IB AI SL YR 1 Summer Packet 2024 Name ___________________________

Part 1 Algebra ***This is due the first day of class!***

This packet is to help you review topics that are a prerequisite

To ensure that the good skills you developed in the past year(s) do not disappear this summer, working on this packet is a requirement to be completed over the summer. It is **NOT** recommended to complete immediately following school dismissal in June or the night before the packet is due. Student learning is most effective if the packet is completed over the months of July and August. IBAISL1 students will be tested on the materials covered in this packet within the first few weeks of school once the teacher has discussed the packet in the classroom.

Please **SHOW ALL THE WORK** in the space provided, if possible or on another sheet of paper. Be sure to circle your answers. The IBAISL exam allows you to use a TI-84 graphing calculator (GDC) on the entire exam so if you use a GDC to solve any part of this packet (unless direction specify otherwise), write down how you input it into your calculator so I can see how you solved the problem. By doing so you will become knowledgeable about how to gain the most points possible (even if the answer is wrong) on the exam.

1. Evaluate:

   a) $-2^4 =$ _______ b) $(-2)^4 =$ _______

2. Evaluate **without** a calculator (PEMDAS):

   a) $(17 - 6 \div 2) + (10^2 \cdot 3)$

   b) $8 - 5 \cdot 2^2 - 5(6-2)$

   c) $14 \div [3(8-2) - 11]$

   d) $\dfrac{100-15}{9+8}$

   e) $32 \div (-7+5)^3$

   f) $\frac{1}{8} - \left(-\frac{12}{7}\right)$

   g) $5 - (-5) + |-9+7|$

3. Evaluate the expression for the given values for the variables:

   a) $6h^2 \div 2 + h \quad when \ h = -2$

   b) $x^3 + 4 \quad when \ x = -5$

   c) $x^3 + 5y \quad when \ x = 4 \ and \ y = -3$

   d) $\dfrac{y-7x}{6x+xy} \quad when \ x = -2 \ and \ y = 3$

   e) $x - \frac{8y}{3} \quad when \ x = \frac{1}{2} \ and \ y = -\frac{9}{8}$

4. Simplify:

a) $(2y^2 + 3y) - (5y^2 + y^5 + y)$

b) $3(b+4) - (7-b)$

c) $2(x^2+3x) - x(x-4)$

d) $2x - (x^2+4) + 4x(x-7)$

e) $(2x+3)(x-4)$

f) $(7x-5)(2x+3)$

g) $(3x-8)^2$

5. Solve for the variables:

a) $-4k + 2(5k-6) = -3k - 39$

b) $3(x+4) = 3x + 11$

c) $10 + x = 5\left(\frac{1}{5}x + 2\right)$

d) $-\frac{11}{2} = -2\frac{1}{3} + 3\frac{1}{6}k$

e) $3 - 4(2n-5) = 71$

6. Substitute coordinates into an equation.

a) If $y = 2x^2 - 3x + c$,
find the value of c at the point $(2, -1)$.

b) If $y = 5x^2 + x + c$,
find the value of c at the point $(1, -5)$.

7. Solve the system using elimination: $\begin{cases} 3x + 2y = 8 \\ 4x - 3y = -12 \end{cases}$ $x =$ ______ $y =$ ______

8. Solve the system using substitution: $\begin{cases} y = 2x - 8 \\ 2x + 4y = 28 \end{cases}$ $x =$ ______ $y =$ ______

9. Solve the system using any method: $\begin{cases} 6x - 3y = 12 \\ -4x + 2y = -8 \end{cases}$ $x =$ ______ $y =$ ______

10. Re-writing Formulas. Solve the formula for the indicated variable:

a) w; $P = 2l + 2w$

example: x; $\frac{1}{2}x + y = 6$

$$2(\tfrac{1}{2}x + y) = (6)2$$
$$x + 2y = 12$$
$$-2y \qquad -2y$$
$$\boxed{x = -2y + 1}$$

b) b; $y = mx + b$

c) h; $V = \frac{1}{3}\pi r^2 h$

d) °C; $°\mathrm{F} = \left(\frac{9}{5}\right)°\mathrm{C} + 32$

11. Write the equation of a line ($y = mx + b$) that passes through the points $(-1, -2)$ and $(2, 7)$. *Hint: Find the slope, then find the y-intercept using one set of the points given.*

12. Write an equation of a line that passes through the point $(1, -5)$ and is **perpendicular** to $y = \frac{1}{8}x + 2$.

13. Write an equation of a line that passes through the point $(2, -1)$ and is **parallel** to $y - 2 = -\frac{2}{5}(x + 1)$.

14. Write an equation of the line that passes through $(5, 4)$ and has a slope of -3. Start with point-slope form $(y - y_1 = m(x - x_1))$.

15. Solve the absolute value function for the variables:

example: $|x + 8| - 5 = 2$

$$\begin{aligned} |x+8| - 5 &= 2 \\ +5 \quad &\quad +5 \\ |x + 8| &= 7 \end{aligned}$$

$$x + 8 = 7 \quad or \quad x + 8 = -7$$

$$-8 \quad -8 \qquad\qquad -8 \quad -8$$

$$\boxed{x = -1 \; or \; x = -15}$$

a) $|12 + 2x| = 6$ $x =$ ______ or $x =$ ______

b) $|5y - 8| = 1$ $x =$ ______ or $x =$ ______

16. Exponent Rules Review

NOTE: Anything to the zero power equals 1!

Product Rule: When multiplying monomials that have the same base, add the exponents.

$$x^m \cdot x^n = x^{m+n} \qquad \text{Example 1: } x \cdot x^3 \cdot x^4 = x^{1+3+4} = x^8$$

Power Rule: When raising monomials to powers, multiply the exponents.

$$\left(x^m\right)^n = x^{m \cdot n} \qquad \text{Example 3: } (x^2y^3)^4 = x^{2 \bullet 4}\, y^{3 \bullet 4} = x^8y^{12}$$

Quotient Rule: When dividing monomials that have the same base, subtract the exponents.

$$\frac{x^m}{x^n} = x^{m-n} \qquad \text{Example 5: } \frac{x^3}{x^{-2}} = x^{3-(-2)} = x^5$$

a) $\dfrac{b \cdot a^2}{a^3b^2}$ b) $(x^2y^3z)^7$ c) $\dfrac{m^6}{m^7}$ d) $(6x^4y^6)^3$

e) $\dfrac{9a^3b^5}{-3ab^8}$ f) $\left(\dfrac{3m^2n^7}{m}\right)^5$ g) $6x^5 \cdot 3x^5 \cdot x^0$ h) $\dfrac{x^{-1}}{4x^4}$

17. Simplify each expression (*Hint: look for perfect squares)* **Leave in simplest radical form - NO DECIMALS**:

a. $\sqrt{512}$ b) $-5\sqrt{294}$ c) $6\sqrt{144}$

$6\sqrt{125}$

$6 \bullet \sqrt{25}\ \sqrt{5}$

$6 \bullet 5\sqrt{5}$

$30\sqrt{5}$

d) $\sqrt{29} \cdot \sqrt{29}$ e) $\sqrt{8} \cdot \sqrt{6}$ f) $\sqrt{216v^4}$

18. Rationalize the denominator (no radicals in the denominator) **Leave in simplest radical form – NO DECIMALS**:

a) $\frac{2}{\sqrt{3}}$

example: $\frac{2\sqrt{3}}{\sqrt{2}} \Rightarrow \frac{2\sqrt{3}\cdot\sqrt{2}}{\sqrt{2}\cdot\sqrt{2}} = \frac{2\sqrt{6}}{\sqrt{4}} = \frac{2\sqrt{6}}{2} = \boxed{\sqrt{6}}$

b) $\sqrt{\frac{3}{4}}$

c) $\frac{\sqrt{3}}{6\sqrt{7}}$

d) $\frac{\sqrt{5}}{\sqrt{2}}$

e) $\frac{3\sqrt{30}}{5\sqrt{6}}$

f) $\frac{\sqrt{2}}{2+\sqrt{3}}$

h) $\frac{5}{-3-4\sqrt{7}}$

19. Factor the following (*Hint: Do they have a common factor that can be factored out first – GCF)*

a) $x^2 - 4x - 5$

b) $9y^2 - 16$

example:

$6n^2 - 18n + 12$

$\div 6 \quad \div 6 \quad \div 6$

$6\ (n^2 - 3n + 2)$

$6\ (n-2)(n-1)$

What two factors multiply to +2 and add to -3 → -2 & -1

GCF = 6 so divide out 6 from each term in the expression

c) $30p^2 + 25p - 20$

d) $x^2 - 14x + 49$

e) $8x^3 - 64$

20. **Solve** the quadratic function by the square root method. Leave the answer in **simplified radical form** if applicable.

a. $x^2 - 64 = 0$

b) $-4x^2 + 84 = 4$

c) $7x^2 = -21$

d) $9(2m - 3)^2 + 8 = 449$

e) $(6t + 2)^2 + 4 = 28$

21. Linear Word Problems: Show all work. Solve for the variables.

a) *Write an algebraic model representing the problem. Then solve.*

The length of a rectangle is twice that of the width. The perimeter of the rectangle is 24 cm. What is the width of the rectangle?

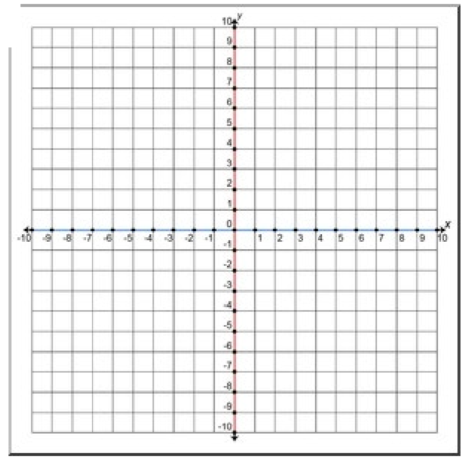
model ____________________________________

b) *Define the variables and write the system of equations.*

A park charges $10 for adults and $5 for kids. How many adult tickets and kid tickets were sold, if a total of 548 tickets were sold for a total of $3750?

22. Graphing Linear Equations:

a



a) $2x + 3y = 6$

i. State the *x* and *y* intercepts: $x =$ ______ $y =$ ______

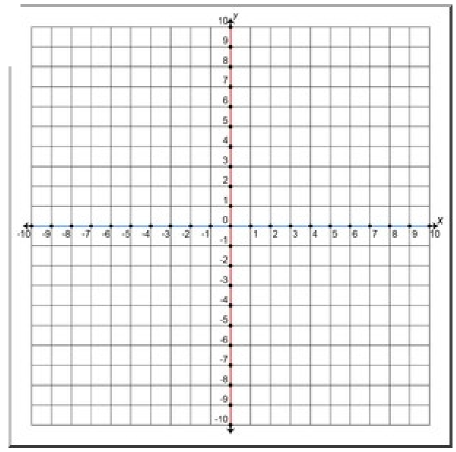
ii. Solve the equation for *y*: ________________________

iii. Graph the equation on the coordinate plane:

iv. State the slope and the y-intercept of this line.

Slope = _________ y-intercept = _______

b & c



b) $x - 3 = 0$ (*Hint*: VUX)

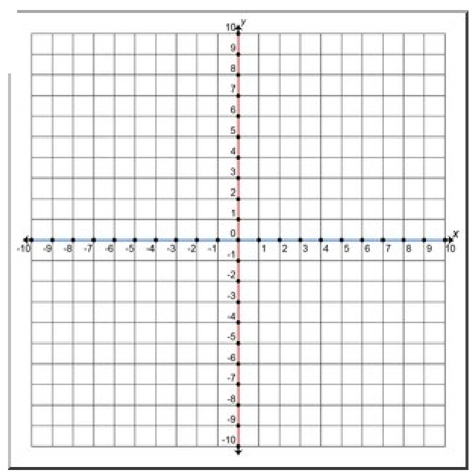
c) $y + 4 = 0$ (*Hint:* HOY)

i. Graph line b) in red and line c) in blue

ii. State the slope of the line b): slope = ____________________

line c): slope = ____________________

d



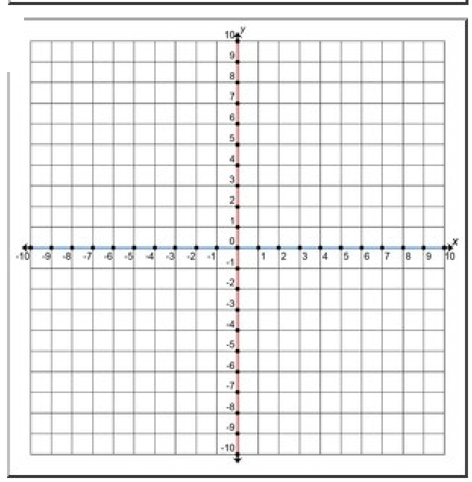
d) $3x - \frac{1}{2}y = 2$

i. Graph the equation on the coordinate plane:

ii. State the slope and the y-intercept of this line.

Slope = _________ y-intercept = _______

e



e) $6x + 24 = -12y$

i. Graph the equation on the coordinate plane:

ii. State the slope and the y-intercept of this line.

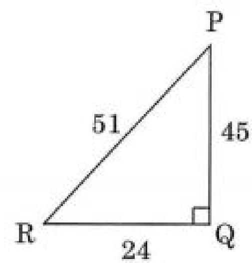
Slope = _________ y-intercept = _______

Part 2 Geometry and Trigonometry

Directions: Show your work for all problems on these pages.

A completed hard copy (work done in pencil) of this packet is due on the first day of school. Be prepared for an assessment of this material the first week of school after your teacher goes over it with you.

1. Use ΔPQR to determine the trig ratios below. Remember to simplify all fractions.



a. $Sin\ P$

b. $Cos\ P$

c. $Tan\ P$

2. Find the value of each ratio. Round your answers to the nearest ten thousandth place (4 places past the decimal).

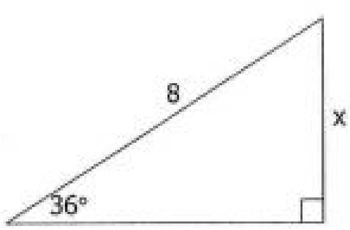
a. $Cos\ 52°$ b. $Sin\ 72°$ c. $Tan\ 48°$

3. Find the measure of each angle to the nearest whole degree.

a. $Sin\ A = 0.7245$ b. $Tan\ C = 9.4618$ c. $Cos\ E = .1212$

For problems #4-9, solve for x. Round sides to the nearest tenths place and angles to the nearest whole degree.

4.



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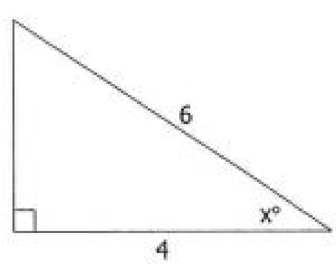

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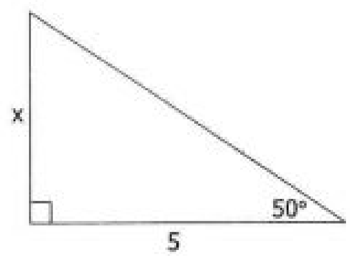

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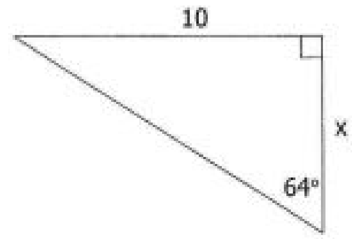

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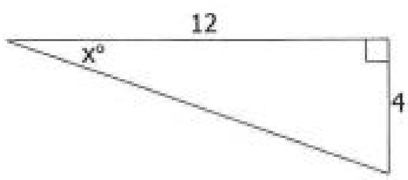

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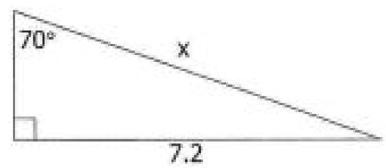
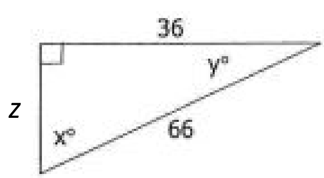


For problems #10 & 11, solve for $x, y, and\ z$. Remember to round sides to the nearest tenths place and angles to the nearest whole degree.

10.

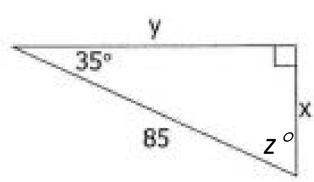


$x° =$

$y° =$

$z =$

11.

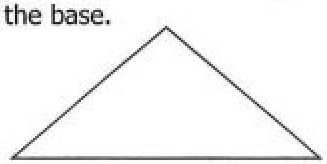


$x =$

$y =$

$z° =$

12. The altitude of an isosceles triangle is 15 cm. If the vertex angle is 64°, find the length of the base.



Solve the following word problems. Remember to round sides to the nearest tenths place and angles to the nearest degree.
(Hint: Draw a picture to help you solve the problems below.)

13. How tall is a tree if it casts a shadow of $50 feet$ and the rays of the sun meet the ground at a $25°$angle?

14. A boy flying a kite lets out $100\ feet$ of string, making an angle of elevation of $40°$. How high above the ground is the kite?

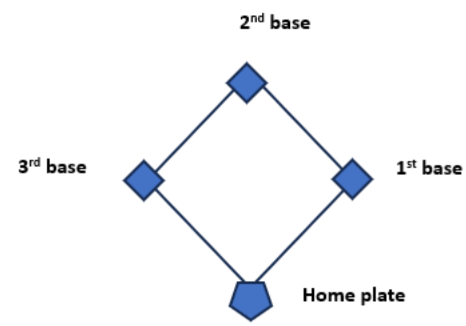
15. As viewed from a cliff $360\ m$ above sea level, the angle of depression to a ship is $28°$. How far is the ship from the shore?

16. The angle of elevation from a ship to the top of a lighthouse is $3°$. If the ship is $1{,}000\ km$ from the lighthouse, how tall is the lighthouse?

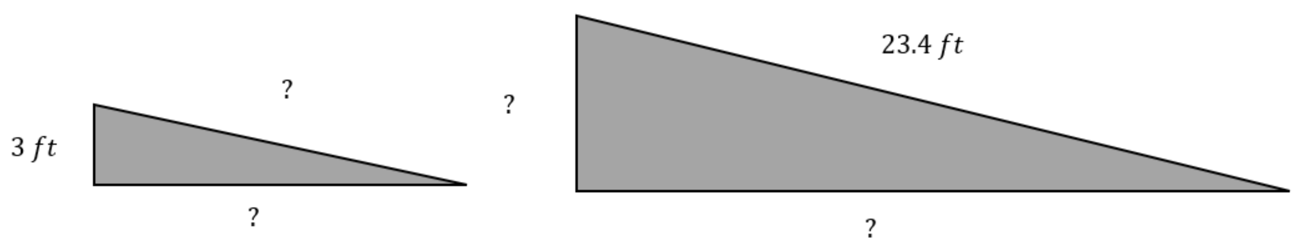
17. A person $150\ feet$ away from the base of a building is measuring the height of a statue at the top of the building. The angle of elevation to the base of the statue is $28°$, and the angle of elevation to the top of the statue is $31°$. What is the height of the statue?

18. A surveyor is standing 100 meters from a bridge. She determines that the angle of elevation to the top of the bridge is $35°$. If her height is 2.5 meters tall, then what is the height of the bridge?

19. A baseball diamond has four right angles and four equal sides. Each side is $90\ feet$. What is the shortest distance between home plate and second base? Round your answer to the nearest tenth.



20. For entrances to be accessible to all, ramps are being put in place in two different buildings. One will be smaller than the other, however, both ramps must be proportional in a $3:1$ ratio. Two measurements are provided below. What are the measurements of the other sides?



21. Lorena and Karla are creating an art project in the shape of a right triangle. They have a $92\ cm$ long piece of wood, which is to be used for the hypotenuse. The two legs of the triangular support are of **equal length**.

Approximately how many more centimeters of wood do they need to complete the support.

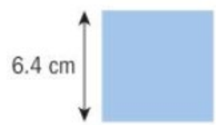
22. Find the circumference of a circle with radius 5.3 cm.

23. Find the area of a circle with a radius of 6.5 cm.

24. Find the area of the following shapes.

a.

b.



c.