

Proving Shapes with Coordinates and Slopes

Grade 10 – Geometry math · Worksheet · Standards: G-GPE.B.4, G-GPE.B.5, G-GPE.B.6, G-GPE.B.7

Name: _____ Date: _____ Class: _____

The problems build skill with the distance and midpoint formulas, slope tests for parallel and perpendicular lines, and ratio points on a segment (G-GPE.B.4, B.5, B.6, B.7). Later items find perimeter and area on the grid and prove triangles and quadrilaterals.

Standards: G-GPE.B.4, G-GPE.B.5, G-GPE.B.6, G-GPE.B.7 · **Level:** Grade 10 Geometry

Problem 1 Distance Between Two Points (easy)

Find the distance between $A(-3, 1)$ and $B(4, 6)$. Give the exact answer and a decimal rounded to the nearest hundredth.

Problem 2 Midpoint of a Segment (easy)

Find the midpoint of the segment with endpoints $(-7, 4)$ and $(5, -10)$.

Problem 3 Missing Endpoint (easy)

The midpoint of segment JK is $(3, -2)$. Point J is $(8, 1)$. Find the coordinates of K .

Problem 4 Parallel or Not? (easy)

Line p passes through $(1, 2)$ and $(4, 8)$. Line q passes through $(-2, -3)$ and $(2, 5)$. Decide whether the lines are parallel.

Problem 5 Perpendicular or Not? (easy)

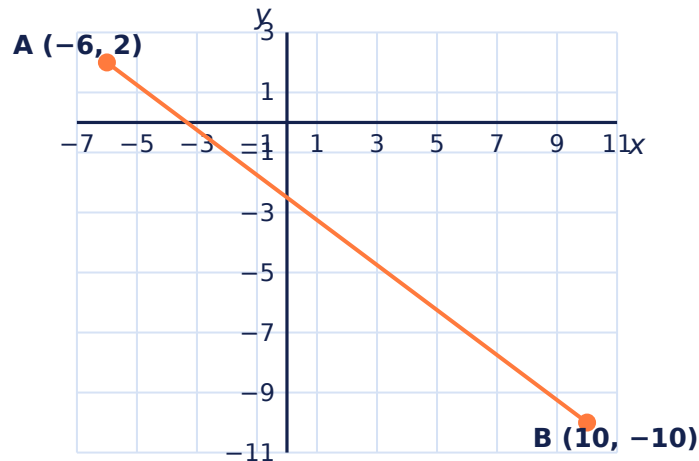
Line m goes through $(-1, 2)$ and $(3, 5)$. Line n goes through $(0, 0)$ and $(6, -8)$. Are they perpendicular?

Problem 6 Parallel Line Through a Point (medium)

Write the equation of the line parallel to $y = -4x + 9$ that passes through $(2, -3)$.

Problem 7 Perpendicular Line Through a Point (medium)

Write the equation of the line perpendicular to $3x - 2y = 8$ that passes through $(-6, 1)$.

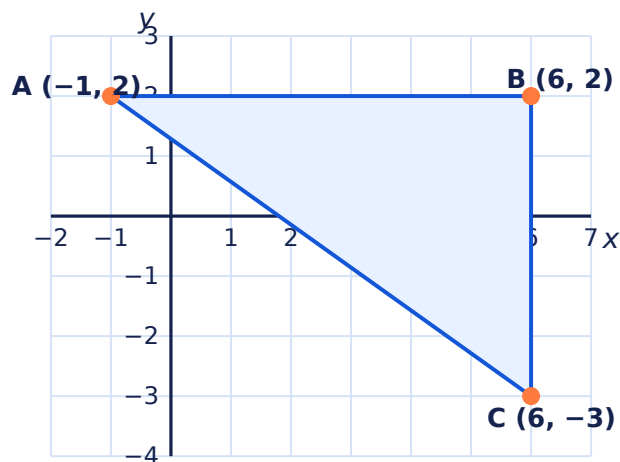
Problem 8 Dividing a Segment 1 : 3 (medium)

Locate P with $AP : PB = 1 : 3$.

A trail runs from A to B . A water station on the trail is placed so that its distance from A is one third of its distance from B . Find the coordinates of the station.

Problem 9 Dividing a Segment 3 : 2 (medium)

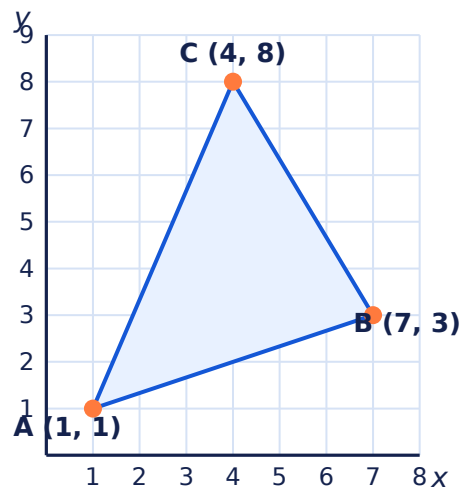
Point P lies on segment AB with $A(-5, 2)$ and $B(10, -8)$, and $AP : PB = 3 : 2$. Find the coordinates of P .

Problem 10 Perimeter and Area of a Right Triangle (medium)

Triangle ABC on the grid.

Find the perimeter and the area of triangle ABC . Give the perimeter as an exact expression and as a decimal to the nearest tenth.

Problem 11 Area by Enclosing Rectangle (medium)



Enclose the triangle in a rectangle.

Find the area of triangle ABC by enclosing it in a rectangle and subtracting the three corner triangles.

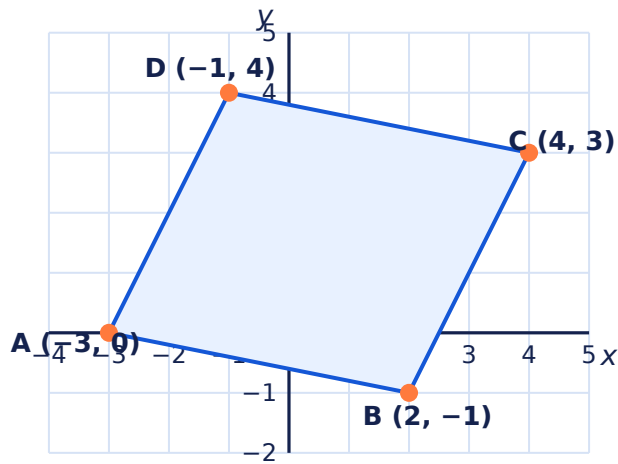
Problem 12 Classify by Side Lengths (medium)

Triangle DEF has vertices $D(-2, 3)$, $E(3, 7)$ and $F(8, 3)$. Use the distance formula to classify it as scalene, isosceles or equilateral.

Problem 13 Prove a Right Triangle (hard)

Show that the triangle with vertices $P(1, 1)$, $Q(4, 6)$ and $R(11, -5)$ is a right triangle, and find its area.

Problem 14 Prove a Parallelogram (hard)



Quadrilateral $ABCD$.

Prove that $ABCD$ is a parallelogram using slopes.

Problem 15 Prove a Rectangle (hard)

Show that $W(-3, -1)$, $X(2, -3)$, $Y(4, 2)$ and $Z(-1, 4)$ are the vertices of a rectangle. Use side slopes and the diagonals.

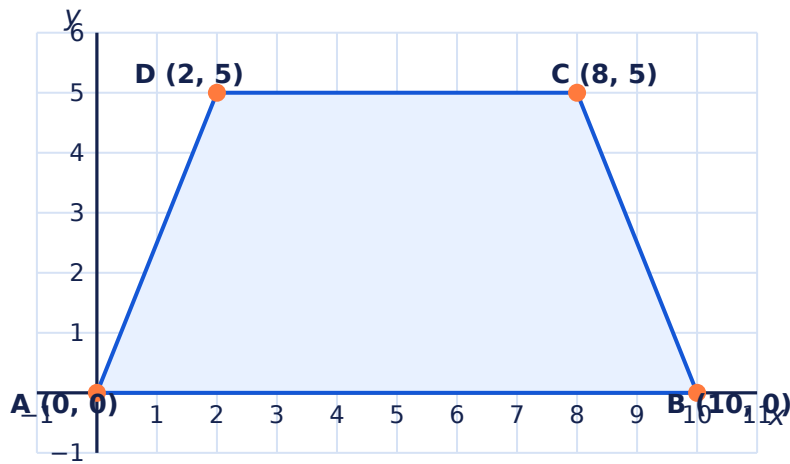
Problem 16 Hikers Meet Halfway (medium)

On a trail map with 1 unit = 1 mile, Imani is at $(-4, 2)$ and Corbin is at $(8, -6)$. They agree to meet at the midpoint of their positions and walk straight there. Find the meeting point and the distance each walks, to the nearest tenth of a mile.

Problem 17 Picnic Table on the Trail (medium)

A straight trail runs from the campground at $(0, 0)$ to the lodge at $(18, 12)$, with 1 unit = 100 yards. A picnic table goes two-thirds of the way along the trail from the campground. Find its coordinates and its distance from the campground in yards.

Problem 18 Fencing a Trapezoid Field (hard)



Field ABCD; 1 unit = 10 yards.

A field has corners at $A(0, 0)$, $B(10, 0)$, $C(8, 5)$ and $D(2, 5)$, with 1 unit = 10 yards. (a) Show that the field is an isosceles trapezoid. (b) Find the length of fence needed around it and its area, to the nearest yard or square yard.

Problem 19 Triangular Park (hard)

A triangular park has corners at $(1, 2)$, $(9, 4)$ and $(5, 10)$, with 1 unit = 1 block. Find the area in square blocks by enclosing it in a rectangle, and the perimeter to the nearest tenth of a block.

Problem 20 Midpoints Form a Parallelogram (hard)

Quadrilateral $ABCD$ has $A(0, 0)$, $B(8, 2)$, $C(10, 9)$ and $D(2, 7)$. Find the midpoints of its four sides and prove that connecting them in order forms a parallelogram.