

## IB Mathematics Applications and Interpretations SL / HL 1<sup>st</sup> year

### Recommended Summer Review Problems

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Honors/AP/IB level math courses at Desert Mountain are for students who are enthusiastic learners of mathematics and whose work ethic is of the highest standard. These students are expected to arrive "ready to go" on the first day of school.

The attached packet is designed to help you *review* concepts with which you should already be familiar. It is recommended that you complete some of the problems from the packet at the beginning of the summer when the concepts are still fresh, and then complete the remainder of the problems near the beginning of the school year. If you do not complete the problems in the packet, your grade will not be affected directly, however, the material in the packet has been taught in your previous math classes and will be assumed to be fully understood by you. I, the teacher, strongly advise you to work the problems this summer.

The problems will be collected and reviewed after the first week of school once we have gone over any questions you have. If you are new to the Scottsdale Unified School District and did not receive notice of this assignment until registration, these review problems will be checked at the end of August.

Some suggestions for the presentation and completion of mathematics assignments at DMHS are listed below. If you adhere to these guidelines with your summer work, you will be ready to meet the expectations of your mathematics teacher during the school year.

- Use notebook paper or plain white paper if extra paper is needed
- All working should be neat and legible
- Place completed work in a small binder or folder with brads
- Use pencil, erase completely when needed
- Work the problems in order and clearly indicate section and problem numbers
- Begin new sections on a new piece of paper

## The Complex Number System

1. Identify which of the following numbers are natural numbers.

$$2, -\frac{5}{8}, -5, 4\pi, 6, 0.3, \sqrt{7}, -\frac{1}{2}$$

2. Identify which of the following numbers are integers.

$$4, -\frac{5}{16}, -5, 8\pi, 12, 0.1, \sqrt{3}, -\frac{1}{4}$$

3. Identify which of the following numbers are irrational numbers.

$$3, -\frac{1}{4}, -3, 6\pi, 9, 0.3, \sqrt{5}, -\frac{1}{5}$$

4. Which subgroups do the following symbols represent?

$\mathbb{Z}$     $\mathbb{Q}$     $\mathbb{R}$

## Concept and Notation of Sets

Write a verbal description of the interval.

1.  $(2, 4)$

2.  $[9, 10)$

3.  $(-\infty, -5]$

4.  $[-2, 1]$

5.  $(-9, \infty)$

Write the following inequalities as an interval.

6.  $-5 < x \leq 9$

7.  $0 < x < 4$

8.  $-6 \leq x \leq 1$

9.  $1-8 < x \leq 3$

Solve the inequality. Graph the solution and express the solution using interval notation.

10.  $-4 \leq 2x - 6 \leq 4$

11.  $-15 \leq -3x + 6 \leq 6$

12.  $-1 \leq \frac{5-2x}{9} \leq 1$

13.  $9x - 8x + 15 > 3x - (10 - 6x)$

14.  $|3 - 6x| - 3 < 2$

15.  $|2 - 5x| - 2 < 2$

## Exponents

Simplify the expression.

1.  $(2x^3)^5$

2.  $(3x)(5x^2)^2$

3.  $\frac{(4x^2)^3}{8x^3}$

4.  $5x^2 \cdot 3x^{-4}$

5.  $(-3x)^2(-2x^{-4}y^2)^3$

6.  $\left(\frac{3x^2y^3}{2x^5y^2}\right)^4$

7.  $\left(\frac{5x^{-3}}{4x^3}\right)^{-2}$

8.  $\left(\frac{3x^{-3}}{4x^3}\right)^{-3}$

9.  $\frac{(2^4x^3y^2)^{-1}}{(2^5x^{-1}y^4)^{-3}}$

## Scientific Notation

Find the product written in scientific notation.

10.  $(6.7 \times 10^{-11})(5.4 \times 10^{15})$

11.  $(4.9 \times 10^{-19})(8.1 \times 10^{15})$

12.  $(5.3 \times 10^{-15})(4.1 \times 10^{19})$

## Radicals

Perform the operation and simplify the expression.

1..  $(\sqrt[4]{x^3})^4$

2.  $(\sqrt[3]{x^6})^3$

Evaluate the expression without using a calculator.

3.  $\sqrt[3]{-\frac{1}{27}}$

4.  $\sqrt[4]{\frac{16}{81}}$

Simplify by removing all possible factors from each radical.

5.  $\sqrt{75}$

6.  $\sqrt{200}$

7.  $\sqrt{12}$

Perform the operation and simplify.

8.  $-2\sqrt{7} - 3\sqrt{64} + 2\sqrt{63}$

9.  $3\sqrt{5} - 2\sqrt{16} + 3\sqrt{20}$

10.  $\sqrt{28} + \sqrt{63}$

11.  $\sqrt{75} + \sqrt{48}$

12.  $\frac{\sqrt{100x^3}}{\sqrt{25x^3}}$

13.  $\frac{\sqrt{48}}{\sqrt{3}}$

14.  $\sqrt{18x^2} \cdot \sqrt{3x^4}$

15.  $\sqrt{15x^3} \cdot \sqrt{3x^2}$

16.  $\sqrt{7xy^3} \cdot \sqrt{21x^4y}$

**Multiplying Binomials**

Perform the operations and identify the result written in standard form.

1.  $(3x-5)(2x-4)$

2.  $(5x-2)(2x-6)$

3.  $(2x+9)(5x+1)$

4.  $(3x+2y)^2$

5.  $(6x-5y)^2$

**Factoring**

Completely factor the expression.

6.  $25t^2 + 60t + 36$

7.  $4g^2 - 12g + 9$

8.  $9p^2 - 24p + 16$

9.  $49x^2 - 64y^2$

10.  $16x^2 - 25y^2$

11.  $30x^2 + 2x - 12$

12.  $t^3 + 6t^2 + 5t$

13.  $4k^5 - 28k^4 + 48k^3$

Factor by grouping.

14.  $3x^3 + 5x^2 - 18x - 30$

15.  $4x^3 + 3x^2 - 28x - 21$

16.  $7x^9 + 3x^8 - 35x - 15$

17.  $6x^4 + 5x^3 - 18x - 15$

18.  $2x^7 + 7x^6 - 4x - 14$

**Solving Quadratic Equations**

Solve by factoring. Write the solution using set notation, i.e.  $x = \{-2, 5\}$ .

1.  $3x^2 - 7x = 6$

2.  $5x^2 - 8x = -3$

3.  $x^2 + x - 42 = 0$

4.  $x^2 - 6x - 16 = 0$

5.  $x^2 - 2x - 35 = 0$

6.  $8x^2 - 7x + 9 = 2x^2 + 6x + 7$

7.  $9x^2 + 30x + 25 = 0$

8.  $x^2 - 11x + 24 = 0$

9.  $x^2 + 8x + 2x + 16 = 0$

Solve by extracting square roots. Write the solution using set notation.

10.  $x^2 - 8 = 0$

11.  $2x^2 - 40 = 0$

Use the Quadratic Formula to solve. Write the solution using set notation.

12.  $2x^2 - 6x - 6 = 0$

13.  $3x^2 + 8x - 2 = 0$

14.  $x^2 + 6x + 2 = 0$

15.  $3x^2 + 8x + 1 = 0$

## Rational Expressions

Perform the operation(s) and simplify.

1.  $\frac{5}{x-1} + \frac{6}{x+1}$

2.  $\frac{3x}{x^2-x-12} + \frac{4}{x+3}$

3.  $\frac{x-5}{x^2-36} - \frac{x-3}{x^2+3x-18}$

4.  $\frac{x^2+3x-10}{x^2-x-6} \div \frac{x^2-2x}{x^2+2x}$

5.  $\frac{x^2-4x-5}{2x^2-5x-3} \cdot \frac{x^2+x-12}{x^2+x-20}$

6.  $\frac{x^2-2x+1}{12} \div \frac{x^2-1}{6}$

## Solving Equations

Find the solution for each variable in the equation.

1.  $5 = 2(x-5) + 3 - x$

2.  $-4(x-3) + 4x = -2x + 5$

3.  $2\frac{3}{4}w - 29 = 59$

4.  $\frac{1}{c+3} - \frac{3}{c+1} = 0$

5.  $\frac{1}{u+2} - \frac{3}{u-1} = 0$

6.  $\frac{x+2}{x-7} = \frac{x-9}{x-5}$

## Coordinate Geometry

Find the distance between the points.

1.  $(-4, -1)$  and  $(-5, -1)$

2.  $(-8, 7)$  and  $(1, 7)$

Find the midpoint of the line segment connecting the given points.

3.  $(13, 17)$  &  $(-12, -18)$ .

4.  $(9, -7)$  &  $(-2, 12)$ .

Find the slope of the line passing through the pair of points.

5.  $(6, -4)$ ,  $(6, 6)$

6.  $(-1, 9)$ ,  $(3, 8)$

7. Find the slope-intercept form of the equation of the line that passes through the given point and has the indicated slope.  $(-1, -3)$ ,  $m = -5$

Find the slope-intercept form of the equation of the line passing through the points.

8.  $(-5, 3)$ ,  $(1, -3)$

9.  $(6, -3)$ ,  $(1, -1)$

10. Find the slope-intercept form of the equation of the line through the point  $(7, 4)$ , parallel to the line  $2x - 7y = -6$ .

11. Find the slope-intercept form of the equation of the line that passes through the point  $(-9, 5)$  and is perpendicular to the line  $7x + 8y = 2$ .

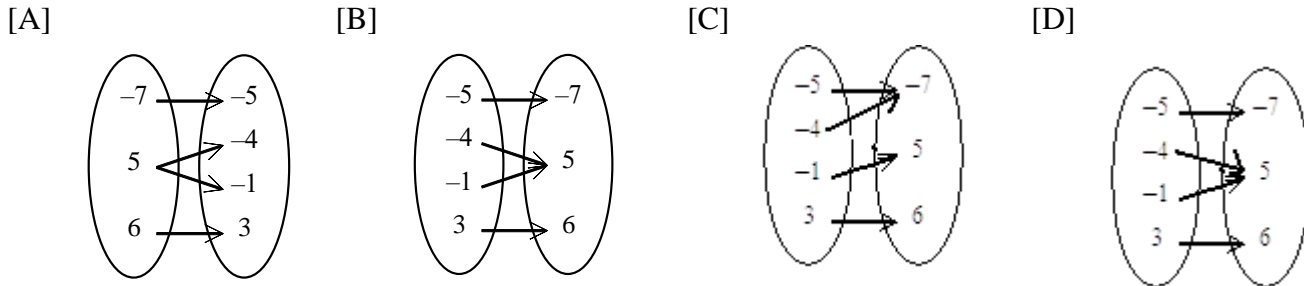


### The Concept of Functions

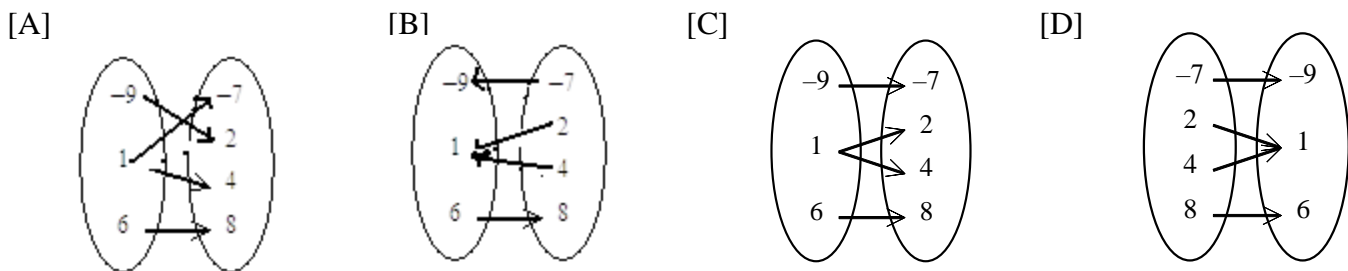
Determine which set of ordered pairs  $(x, y)$  represents  $y$  as a function of  $x$ .

1.  $\{(4, 2), (8, -1), (-8, 4), (-1, -8)\}$
2.  $\{(4, -2), (-2, -8), (4, -1)\}$
3.  $\{(4, -2), (-2, 4), (-1, -1)\}$
4.  $\{(6, -7), (-2, 0), (-2, 6), (0, -2)\}$
5.  $\{(-3, -7), (6, -8), (6, -3), (-8, 6)\}$
6.  $\{(-5, 3), (7, 3), (-1, 3), (0, 3)\}$

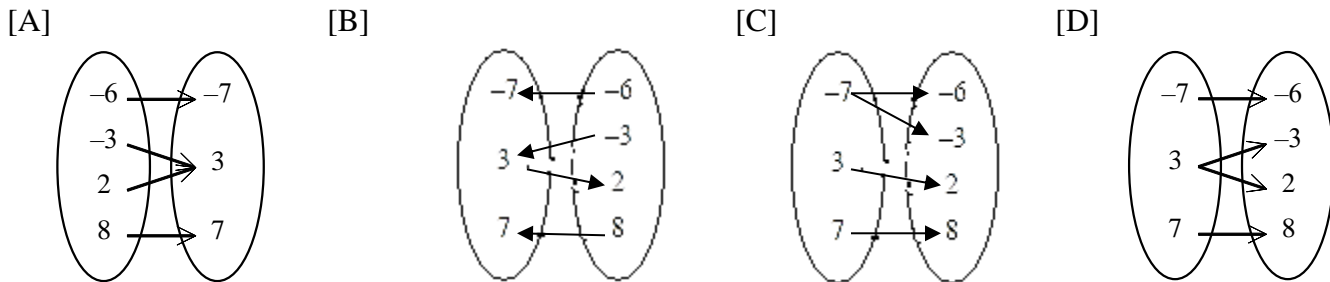
7. Identify the model of the relation  $\{(-5, -7), (-4, 5), (-1, 5), (3, 6)\}$ . Determine whether the relation is a function.



8. Identify the model of the relation  $\{(-7, -9), (2, 1), (4, 1), (8, 6)\}$ . Determine whether the relation is a function.



9. Identify the model of the relation  $\{(-6, -7), (-3, 3), (2, 3), (8, 7)\}$ . Determine whether the relation is a function.



Does the table describe  $y$  as a function of  $x$ ? Explain your reasoning.

10. 

Input $x$	1	2	3	4
Output $y$	3	6	9	12

11. 

Input $x$	1	2	1	4
Output $y$	3	6	9	12

12. 

Input $x$	0	0	0	0
Output $y$	0	1	2	3

## Logarithms

Write each of the following in the form  $y = b^x$ .

1.  $\log_2 8 = 3$

2.  $\log_3 81 = 4$

3.  $\log_x 5 = t$

4.  $\log_7 x = 4$

Evaluate the following without a calculator.

5.  $\log_3 9$

6.  $\log_5 125$

7.  $\log_7 \frac{1}{7}$

8.  $\log_6 \sqrt{\frac{1}{6}}$

9.  $\log_8 1$

Find the value of  $y$  in each of the following.

10.  $\log_y 49 = 2$

11.  $\log_4 y = -3$

12.  $\log_3 243 = y$

13.  $\log_{10} y = -1$

14.  $\log_2 y = 2.5$

15.  $\log_y 1296 = 4$

16.  $\log_y 27 = 3$

17.  $\log_4 2 = y$