(A) Lesson Context

BIG PICTURE of this UNIT:	• How do I determine the measure of angles in geometric shapes, without direct measurement? • How do I solve for sides or angles in right triangles? • How can I solve problems that require geometric models using right triangles??

(B) Lesson Objectives:

a. Determine the angles of lines if given the equation of lines
b. Determine the measure of angles in quadrilaterals, given either the points or lines that make up the shape
c. Do some simple surveying around campus to determine heights and distances

(C) REVIEW Investigation #1

a. Graph the line $y = 3x$ and determine the slope of the line $y = 3x$
b. This line makes a hypotenuse of a right triangle. State the value of the tangent ratio of this triangle.
c. Determine the angle that the line makes with the positive x-axis.
d. Now, work with the following lines and (i) draw each line and then determine (ii) the slope & (iii) the tangent ratio and then finally (iv) the angle

   i. $2x - 5y = 8$

   ii. $y + 4 = \frac{1}{4}(x - 3)$

   iii. $y = \frac{1}{2}(x + 5)$

(D) REVIEW Investigation #2

a. Draw the line $y = 3(x - 3)$ (or $y = 3x - 9$).
b. This line represents a transformation of the line $y = 3x$. Explain how the line (or $y = 3x - 9$) has been transformed, given the original line ($y = 3x$) that we started with in Investigation #1.
c. Using trigonometric methods, determine the measure of the angle BAC (i.e. determine the measure of the angle that the line $y = 3x - 9$) makes with the x-axis

(E) Investigation #3– Lines with Negative Slopes

a. Graph the line $y = -3x$ and determine the slope of the line $y = -3x$

b. This line makes a hypotenuse of a right triangle. State the value of the tangent ratio of this triangle.

c. Determine the angle that the line makes with the positive x-axis.

d. Now, work with the following lines and (i) draw each line and then determine (ii) the slope & (iii) the tangent ratio and then finally (iv) the angle

i. $2x + 5y = 8$

ii. $y + 4 = -\frac{1}{4}(x - 3)$

iii. $y = -\frac{1}{2}(x + 5)$

(F) **Consolidation**

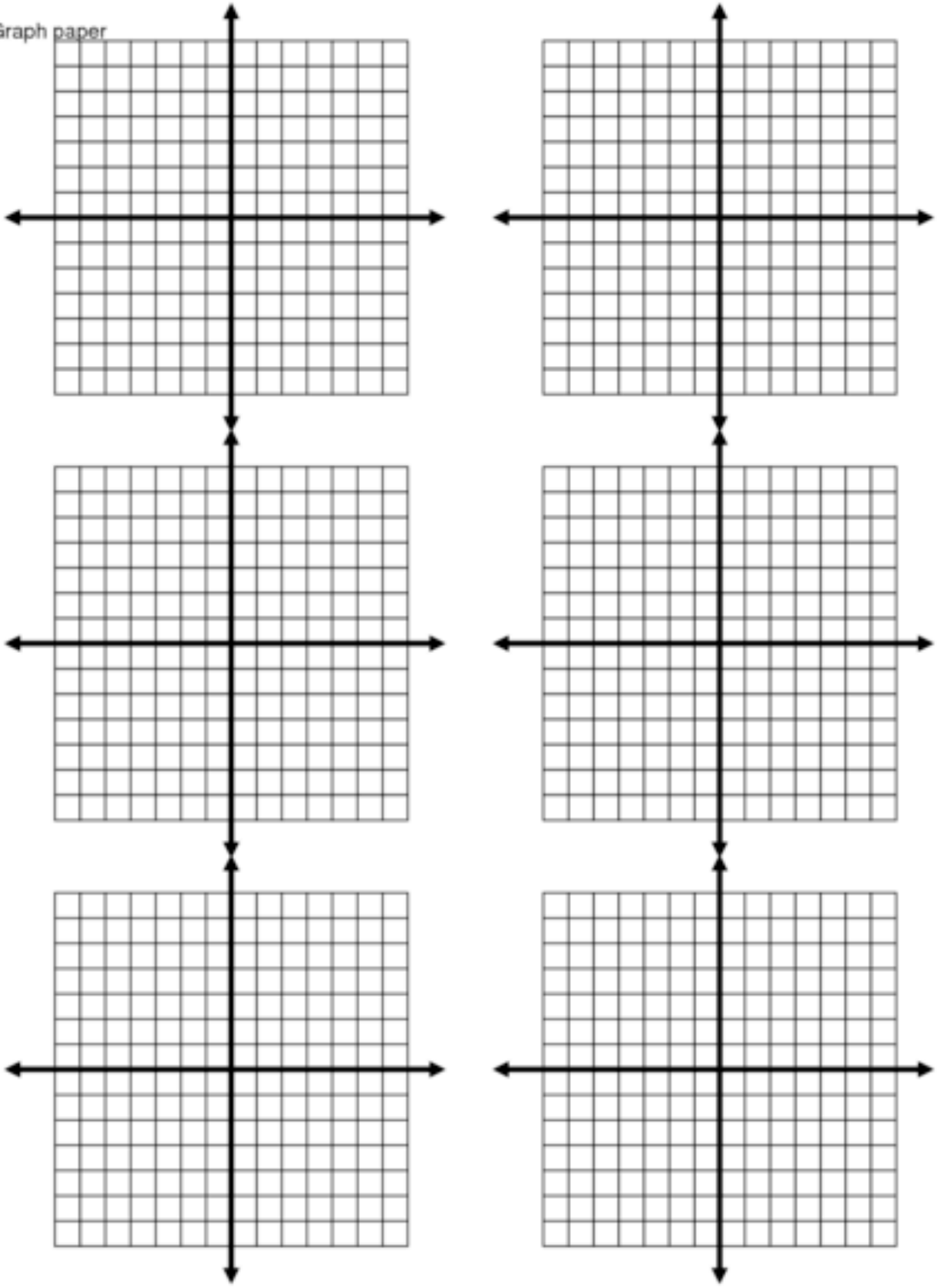
Determine the meaure of the angle that the following lines make with the x-axis:

(a) $y = \frac{2}{5}x + 1$	(b) $y = -\frac{8}{3}x - 2$	(c) $y - 2 = \frac{3}{4}(x - 1)$	(d) $y + 3 = -\frac{7}{6}(x + 4)$
(e) $2x - 7y = 14$	(f) $8x + 5y = 10$	(g) $x = 4$	(h) $7y = 14$

(G) **Extension #1**

You are given a triangle enclosed by the lines Line #1: $y = x + 3$ & Line #2: $y = 2x + 5$ & Line #3: $y = \frac{1}{2}x + 5$. Draw the lines, outline the triangle and then determine the measure of all three interior angles.

Graph paper



In this assignment, you will use trigonometry to model & eventually solve 2 types of problems. One set of problems is geometry based (to relate to our second unit on coordinate geometry) and the second set of problems will be applications based – you will do some simplistic surveying. In both types of problems, the key strategy will be to understand how right triangles can be used to model & visualize problems & their solutions. The problems will then be solved using the trigonometric ratios.

Requirements for the presentation of the work in your assignment:

A. ***FIRST***: Always start with a clearly labeled diagram

B. ***SECOND***: Outline a plan that you intend to follow. In Problem Set A, you will briefly outline the keys steps that you need to work through & a brief rational (reason) for WHY you need to work through a given key step. You will also require a second component to your plan: that being a plan on HOW TO DO THE SURVEYING, in order to get the relevant data/measurements. In Problem Set B, you will briefly outline the keys steps that you need to work through & a brief rational (reason) for WHY you need to work through a given key step.

C. ***THIRD***: Carry out your plan in collecting the relevant measurements and then carry out your calculations.

D. ***FOURTH***: Write your conclusions (which will just be your heights/distances in Problem Set A and measures of your angles in Problem Set B)

Problem Set A – Surveying Applications – DETERMINE THE HEIGHT OF THE MS BUILDING

1. (GREEN LEVEL QUESTION – everyone MUST do this level first) Design a method of determining the height of the MS building and then go outside and survey to gather your data and solve the problem. Method must be approved before you may leave to survey. To CONFIRM/VERIFY your result, you MUST do a "second trial", but from a different location from the first trial.

2. (BLUE LEVEL QUESTION) Design a method of determining the height of the MS building. NOTE: All data measurements must be done from WITHIN the MS field – no DIRECT measures are allowed. Then go outside and survey to gather your data and solve the problem. Method must be approved before you may leave to survey.

3. (BLACK LEVEL QUESTION) Design a method of determining the height and LENGTH of the MS building. NOTE: All data measurements must be done from WITHIN the MS field. Then go outside and survey to gather your data and solve the problem. Method must be approved before you may leave to survey.