IB ANALYSIS & APPROACHES HL 1 SUMMER MATH PACKET

The purpose of these assignments is to ensure you understand the prerequisite skills required to succeed in this course. It is expected that all of the content below is material previously taught to you. If you find material that appears to be brand new, please refer to the playlist titled IB A&A HL Prior Learning on my YouTube Channel. The link is posted in Google Classroom. Once we return in August, I will be available to answer any questions.

These assignments are required. Each section will be worth 50 points and will be graded for completion. Summer math will count for 5% of your grade during the first semester. There *will* be an assessment over this content when we return in the fall.

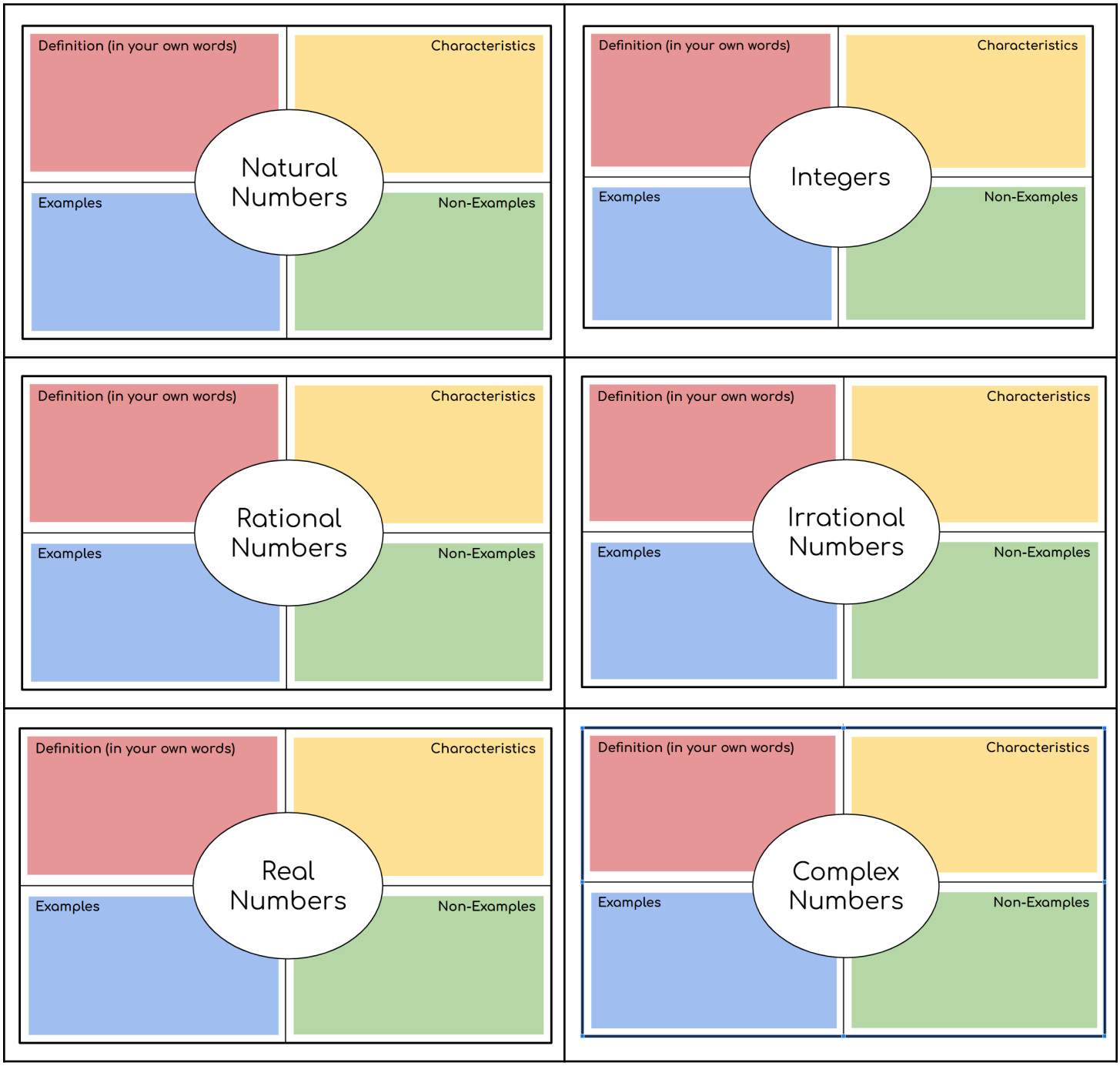
All assignments should be scanned and uploaded to the respective Google Classroom assignment. Late submissions will be awarded 50%. The final day to submit late assignments will be on the first day of school at 3:00 pm.

Due Date	**Assignment**	**Time***
Sun. 6/15 11:59 pm	Section A (Number & Order of Operations)	2-3 hours
Sun. 7/6 11:59 pm	Section B (Algebraic Expressions) Section C (Algebraic Equations)	3-4 hours 2.5-3.5 hours
Sun 7/27 11:59 pm	Section D (Functions) Section E (Statistics & Probability)	3-4 hours 2-3 hours
Sun. 8/17 11:59 pm	Section F (Geometry & Trigonometry)	3-4 hours

**I used Chat GPT to provide an estimated time per assignment. Actual times may vary.*

Section A (Number & Order of Operations) **No Calculator**
Due in Google Classroom on Sun. 6/15 11:59 pm

1. Complete each of the Frayer Models below.



2. Round each number as directed:
    a. 135.4867 to the nearest hundredth

    b. 0.006789 to four significant figures

    c. 128.9949 to the nearest whole number

3. What is the definition of absolute value?

4. Evaluate using the correct order of operations without the use of a calculator:
    a. $6 + 2 \times (5 - 3)^2$

    b. $12 - [4 \times (3 + 2)] \div 2$

    c. $(-11 - 6 - -5 + 1 + 3 \times 2) \div -5$

    d. $6 + q + 5 - (q - p) + 15$

    e. $-3 \div 3(a + c(b + 5) - (-6 + a))$

5. Add, multiply, subtract, and divide without the use of a calculator:
   a. $\frac{3}{4} + \frac{5}{8}$

   b. $4.2 - 1.38$

   c. $\frac{2}{3} \div \frac{5}{9}$

   d. $\frac{\frac{x^2}{9}+\frac{1}{4}}{6x}$

   e. $\frac{\frac{16}{m-3}-\frac{4}{m-4}}{\frac{16}{m^2}-\frac{m-4}{m-3}}$

6. Define each of the following:
   a. Prime number

   b. Factor

   c. Multiple

7. List all prime numbers less than 30

8. List all the factors of 36

9. List the first five multiples of 7.

10. Find the GCF of 24 and 60

11. Find the LCM of 6 and 14.

12. Draw the first 10 rows of Pascal's triangle. (Row 0 = top row: 1)

13. Use Pascal's triangle to expand each of the following:
    a. $(a + b)^3$
    b. $(x + 2)^4$

Section B (Algebraic Expressions) No Calculator
Due in Google Classroom on Sun. 6/15 11:59 pm

1. Expand the following expressions
   a. $(x + 4)(x - 3)$

   b. $(2x - 1)^2$

   c. $(x + 5)(x^2 - 5x + 6)$

2. Factor the following expressions completely
   a. $x^2 + 7x + 12$

   b. $4x^2 - 25$

   c. $x^3 - 4x^2 - 7x + 28$

d. $x^4 - 7x^2 + 10$

e. $6x^9n - 30x^5n - 300xn$

f. $10x^3 - 8x^2 + 25x - 20$

3. Rearrange each formula to solve for the indicated variable
   a. $A = \pi r^2$, solve for r

   b. $v = u + at$, solve for t

   c. $y = \frac{3x-2}{4}$, solve for x

4. Simplify each expression. Write your final answers with positive exponents
   a. 5^0

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

   c. $x^5 \cdot x^{-2}$

   d. $\frac{y^7}{y^3}$

   e. $(\frac{2}{3})^{-2}$

   f. $(16x^2)^{1/2}$

   g. $(27)^{2/3}$

5. Solve each equation.
   a. $|7m| + 3 = 73$

   b. $-10|v + 2| = -70$

   c. $\frac{|-9+v|}{8} = 3$

6. Solve and represent the solution on a number line sketch
   a. $3x - 4 < 11$

   b. $2x + 5 \geq x - 3$

7. Simplify the following radical expressions
   a. $\sqrt{98k}$

   b. $\sqrt[3]{56x^5y}$

   c. $4\sqrt{15}(-3\sqrt{6} + 5)$

   d. $(\sqrt{3} + \sqrt{5x})(\sqrt{3} - \sqrt{5x})$

8. Rationalize the denominator
   a. $\frac{\sqrt{9}}{\sqrt{25}}$

   b. $\frac{4\sqrt{2}}{3\sqrt{5}}$

   c. $\frac{\sqrt{3}+3\sqrt{5}}{2\sqrt{8}}$

   d. $\frac{-2x+\sqrt{-5x^4y^3}}{3\sqrt{15x^3y}}$

9. Write the following numbers in scientific notation
   a. 0.000356

   b. 5,600,000

   c. 981

   d. $\frac{6.2\times10^4}{2\times10^2}$

10. Simplify the expressions
    a. $\frac{2x+6}{4}$

    b. $\frac{x^2-9}{x+3}$

    c. $\frac{a^2+5a+4}{a^2+9a+20}$

11. Perform the indicated operations
    a. $\frac{x+2}{x}+\frac{3x}{x^2}$

    b. $\frac{5}{x+1}-\frac{2}{x-1}$

    c. $\frac{3x}{x^2-9}+\frac{2}{x-3}$

d. $\frac{x+2}{2x^2+13x+20} - \frac{x+3}{2x^2+13x+20}$

e. $\frac{5n+5}{5n^2+35n-40} + \frac{7n}{3n}$

f. $\frac{n+3}{n-2} \div \frac{(n-1)(n+3)}{(n-1)^2}$

g. $\frac{10x^2-20x}{40x^3-80x^2} \times \frac{16x^3+80x^2}{6x+30}$

Section C (Algebraic Equations) No Calculator
Due in Google Classroom on Sun. 7/6 11:59 pm

1. Solve the following linear equations
   a. $3x - 7 = 2x + 5$

   b. $\frac{2(x+1)}{3} = \frac{x-4}{2}$

   c. $\sqrt{2m - 6} = \sqrt{3m - 14}$

   d. $(18 - n)^{1/2} = (\frac{n}{8})^{1/2}$

2. Solve the system of two equations by substitution or elimination:

a. $\begin{cases} 2x + 3y = 7 \\ x - y = 4 \end{cases}$

3. Solve the following system of three variables (use substitution or elimination):

a.

$$\begin{aligned} 4x + 4y + z &= 24 \\ 2x - 4y + z &= 0 \\ 5x - 4y - 5z &= 12 \end{aligned}$$

b.

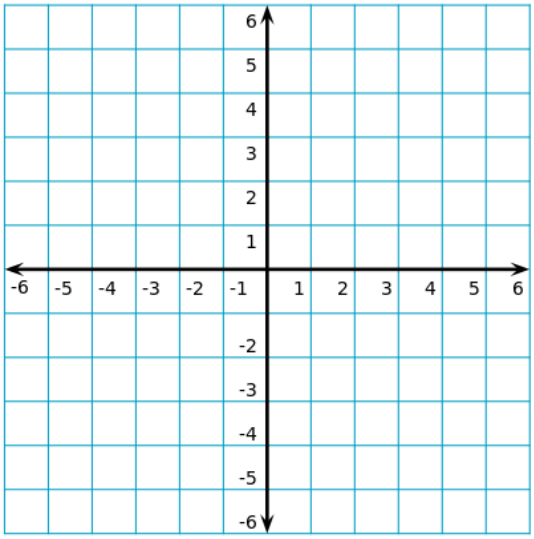
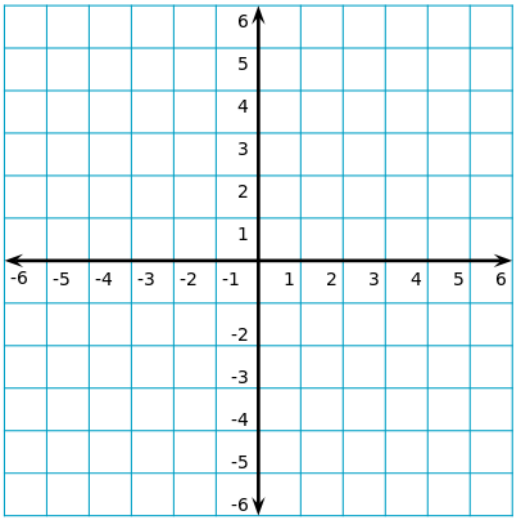
$$\begin{aligned} -2y + 5z &= -3 \\ y &= -5x - 4z - 5 \\ x &= 4z + 4 \end{aligned}$$

c.

$$\begin{aligned} -5r + 5s + 3t &= -23 \\ -5r + 3s - 3t &= -11 \\ -6r + 6t &= -12 \end{aligned}$$

Section D (Functions) Calculator Required
Due in Google Classroom on Sun. 7/6 11:59 pm

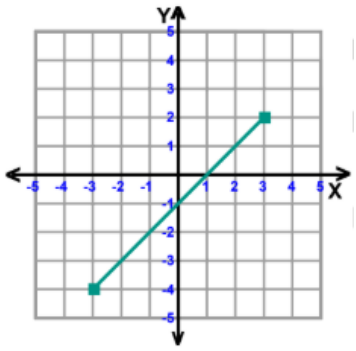
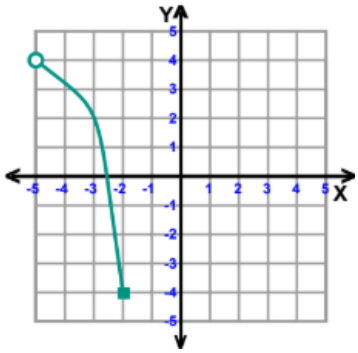
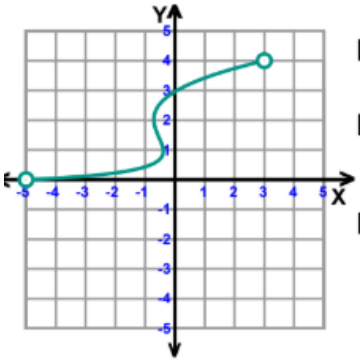
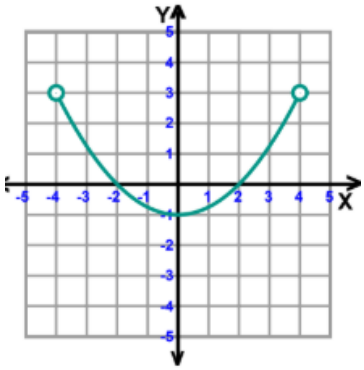
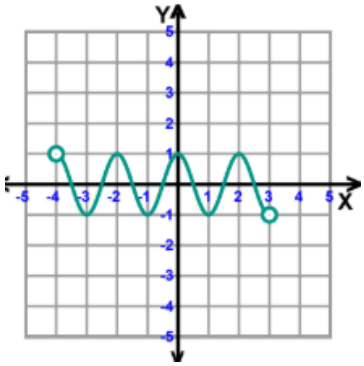
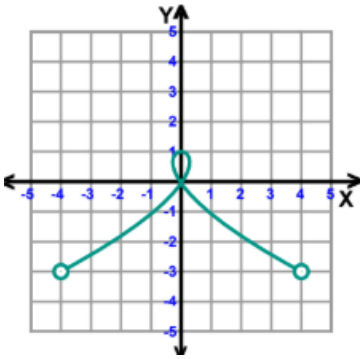
1. For each function below, sketch and identify all key components using technology.

a. $y = 2x^2 - 6x + 3$	b. $y = -x^2 + 2x + 1$
	
x-intercept(s):	x-intercept(s):
y-intercept(s):	y-intercept(s):
vertex:	vertex:
Axis of symmetry:	Axis of symmetry:

2. Determine whether the following pairs of lines are parallel, perpendicular, or neither.
   a. $6x + 3y = 1$ and $y = -2x + 7$

   b. $2x + 14y = 7$ and $3.5x + y = -7$

3. State the domain and range of the following functions using interval notation and unions if necessary:

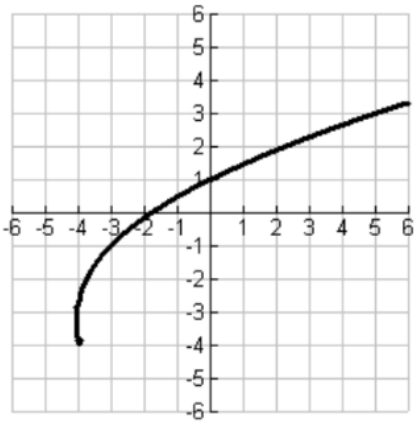
		
Domain: Range:	Domain: Range:	Domain: Range:
		
Domain: Range:	Domain: Range:	Domain: Range:

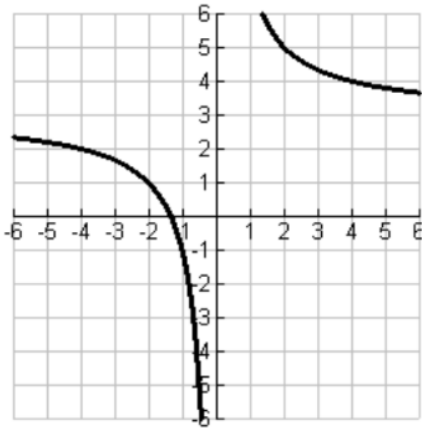
4. Find the inverse of the following functions algebraically

   a. $f(x) = x^2 - 4$

   b. $f(x) = \frac{3x-8}{x-3}, x \neq 3$

5. Draw the inverse of each graph below.



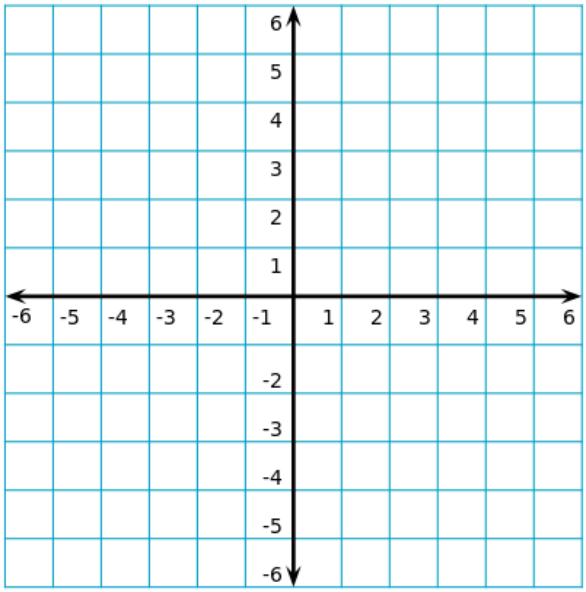
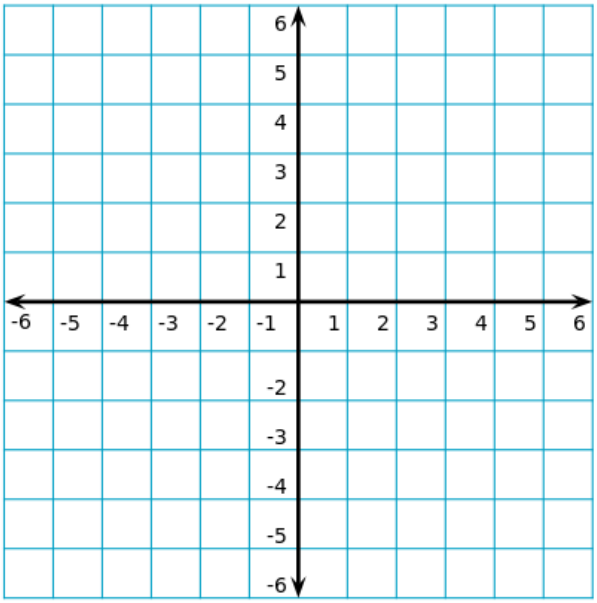


6. Use a graphing tool to find the points of intersection of the following. List your answers as ordered pairs.

   a. $2x + 3y = 14$ and $sin(3x) = y + 5$ (radian mode)

   b. $y = 7x^4 + 2x^3 - 2x + 1x - 10$ and $y = -|2x - 4| + 3$

7. Sketch the following rational functions by hand. For each, identify the vertical and horizontal asymptotes. Then, state the domain and range.

$f(x) = \frac{x-2}{-x^2+2x}$	$f(x) = \frac{x^2-4}{-3x^2-9x}$
	
Vertical Asymptote(s):	Vertical Asymptote(s):
Horizontal Asymptote(s):	Horizontal Asymptote(s):
Domain:	Domain:
Range:	Range:

Section E (Statistics and probability) Calculator Required
Due in Google Classroom on Sun 7/27 11:59 pm

1. Given the dataset: 14, 18, 20, 20, 22, 24, 16, 30, 30, 32, 35
    a. Find the following: mean, median, mode, range

    b. Now add the number 100 to the dataset. Recalculate the mean and median. Explain the impact of the outlier on the data.

2. A bag contains 3 red, 4 green, and 5 blue marbles. One marble is chosen at random.
    a. What is the probability that it is:
        i. Red

        ii. Not green

        iii. Blue or green

    b. If two marbles are drawn with replacement, what is the probability that they are both red?

3. In a group of 40 students, 18 like coffee (C), 25 like tea (T), and 10 like both.
    a. Draw a Venn Diagram and place the numbers correctly.

    b. How many students like:
        i. Only coffee?

        ii. Only tea?

        iii. Neither coffee nor tea?

    c. What is the probability that a randomly selected student:
        i. Likes tea?

        ii. Likes coffee or tea?

        iii. Likes neither?

4. A fair coin is tossed twice.
    a. Draw a tree diagram showing all possible outcomes.

    b. What is the probability of:
        i. Getting two heads?

        ii. Getting at least one tail?

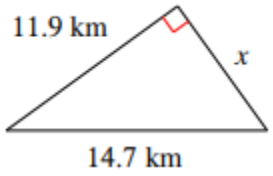
        iii. Getting one head and one tail (in any order)?

    c. Now consider a biased coin where P(H)= 0.6 and P(T)=0.4. Update the tree diagram and recalculate the same probabilities.

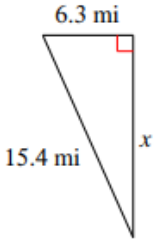
Section F (Geometry & Trigonometry) Calculator Required
Due in Google Classroom on Sun 7/27 11:59 pm

1. Solve for x in the right triangles below.

a.



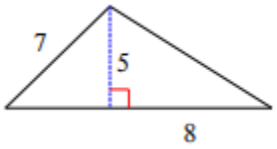
b.



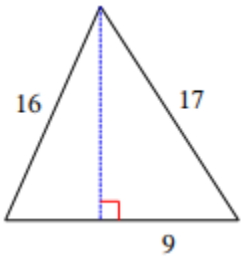
2. A ladder leans against a wall. The base is 5 feet from the wall, and the ladder reaches 12 feet high. How long is the ladder?

3. Find the area of each figure below.

a.

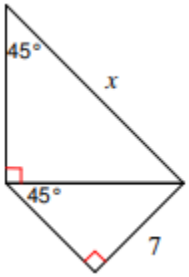


b.

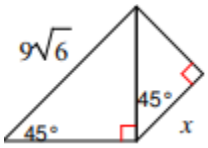


4. Using your knowledge of special right triangles, solve for the variables without using a calculator.

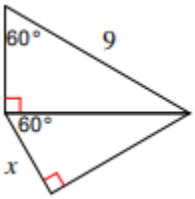
a.



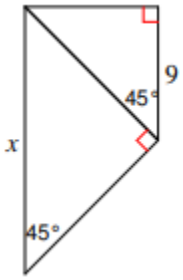
b.



c.

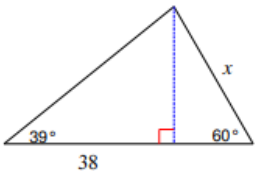


d.

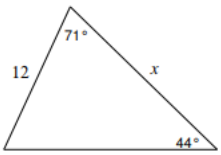


5. For parts a and b, find the length of the side labeled x. For parts c and d, find the area of the triangle.

a.

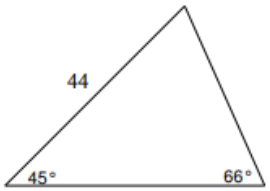


b.



c.

d.



6. A person standing 1.5 m tall sees the top of a 20 m building at an angle of elevation of 35°. How far is the person from the base of the building (horizontal distance)?

7. Given points A(2,3) and B(8,11). Find the midpoint of segment AB and find the distance between A and B.

8. Given vertices of triangle ABC: A(1,1), B(4,1), C(4,5). Find the area and perimeter.

9. Perform the following transformations on triangle PQR with vertices P(2, 1), Q(4,1), R(4, 3). Use graph paper to sketch the original and transformed figures.
    a. Translate the triangle 3 units right and 2 units down.
    b. Reflect the original triangle across the y-axis.
    c. Rotate the triangle 90° counterclockwise about the origin.
    d. Dilate the triangle by a scale factor of 2 about the origin.

10. Label and define each part in a circle:
    a. Center
    b. Radius
    c. Diameter
    d. Chord
    e. Arc
    f. Sector
    g. Tangent
    h. Secant

11. For each figure, identify all properties that it satisfies (opposite sides parallel, diagonals bisect each other, etc).
    a. Parallelogram

    b. Rhombus

c. Rectangle

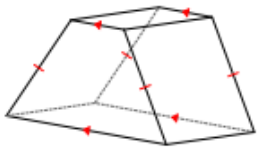
d. Square

e. Kite

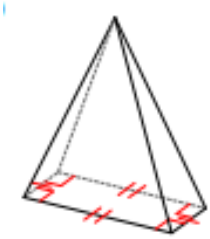
f. Trapezoid

12. Name each figure below.

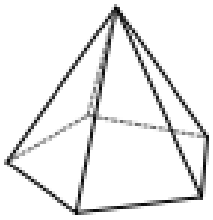
a.



b.

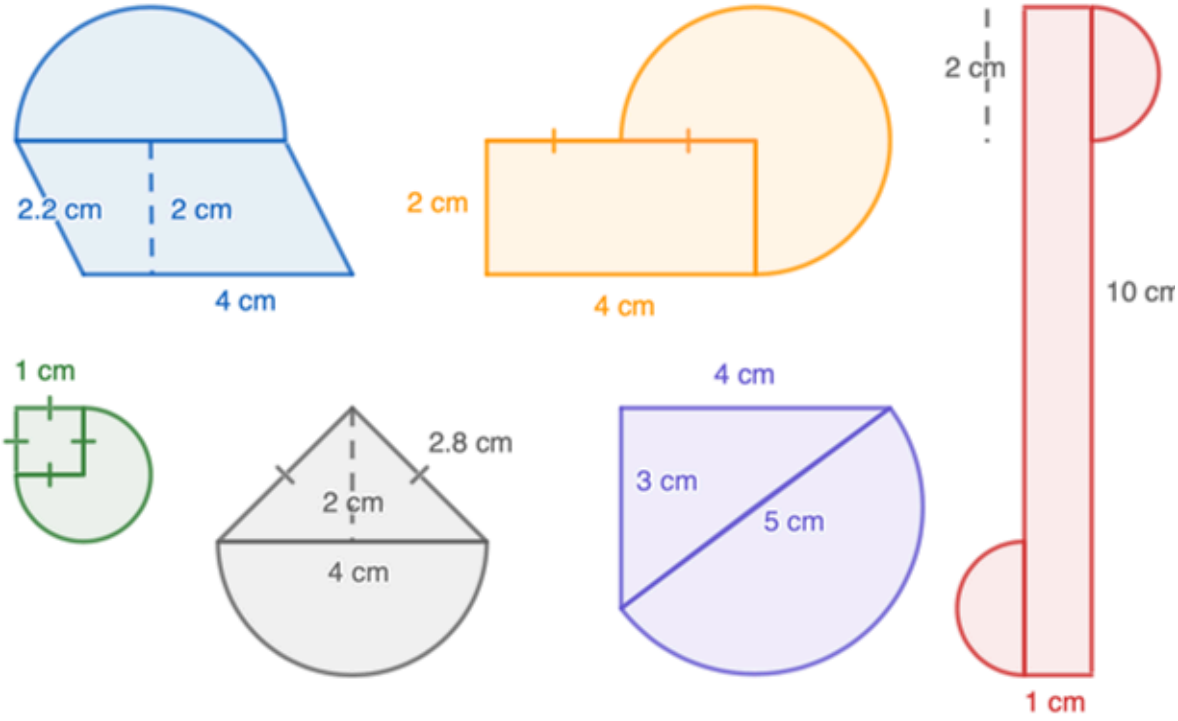


c.



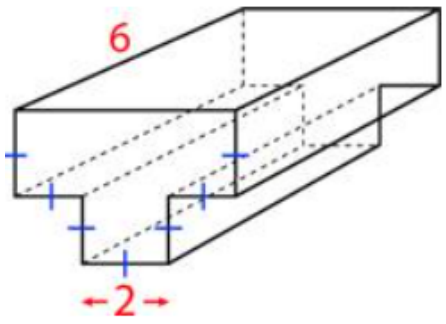
d.

13. Find the area and perimeter of each shape below.

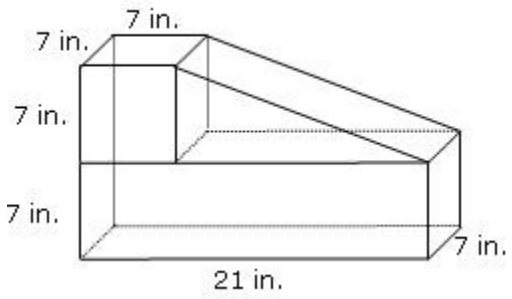


14. Find the volume and surface area of each figure below

a.



b.



15. Tennis balls with a 3-inch diameter are sold in cans of three. The can is a cylinder. Round your answers to the nearest hundredth.

a. What is the volume of one tennis ball?

b. What is the volume of the cylinder?

c. Assume the balls touch the can on the sides, top, and bottom. What is the volume of the space not occupied by the tennis balls?

IB ANALYSIS & APPROACHES HL 2 SUMMER MATH

The goal of summer math assignments is to review content covered in the first year of IB Analysis & Approaches HL while simultaneously reviewing for the IB Examinations you will take at the end of your senior year.

These assignments are required. Each assignment will be worth 50 points and will be graded for completion. Summer math will count for 5% of your grade during the first semester. There will *not* be an assessment over this content when we return in the fall.

All assignments should be scanned and uploaded to the respective Google Classroom assignment. Late submissions will be awarded 50%.

Due Date	**Assignment**	**Time***
Sun. 6/15 11:59 pm	May 2021 Paper 1 TZ1 (#1-3, 5, 6, 7, 9, 10) May 2021 Paper 2 TZ1 (#1-3, 5, 9a)	4 hr
Sun. 7/6 11:59 pm	May 2021 Paper 1 TZ2 (#1-3, 4a,5, 6, 7, 10a,c,d) May 2021 Paper 2 TZ2 (#1-5, 7, 10) Make corrections on May 2021 TZ1 papers, then upload	4 hr
Sun 7/27 11:59 pm	May 2022 Paper 1 TZ1 (#2, 3, 5, 6, 10) May 2022 Paper 2 TZ1 (#1-3, 5, 6, 7, 8, 11) Make corrections on May 2021 TZ2 papers, then upload	4 hr
Sun. 8/17 11:59 pm	May 2022 Paper 1 TZ2 (#1, 3, 4, 5, 6a, 10, 11) May 2022 Paper 2 TZ2 (#1, 3, 4, 8, 9) Make corrections on May 2022 TZ1 & TZ2 papers, then upload	5 hr

*IB Exam Papers are uploaded in the IB A&A HL 2 Google Classroo

*I used Chat GPT to approximate how long it would take you to complete these assignments. Please use that as a guide when planning your summer work. Actual time may vary.