Mathematics Quiz – Graphing and Trends (Extended)

Name: **Grade: /47**

You may use a graphing calculator, a pen or pencil and a ruler. Time given for the test is 60 minutes.

Test Objectives and Points

- Recognising trends
- Solving simple and complex inequalities
- Recognising and sketching general trends
- Understanding and using the general equation of a line
- Justifying and explaining phenomena and rules associated with gradient
- Calculating gradients, midpoint, distance and the distance from a point to a line
- Understanding basic parallel line rules
- Understanding independent and dependent variables and how they can affect x and y values, along with trends
- Interpreting contextual graphing and trend questions
- Deriving values and equations based on points
- Solving and calculating axis intercepts
- Rules associated with parallel lines and perpendicular lines
- Use algebraic substitution and rearranging equations to solve inequalities and to derive the form y=mx+c
- Understand and apply the equation of a circle to a range of contextual problems
- Understand mathematical terminology regarding proportions and ratios

- If the equation for Main Road in the town of Green Lake could be defined as 2x+3, what is the slope of the road? Explain.

1 mark

- An ice-cream shop is at point (5,7) and a rival ice-cream shop is at point (7,9). What would be the most direct distance between them?

1 mark

- Would the lines 4x+3 = y and 15 = -4x+y ever intersect? Why? Why not?

2 marks

- A new proposed straight road will run through the town with the equation of 2x+5. Plot the graph that shows this.

3 marks

- Find the midpoint between the lake at (2,3) and the factory at (4,6). Find the slope and then the y-intercept for a trend of such a line that these two points would fall on.

4 marks

- If the x-intercept of Main Road is where it meets South Road, and a point of Main Road is (0,3). Then at what co-ordinate point would these roads meet?

1 mark

- The lake is a perfect circle and two opposing points of the lake are: (2,3) and (6,7). Find the equation of a circle for the lake.

3 marks

- Write an inequality that would represent the region south of Main Road, if Main Road had a slope of 2x+3.

1 mark

- Deduce which line has the greatest length from these two inequalities if there are two rules about the domain of both of these lines; y <= 12 and y >= -6

  Line A: 5 >= 2x + 1 **Line B:** 6 <= 3x + 1

3 marks

- Solve and derive the following inequalities

  a)

$$\frac{x-9^2}{0.5-(-2^2)} \leq \frac{14-95}{2(4+3^2)}$$

3 marks

b) X is at least twice as great as a y value that is **inversely proportionate** from the distance between x and y intercept in the equation 40-5y = -20x

3 marks

c) $\frac{2x}{(4x+16)} < 12x$

3 marks

- Algebraically calculate the shortest distance to a line from the point (17,8) to the line -4y + 5x – 2 = 0-9

4 marks

- A water tank is to be built at position (6,3). It must be connected to Green Lake's existing water supply with the line of 4y-7+20x=0. Derive the equation of the perpendicular water supply to this line and then calculate the distance needed to connected the water tank to the point at which the perpendicular line crosses the water supply.

4 marks

- Derive the middle of the town if Green Lake Hotel is 10km to the East of said and is situated on a road that has a gradient twice that of the this road with a perpendicular line to the road that has the fountain, the center of the town. Note that the intersection of the two roads (the one with the hotel and the one that has twice the gradient of that road) is (4,9).

4 points

- Algebraically prove that the gradient of a line that is vertical is undefined.

2 points

- Justify why polynomials would be regarded as functions but a circle plotted on a Cartesian set of axes would not be considered as a function

2 points

- On the nanoscale, gold can be a red or purple colour depending on the wavelength of photon that is absorbed. Through testing, it was found that sodium citrate reduces the size of nanoparticles and that smaller nanoparticles would absorb high energy (yet small wavelengths) of particles. If volume of Sodium Citrate was plotted as the independent variable against the absorbance of a wavelength in nanometers as the dependent variable, would the trend found be increasing or decreasing? Assume a linear trend.

3 points

Comments: