

Geometry Definitions

1. What does the word geometry mean?
2. Euclidean Definition of a point?
3. What is the RGB code for white color? Black color?
4. What is the Euclidean definition of a line?
5. Three Houses A, B, and C are built along a straight road. You need to place a well W so that the total distance from W to A,B, and C is the shortest possible. Where would you place the well?

Angles and Triangles

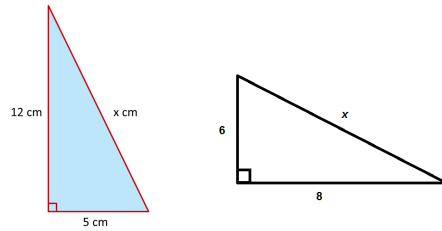
1. Give an algebraic proof to the vertical angles.
2. What are the 3 triangle congruence theorems?
3. Use a compass and ruler to construct a triangle having the following sides.



4. Name 3 Greek letters commonly used in geometry?
5. Prove that the angles of an isosceles triangle opposite the congruent sides are congruent.

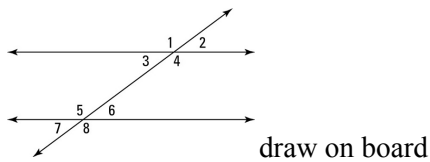
Rhombuses, Parallelograms, Pythagorean Theorem

1. Use pythagorean theorem to find x for the right triangles below.

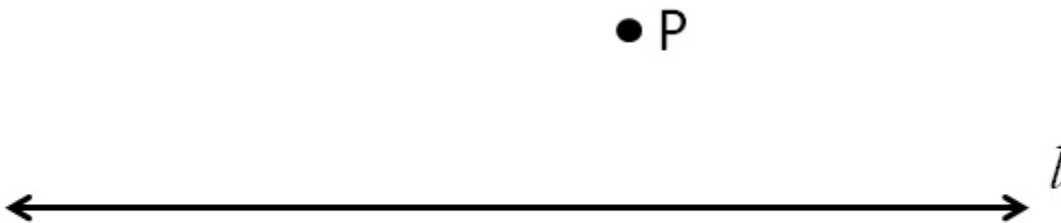


2. Prove that the opposite sides of a rhombus are congruent.
3. Prove that diagonals split angles of rhombus in halves. Hint: prove triangles are congruent
4. Use a compass and straightedge to find the midpoint of a following segment.
5. Find two pythagorean triples.
6. What is the expansion of $(a+b)^2$

Parallel lines and Transversals



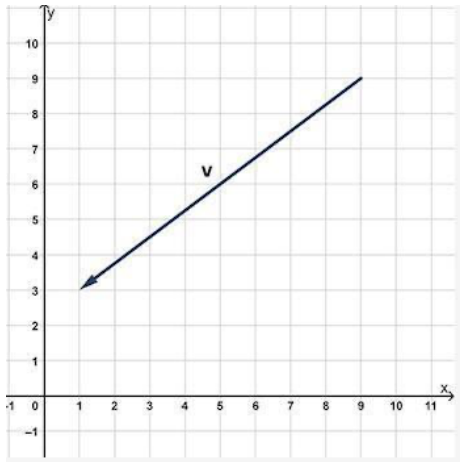
1. What is the name of angle pair 1,4? How are their angle measures related?
2. What is the name of angle pair 2,7? How are their angle measures related?
3. What is the name of angle pair 4,6? How are their angle measures related?
4. Use a compass and a ruler to draw a straight line parallel to the one given below and pass through the point not lying on the original straight line.



Vectors

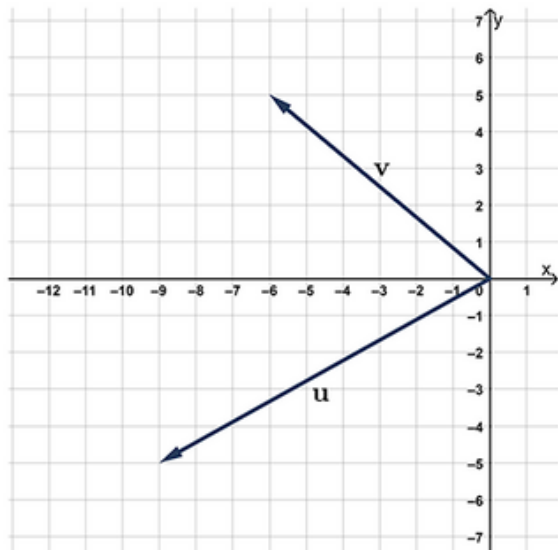
1. What are the two parts of a vector?
2. Give two examples of vectors in 3D.
3. What is the addition rule for vectors? (How do you add vectors?)
4. How do you subtract vectors?

5. For the given vector v and point $A(7,4)$, construct a vector $w = -2.5v$ having A as its initial point on the graph.



6. For the given vectors v and u , construct the vector $v - u$.

Vectors u and v are shown in the graph.



What is $\text{proj}_u v$?

Forces

1. If a person is standing on the ground, draw the forces acting upon them. How do the force magnitudes relate to each other?
2. Name a pair of opposite forces.
3. Name one Newton's laws of motion that has to do with force? If you know one :)

Irrational and Rational Numbers

1. Is π a rational or irrational number?
2. Is 9.454545.. a rational or irrational number?
3. Is $\sqrt{3}$ a rational or irrational number?
4. Is $\sqrt{144}$ a rational or irrational number?
5. Is 0 a rational or irrational number?

Math Competition Problems

1. Adam's house number has three digits. Removing the leftmost digit of this number, you obtain the house number of Adam's friend Ben. Removing the leftmost digit of Ben's house number, you obtain the house number of Chiara. The sum of the three house numbers is 912. What is the middle (the tens') digit of Adam's house number?
 - a. 5
 - b. 3
 - c. 2
 - d. 0
 - e. Another digit

2. Sixty six cats signed up for the contest MISS CAT 2013. After the first round 21 cats were eliminated because they failed to catch a mouse. Of the remaining cats, 27 had stripes and 32 had one black ear. All striped cats with one black ear got to the final. What is the minimum number of finalists?
 - a. 5
 - b. 7
 - c. 13
 - d. 14
 - e. 27

3. 40 boys and 28 girls stand in a circle, hand in hand, all facing inwards. Exactly 18 boys give their right hand to a girl. How many boys give their left hand to a girl?
 - a. 18
 - b. 9
 - c. 28
 - d. 14
 - e. 20

4. A stack of loads must be transported. If Ann does the job alone, it will take one hour. If Ben does the job alone, it will take two hours. How long will it take if Ann and Ben do the job together?

- a. 30 minutes
- b. 40 minutes
- c. 1 hour
- d. 1.5 hours
- e. 3 hours

5. There were 2013 inhabitants on an island. Some of them were knights and the others were liars. The knights always tell the truth and the liars always lie. Every day, one of the inhabitants said: "After my departure the number of knights on the island will equal the number of liars" and then left the island. After 2013 days, there is nobody on the island. How many liars were there initially?

- a. 0
- b. 1006
- c. 1007
- d. 2013
- e. It is impossible to tell

