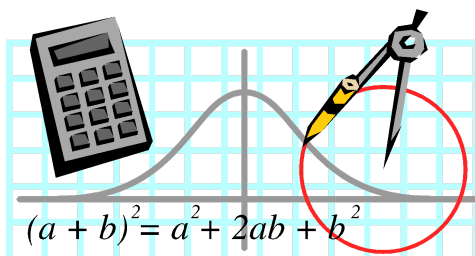


West Essex Regional School District

Discrete Mathematics Summer Assignment 2023



Discrete CPA is a college preparatory course that provides a review and extension of skills acquired in algebra and geometry. Techniques are introduced to engage students in and strengthen their problem-solving skills. The course will provide a strong development of trigonometry and probability and statistics using real world applications, as well as explore other discrete topics throughout the year.

The first major theme of the curriculum is a review of concepts learned in Algebra II and several will be completed over the summer. Upon completing the summer assignment, each student should be able to:

- Identify values within the Real Number System
- Simplify expressions involving exponent
- Solve equations in one variable
- Factor
- Use the distance and midpoint formulas to solve problems
- Graph and write equations for a circle
- Graph and write linear equations

Assignments

- All assignments will be collected on **The First Day of School** and count toward a 10 point homework grade. You will lose 2 points for each day the assignment is late.
- There will be assessments based on this summer assignment. The dates of the assessments will be announced prior to the quizzes.

Complete all work in the **packet in the space provided** for each problem using **Pencil**. Credit will not be given otherwise. It is also recommended that students use a three-ring binder for all notes, assignments, and worksheets throughout the school year. Complete all problems in the exercises unless otherwise indicated.

Show all work!

I. Suggested Due Date: 8/4/23

The Real Number System
Properties of Exponents
Solving Linear Equations

II. Suggested Due Date: 8/11/23

Factoring Expressions

III. Suggested Due Date: 8/18/23

Distance and Midpoint
Graphing and Writing Equations of Circles
Slope and Rate of Change

IV. Suggested Due Date: 8/25/23

Graphing Linear Equations
Writing Linear Equations
Cumulative Quiz

Have a great summer....

Internet Resources for Summer Packet

Your first resource should be the DISCRETE SUMMER NOTES PACKET found on the Discrete Google Classroom Page.

Here are additional internet resources that may be helpful to use while completing your summer packet. They will provide another resource of information to review materials you have learned in your prior math courses.

www.khanacademy.com

<http://mathbits.com/MathBits/TeacherResources/Algebra2/Algebra2.htm>

<http://www.purplemath.com/>

<http://www.algebrahelp.com/resources/>

www.thatquiz.org

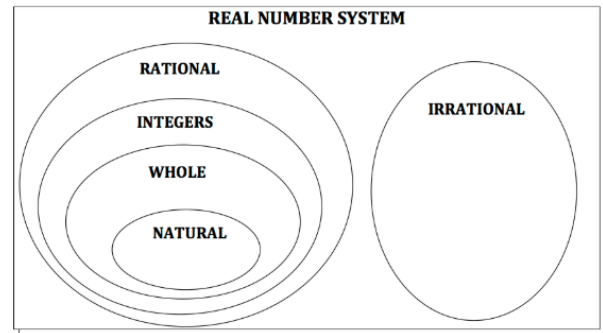
<http://www.math.com/homeworkhelp/Algebra.html>

<http://www.freemathhelp.com/algebra-help.html>

http://www.teacherschoice.com.au/mathematics_how-to_library.htm

<http://www.algebrahelp.com/>

The Real Number System:



1) Place the following set of numbers in the diagram:

$$\{\sqrt{49}, -.405, -0.\bar{3}, 0, 0.1, -3, 18, 6\pi, -56, \sqrt{2}\}$$

2) Real numbers are *ordered*. Each real number corresponds to a point on a line. Using 0 as the middle point,

draw a number line and label the points $2, \pi, -\frac{11}{32}, 0$.

Multiple Choice: Circle the correct answer.

3) The number π is:

- | | |
|------------------------|-------------------------|
| A) Real and Rational | B) Irrational and Whole |
| C) Real and Irrational | D) Rational and Natural |

4) It is possible for a number to belong to which two sets?

- | | |
|----------------------------|----------------------------|
| A) Rational and Irrational | B) Irrational and Integers |
| C) Rational and Natural | D) Whole and Irrational |

5) Classify $\frac{1}{3}$

- | | |
|-----------------------------------|--|
| A) real, rational | B) real, rational, integer |
| C) real, rational, whole, natural | D) real, rational, whole, natural, integer |

6) Which of the choices shows all the rational numbers in this group of numbers?

$$-6, 0, \frac{4}{5}, 1.7, 4.\overline{763}$$

- | | |
|---|--|
| A) $-6, 0, \frac{4}{5}, 1.7$ | B) $-6, 0, \frac{4}{5}, 1.7, 4.\overline{763}$ |
| C) $-6, \frac{4}{5}, 1.7, 4.\overline{763}$ | D) $0, \frac{4}{5}, 1.7, 4.\overline{763}$ |

True or False: Circle the correct answer.

- | | |
|---|------------|
| 7) Every integer is a rational number. | TRUE/FALSE |
| 8) Every rational number is an irrational number. | TRUE/FALSE |
| 9) Every natural number is an integer. | TRUE/FALSE |
| 10) Every integer is a natural number. | TRUE/FALSE |

Properties of Exponents:

Evaluate the expression using rules of exponents. Tell which property of exponents you used.

1) $2^5 \cdot 2^3$

2) $(3xy)^0$

3) $\left(\frac{3}{x}\right)^2$

4) $\frac{5^{-4}}{5^7}$

5) 4^{-4}

6) $(2^{12})^3$

7) $(-6x)^2$

Simplify the expression.

8) $\frac{x^8}{x^4}$

9) $\frac{y^4}{y^{17}}$

10) $(3^2s^3)^6$

11) $(4^0w^2)^{-5}$

12) $(y^4z^2)(y^{-3}z^{-5})$

13) $(2m^3n^{-1})(8m^4n^{-2})$

14) $(5g^4h^{-3})^{-3}$

15) $\frac{8e^{14}f^{12}}{18ef^{15}}$

16) $\frac{x^5y^{18}}{x^5y^{16}}$

17) $\frac{16q^0r^{16}}{4q^{13}r^{17}}$

Solving Linear Equations:

Solve each equation. Make sure to check your solution!

1) $14x = 7$

2) $3n + 2 = 14$

3) $-6t - 5 = 13$

4) $11q - 4 = 6q - 9$

5) $11p - 9 + 8p - 7 + 14p = 12p + 9p + 4$

6) $4(2x - 1) = 3(x + 2)$

7) $2y + 3(y - 4) = 2(y - 3)$

8) $-9m - (4 + 3m) = -(2m - 1) - 5$

9) $\frac{x - (-1)}{-5} + 3 = -13$

10) $\frac{m - 2}{3} + \frac{m}{4} = \frac{1}{2}$

11) $\frac{3k}{5} - \frac{2k}{3} = 1$

12) $.02(50) + .08r = .04(50 + r)$

Factoring Expressions:

Factor out the GCF of each expression.

1) $20x^4 + 36x^2$

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

3) $5x^3 - 10x^2 + 25x + 50$

Use the grouping method to factor each expression.

4) $15x^2 - 3x + 10x - 2$

5) $8x^2 - 5x - 24x + 15$

6) $2x^2 + 8xz - xy - 4yz$

Given the difference of two squares, factor each expression completely.

7) $4x^2 - 25$

8) $36x^2 - 81$

9) $16x^4 - 81y^8$

Factor each perfect-square trinomial.

10) $4x^2 + 24x + 36$

11) $9x^2 - 42x + 49$

12) $16x^2 + 72x + 81$

Factor each trinomial where the leading coefficient is 1.

13) $x^2 + 5x + 6$

14) $x^2 - 7x + 10$

15) $x^2 - 7x - 30$

Factor each trinomial where the leading coefficient is NOT 1.

16) $2x^2 + x - 3$

17) $8x^2 - 14x + 3$

18) $3x^2 + 11x - 20$

Factor each expression completely.

19) $x^2 + 12x + 36$

20) $x^2 - 144$

21) $4x^2 + 25$

22) $b^2 - b + 2b - 2$

23) $4t^2 + 4t - 15$

24) $a^3 + 9a^2 + 18a$

25) $-9x^3 + 9x$

26) $5x^2 - 20x + 15$

27) $2xy - x^2y + 6 - 3x$

28) $16x^4 - 81$

29) $3a^2 - 10a + 8$

30) $9x^2 + 24x + 16$

31) $-35x^6 - 5x^5 - 50x^3$

32) $3x^3 - 3x^2 + 15x$

Distance and Midpoint:

Find the distance between the two points rounded to the nearest hundredth. Then find the midpoint of the line segment joining the two points.

1) $(-9, 7), (3, -4)$

2) $(-2.8, 6.1), (-1.2, 2.5)$

3) $\left(4, \frac{5}{2}\right), \left(\frac{3}{2}, 2\right)$

The vertices of a triangle are given. Find the length of each side of the triangle. Then, classify the triangle as scalene, isosceles, or equilateral.

4) $A(2, 5), B(-2, 8), C(-4, -1)$

5) $D(-3, -1), E(0, 3), F(3, -1)$

Use the given distance d between the two points to find the value of x or y .

6) $(-12, 7), (x, -10); d = \sqrt{545}$

For \overline{PQ} , the coordinates of P and M , the midpoint of \overline{PQ} , are given. Find the coordinates of Q .

7) Let $P(-3, 4)$ and $M(1, 1)$

Graphing and Writing Equations of Circles:

1) Write an equation of a circle with center $(-4, 2)$ and radius $r = 3$.

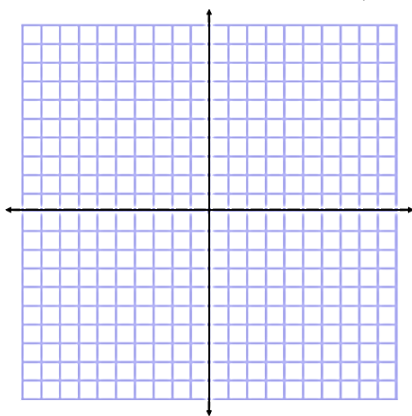
2) Write the standard form of the equation of the circle that passes through $(3, 2)$ and whose center is the origin.

Identify the center and the radius of the circle, then graph.

3) $x^2 + y^2 = 16$

Center:

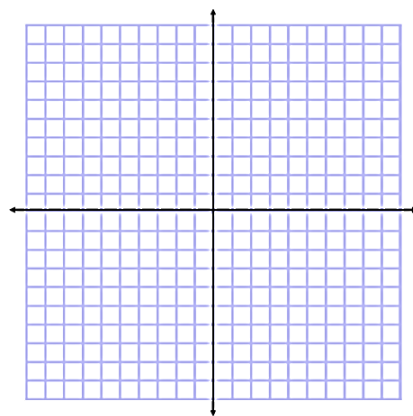
Radius:



4) $y^2 - 36 = -x^2$

Center:

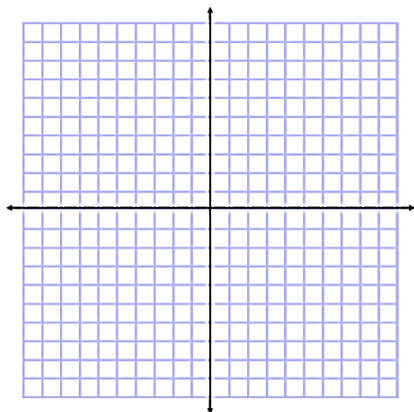
Radius:



5) $(x - 5)^2 + (y + 1)^2 = 9$

Center:

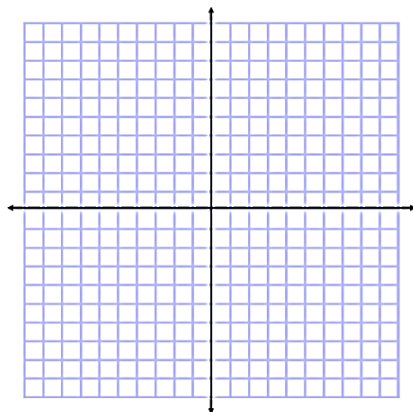
Radius:



6) $(x + 2)^2 + (y - 3)^2 = 25$

Center:

Radius:



Slope and Rate of Change:

Determine the slope of the line passing through the given points. Then, tell whether the line through the given points rises, falls, is horizontal, or is vertical.

1) $(-4, 2), (1, 0)$

2) $(1, 6), (1, 0)$

3) $(0, -3), (4, -3)$

4) $(-1, -1), (2, 0)$

Tell whether the lines are *parallel*, *perpendicular*, or *neither*.

5) Line 1: through $(-1, -1)$ and $(1, 3)$
Line 2: through $(-2, -2)$ and $(1, 4)$

6) Line 1: through $(1, 5)$ and $(0, 3)$
Line 2: through $(2, -3)$ and $(0, 1)$

7) Use the table, which shows the growth of human hair over 5 months, to find the average rate of change in the length of human hair over time. Then predict the length of human hair at 11 months.

Month	1	2	3	4	5
Length of hair (in inches)	6.1	6.4	6.8	7.2	7.3

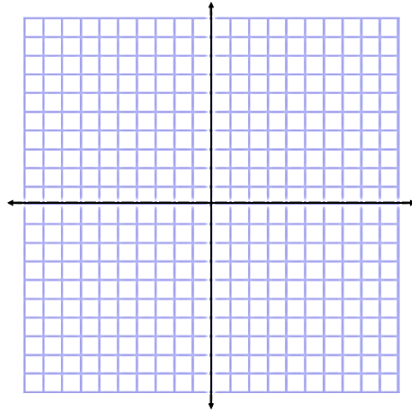
Graphing Linear Equations:

Graph the equation from slope-intercept form by first stating the slope and y-intercept.

1) $y = 5x - 3$

Slope:

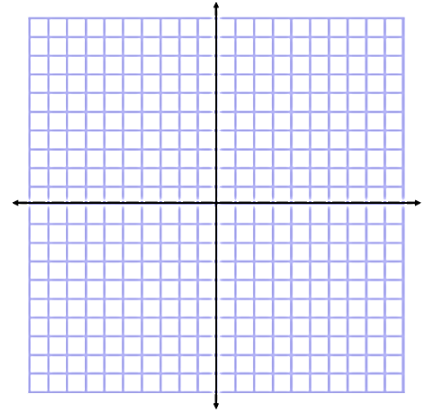
y-int:



2) $y = -\frac{2}{5}x + 1$

Slope:

y-int:

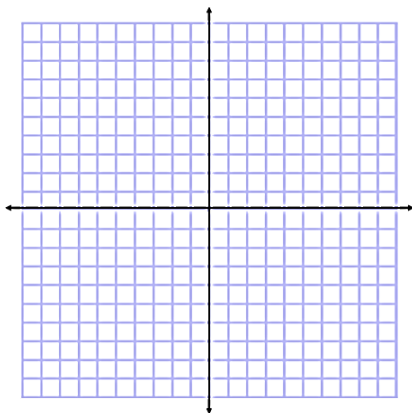


Graph the equation from standard form *WITHOUT* re-writing it in slope-intercept form. State the x- and y-ints.

3) $x + 2y = 4$

x-int:

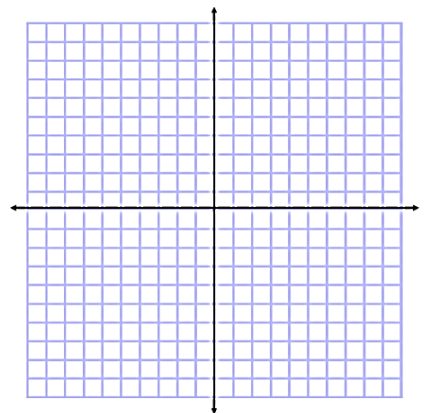
y-int:



4) $5x - 3y = 15$

x-int:

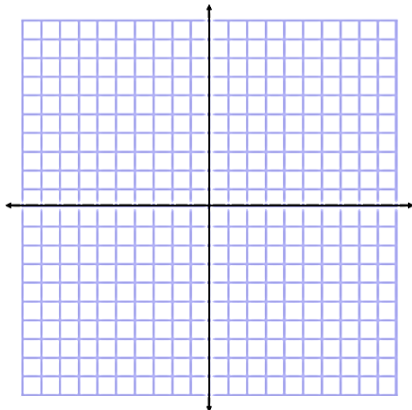
y-int:



5) $x = -1$

x-int:

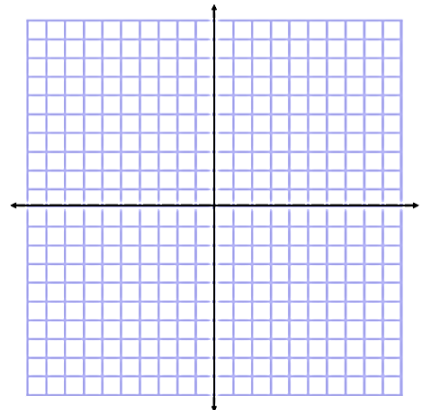
y-int:



6) $y = 4$

x-int:

y-int:

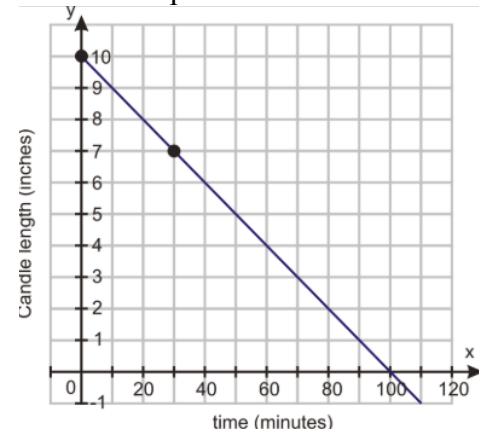


7) The graph below gives the relationship between candle length and minutes that have passed.

a) Determine the slope and y-intercept of the graph then describe what each represents.

b) Estimate the height of the candle after 85 minutes.

c) After approximately how many minutes will the candle be 5.5 inches long?



Writing Linear Equations:

- 1) Find the x- and y-intercepts for the equation $3x - 2y = 12$.

- 2) Write the equation of the line in both point-slope form and slope-intercept form that passes through the point $(-1, 3)$ and has the slope of $-\frac{2}{5}$.

- 3) Write the equation of the line in both point-slope form and slope-intercept form that passes through the point $(0, 4)$ and is perpendicular to the line $y = -\frac{5}{4}x$.

Write an equation in slope-intercept form of the line with the given conditions.

- 4) With a slope of 4 and a y-intercept of -1 .
- 5) With a slope of -5 that passes through $P(3, -2)$.

- 6) That passes through $(2, 3)$ and parallel to $y = -x + 3$.
- 7) That passes through $(0, 1)$ and perpendicular to $y = 2x + 1$.

Write an equation in point-slope form of the line that passes through the given points.

- 8) $(1, -1), (4, 2)$
- 9) $(-2, 4), (3, -1)$
- 10) $(-3, -1), (0, 1)$

Cumulative QUIZ

1) Put an "x" in each box for which the number on the left of the chart belongs to the set of numbers across the top.

	Integer	Rational	Irrational	Real	Natural	Whole
a. 5						
b. $\sqrt{25}$						
c. -7						
d. $\sqrt{3}$						
e. $\sqrt{16}$						
f. 0						
g. π						
h. 1.765						
i. $-\frac{17}{5}$						
j. $-\sqrt{6}$						

Simplify each expression.

2) d^2d^4

3) $\frac{(xy^3)^2}{xy^{-1}}$

4) $(9y^{-4})^2$

Solve each equation.

5) $6x - 2 = 5x - 7 - 3x$

6) $\frac{6x+7}{4} + \frac{3x-5}{7} = \frac{5x+78}{28}$

7) $3(8x - 5) + 3 = 20x + 2(x - 6)$

Factor Completely.

8) $4x^2 - 20x + 25$

9) $x^2 - 3x - 28$

10) $x^2 - 49$

11) $3x^2 - 8x + 5$

12) Find a) the distance and b) the midpoint between the points (4, 1) and (1, 4).

13) Identify the center and radius of the circle given the equation $(x - 5)^2 + (y - 1)^2 = 25$

14) Write the equation of the circle with center (3, -2) and radius of $\sqrt{5}$.

15) Identify the slope and y-intercept of the equation $y = \frac{2}{5}x + 4$.

16) Write the equation of the line that goes through (1, -2) and (-3, -5) in both point-slope form and slope-intercept form.