

IB Math Studies – Summer Work

Welcome to Math Studies! Attached are two assignments that you need to complete over the summer. The first one is a review of basic Algebra. The second part is a writing project in which you need to attempt each problem and explain your approach. This assignment is due the first day of class. There will be a test on Part I on the second day of class. I will be available over the summer via email at amurray@rbrhs.org if you have any questions. Please note that it is recommended that you purchase a TI-84+ graphing calculator, since we will be using it in class during the year, and it is necessary for the IB exam.

Enjoy your summer and I look forward to having you in class next year!

Sincerely,

Ms. Murray

www.rbrhs.org/wt/murray/

IB Math Studies Summer Work – Part I. Algebra Review

Show all of your work on separate paper neatly and clearly. Graphs must be completed on graph paper.

Part I Sets of Numbers

Order the given numbers from greatest to least. Then classify each number by the subsets of the real numbers (\mathbb{R} = Real, \mathbb{Q} = Rational, \mathbb{I} = Irrational, \mathbb{Z} = Integer, \mathbb{W} = Whole, and/or \mathbb{N} = Natural) to which it belongs.

1. $2.5, -3\frac{1}{3}, \sqrt{5}, -\frac{4}{5}, 0.\overline{75}$

2. $\sqrt{3}, -\frac{\pi}{2}, \frac{5}{6}, -1.\overline{15}, -2$

Part II Properties of Real Numbers

Identify the property (Additive Identity, Multiplicative Identity, Additive Inverse, Multiplicative Inverse, Commutative, Associative, or Distributive) demonstrated by each equation.

3. $3(2a + b) = 3(2a) + 3b$

4. $21 + 0 = 21$

5. $(2\pi)r = 2(\pi r)$

Part III Square Roots

Simplify each expression. Answers should be exact (expressed with square roots) and not in decimal form.

6. $-\sqrt{72}$

7. $5\sqrt{12} + 9\sqrt{3}$

8. $\frac{-4\sqrt{10}}{\sqrt{2}}$

9. $\sqrt{32} \cdot \sqrt{6}$

Part IV Simplifying Algebraic Expressions

Evaluate each expression for the given values of the variables. Show step-by-step how you simplify each expression.

10. $\frac{a^2}{3} + \frac{ab}{4}$ for $a = 3$ and $b = -4$

11. $\frac{d^2}{2cd}$ for $c = -1$ and $d = 2$

Simplify each expression.

12. $2x^2 - 3y + 5x^2 - x^2$

13. $3(x + 2y) - 5x + y$

Part V Properties of Exponents

Simplify each expression so that answers are in lowest terms with no negative exponents. Assume all variables are nonzero.

14. $(x^{11}y^{-2})^4$

15. $\frac{-3s^3t^2}{s^{-2}t^8}$

16. $4(a^2b^6)^{-3}$

17. $\left(\frac{m^4}{-5m^{-2}n^3}\right)^2$

18. The atomic mass of an element from the periodic table is the mass, in grams, of one *mole*, or 6.02×10^{23} atoms. Suppose a sample of oxygen contains 4.515×10^{26} atoms. How many moles of oxygen atoms are in the sample?

Part VI Solving Linear Equations and Inequalities

Solve each equation, showing step-by-step how you arrive at your answer.

19. $15 + 8x = 3x$

20. $\frac{3}{2}(5x + 7) = 16$

21. $12 - 15x = 25 - 5x$

22. $3(x + 5) - 8(x - 3) = 20$

23. $\frac{5}{2}\left(3x - \frac{3}{2}\right) - \frac{3}{4} = \frac{2}{3}x + 4$

Solve and graph the solution on a number line.

24. $45 \geq -25 + 10x$

25. $12 - 4x < 24$

26. $4(9 - 2x) \leq 3(4x + 2)$

27. $5x - 4(2x + 6) \geq 15$

28. Marie has \$55 in her bank account, and she would like to buy a video game system that costs \$395. Marie saves \$6 for each hour she works. How many hours must Marie work to have enough money to buy the video game system? Write an inequality for this situation and solve it.

Part VII Proportional Reasoning

Solve each proportion. Show the steps leading to your answer.

29. $\frac{x}{12} = \frac{8}{3}$

30. $\frac{3}{5} = \frac{4x}{9}$

31. $\frac{5}{-x} = \frac{2.5}{8}$

$$32. \frac{5}{9} = \frac{4}{2x-3}$$

33. A building casts a 24-foot shadow at the same time that a 6-foot tall person casts an 8-foot shadow. How tall is the building? Write a proportion and solve it.

Part VIII Graphing Linear Equations

Algebraically determine the x - and y -intercepts of the line. Then use these points to graph each line.

34. $2x + 3y = 18$

35. $5x - 3y = -15$

36. $\frac{1}{2}x + 2y = 6$

37. $-x - y = \frac{7}{2}$

Write each function in slope-intercept ($y = mx + b$) form and then graph it.

38. $y - 3x = 1$

39. $4x + 2y = 8$

40. $3x - 10 - 5y = 0$

41. $5 - x = \frac{y}{3}$

Part IX Writing Linear Equations

Write an equation in slope-intercept form for the line...

42. through $(3, 12)$ and $(6, 27)$.

43. through $(4, -6)$ with slope $\frac{3}{4}$.

44. parallel to $y = \frac{3}{2}x - 6$ and through $(-6, 2)$.

45. perpendicular to $5x + 2y = 8$ and through $(5, 3)$.

Part X Linear Inequalities in Two Variables

Solve for y in each inequality. Then graph.

46. $y - 1 \leq 5$

47. $2x + 5y > 10$

48. $3x - 4y > 5x + 12$

49. $3(2x - 1) + y > 6x - 4$

50. Dorothy has \$30 to spend on holiday cards. Large cards cost \$2.50 each, and small cards cost \$1.50 each. Write and graph an inequality for the number of cards Dorothy can purchase.

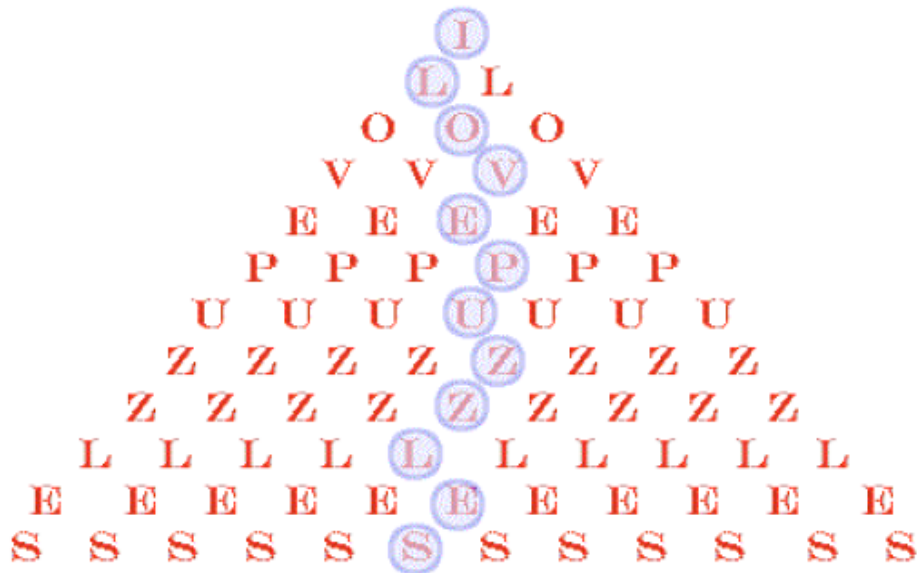
The Writing Prompts

Once you have attempted the four problems (on the following pages) in this section of your summer assignment, respond to the following prompts. Answers may be typed or neatly handwritten and should be at least one paragraph in length. Good responses should elaborate upon strengths and weaknesses, showing an in-depth awareness of your problem-solving skills. Grammatical errors in your responses will also be noted.

1. Compare the methods by which you solved the problems. For example, did you draw a picture, act it out, break it down, list all possibilities, read it aloud, discuss it with someone, work backwards, write an equation, etc.? What things did you do that really helped you solve the problems? Are there strategies you used that worked for more than one problem? What do your strengths appear to be in solving problems?
2. Which two problems were your favorite in this assignment? Why did you pick them as your favorite problems to work? Can you think of any other types of problems you have worked that utilize these same skills to solve them? If so, describe them or give an example. What are a few reasons you like working these problems?
3. Which two problems were your least favorite in this assignment? Why did you pick them as your least favorite problems to work? Can you think of any other types of problems you have worked that utilize these same skills to solve them? If so, describe them or give an example. What are a few reasons you dislike working these problems?
4. In looking over your work as a whole, what aspects of problem-solving appear to be your weakest areas? Is it in *understanding the problem*, *devising a strategy for solving the problem*, *carrying out your strategy*, or *verifying that your solution makes sense*? Elaborate upon your reasoning, and state a few ideas for how you might improve these weaker areas over the course of the coming school year.

#1: The Pinball Puzzle

Below is a triangle of letters. You can spell I LOVE PUZZLES by bouncing down the letters like a pinball from the I down to the S. How many ways can you spell I LOVE PUZZLES? You may only bounce to one of the two letters below the letter you last hit. One possible path has been marked.



#2: Chew on This



If the third letter before the second consonant after the third vowel in the alphabet is in the twenty-sixth word of this problem, then print the fortieth word of this problem and then print the twenty-second letter of the alphabet after this word. Otherwise list three uses for chewing gum.

#3: Reasonable 'rithmetic

Each letter in these problems represents a different digit.

1. What is the value of C?
2. What is the value of D?
3. What is the value of K?
4. What is the value of N?

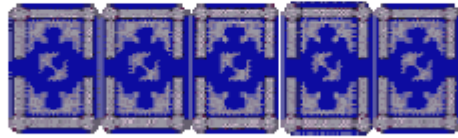
$$\begin{array}{r}
 8789 \\
 3BA7 \\
 482A \\
 +7AB5 \\
 \hline
 2C287
 \end{array}$$

$$\begin{array}{r}
 DEFF \\
 -E2F6 \\
 \hline
 1997
 \end{array}$$

$$\begin{array}{r}
 GJ \\
 7 \overline{)HGK} \\
 \underline{21} \\
 HK \\
 \underline{HK} \\
 K
 \end{array}$$

$$\begin{array}{r}
 52 \\
 LQ \overline{)NMP} \\
 \underline{N}P \\
 M2 \\
 \underline{M}2 \\
 2
 \end{array}$$

#4: Pick A Card



Nine cards are arranged in a 3 by 3 array.
Every jack borders on a king and a queen
(horizontally or vertically, but not diagonally).
Every king borders on an ace.
Every queen borders on a king and an ace.
There are at least two aces, two kings,
two queens, and two jacks.
What kind of card is in the center
position of the 3 by 3 array?