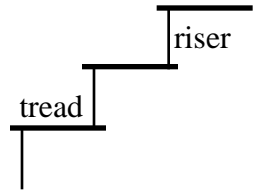


Is GBS up to Code???

Stairs are made up of **treads**, the horizontal distance that you step on, and **risers**, the vertical distance that you step up.

For both safety and comfort reasons, treads and risers must meet certain requirements by law. These laws allow for small errors in construction and settling of buildings over time (and consequent changes in riser height, for example). The building laws also change over the years--so, houses and buildings built earlier than 1999 might not be in complete compliance of current laws on risers and treads (however, any "gross" violations do have to be changed!!)



CURRENT BUILDING LAWS:

- * The ideal ratio of riser to tread is 0.7
- * $r + t = 17$ inches
- * $r \cdot t = 70$ to 75
- * there can be no more than $\frac{3}{16}$ of an inch variation in height of risers in a set of stairs.

I. Do the two different sets of stairs in the new pit at GBS fit these guidelines?

To find out, use a ruler to measure one riser and one tread from each set of stairs in **INCHES** and complete the following table:

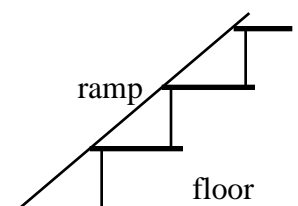
	riser height (in)	tread length (in)	SLOPE = riser/tread	sum, $r + t$	product, $r \cdot t$
Concrete stairs to 2nd floor					
Carpeted stairs down to bottom of pit					

Conclusions: *Answer the question above in at least TWO complete sentences.* _____

II. Angles of Inclination...

The angle of inclination of a staircase is the angle of the ramp you'd make with the floor if you laid a board up the stairs. Compute the angle of inclination for...

- 1) the IDEAL staircase: _____
- 2) the concrete stairs to the second floor: _____
- 3) the carpeted stairs down to the bottom of the pit: _____



Generally, staircases do not have to be changed if the angle of inclination is LESS than the ideal, but they do if the angle is MORE than the ideal.

Do the stairs at GBS need to be changed? _____

III. Other common slopes in buildings...

4) You could think of a floor as a BIG tread with no riser. What is the slope of the floor? _____

5) You could think of a wall as a LONG riser with no tread. What is the slope of a wall? _____
 (remember, division by zero is considered "undefined.")

IV. Another rule for risers and treads...

Risers and treads can also meet the following rule to fit the law:

$$2r + t = 24 \text{ inches}, \text{ where } r = \text{riser height and } t = \text{tread length}$$

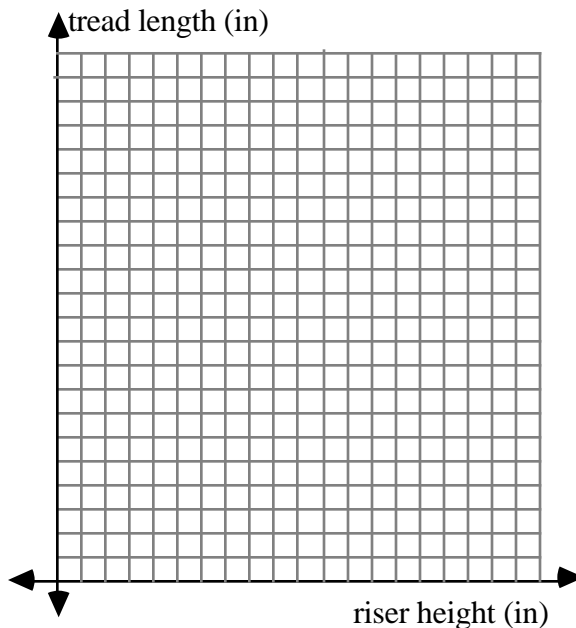
We can rewrite this equation as: $t = -2r + 24$, or, written in function notation

$$t(r) = -2r + 24, \text{ where the tread length, } t(r), \text{ depends on the riser height, } r$$

Now it looks like equations we've already graphed!

Complete the table below and graph the different possibilities for risers and treads on the grid.

<u>riser (r, or input)</u>	<u>tread (t(r), or output)</u>
1 inch	_____
2 inches	_____
3 inches	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____
13	_____



6) a) What is the y-intercept of this equation? _____

b) What does the y-intercept mean for lengths of treads and heights of risers?

7) a) What riser will give you a tread of 12 inches? *Show work*

b) What riser will give you a tread of 9 inches? *Show work*

8) Can you have a riser of more than 12 inches? Why or why not?

9) a) What is the slope of this equation? _____

b) Explain what the slope means in words, including units:

10) Do either of the staircases in the pit at GBS satisfy this rule? _____
Show your calculations to **SHOW HOW YOU KNOW**:

V. Summary

Write a 3-paragraph letter to the principal, Mr. Smith, advising him of your calculations and whether or not he needs to have any stairs changed this summer. Your letter should include

- paragraph 1: a short introduction of yourself and the project
 - paragraph 2: an explanation of your measurements and calculations for **slope** and **angle of inclination** (sections I & *part of II*)
 - paragraph 3: a recommendation of further action by the school and conclusion
- ****Be sure you sign your letter!

Extra Credit: Add a paragraph to your letter in which you explain section IV to Mr. Smith, telling him whether either set of stairs fits this guideline.

VI. Evaluation

	not yet...		ok		expert!
Measurements & Calculations (I & II)	1	2	3	4	5
Completeness of all questions, graphs, etc. (III & IV)	1	2	3	4	5
Letter					
-appropriate address & signature	0		1		2
-completeness of explanation & recommendation	1	2	3	4	5
-overall correctness	1		2		3
<i>Extra Credit:</i>	1		2		3
TOTAL:					_____ / 20 pts

DUE DATE: _____ **if hand-written;** _____ **if typed**