Lesson 3.10 Perpendiculars Distance

Click Link Below to Open the Interactive Pear Deck PowerPoint
https://app.peardeck.com/student/tbxmhoima

pdf

Lesson 3.10
Perpendic...

Lesson 3.10 Perpendiculars and Distance Workbook pages 209-214

Content Objective
Students use perpendicular lines to find distance.

McGraw Hill

Florida's B.E.S.T. Standards for Mathematics

MA.912.GR.1.1
Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles.

MA.912.GR.3.3
Use coordinate geometry to solve mathematical and real-world geometric problems involving lines, circles, triangles, and quadrilaterals.

real-world geometric problems involving lines, circles, triangles and quadrilaterals.

Learn
Distance Between a Point and a Line
Key Concept : Distance Between a Point and a Line

The distance between a line and a point not on the line is the length of the segment perpendicular to the line from the point.

The shortest distance between point C and line AB is the length of the segment that is perpendicular to the line through the point. So, the distance between C and AB is CD.
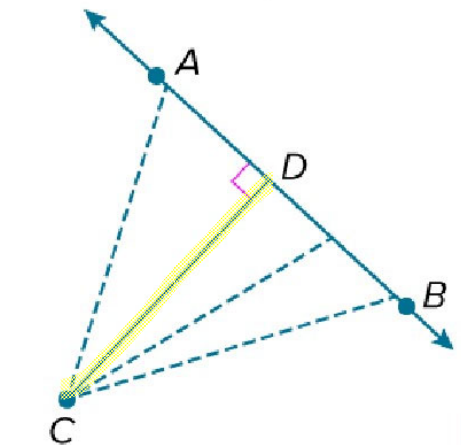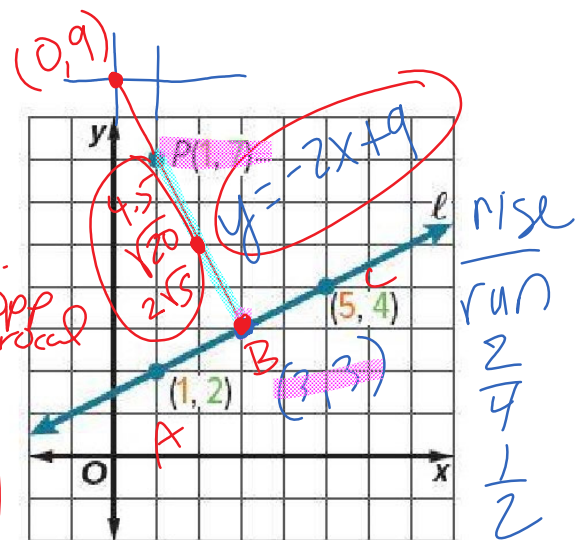
Example 1
Distance from a Point to a Line on the Coordinate Plane

Step 1   Find the equation of line ℓ.

Begin by finding the slope of the line through points (1, 2) and (5, 4).

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

(handwritten annotations):

$x_1, y_1 \quad x_2, y_2$

$\dfrac{4-2}{5-1} = \dfrac{2}{4} = \dfrac{1}{2}$

perp.
neg. opp
reciprocal

new slope $-\dfrac{2}{1}$

$(0, 9)$

$y = -2x + 9$

rise / run $\dfrac{2}{4} \quad \dfrac{1}{2}$

$(5, 4)$

$(1, 2)$

Example 1

Distance from a Point to a Line on the
Coordinate Plane

**Step 2   Find the equation of the line perpendicular to
line ℓ.**

Write the equation of line w that is perpendicular to line ℓ
and contains $P(1, 7)$. Because the slope of line ℓ is $\frac{1}{2}$, the
slope of line w is -2. Write the equation of line w through
$P(1, 7)$ with slope -2.
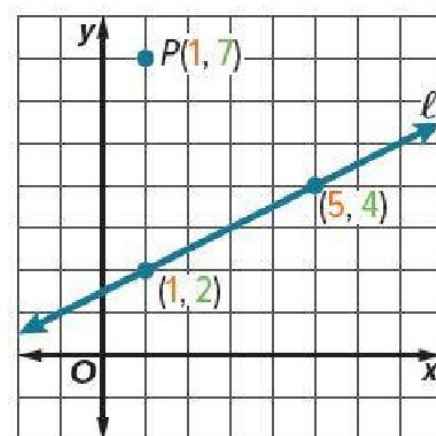
Use slope intercept form $y = mx + b$

(handwritten annotations)
$x \; y$ m $9 = b$

$y = -2x + 9$

$7 = -2(1) + b$
$7 = -2 + b$
$+2 = +2$

Example 1

Distance from a Point to a Line on the
Coordinate Plane

Step 3   Prove by Graphing!

Example 1

Distance from a Point to a Line on the
Coordinate Plane

Example 1
Distance from a Point to a Line on the Coordinate Plane

Step 4   Calculate the distance between *P* and *Q*.

Use the Distance Formula to determine the distance between $P(1, 7)$ and $Q(3, 3)$.

$x_1, y_1 \qquad x_2, y_2$

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

$(3-1)^2 + (3-7)^2$

$(2)^2 + (-4)^2$

$4 + 16 = \sqrt{20}$

$\sqrt{20}$

$\sqrt{4}\ \sqrt{5}$

The distance between point *P* and line ℓ is _____ **4.5 or $2\sqrt{5}$**

Example 1
Distance from a Point to a Line on the Coordinate Plane
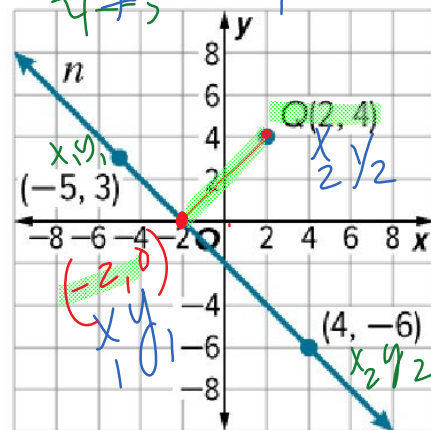
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Check

Line *n* contains points $(-5, 3)$ and $(4, -6)$. Find the distance between line *n* and point $Q(2, 4)$. Round to the nearest tenth, if necessary.

$\dfrac{y_2 - y_1}{x_2 - x_1}$ $\dfrac{-6-3}{4+5} = \dfrac{-9}{9} = -1$

new slope 1

$\sqrt{(2+2)^2 + (4-0)^2}$

$\sqrt{4^2 + 4}$

$\sqrt{16 + 16}$

$\sqrt{32} = 5.7$

$\sqrt{32}$

$\sqrt{16}\ \sqrt{2}$

$4\sqrt{2}$

$(-5, 3)$ x, y
$Q(2, 4)$ x_2, y_2
$(-2, 0)$ x, y
$(4, -6)$ x_2, y_2

Distance Between Parallel Lines

Find the distance between the two lines:
y=x+4 and y=x-2

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

ORig slope

new slope

$(0, 4)$ x, y

and y=x-2

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

$(3-0)^2 + (1-4)^2$

OK so
new slope $\frac{1}{1}$

new slope $= \frac{1}{1}$

$(0,4)$

$\sqrt{18}$ 4.2

$3\sqrt{2}$

$(3)^2 + (-3)^2$

$9 + 9$

$\sqrt{18} = 4.2$

$\sqrt{18}$

$\sqrt{9} \quad \sqrt{2}$

$3\sqrt{2}$

$(3,1)$

x   y

2   0
2

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

Distance Between Parallel Lines
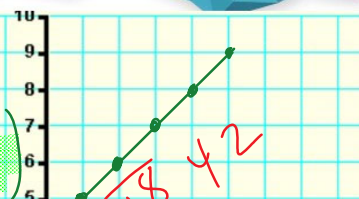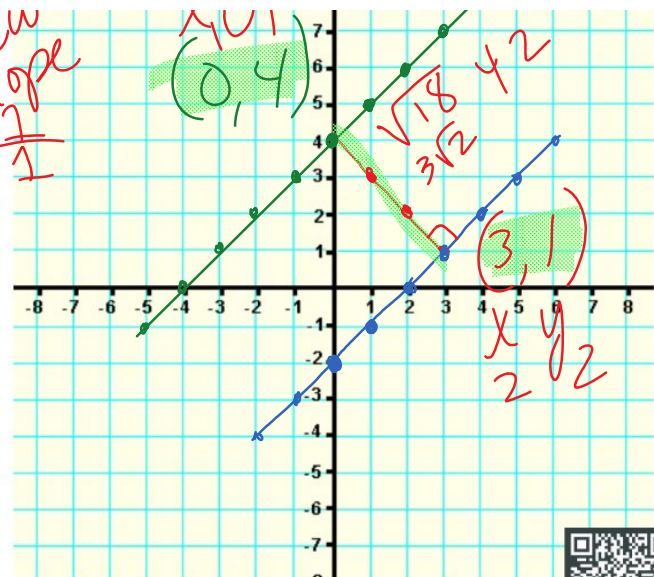
Find the distance between the two lines:
y= ½ x + 1 and y= ½ x - 4

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

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

Class Notes Page 5