

Print your name:

Show all of your work, and explain your reasoning. Be sure to give units for your answers where appropriate.

1. In words, define the following concepts: convex region, simple closed curve, and median of a triangle.

2. A birthday cake has been baked in a “square” cake pan that measures 8" by 8" by 2". When baked, the cake rises one inch above the rim of the pan. The top and the sides are frosted. Find the volume of the cake and the surface area that is frosted. (Indicate which is which and give the units.)

3. The corporation Megaphar spends 20% of their budget on research. They spend $\frac{5}{8}$ of what remains on marketing. Make up a pie chart with three categories *marketing*, *research*, and *other*. Find both the angles and the percentages. Show your work.

4. At 1pm a compact car leaves town heading due west at 40mph. At 2pm a truck leaves town heading due north at 30mph. How far apart (as the crow flies) are the two vehicles at 4pm ? Draw a picture and show and explain your work. Give the name of the theorem you are using.

5. Give the names of all possible regular polyhedra. Which one did we construct in class ? What did we use to construct it ? State Euler's formula for polyhedra, defining each of its terms.

6. Suppose the triangles $\triangle ABC$ and $\triangle DEF$ are similar $\angle A = \angle E$ and $\angle C = \angle D$. If the lengths $AB = 3$ and $BC = 7$, $CA = 6$ and $DE = 9$, find the length EF . Explain your reasoning.

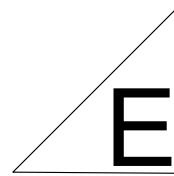
7. Graph the line given by $5x + 2y = 8$. Find its y-intercept and its slope. (Don't forget to say which is which.)

8. 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.

9. A farmer has 80 animals. Some are cows and the rest are chickens. There are 212 legs overall. Using algebra, determine how many of animals are cows and how many are chickens. Show your reasoning.

10. The standardized test MATHAPT consists of multiple choice questions, each of which has four possible answers. Each correct answer results in +8 points while each incorrect answer results in -2 points. Find the expected value of guessing. Using the expected value, determine whether guessing here would be a good thing, a bad thing or a neutral thing ?

11. Draw the image of the triangle E (and its label, the letter E) under the dilation with pictured center and scaling factor $\frac{1}{2}$. Explain each step of your construction. Without doing any measurements, describe how the dilation has changed the area of the triangle.



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center

12. The final grades at Hogwarts are normally distributed. An A is a score of 90 or higher. (Note - it is possible to score greater than 100, due to magic.) Professor's Sprouts class has a mean score of 80 with a standard deviation of 2.5, while Professor Snape's class has a mean score of 72 and a standard deviation of 18. Which professor gives out a larger percentage of A's? Explain your reasoning using your knowledge about normal distributions (saying "one is more spread out" is not an acceptable answer).

13. Give an example of a geometric construction that cannot be done with straightedge and compass, yet one that we did in class using another technique. Mention the technique we used.

14. Suppose that A and B are events with $P(A) = .45$ and $P(B) = .45$ and $P(A|B) = .25$. Are the events A and B independent or dependent? Explain why.

15. Find the area of a circle whose circumference is 6 inches.

16. Find the mean, median and mode of the data 8, 4, 6, 8, 4, 3, 6, 5, 5, 8.

Scratch Paper — not graded

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