pts

Math 130**Functions and Graphs**Week 1

Goal: The purpose of these activities is to better understand functions and their graphs.

Question 1 *Every square has both a perimeter p and an area A. In other words, there is a relationship between the set of perimeters of squares and the set of areas of squares. Is this relationship a function?*

Part II

s A a function of p? Is p a function of A? Explain.

Solution Yes to both. For each value of p, there is exactly one value of A related to p. Therefore A is a function of s. But also, for each value of A, there is exactly one value of p related to A. So p is a function of A.

Part II

W

e often use function notation such as $f(p) = A$. What would $f(36)$ be equal to? Explain what $f(36)$ represents. Include possible units for 36 and $f(36)$.

Solution If $f(p) = A$, that means that the function f takes a perimeter p and gives an area A. So $f(36) = 81$ (since the perimeter is 4 times the side length, this square has side length 9, so has area 81). This means that a square with perimeter 36 cm has area of 81 sq cm. Note that $f(36)$ is an area, so it has units such as square centimeters while the 36 is the perimeter, with units centimeters.

Part III

I

t is also true that every rectangle has a perimeter p and an area A. If we take this as our relationship, is A a function of p? Is p a function of A? Explain, using function notation (like $f(p) = A$).

Solution These are not functions. The area is not a function of perimeter because there are multiple areas that correspond to rectangles of a given perimeter. Say we did write $f(p) = A$. Then $f(20)$ would be the area of a rectangle with perimeter 20 units. If this rectangle was a square, then the side length would be 5 units, so we would have $f(20) = 25$ square units. But the rectangle could also be a 3×7 rectangle (which has perimeter $3 + 3 + 7 + 7 = 20$ units). In that case we would say $f(20) = 21$ square units. If f is going to be a function, we must have $f(p)$ only ever be one value (for each specific value of p). In fact there are infinitely many different rectangles with perimeter 20 but different areas.

Similarly, the perimeter is not a function of area. An area of 24 could correspond to a 2×12 rectangle (with perimeter 28) but also a 4×6 rectangle (with perimeter 20), along with infinitely many other rectangles with different perimeters.

Question 2 *A nice way to represent some functions is with* a graph. *Before we think about how to do this, let's review what it means to graph an* equation.

Part IVC

onsider the equation $y = 2x - 1$. We can pick pairs (x, y) and plug them into the equation. Sometimes this will give a true equation, for example the pair $(3, 5)$. Some pairs will give a false equation, such as $(7, 1)$. Draw an xy-plane below and plot all pairs that make the equation true.

Solution The pairs that make the equation true will form a line with slope 2 and y-intercept 1.

Part V

R

epeat the previous question, this time using the equation $x^2 + y^2 = 25$. Some points to try: $(-4, 3)$, $(6, 1)$, etc. What is the largest and smallest each of x and y could be?

Solution The graph will be a circle of radius 5, centered at the origin.

Part VI

B

oth of the equations above represent relationships between values of x and values of y. Are the relationships functions? How could you use function notation to represent the relationship?

Solution The first equation does represent a function. We can say that y is a function of x, and write $f(x) = y$. In other words, to get the y value for a given x value, we compute $f(x) = 2x - 1$, which gives y since $y = 2x - 1$.

The second equation is NOT a function. For example, when $x = 3$, we could have y be 4 or -4 and still make the equation true.