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Dear Parent/Guardian,

We are pleased that your student is enrolled in Geometry Honors 273 for the upcoming school year. The course team has created a summer packet that reviews the algebra and geometry topics that students should be familiar with. We highly recommend this be completed! Teachers always briefly review these skills the first time they are seen, but it is the student's responsibility to master the material. The course moves at a fast pace, and we expect students to use their prior knowledge and apply it to the geometric world next school year.

The summer review contains different sections of material with answers in the back for students to check their answers. All problems should be done without a calculator. While there is not a test or quiz specifically on this material, these skills are used throughout the year not only on problems in class but on assessments as well. We believe it is beneficial to complete this packet and review this material before the first day of school.

If students need additional assistance with these topics, they should visit the Titan Learning Center (TLC) in the library to obtain extra help. This tutoring center is staffed by both peer and adult tutors.

Printing the packet is recommended so students can complete the problems in the space provided. To obtain the packet, please visit the Mathematics Department website:

<https://gbs.glenbrook225.org/academics/departments/mathematics>

Scroll down to the menu options. You will click on *Summer Packets*, then: **Geometry Honors 273**

We look forward to meeting your student in August!

Sincerely,

Phillip Gartner

Instructional Supervisor of GBS Mathematics Department

1. Solve the following for the variable:

You should know how to solve equations with fractions as well as proportions.

a. $2p + 5 = 13$

b. $3u + (u - 2) = 10$

c. $180 - x = 3(90 - x)$

d. $\frac{1}{2}(x - 7) = -8$

e. $\frac{2}{3}x + \frac{1}{2}x = \frac{3}{4}$

f. $\frac{3}{5} = \frac{q}{20}$

g. $\frac{y + 7}{y} = \frac{2}{3}$

h. $12 = \frac{6 \cdot H}{2}$

i. $\frac{6 + x}{2} \cdot 10 = 70$

j. $x^2 = 64$

k. $3(x^2 - 4) = 15$

l. $100\pi = \pi r^2$

2. Use the distributive property to multiply the following expressions:
(Write your answer in descending degree...this is called the standard form for polynomials.)
You need to be able to simplify expressions, especially binomials.

a. $(x+3)(x-7)$

b. $y(3y^2-5y-10)$

c. $(x+4)(x+4)$

d. $(x+4)^2$ (Hint: NOT x^2+16)

e. $(2x-3)^2$

f. $(2x^2-3x)(-4x^2+5)$

3. Factor the following polynomials:

You need to be able to factor all different forms explicitly focusing on quadratics.

a. $9x^2-x$

b. $8x^5-32x^3$

c. $x^2+7x+12$

d. $x^2+7x-60$

e. $x^2-10x+25$

f. x^2-81

g. x^2-49

h. $2x^2+3x-9$

i. $4n^2-15n-25$

4. Solve the following by factoring and the zero product property:

You need to be able to solve equations by factoring

a. $(x-3)(8x+5)=0$

b. $x^2+14x+13=0$

c. $x^2+7x=8$

Hint: Not In Standard Form

d. $x^2+5x+12=-2x$

e. $2x^2-14x+40=x^2-9$

f. $2x^2+26x+72=0$

g. $3x^2-11x+10=0$

h. $3x^2-20x-60=x^2+x+5$

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

5. Simplify the following fractions (you may have to think about factoring...)

a. $\frac{5x-10}{15}$

b. $\frac{x+6}{x^2-36}$

c. $\frac{3x^2-6x-24}{3x^2+2x-8}$

6. Solve the following systems algebraically and show your work.

You need to be able to solve systems using substitution and elimination methods.

a. $\begin{cases} y=2x+11 \\ y=-x+5 \end{cases}$

b. $\begin{cases} 3x+2y=17 \\ 3x-2y=-5 \end{cases}$

$$c. \begin{cases} 2x + 4y = 2 \\ x = y + 7 \end{cases}$$

$$d. \begin{cases} -2x + 5y = 26 \\ 3x - 2y = 5 \end{cases}$$

$$e. \begin{cases} 4(x - 3y) = 0 \\ 2(x - 5y) = 0 \end{cases}$$

$$f. \begin{cases} 3x - 2y = 5 \\ \frac{1}{2}y - 1 = -6x \end{cases}$$

7. Graph the following on the grids provided by using at least two points and a straight line:
You need to be able to graph lines in various forms.

$$a. y = \frac{2}{3}x - 5$$

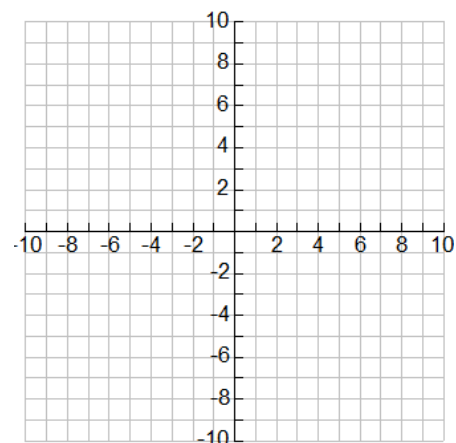
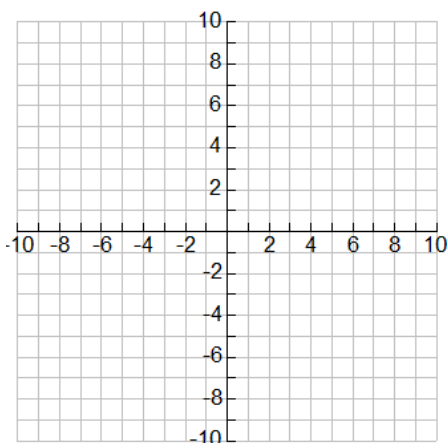
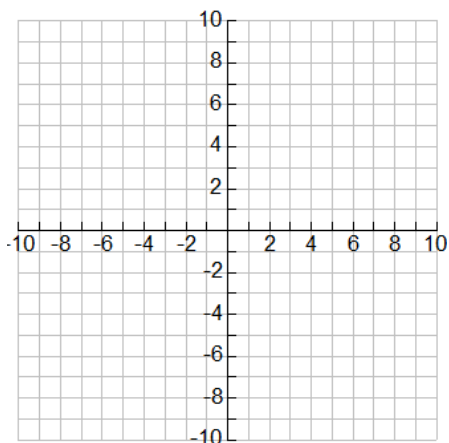
(This is slope-intercept form)

$$b. 3x - 8y = -24$$

(This is standard form)

$$c. y - 4 = -2(x + 4)$$

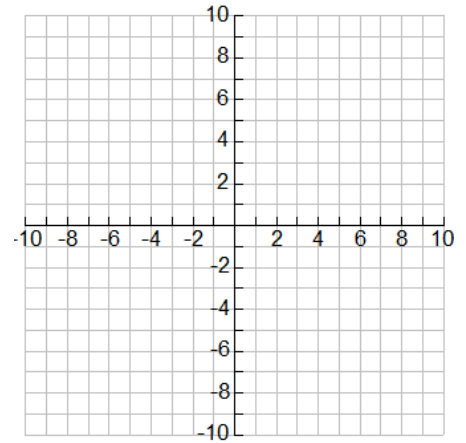
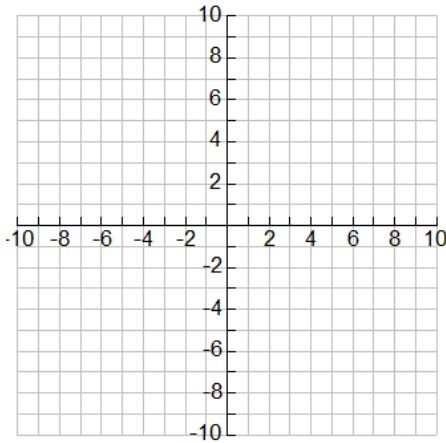
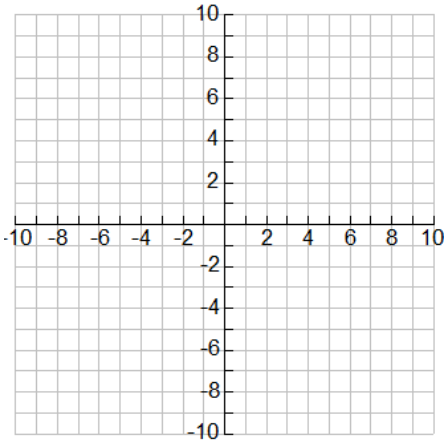
(This is point-slope form)



d. $x = 5$

e. $y = -7$

f. $y - 9 = 4(x - 2)$

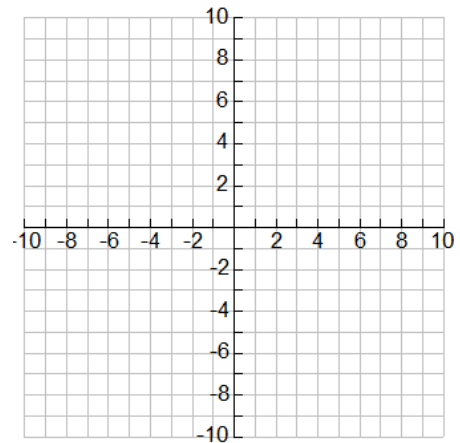
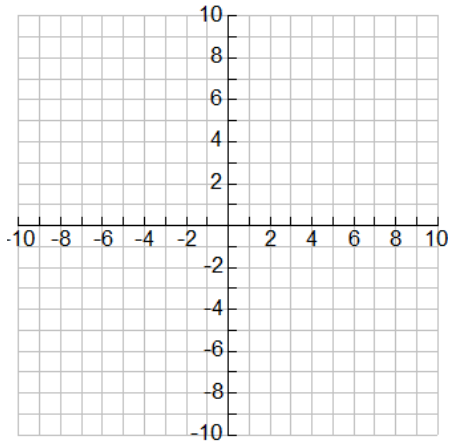


8. Find the solution to the following systems by graphing:

You need to be able to solve systems by graphing in addition to the algebraic methods you already practiced

a.
$$\begin{cases} y = -4x + 5 \\ y = \frac{5}{2}x - 8 \end{cases}$$

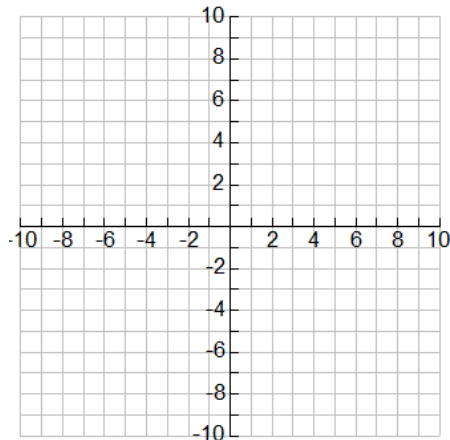
b.
$$\begin{cases} x = -4 \\ y = 6 \\ y = -\frac{3}{2}x \end{cases}$$



Solution: (_____ , _____)

Solution: (_____ , _____)

c.
$$\begin{cases} 2y - 4 = x \\ x = 4y \end{cases}$$



Solution: (_____ , _____)

9-11. Write equations of lines through the specified form.

You need to be able to write equations of lines given various information.

9. Write an equation of a line in slope-intercept form $y = mx + b$ for the following:

a. The slope of the line is -3 and the y-intercept is 5.

b. The line goes through the points (3, 1) and (0, 7). *Note: Question 15 has a formula you may need*

c. The line that is parallel to $y = 5x - 4$ and goes through the point (7, -3).

10. Write an equation of a line in point-slope form $y - y_1 = m(x - x_1)$ for the following:

a. The slope of the line is 7 and it goes through the point (2, 3).

b. The line goes through the points (2, -7) and (-4, 9).

c. The line that is perpendicular to $y = -\frac{1}{3}x + 8$ and goes through the point (-8, -2).

11. Use any form you want for the following:

a. Write an equation of a vertical line through the point (4, -5).

b. Write an equation of a horizontal line through the point (4, -5).

c. Write an equation of a line with an undefined slope through the point (4, -5).

d. Write an equation of a line with a zero slope through the point (4, -5).

e. Write an equation of a line perpendicular to $6x - 4y = 12$ and through the point (7, -5).

12. Simplify the following radicals:

You should know how to perform operations (adding, subtracting, multiplying, & dividing) with radicals.

a. $\sqrt{25}$

b. $\sqrt{24}$

c. $\sqrt{108}$

d. $3\sqrt{49}$

e. $5\sqrt{18}$

f. $2\sqrt{50}$

g. $\sqrt{27} + 4\sqrt{75}$

h. $9\sqrt{20} - 3\sqrt{45}$

i. $7\sqrt{24} - \sqrt{48} + 3\sqrt{54}$

j. $\sqrt{3} \cdot \sqrt{4}$

k. $\sqrt{8} \cdot \sqrt{6}$

l. $2\sqrt{3} \cdot \sqrt{3}$

m. $4\sqrt{5} \cdot 2\sqrt{5}$

n. $8\sqrt{3} \cdot 4\sqrt{8}$

o. $7\sqrt{3} \cdot 7\sqrt{3}$

p. $(7\sqrt{3})^2$

q. $(3\sqrt{5})^2$

r. $\frac{15}{\sqrt{3}}$

Note: You rationalize the denominator here

s. $\frac{14}{\sqrt{2}}$

t. $\frac{19}{\sqrt{3}}$

u. $\frac{7\sqrt{10}}{\sqrt{2}}$

13. Evaluate each of the expressions below:

a. $2ab$ when $a = -3$ and $b = -4$

b. πrl when $r = \frac{11}{3}$ and $l = 6$

c. $x^2 - y^2$ when $x = 2\sqrt{3}$ and $y = -4$

d. $\frac{1}{3}\pi r^2 h$ when $r = 2\sqrt{6}$ and $h = 4$

14. Find the distance between the numbers on the number lines below.



c. The distance between two points on a number line is 8. One of the numbers is at -3. Find all possibilities for the location of the other number. (Hint: Draw a picture)

15. For the following pairs of points find the following:

- The distance between them
- The coordinate of the midpoint between them
- The slope of the line on which they lie

Remember that for any points (x_1, y_1) and (x_2, y_2) the following formulas are true:

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{Coordinate of Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \quad \text{Slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Note: These are equations that you should have memorized and know how to use

Pair 1: (3, 4) and (15, 20)

Pair 2: (-2, 6) and (7, 0)

16. The Pythagorean Theorem (possibly the coolest of all geometry theorems we will discuss) states that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs. In algebraic form where the hypotenuse of a right triangle is “c” and the legs are “a” and “b” this looks like: $c^2 = a^2 + b^2$

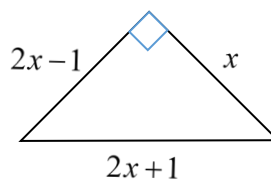
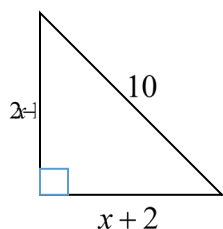
a. If the legs of a right triangle are 5 and 12, then set up an equation and solve for the hypotenuse.

b. If the legs of a right triangle are 3 and 7, then set up an equation and solve for the hypotenuse.

c. If the hypotenuse of a right triangle is 10 and a leg is 5, then find the value of the missing leg. Draw a picture as well with proper labels.

d. Find x (Hint: Look back at 2–4 in the packet)
(Additional Note: Remember that side lengths cannot be negative)

e. Find x



17. You have learned about areas of shapes in your previous math experiences. Here are the formulas again in case you forgot some of them. We will learn all of these but for right now, you should know squares, rectangles, triangles, and circles.

Area of a square: $A = s^2$ where s is a side length	Area of a rectangle: $A = bh$ where b is a base and h is a height	Area of a parallelogram: $A = bh$ where b is a base and h is a height
Area of a triangle: $A = \frac{bh}{2}$ where b is a base and h is a height	Area of a trapezoid: $A = \frac{h(b_1 + b_2)}{2}$ where h is a height, b_1 is a base and b_2 is the other base	Area of a kite/rhombus: $A = \frac{d_1 d_2}{2}$ where d_1 is a diagonal length and d_2 is the other diagonal
Area of a circle: $A = \pi r^2$ where r is the radius of the circle	Circumference of a circle $C = \pi d$ or $C = 2\pi r$ where d is the diameter of the and r is the radius of the circle	For circles: The diameter of a circle is twice the length of the radius

a. Find the area of a square with a side of 4 b. Find the area of a triangle with a base of 10 and height of 4

c. A triangle has an area of 144 and a base of 18. What is the height?

d. The base of a right triangle is 3 and has a hypotenuse of 5. Find the height and its area.

e. A rectangle has a length of 4 and a height of 8. Find the perimeter and the area of the rectangle.

f. A rectangle has a base of 6 inches and an area of 54 in^2 . Find the height.

g. A rectangle has a perimeter of 38 and a height of 8. What is the area?

h. A circle has a radius of 4. Find its area and circumference.

i. A circle has an area of 100π . Find the radius and then find the circumference.

j. A circle has a circumference of 18π . What is the area?

18. Please answer the following honestly to assist your teacher in making sure you are prepared:

a. Overall, how did you feel about the material in this packet?

b. Were there any topics that appeared new to you? If so, which ones?

c. Which topics, if any, did you struggle with?

d. How long did it take you to complete this packet? Give the best estimate you can.

e. Any other comments?

Answers

1a. $p = 4$ 1b. $u = 3$ 1c. $x = 45$ 1d. $x = -9$ 1e. $x = \frac{9}{14}$ 1f. $q = 12$
1g. $y = -21$ 1h. $H = 4$ 1i. $x = 8$ 1j. $x = \pm 8$ 1k. $x = \pm 3$ 1l. $r = \pm 10$

2a. $x^2 - 4x - 21$ 2b. $3y^3 - 5y^2 - 10y$ 2c. $x^2 + 8x + 16$ 2d. $x^2 + 8x + 16$
2e. $4x^2 - 12x + 9$ 2f. $-8x^4 + 12x^3 + 10x^2 - 15x$

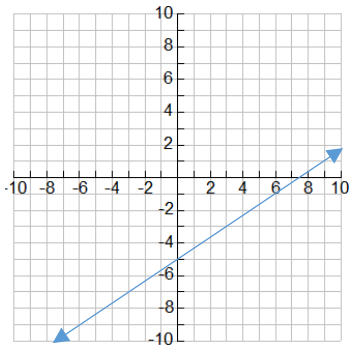
3a. $x(9x - 1)$ 3b. $8x^3(x + 2)(x - 2)$ 3c. $(x + 3)(x + 4)$ 3d. $(x + 12)(x - 5)$
3e. $(x - 5)^2$ 3f. $(x + 9)(x - 9)$ 3g. $(x + 7)(x - 7)$ 3h. $(2x - 3)(x + 3)$
3i. $(4n + 5)(n - 5)$

4a. $3, -\frac{5}{8}$ 4b. $-13, -1$ 4c. $-8, 1$ 4d. $-4, -3$ 4e. 7
4f. $-9, -4$ 4g. $\frac{5}{3}, 2$ 4h. $-\frac{5}{2}, 13$ 4i. $0, \frac{1}{2}, 1$

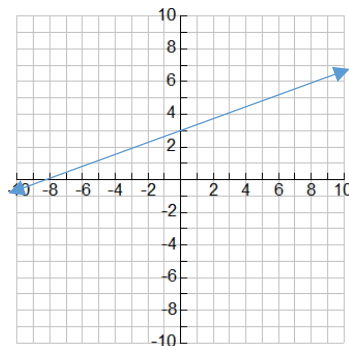
5a. $\frac{x - 2}{3}$ 5b. $\frac{1}{x - 6}$ 5c. $\frac{3(x - 4)}{3x - 4}$

6a. $(-2, 7)$ 6b. $(2, \frac{11}{2})$ 6c. $(5, -2)$ 6d. $(7, 8)$ 6e. $(0, 0)$ 6f. $(\frac{1}{3}, -2)$

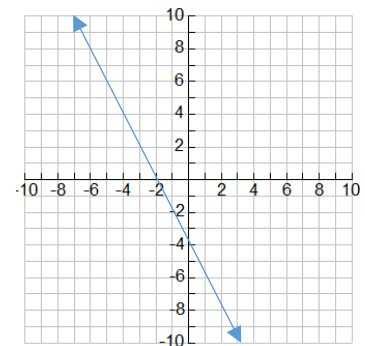
7a.



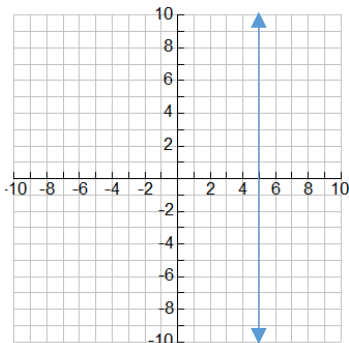
7b.



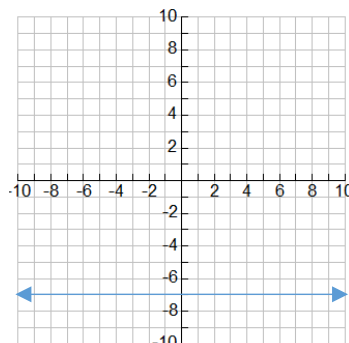
7c.



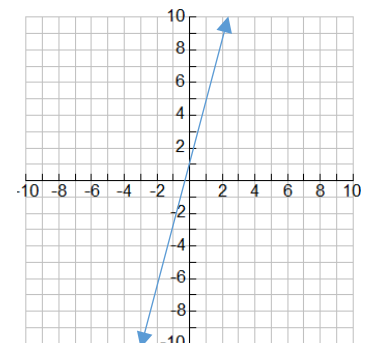
7d.



7e.



7f.



8a. (2, -3) 8b. (-4, 6) 8c. (-8, -2)

9a. $y = -3x + 5$ 9b. $y = -2x + 7$ 9c. $y = 5x - 38$

10a. $y - 3 = 7(x - 2)$ 10b. $y - 9 = -\frac{8}{3}(x + 4)$ OR $y + 7 = -\frac{8}{3}(x - 2)$ 10c. $y + 2 = 3(x + 8)$

11a. $x = 4$ 11b. $y = -5$ 11c. $x = 4$ 11d. $y = -5$ 11e. $y + 5 = -\frac{2}{3}(x - 7)$

12a. 5 12b. $2\sqrt{6}$ 12c. $6\sqrt{3}$ 12d. 21 12e. $15\sqrt{2}$ 12f. $10\sqrt{2}$ 12g. $23\sqrt{3}$

12h. $9\sqrt{5}$ 12i. $23\sqrt{6} - 4\sqrt{3}$ 12j. $2\sqrt{3}$ 12k. $4\sqrt{3}$ 12l. 6 12m. 40

12n. $64\sqrt{6}$ 12o. 147 12p. 147 12q. 45 12r. $5\sqrt{3}$ 12s. $7\sqrt{2}$ 12t. $\frac{19\sqrt{3}}{3}$

12u. $7\sqrt{5}$

13a. 24 13b. 22π 13c. -4 13d. 32π

14a. 9 14b. 16 14c. -11 or 5

15. Pair 1: a. 20 b. (9, 12) c. $\frac{4}{3}$ Pair 2: a. $3\sqrt{13}$ b. $\left(\frac{5}{2}, 3\right)$ c. $-\frac{2}{3}$

16a. 13 16b. $\sqrt{58}$ 16c. $5\sqrt{3}$ 16d. 6 16e. 8

17a. 16 17b. 20 17c. 16 17d. $h = 4, A = 6$ 17e. $P = 24, A = 32$ 17f. 9

17g. 88 17h. $A = 16\pi, C = 8\pi$ 17i. $r = 10, C = 20\pi$ 17j. 81π