

Exeter Math problem set #4

1. A recent CNN poll about crime in schools reported that 67% of the persons polled were in favor of a crime bill currently being debated in Congress. CNN also reported that there was a 3% margin of error in the statistics. Explain why the range of possible percentage points can therefore be written as $|x - 0.67| \leq 0.03$.

2. The equation $|x - 7| = 2$ is a translation of “the distance from x to 7 is 2.”

(a) Translate $|x - 7| \leq 2$ into English, and graph its solutions on a number line.

(b) Convert “the distance from -5 to x is at most 3” into symbolic form, and solve it.

3. Fill in the blanks:

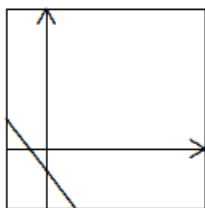
(a) The inequality $|x - 1.96| < 1.04$ is equivalent to “ x is between ____ and ____.”

(b) The inequality $|x - 2.45| \geq 4.5$ is equivalent to “ x is not between ____ and ____.”

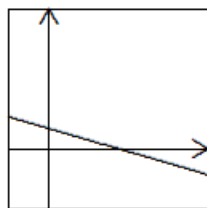
4. Jay thinks that the inequality $k < 3$ implies the inequality $k^2 < 9$, but Val thinks otherwise. Who is right, and why?

5. Which of the following calculator screens could represent the graph of $9x + 5y = 40$?

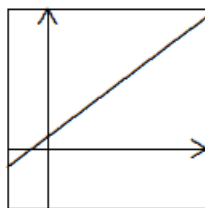
(a)



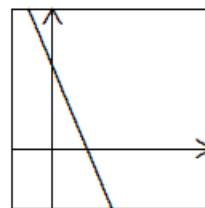
(b)



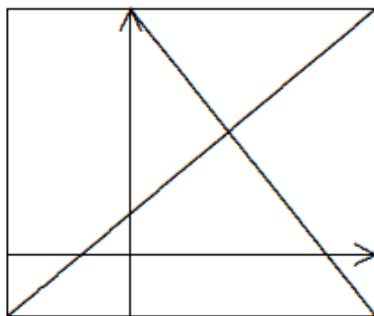
(c)



(d)



6. The diagram below shows a calculator screen, on which the lines $5x + 4y = 32$ and $-5x + 6y = 8$ have been graphed. What are the window specifications for this picture? In other words, the window can be described by the two inequalities $a \leq x \leq b$ and $c \leq y \leq d$, using what numbers in place of a , b , c , and d ?



7. Lee's pocket change consists of x quarters and y dimes. Put a dot on every lattice point (x, y) that signifies that Lee has exactly one dollar of pocket change. What equation describes the line that passes through these points? Notice that it does not make sense to connect the dots in this context, because x and y are discrete variables, whose values are limited to integers.

(Continuation) Put a dot on every lattice point (x, y) that signifies that Lee has at most one dollar in pocket change. How many such dots are there? What is the relationship between Lee's change situation and the inequality $0.25x + 0.10y \leq 1.00$?

(Continuation) Write two inequalities that stipulate that Lee cannot have fewer than zero quarters or fewer than zero dimes

8. Mark $A = (0, 0)$ and $B = (10, 0)$ on your graph paper, and use your protractor to draw the line of positive slope through A that makes a 25-degree angle with AB . By making suitable measurements, calculate (approximately) the slope of this line.

(Continuation) Turn on your calculator, press the **MODE** button, and select the Degree option for angles. Return to the home screen, and **ENTER** the expression $\text{TAN}(25)$. You should see that the display agrees with your answer to the preceding item.

9. Let $A = (0, 0)$, $B = (4, 0)$, and $C = (4, 3)$. Measure angle CAB . What is the slope of AC ? Use this slope and the **TAN** button to check your angle measurement. Use your calculator to come as close as you can to the theoretically correct size of angle CAB .

(Continuation) On your calculator, **ENTER** the expression $\text{TAN}^{-1}(0.75)$. Hmm. . .

10. Draw a right triangle that has a 15-cm hypotenuse and a 27-degree angle. To the nearest tenth of a cm, measure the side opposite the 27-degree angle, and then express your answer as a percentage of the length of the hypotenuse. Compare your answer with the value obtained from your calculator when you enter **SIN 27** in degree mode.

(Continuation) Repeat the process on a right triangle that has a 10-cm hypotenuse and a 65-degree angle. Try an example of your choosing. Write a summary of your findings.

11. To the nearest tenth of a degree, find the sizes of the acute angles in the 5-12-13 triangle and in the 9-12-15 triangle. This enables you to calculate the sizes of the angles in the 13-14-15 triangle. Show how to do it, then invent another example of this sort.

12. Find a triangle two of whose angles have sizes $\text{TAN}^{-1}(1.5)$ and $\text{TAN}^{-1}(3)$. Answer this question either by giving coordinates for the three vertices, or by giving the lengths of the three sides. To the nearest 0.1 degree, find the size of the third angle in your triangle.

13. A line of slope $\frac{1}{2}$ intersects a line of slope 3. Find the size of the acute angle that these lines form, to the nearest tenth of a degree.

14. Without doing any calculation, what can you say about the tangent of a k -degree angle, when k is a number between 90 and 180? Explain your response, then check with your calculator.

15. Ask your calculator for the sine of a 56-degree angle, and for the cosine of a 34-degree angle. Ask your calculator for the sine of a 23-degree angle, and for the cosine of a 67-degree angle. The word cosine abbreviates "sine of the complement." Explain the terminology. The cosine button on your calculator seems to be unnecessary, and yet it is there. Explain.