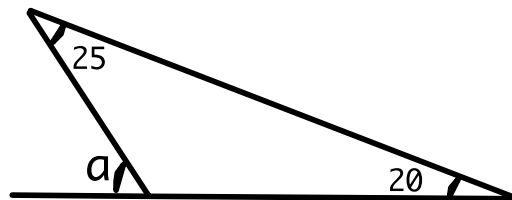


Note: figures below are not necessarily drawn accurately or to scale. So you will not be able to answer questions by just measuring the figures. Further do not rely on measuring any of your figures for any answers.

0. Review all the homework and quizzes.
1. Draw a scalene obtuse triangle and describe what the words “scalene” and “obtuse” mean.
2. Draw a picture of an annulus. Find its area if the radius of the inner circle is $\sqrt{2}$ inches and the radius of the outer circle is 3 inches. Be sure to include the units.
3. State the formula for the area of a triangle. Draw a picture illustrating each of your terms.

4. Find the angle a as pictured:



5. Draw a square. Then draw a circle inside of the square. What percentage of the square is covered by your circle? What is the maximum that you could get?
6. Find the measure of interior angle of a regular octagon. Explain your reasoning.
7. Define trapezoid. State the formula for the area of a trapezoid, using a figure to illustrate your terms.

8. Draw a parallelogram with sides having lengths 2, 4, 2, 4. Find its area. Then draw a second parallelogram not congruent to the first but with the same lengths. Find its area. Are the two areas equal ?

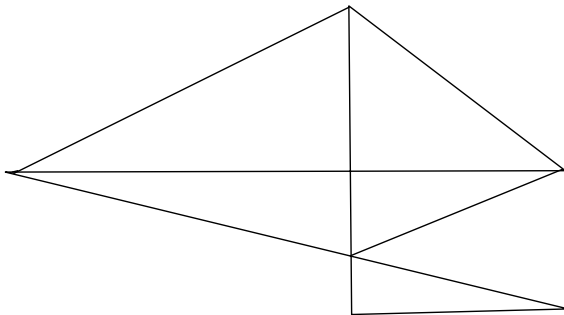
9. Draw a tetrahedron when viewed from above (so there are no hidden lines, but you can see all but one of its faces). Is it possible or impossible to draw it without retracing and/or lifting your pen ? Explain.

10. At noon a car leaves town heading due west at 90mph. At 1:30pm a second car leaves town heading due north at 60mph. How far apart (as the proverbial crow flies) are the two cars at 2pm ? Draw a picture and show and explain your work. Give the name of the theorem you are using.

11. Review all the homework and quizzes.

12. Using the fact that there are 5280 feet in one mile, *set up* an equation that shows that a speed of 60 mph (miles per hour) is approximately equal to 88 fps (feet per second). Write your equation so it is clear when and why you sometimes multiply and sometimes divide.

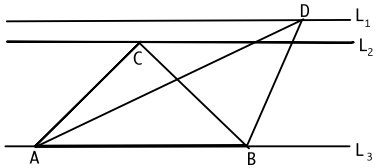
13. A graph or network is pictured below. Is it traversable, i.e., is it possible to draw it without lifting your pencil or retracing any edge ? Explain your reasoning.



14. Explain what a net is. Then draw a net for the cube and a tetrahedron.

15. Draw an acute triangle that is not a right triangle and using its medians, find its centroid. (also, define all the terms in the preceding sentence.)

16. Given that the lines L_1, L_2, L_3 are all parallel, determine which triangle $\triangle ABC$ or $\triangle ABD$ has larger area. Use an appropriate formula to explain your reasoning.

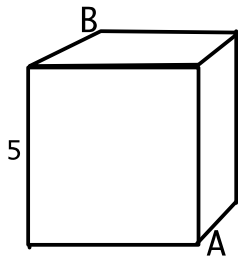


17. Give the names of all possible regular polyhedra. Which one did we construct in class and what did we use to construct it ?

18. How many square inches are there in a square foot ? Explain using a formula and a picture.

19. Draw a grid for taxicab geometry and draw concentric taxi-circles of radius 2 and 4.

20. Find the distance between the corners A and B of the pictured cube (where 5 is the length of the pictured side):



21. While talking on a cell phone you hear your friend who is staying at the beach say that “it is soooo pretty and the weather is great. Looking out over the water we can see the horizon 6 xxxxx away” (where xxxxx indicates static). What do you think the unknown word was ?

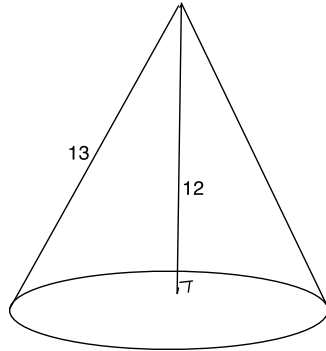
22. Define *isosceles* triangle and *equilateral* triangle.

23. State the Pythagorean theorem. Which American President had his own proof of it ?

24. A circular carpet of radius 3 feet is made by sewing a 2 inch braid around and around. Estimate the length of the braid needed. (Your answer may involve π).

25. Find the height (i.e., length of an altitude) of an equilateral triangle when the base has length 2.

26. A right circular cone (see the figure below) has height 12 and slant height 13. Find the radius of the base circle.



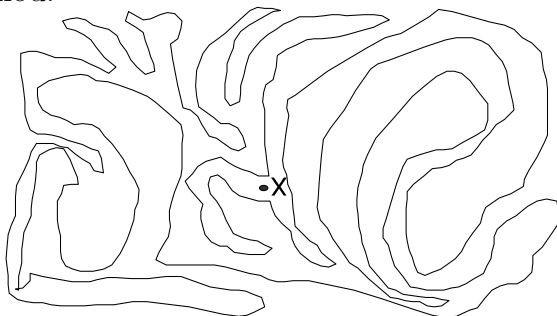
27. Define rhombus. How is it related to a square ?

28. State Euler's formula for polyhedron, explicitly defining each term. Then draw a tetrahedron and verify that the formula holds for it.

29. A math class (not ours) is offered the option of either using one 8.5×11 sheet of paper for notes or six 3×5 index cards (all measurements are in inches). Which is the better deal and why ?

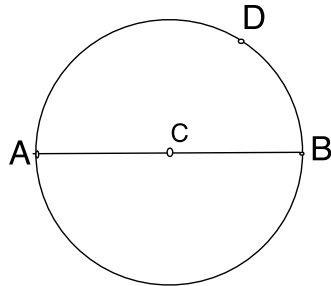
30. Define *convex* curve.

31. State the Jordan Curve Theorem. Then determine whether or not the point labelled X in the figure below is in the inside or the outside region of the pictured curve. Explain your method.



32. Can arbitrary angles be trisected using only a compass and straightedge ? What method did we use in class to trisect angles ?

33. A circle with center C is pictured below. A theorem due to Thales says something about a triangle whose vertices are three of the four points pictured. Which three? And what does the theorem say about that triangle?



34. A triangle has a side of length 9 cm and another of length 5 cm. What is the largest that the length of the other side could be? What is the smallest?

35. A robot travels 10 feet due north and then 5 feet due east. How far apart are the robot's starting and ending position? Name the mathematical theorem you are using.

36. If a medium pizza feeds two people, then how many people can be fed by pizza whose diameter is eight times as big as that of the medium pizza?

37. How far apart are opposite corners of a square that measures 1 foot on each side?

38. Explain in what way the following verse has mathematical significance:

*Now I will a rhyme construct,
By chosen words the young instruct.
Cunningly devised endeavour,
Con it and remember ever.
Widths in circle here you see,
Sketched out in strange obscurity.*

39. During an interval of twenty minutes, through how many degrees does the minute hand of a clock move? the hour hand?

40. Can a straight line transversely intersect a simple closed curve exactly 309 times? Explain.

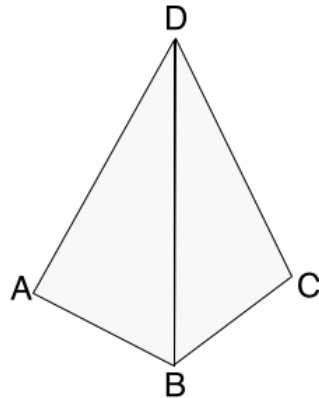
41. Find the measure of an interior angle of a regular 12-gon. Then find the measure of a central angle.

42. A polyhedron is made up of 3 squares and 6 triangles. It has $E = \frac{(3 \cdot 4) + (6 \cdot 3)}{2}$ edges. Find the number of vertices.

43. Describe how to construct a Möbius strip. Mention a mathematical property of significance that a Möbius strip has.

44. What is wrong with asking which is larger, the area of a circle or the length of its circumference? Suppose the radius is 1 foot? What if the radius is expressed as 12 inches?

45. A polyhedron pictured below has triangles as its faces. Using the vertices, give the names of all of the faces. (Note there are hidden edges and faces.)



46. How many edges does a pentagonal pyramid (i.e., a pyramid with a pentagon as a base) have? How many vertices? How many faces? What formula do these numbers satisfy?

47. Draw a non-convex kite, defining each of your terms.

48. Find the circumference of a circle with area 16 square meters. Show your steps.

49. Given that the speed of sound is 768 mph, set up an equation that converts the speed of sound to one in miles per second. You need not do any computations. Write your equation so it is clear when and why you might multiply and/or divide. If you worked out the calculations, what would it tell you about lightning and thunder?

50. Review everything else.