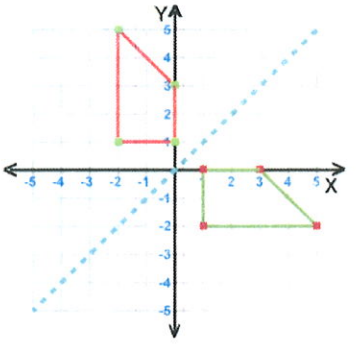
MAT 222, Exam #3, Summer 2017 Name KEY

Instructions: You may use a protractor, compass, ruler and calculator for this exam. You may also use a 3x5 index card, which you will turn in with the exam along with any scrap paper provided by the testing center. It's important to show all work, and explain your reasoning. It is helpful to put a box or circle around your final answer after calculations. Give exact answers unless specifically asked to round.

1. Determine if each statement is True or False. If you mark false, explain why the statement is false, or rewrite the statement as a true one. In the figure, assume lines $\overleftrightarrow{AG}$ and $\overleftrightarrow{DI}$ are parallel. (1 point each)



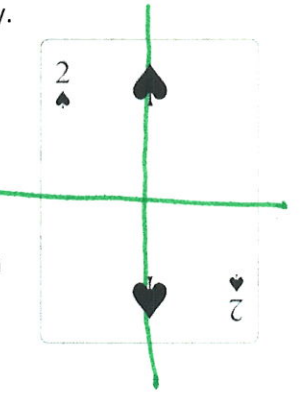
a. (T) F Translations are a type of isometry.

b. T (F) The image to the right represents a rotation.

c. (T) F All objects have at least one rotational symmetry.

d. (T) F The image of the playing card has reflection symmetry, but requires two lines of reflection.

e. (T) F The image of the playing card has rotational symmetry.



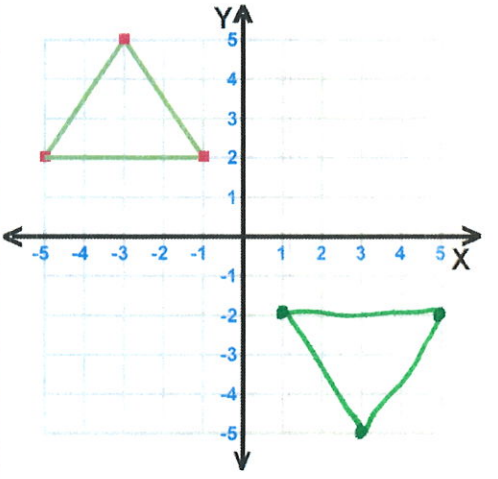
f. (T) F The numbers 10, 24, 26 form a Pythagorean triple.
$10^2+24^2 = 676 = 26^2$

g. T (F) A regular pentagon cannot be used alone to tile a plane.

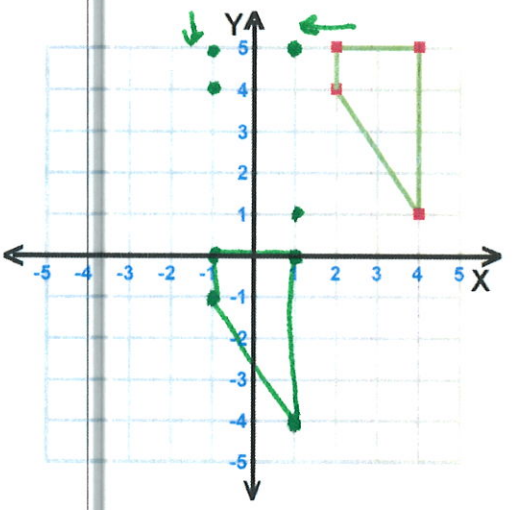
h. T (F) If all sides of a volume are scaled by a factor of 2, then the measure of the volume is also scaled by a factor of 2. (scaled by 8)

i. (T) F A polygon with 8 faces and 12 vertices has 18 edges.

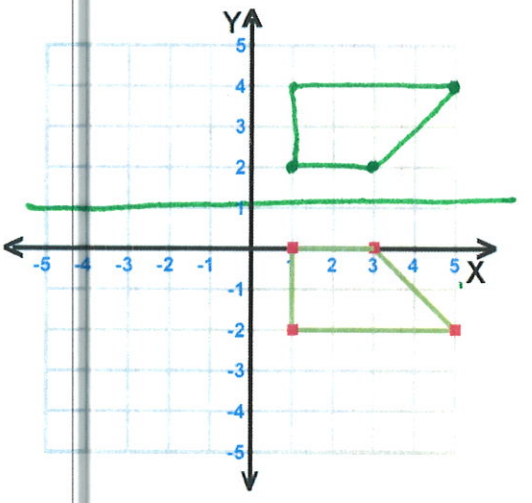
2. Use the graphs below to plot the indicated transformations.
   a. Rotation about the origin by 180°. (4 points)



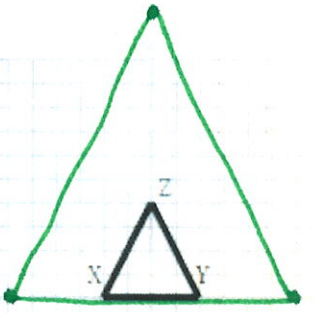
b. $(x, y) \rightarrow (x - 3, y - 5)$ (4 points)



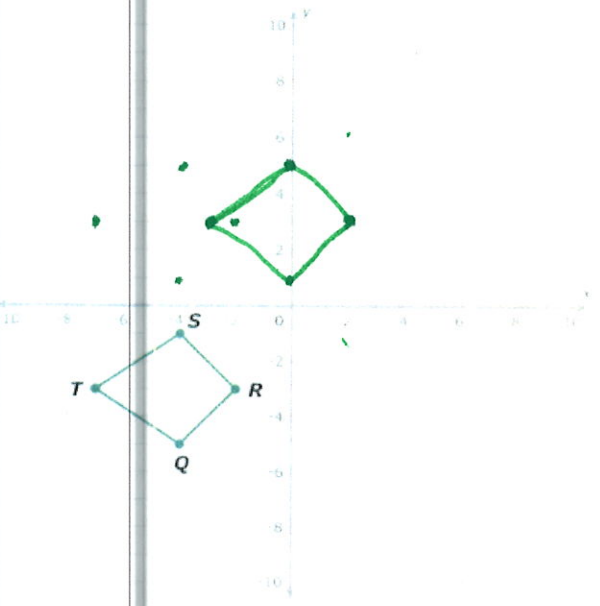
c. Reflection across the line $y = 1$ (4 points)



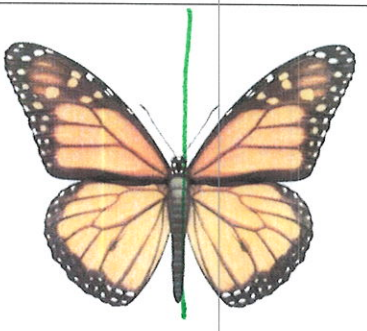
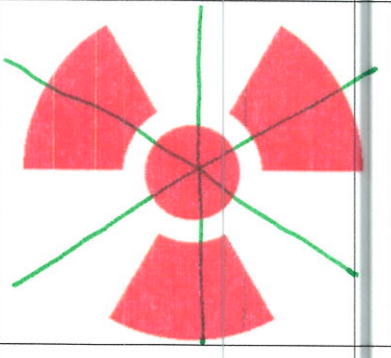
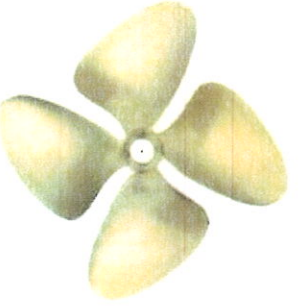
3. Construct a dilation of the image in the graph, centered at the origin, with a scale factor of 3. (4 points)



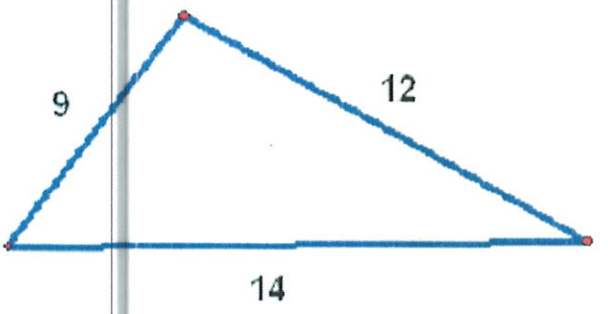
4. Construct a glide reflection of the image below with reflection across the x-axis and translation of $(x, y) \rightarrow (x + 4, y + 2)$. (6 points)



5. Determine the number of lines of symmetry and degree of rotational symmetry for each of the figures below. (12 points)

		
Lines of Symmetry: 1	Lines of Symmetry: 3	Lines of Symmetry: 0
Rotational Symmetry: 360° identity (1)	Rotational Symmetry: 120° (3)	Rotational Symmetry: 90° (4)

6. Determine if the triangle is a right triangle. Explain your reasoning. If it is not a right triangle, is it acute or obtuse? (6 points)



$9^2 + 12^2 = 225$

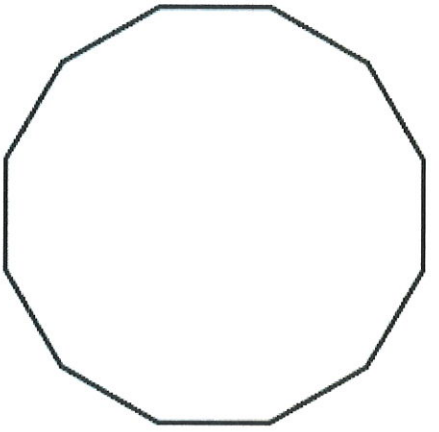
$\neq$

$14^2 = 196$

not a right triangle

$14 < 15$ Scalene (acute)

7. A dodecagon has 12 sides.
   a. What is the sum of the measures of the interior angles? (4 points)



$180(12-2) = 1800°$

   b. If the dodecagon is regular, what is the measure of each interior angle? (4 points)

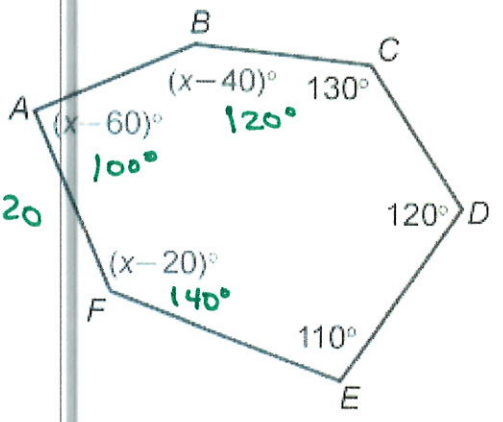
$\frac{1800}{12} = 150°$

   c. What is the measure of each exterior angle? (4 points)

$180 - 150° = 30°$

8. Find the value of the variable. (8 points)

$180(6-2) = 720$



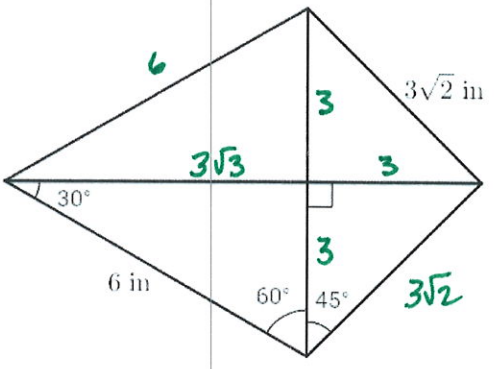
$x-60 + x-40 + 130 + 120 + 110 + x-20 = 720$

$3x + 240 = 720$

$3x = 480$

$\boxed{x = 160°}$

9. Find the area of the kite shown. Round your answer to the nearest tenth. (10 points)



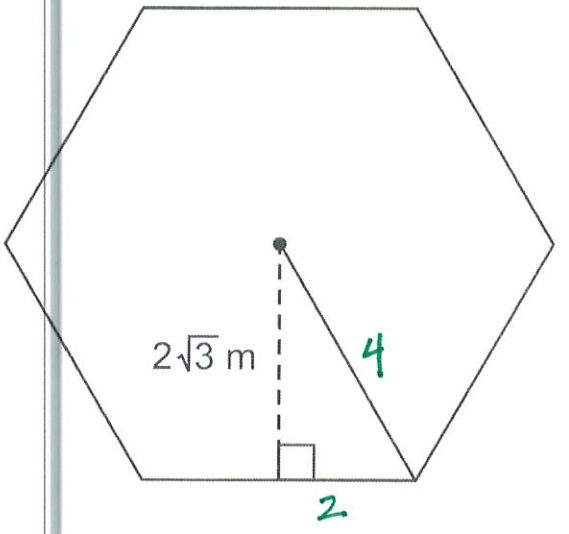
$3 \times 3 + 3\sqrt{3} \cdot 3 =$

$9 + 9\sqrt{3} \approx 24.6$

10. Use the image to the right of the regular hexagon to answer the following:

a. What is the area of the hexagon? (6 points)

$6\left(2\sqrt{3} \cdot \frac{1}{2} \cdot 4\right) = 24\sqrt{3}$



b. What is the perimeter? (4 points)

$4 \times 6 = 24$

c. If you scaled the polygon in the previous problem so that the sides were half the size of the original. What would be the new area? (3 points)

area scales by $\left(\frac{1}{2}\right)^2$

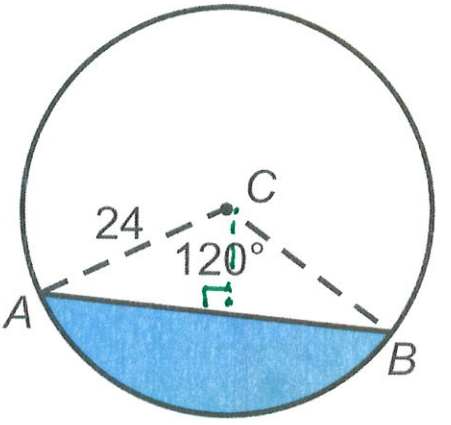
$(\sqrt{3})24 \cdot \frac{1}{4} = 6\sqrt{3}$

d. What would be the new perimeter? (3 points)

perimeter scales by $\frac{1}{2}$

$24 \cdot \frac{1}{2} = 12$

11. Find the area of the shaded segment in the diagram. Round your answer to the nearest tenth. (8 points)



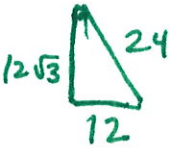
$A_{circle} = 24^2 \cdot \pi = 576\pi$

$\text{area Sector} = \frac{576\pi}{3} = 192\pi$

area triangle

$\frac{1}{2}(12)12\sqrt{3} * 2 =$

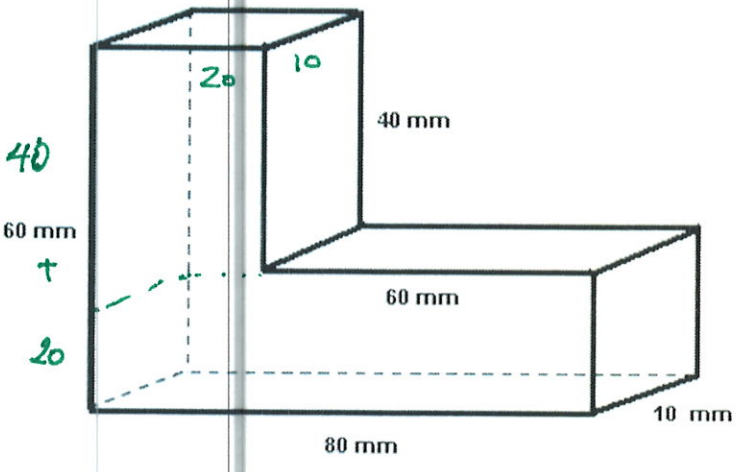
$144\sqrt{3}$



area of segment $= 192\pi - 144\sqrt{3} \approx 353.8$

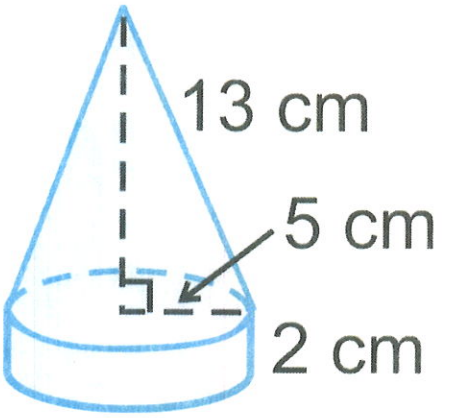
12. Find the volume of the solid shown to the right. (7 points)

24,000



$40 \times 20 \times 10 + 10 \times 80 \times 20$

13. Find the surface area of the object shown. Note that the base of the cone and the top surface of the cylinder are not part of the surface in this configuration. (8 points)



Cone sides – $\pi \cdot 5(\sqrt{13^2+5^2}) = 5\pi\sqrt{194}$

base $= 5^2\pi = 25\pi$

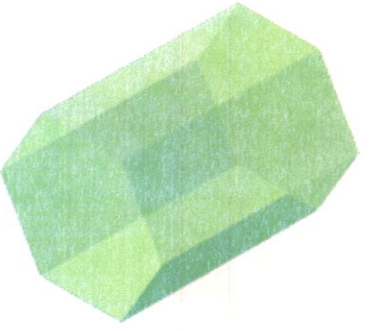
Sides of cylinder $= 10\pi(2) = 20\pi$

Surface area $= 45\pi + 5\pi\sqrt{194} \approx 360.2\ cm^2$

14. What is the surface area and volume of a sphere with radius 5 meters? Give your answers in terms of π. (8 points)

$4\pi r^2 = 4\pi(25)m^2 = 100\pi\ m^2$

15. For the hexagonal cylinder shown, how many faces, edges and vertices are there? Does your answer agree with Euler's Formula? (6 points)



18 edges

8 faces

12 vertices

$12 + 8 = 20 - 2 = 18$

Yes.