

**To all students entering 10th grade Extended or Extended Advanced Math.**

In order to keep our current math skills sharp, please complete this summer review packet. Use your previous class notes and work, websites such as Khan Academy and IXL and other math reference books for guides. Please complete before the first day of school in August 2020. You will be tested on this material when you return to school. If there are topics you are struggling with, please use the extra resources provided to practice!

Show all work, graphs and solutions clearly on a **separate** sheet of paper. Your work should be numbered and organized so it is easy to read. Solutions are not provided with this packet.

Have a good summer!

CDS Mathematics Department

Name: \_\_\_\_\_

**10<sup>th</sup> grade Extended and Ext Adv. Summer Packet 2021**  
**DUE on the FIRST day of SCHOOL**

## Formulas:

<b>Pythagorean Theorem</b>	$a^2 + b^2 = c^2$
<b>Quadratic Formula</b>	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
<b>Trig Functions</b>	$\sin = \frac{opp}{hyp}; \cos = \frac{adj}{hyp}; \tan = \frac{opp}{adj}$
<b>Cosine Rule</b>	$a^2 = b^2 + c^2 - 2bc \cos A$ $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ $b^2 = a^2 + c^2 - 2ac \cos B$ $\cos B = \frac{a^2 + c^2 - b^2}{2ac}$ $c^2 = a^2 + b^2 - 2ab \cos C$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
<b>Sine Rule</b>	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ or $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
<b>Area of a triangle</b>	$A = \frac{1}{2}ab \sin C$ or $A = \frac{1}{2}bh$
<b>Arithmetic Series</b>	$a_n = a_1 + (n - 1)d$
<b>Geometric Series</b>	$a_n = a_1 r^{n-1}$
<b>Probability of an event A</b>	$P(A) = \frac{n(A)}{n(U)}$
<b>Independent events (or with replacement)</b>	$P(A \cap B) = P(A)P(B)$
<b>Midpoint, Distance, Slope</b>	$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $m = \frac{y_2 - y_1}{x_2 - x_1}$

# Simplifying Expressions

Topic	Extra Help	Extra Practice (IXL)
Factoring	<a href="https://www.khanacademy.org/math/algebra/polynomial-factorization/factoring-quadratics-strategy/v/strategy-in-factoring-quadratics-1">https://www.khanacademy.org/math/algebra/polynomial-factorization/factoring-quadratics-strategy/v/strategy-in-factoring-quadratics-1</a>	Algebra 2 Tab I.3, I.4, I.5
Foiling	<a href="https://www.khanacademy.org/math/algebra/introduction-to-polynomial-expressions/multiplying-binomials-2/v/multiplying-binomials">https://www.khanacademy.org/math/algebra/introduction-to-polynomial-expressions/multiplying-binomials-2/v/multiplying-binomials</a> <a href="https://www.khanacademy.org/math/algebra/introduction-to-polynomial-expressions/multiplying-polynomials-by-binomials/v/more-multiplying-polynomials">https://www.khanacademy.org/math/algebra/introduction-to-polynomial-expressions/multiplying-polynomials-by-binomials/v/more-multiplying-polynomials</a>	Algebra 2 Tab K.3
Index Laws	<a href="https://www.khanacademy.org/math/algebra2/exponential-growth-and-decay-2/equivalent-forms-of-exponential-expressions/v/simplifying-an-exponential-expression">https://www.khanacademy.org/math/algebra2/exponential-growth-and-decay-2/equivalent-forms-of-exponential-expressions/v/simplifying-an-exponential-expression</a>	Algebra 1 Tab V.3, V.4, V.5, V.6, V.7, V.8
Radical Operations	<a href="https://www.khanacademy.org/math/algebra-home/alg-exp-and-log/miscellaneous-radicals/v/adding-and-simplifying-radicals">https://www.khanacademy.org/math/algebra-home/alg-exp-and-log/miscellaneous-radicals/v/adding-and-simplifying-radicals</a> <a href="https://www.khanacademy.org/math/algebra-home/alg-exp-and-log/miscellaneous-radicals/v/multiply-and-simplify-a-radical-expression-2">https://www.khanacademy.org/math/algebra-home/alg-exp-and-log/miscellaneous-radicals/v/multiply-and-simplify-a-radical-expression-2</a>	Algebra 2 Tab L.4, L.7, L.8, L.9, L.10, L.11
Complex Fractions	<a href="https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions/simplify-rational-expressions/v/simplifying-rational-expressions-introduction">https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions/simplify-rational-expressions/v/simplifying-rational-expressions-introduction</a>	Algebra 2 Tab N.4, N.5 N.6

## Factoring

- $x^2 - 4x - 12$
- $3x^2 - 75$
- $2x^2 - 3x - 20$
- $30x^4 + 21x^2 - 36x^3$
- $5x^3 + 15x^2 + 2x + 6$

## Foiling

- $(x - 4)(x + 5)$
- $(5x - 1)(2x + 3)$
- $(3x + 2)(2x^2 - x - 5)$
- $(3x - 5)(x + 7)(2x + 1)$

## Index Laws

- $(b^3)^5$
- $a^4b^3c^5(a^2b^3c)$
- $\frac{x^5y^{-2}}{x^{-6}y^{-9}}$
- $\left(\frac{x^8}{xy^5}\right)^{-2}$

## Operations with Radicals

- $\frac{\sqrt{60}}{\sqrt{6}}$
- $\sqrt{12a^6b^3}$
- $5\sqrt{3} + 7\sqrt{5} - 12\sqrt{3}$
- $-5\sqrt{20x^9y^{12}}$
- $\sqrt{15}(\sqrt{6})$
- $2\sqrt{27} - 8\sqrt{12}$
- $\sqrt{5}(2\sqrt{10} - 3)$
- $(\sqrt{5} - 2\sqrt{3})(\sqrt{10} + 3\sqrt{5})$

## Solving Equations:

Topic	Extra Help	Extra Practice IXL
Solving Quadratics	<a href="https://www.khanacademy.org/math/algebra/quadratics">https://www.khanacademy.org/math/algebra/quadratics</a>	Algebra 2 Tab J.4, J.5, J.6, J.8, J.9
Solving Radical Equations	<a href="https://www.khanacademy.org/math/algebra2/radical-equations-and-functions">https://www.khanacademy.org/math/algebra2/radical-equations-and-functions</a>	Algebra 2 Tab L.13
Solving Exponential Equations	1. <a href="https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/solving-exponential-equations-with-logarithms/v/solve-exponentials">https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/solving-exponential-equations-with-logarithms/v/solve-exponentials</a> 2. <a href="https://www.khanacademy.org/math/algebra2/exponential-growth-and-decay-2/solving-exponential-equations-using-properties-of-exponents/v/solving-exponential-equations-with-exponent-properties">https://www.khanacademy.org/math/algebra2/exponential-growth-and-decay-2/solving-exponential-equations-using-properties-of-exponents/v/solving-exponential-equations-with-exponent-properties</a>	Algebra 2 Tab S.4, S.5, R.1
Solving Rational Equations	<a href="https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions/solving-rational-equations/v/equations-with-two-rational-expressions">https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions/solving-rational-equations/v/equations-with-two-rational-expressions</a>	Algebra 2 Tab N.7 Precalc Tab E.2

### Solving

1.  $2\sqrt{5x-7} + 12 = 18$

4.  $\frac{3x-7}{2x} = \frac{5x+6}{3x}$

7.  $3x^2 + 8x = -4$

2.  $5^{3x-7} = 25^{2x+1}$

5.  $8x - 7 = 19$

8.  $\sqrt[3]{4x-9} - 8 = 1$

3.  $x^2 + 8x - 20 = 0$

6.  $-2x + 8 \leq 24$

9.  $\frac{3x-2}{x+1} = \frac{4x+5}{x-1}$

13. A number squared is equal to 12 times the number minus 36. Find the number.

14. The area of a rectangle is  $108\text{cm}^2$ . The length is  $3\text{cm}$  greater than the width. Find the length and the width of the rectangle.

15. A ball is thrown into the air vertically with a velocity of 112 feet per second. The ball was released 6 feet above the ground. The height above the ground  $t$  seconds after release is modeled by  $h(t) = -16t^2 + 112t + 6$

a. When will the ball reach 130 feet?

b. In how many seconds after its release will the ball hit the ground?

# Solving Systems of Equations

Topic	Extra Help	Extra Practice IXL
Systems of Equations	<a href="https://www.khanacademy.org/math/algebra/systems-of-linear-equations">https://www.khanacademy.org/math/algebra/systems-of-linear-equations</a>	Algebra 2 Tab E.1, E.2, E.6, E.7, E.8 and E.9
Systems of Inequalities	<a href="https://www.khanacademy.org/math/algebra/two-variable-linear-inequalities">https://www.khanacademy.org/math/algebra/two-variable-linear-inequalities</a>	Algebra 2 Tab F.1 and F.2

## Systems of Equations

1. Solve the following systems of equations:

a.  $y = x - 10$   
 $5y + 10x = 10$

b.  $2x - 3y = 12$   
 $4x + 10y = 16$

2. Solve the following system graphically:  $x + y = -2$   
 $2x - y = -7$

3. George bought a total of 8 lbs of peanuts and cashews. Peanuts, p, cost \$2 per pound and cashews, c, cost \$5 per pound. The total amount George spent on peanuts and cashews was \$25. Create a system of equations to model this information and determine how many pounds of peanuts and cashews that George bought.

## Systems of Inequalities

4. Which of the following is a solution to the given system of inequalities?  $3x + y < 12$   
 $x + y > 4$

a. (3, 1)

c. (2, 6)

b. (4, 3)

d. (6, 0)

5. At an ice cream parlor, ice cream cones cost  $x$  dollars each and sundaes cost  $y$  dollars each. The total cost of 4 cones and 3 sundaes is more than \$20. The total cost of 5 cones and 1 sundae is less than \$16. Which system of inequalities models this situation?

a.  $4x + 3y < 20$   
 $5x + y > 16$

b.  $4x + 3y > 20$   
 $5x + y < 16$

c.  $y \leq 16$   
 $4x + 3y \geq 20$

## Geometry

Topic	Extra Help	Extra Practice IXL
Distance and Midpoint	<a href="https://www.khanacademy.org/math/geometry/hs-geo-analytic-geometry/hs-geo-distance-and-midpoints/v/distance-formula">https://www.khanacademy.org/math/geometry/hs-geo-analytic-geometry/hs-geo-distance-and-midpoints/v/distance-formula</a>	Geometry Tab B.7, B.8, B.9
Slope and Linear Equations	1. <a href="https://www.khanacademy.org/math/algebra-basics/alg-basics-graphing-lines-and-slope/alg-basics-writing-slope-intercept/v/equation-of-a-line-1">https://www.khanacademy.org/math/algebra-basics/alg-basics-graphing-lines-and-slope/alg-basics-writing-slope-intercept/v/equation-of-a-line-1</a> 2. <a href="https://www.khanacademy.org/math/geometry/hs-geo-analytic-geometry/hs-geo-parallel-perpendicular-eq/v/parallel-lines">https://www.khanacademy.org/math/geometry/hs-geo-analytic-geometry/hs-geo-parallel-perpendicular-eq/v/parallel-lines</a>	Geometry Tab E.2, E.5, E.6
Pythagorean Theorem	<a href="https://www.khanacademy.org/math/basic-geo/basic-geometry-pythagorean-theorem">https://www.khanacademy.org/math/basic-geo/basic-geometry-pythagorean-theorem</a>	Geometry Tab Q.1, Q.2 Algebra 2 Tab Y.1
Parallel lines w/Transversals	<a href="https://www.khanacademy.org/math/geometry/hs-geo-foundations/hs-geo-angles/v/angles-formed-by-parallel-lines-and-transversals">https://www.khanacademy.org/math/geometry/hs-geo-foundations/hs-geo-angles/v/angles-formed-by-parallel-lines-and-transversals</a>	Geometry Tab D.3, D.4

### Distance, Slope and Midpoint

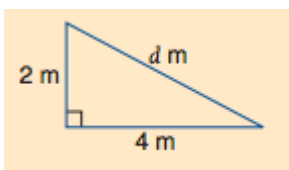
- Find the midpoint given the following points:
  - $(-2, 5)$  and  $(3, 6)$
  - $(5, 9)$  and  $(-7, -1)$
  - $(-4, -6)$  and  $(-12, -19)$
- Given the midpoint (M) and one endpoint (A), find the other endpoint (B):
  - $M(-4, 6)$  and  $A(5, 9)$
  - $M(3, -7)$  and  $A(14, 12)$
- Find the length and slope of the line between each given sets of points:
  - $(3, 9)$  and  $(7, 19)$
  - $(-4, -8)$  and  $(4, 7)$
  - $(-3, 5)$  and  $(6, -1)$
- The distance between A and B is  $\sqrt{34}$ . Given  $A(3, 6)$  and  $B(x, 12)$ , find the value of x.
- A triangle has the vertices  $(-4, 1)$ ,  $(2, 5)$  and  $(-6, -4)$ . Determine whether the triangle is equilateral, isosceles or scalene.

## Linear Equations

1. Write the equation of the line that goes through the point  $(8, -2)$  with slope  $-\frac{1}{2}$ .
2. Write the equation of the line that goes through the point  $(9, 12)$  and is parallel to the line  $y = 3x - 4$ .
3. Write the equation of the line that goes through the point  $(-4, 5)$  and is perpendicular to the line  $y = -\frac{1}{2}x - 9$ .

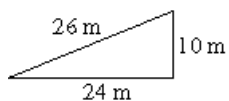
## Pythagorean Theorem

1. Find the unknown side length:

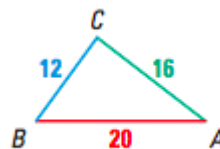


2. Determine if a triangle with the given side lengths is a right triangle:

a.

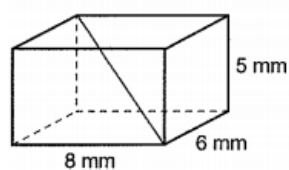


b.

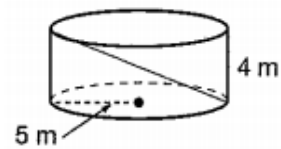


3. Find the length of the indicated diagonal in each 3-D shape:

a.



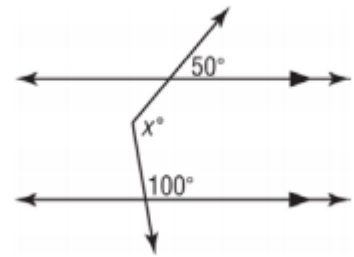
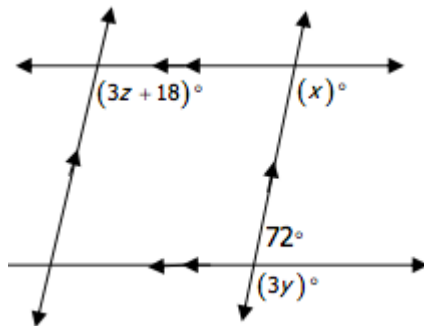
b.



## Parallel Lines w/Transversals

1. Find all unknown angles:

a.



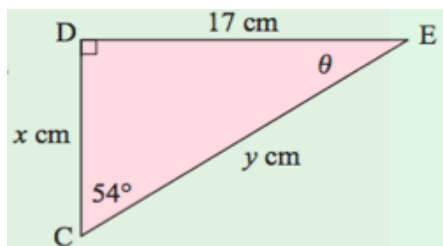
## Trigonometry

Topic	Extra Help	Extra Practice IXL
Right Triangle Trig	<a href="https://www.khanacademy.org/math/trigonometry/trigonometry-right-triangles">https://www.khanacademy.org/math/trigonometry/trigonometry-right-triangles</a>	Geometry Tab R.1, R.7, R.8, R.9, R.10
Special Right Triangles	<a href="https://www.khanacademy.org/math/trigonometry/trigonometry-right-triangles/trig-ratios-special-triangles/a/trig-ratios-of-special-triangles">https://www.khanacademy.org/math/trigonometry/trigonometry-right-triangles/trig-ratios-special-triangles/a/trig-ratios-of-special-triangles</a>	Geometry Tab Q.4 Algebra 2 Tab Y.2
Non-Right Triangle Trig	<a href="https://www.khanacademy.org/math/trigonometry/trig-with-general-triangles">https://www.khanacademy.org/math/trigonometry/trig-with-general-triangles</a>	Geometry Tab R.11, R.12, R.13 Algebra 2 Tab Y.17, Y.18, Y.19

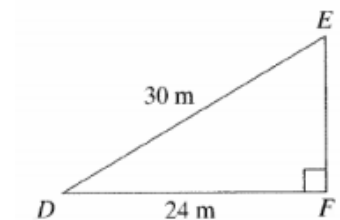
### Right Triangle Trigonometry

1. Solve the given right triangles: (find unknown lengths and angles)

a.



b.



2. If a tree casts an 8m shadow and the angle from the ground to the top of the tree is  $37^\circ$ , what is the height of the tree? Round to the nearest meter.

3. Which of the following could be the side lengths of a 45-45-90 triangle?

a.  $2, 4, 2\sqrt{2}$

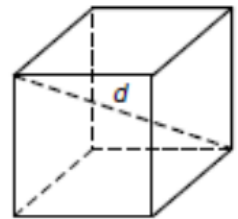
c.  $2, 2, 2\sqrt{2}$

b.  $2, 4, 2\sqrt{3}$

d.  $4, 4, 4\sqrt{3}$

4. The hypotenuse of a 30-60-90 triangle is  $12\sqrt{2}$ . Find the area of the triangle.

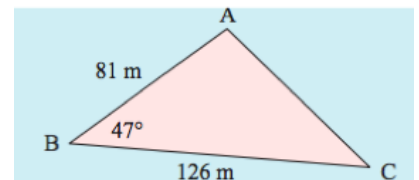
5. Find the length of the diagonal shown in the given cube that has side lengths of 4 inches.



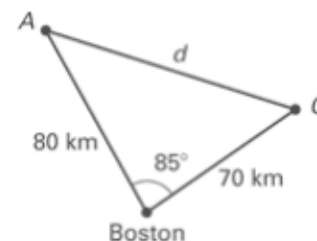
6. Lauren is at the top of a 15 m lookout tower. From an angle of depression of  $25^\circ$ , she sees Evan coming toward her. How far is Evan from the base of the tower?

### Non-Right Triangle Trig

1. Solve the given non-right triangles (find unknown lengths and angles)



2. Two ships leave Boston Harbor at the same time. What is the distance between ships A and C after they have traveled 80 kilometers and 70 kilometers respectively?



## Venn Diagrams and Probability

Venn Diagrams	1. <a href="https://www.khanacademy.org/math/statistics-probability/analyzing-categorical-data/two-way-tables-for-categorical-data/v/two-way-frequency-tables-and-venn-diagrams">https://www.khanacademy.org/math/statistics-probability/analyzing-categorical-data/two-way-tables-for-categorical-data/v/two-way-frequency-tables-and-venn-diagrams</a> 2. <a href="https://www.ck12.org/book/CBSE_Maths_Book_Class_11/section/1.5/">https://www.ck12.org/book/CBSE_Maths_Book_Class_11/section/1.5/</a>
Tree Diagrams	<a href="https://www.ck12.org/c/probability/tree-diagrams/lesson/Tree-Diagrams-BSC-PST/?collectionHandle=probability&amp;conceptCollectionHandle=probability-%3A%3A-tree-diagrams&amp;collectionCreatorID=3">https://www.ck12.org/c/probability/tree-diagrams/lesson/Tree-Diagrams-BSC-PST/?collectionHandle=probability&amp;conceptCollectionHandle=probability-%3A%3A-tree-diagrams&amp;collectionCreatorID=3</a>
Sample Space Diagrams	<a href="https://www.youtube.com/watch?v=8PDUtGQjkNY">https://www.youtube.com/watch?v=8PDUtGQjkNY</a>

### Venn Diagram

1. In a group of 30 students, 18 of them took physics and 17 took chemistry. 2 students took neither. Draw a Venn diagram to illustrate this information and find the number of students who:
  - a. took at least one subject
  - b. Took physics, given that they took chemistry
  - c. Took exactly one subject
  - d. Took chemistry, given that they did not take math

### Probability from Sample Space Diagrams

2. Three coins are flipped simultaneously.
  - a. Illustrate the sample space using a list.

- b. Find the  $P(\text{at least one head})$
- c. Find the  $P(\text{exactly two tails})$
- d. Find the  $P(\text{exactly one head or exactly one tail})$

**Probability from Tree Diagrams**

3. There are only red marbles and green marbles in a bag. There are 5 red marbles and 3 green marbles. Dwayne takes at random a marble from the bag. He replaces the marble and takes at random a second marble from the bag. Draw a tree diagram to represent this situation.
- a. What is the probability that 2 different color marbles are drawn?
  - b. What is the probability that at least one green marble is drawn?
  - c. Dwayne accidentally drops the first marble and can not replace it in the bag. Draw a tree diagram to model this situation.
  - d. Answer questions (a) and (b) for this new situation (without replacement).