SLOPE AS THE ORIGINAL LINE, THE PROBLEM SIMPLIFIES TO:

- USING THE POINT-SLOPE FORM OF A LINE'S EQUATION.
- SUBSTITUTING THE POINT (5,4) INTO THIS FORM.

- SOLVING FOR THE Y-INTERCEPT OR DIRECTLY WRITING THE SLOPE-INTERCEPT FORM.

STEP 1: WRITE THE GENERAL EQUATION OF A PARALLEL LINE

SINCE THE SLOPE MUST BE THE SAME AS THE ORIGINAL LINE (WHICH IS 4), THE EQUATION TAKES THE FORM:

$$Y = 4x + c$$

WHERE C IS THE Y-INTERCEPT OF THE NEW LINE, WHICH WE NEED TO DETERMINE.

STEP 2: USE THE GIVEN POINT TO FIND C

THE POINT (5, 4) LIES ON THE NEW LINE, SO SUBSTITUTING $x=5$ AND $y=4$ INTO THE EQUATION GIVES:

$$4 = 4(5) + c$$

CALCULATING:

$$4 = 20 + c$$

SOLVING FOR C:

$$c = 4 - 20$$

$$c = -16$$

STEP 3: WRITE THE FINAL EQUATION

WITH THE VALUE OF C DETERMINED, THE EQUATION OF THE PARALLEL LINE PASSING THROUGH (5,4) IS:

$$Y = 4x - 16$$

INTERPRETING THE RESULT

THE DERIVED EQUATION, $Y=4x-16$, CONFIRMS SEVERAL KEY POINTS:

- IT HAS THE SAME SLOPE AS THE ORIGINAL LINE, MAINTAINING PARALLELISM.
- IT PASSES THROUGH THE POINT (5,4), SATISFYING THE CONDITION SPECIFIED.
- ITS Y-INTERCEPT IS AT -16, MEANING IT CROSSES THE Y-AXIS AT THAT POINT.

THIS EQUATION CAN BE USED IN VARIOUS APPLICATIONS, SUCH AS GRAPHING THE LINE, CALCULATING INTERSECTIONS WITH OTHER LINES, OR ANALYZING GEOMETRIC RELATIONSHIPS.

VISUALIZING THE LINES

TO BETTER UNDERSTAND THE RELATIONSHIP BETWEEN THE ORIGINAL LINE AND THE NEW PARALLEL LINE, VISUALIZATION IS OFTEN HELPFUL.

GRAPHING THE ORIGINAL LINE: $Y=4x+4$

- THE Y-INTERCEPT IS AT $(0,4)$.
- FOR EXAMPLE, AT $x=0$, $y=4$.
- AT $x=1$, $y=8$.
- AT $x=-1$, $y=0$.

GRAPHING THE PARALLEL LINE: $Y=4x-16$

- THE Y-INTERCEPT IS AT $(0,-16)$.
- FOR $x=0$, $y=-16$.
- AT $x=1$, $y=-12$.
- AT $x=-1$, $y=-20$.

BY PLOTTING THESE POINTS, YOU'LL SEE THAT THE LINES ARE INDEED PARALLEL, RUNNING ALONGSIDE EACH OTHER AT A CONSISTENT DISTANCE, NEVER INTERSECTING.

PRACTICAL APPLICATIONS AND ADDITIONAL INSIGHTS

UNDERSTANDING HOW TO FIND EQUATIONS OF LINES PARALLEL TO A GIVEN LINE AND PASSING THROUGH SPECIFIC POINTS IS FUNDAMENTAL IN VARIOUS FIELDS BEYOND PURE MATHEMATICS.

REAL-WORLD APPLICATIONS

- ENGINEERING AND ARCHITECTURE: DESIGNING PARALLEL STRUCTURAL ELEMENTS.
- NAVIGATION: PLOTTING ROUTES THAT MAINTAIN A CONSISTENT BEARING.
- ECONOMICS: GRAPHING PARALLEL SUPPLY AND DEMAND CURVES.
- COMPUTER GRAPHICS: RENDERING PARALLEL LINES IN VISUAL INTERFACES.

EXTENSIONS OF THE CONCEPT

ONCE COMFORTABLE WITH PARALLEL LINES, LEARNERS CAN EXPLORE:

- FINDING THE EQUATION OF A LINE PERPENDICULAR TO A GIVEN LINE PASSING THROUGH A POINT.
- DETERMINING THE DISTANCE BETWEEN TWO PARALLEL LINES.
- WORKING WITH LINES IN THREE-DIMENSIONAL SPACE.

CONCLUSION: MASTERING THE CONCEPT

THE PROCESS OF FINDING AN EQUATION OF A LINE PARALLEL TO $Y=4x+4$ AND PASSING THROUGH A GIVEN POINT, SUCH AS $(5,4)$, EXEMPLIFIES THE ELEGANCE AND LOGICAL STRUCTURE OF ALGEBRAIC REASONING. BY UNDERSTANDING THE IMPORTANCE OF SLOPES AND THE POINT-SLOPE FORM, ONE CAN DERIVE PRECISE EQUATIONS THAT SATISFY SPECIFIC GEOMETRIC CONDITIONS. THIS SKILL NOT ONLY ENHANCES MATHEMATICAL LITERACY BUT ALSO EQUIPS LEARNERS WITH TOOLS APPLICABLE IN DIVERSE SCIENTIFIC AND PRACTICAL CONTEXTS. MASTERY OF THESE TECHNIQUES PAVES THE WAY FOR TACKLING MORE COMPLEX GEOMETRIC PROBLEMS AND DEEPENING ONE'S APPRECIATION FOR THE INTERCONNECTEDNESS OF ALGEBRA AND GEOMETRY.

IN SUMMARY:

- THE ORIGINAL LINE: $Y=4x+4$ (SLOPE = 4)
- PARALLEL LINE MUST HAVE THE SAME SLOPE: 4
- USING POINT $(5,4)$, FIND THE Y-INTERCEPT: $C = -16$
- EQUATION OF THE REQUIRED LINE: $Y=4x - 16$

BY FOLLOWING THIS SYSTEMATIC APPROACH, LEARNERS CAN CONFIDENTLY FIND EQUATIONS OF LINES UNDER VARIOUS CONDITIONS, REINFORCING BOTH THEIR UNDERSTANDING AND THEIR PROBLEM-SOLVING SKILLS.

[Find An Equation Of A Line Parallel To Y 4x 4 And Passing Through The Point 5 4 Y](#)

Find An Equation Of A Line Parallel To Y 4x 4 And Passing Through The Point 5 4 Y

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