key

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Math 118 - Dr. Miller - Final Exam - Spring 2006

E1

1. *[6 pts - 1 each]* In each blank, write the most reasonable choice from among the numbers 0.001, 0.01, 0.1, 1, 10, 100, or 1000. You may re-use a number if you wish.

   (a) The thickness of a penny is about ____.1____ cm.

   (b) The distance from here to Pittsburgh is about ___100___ km.

   (c) A paperclip weighs about ____1____ g.

   (d) Our table dividers weigh about ___10___ kg apiece.

   (e) Don't touch that boiling kettle! It's ___100___ ° C!

   (f) After baling hay, my dad always gulps a ___1___ ℓ glass of iced tea.

E1

2. Convert as indicated; rounding to the nearest tenth if necessary. Show clear, organized work where needed.

   (a) *[2 pts]* Convert 4 tons and 800 pounds to tons.

   ~~4.8~~ 4.4 tons

   -2 each error

   (b) *[2 pts]* Convert 17.6 yards to feet.

   52.8 feet

   "

   (c) *[2 pts]* Convert 3.67 hg to cg.

   36,700cg

   " -1 3670

   kl hl dal g dg cg

   (d) *[4 pts]* That carpet costs \$16 per square yard. How many cents is that per square inch?

   -1 12 in
   -2 feet squared

   $$\frac{\$16}{1\,yd^2} \times \frac{100¢}{\$1} \times \frac{1\,yd}{36\,in} \times \frac{1\,yd}{36\,in} = 1.2¢ \text{ per } in^2$$

   (e) *[8 pts]* I've lost 32 pounds (*hurray!*) over the past 17 weeks. How many grams per hour is that? (Note that one kilogram equals 2.2 pounds.)

   -1 2.2 kg / 1 lb → 24.6

   -2 1g / 1000kg

   $$\frac{32\,lb}{17\,wk} \times \frac{1\,wk}{7\,days} \times \frac{1\,day}{24\,hr} \times \frac{1\,kg}{2.2\,lb} \times \frac{1000\,g}{1\,kg} = 5.1\,g/hr$$

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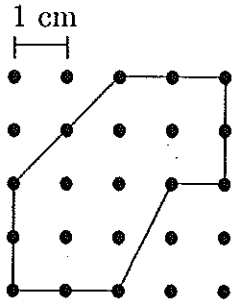
"skim" ok

3. (a) *[3 pts]* Briefly explain the difference, conceptually, between the area and the perimeter of a shape. Perimeter is the distance around a shape. Area is the (2-dimensional) space it encloses.

(b) *[6 pts]* Compute the area of the figure below. Show clear work; round to the nearest tenth as needed. (Counting blocks is not sufficient.)



Area = total − upper △ − lower trap

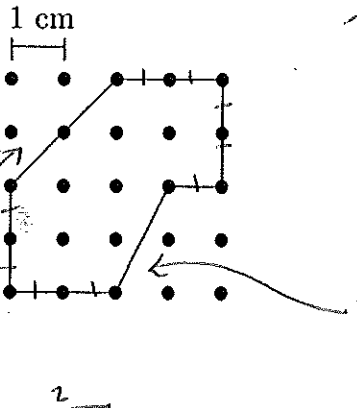
$= 16 - \frac{1}{2}(2)(2) - \frac{1}{2}(3)(2)$

$= 16 - 2 - 3$

$= 11\ cm^2$

(c) *[6 pts]* Compute the perimeter of the same figure (reproduced below). Show clear work; round to the nearest tenth as needed.

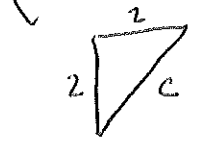
(-2) each slant.



Perimeter = 9 straight + upper slant + lower slant

$= 9 + 2.8 + 2.2$

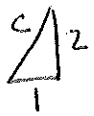
$= 14\ cm$



$c^2 = 2^2 + 2^2$

$c^2 = 8$

$c = 2.8$



$c^2 = 1^2 + 2^2$

$c^2 = 5$

$c = 2.2$

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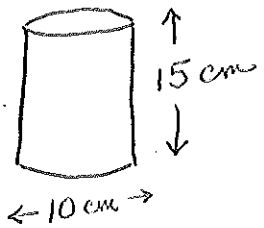
4. *[12 pts - 6 each]* Find both the total surface area and the total volume of a circular cylinder 15 cm high and 10 cm in diameter. Show clear work, indicating which is which, and rounding your answers to the nearest tenth as needed.



-2 circum w/o area
-1 bad unit

SA = 2 circles + "side"

$= 2\pi(5)^2 +$ (1)

$C = \pi d$
$= 31.4$ (4)

$= 2\pi(5)^2 + 31.4(15)$

$= 628.3\ cm^2$ (1)

78.5

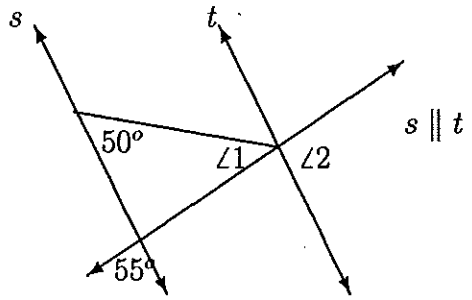
$V = Bh$ (4)

$= (\text{area of circle}) \cdot 15$

$= (\pi(5)^2) \cdot 15$

$= 1178.1\ cm^3$ (2)

5. *[8 pts]* Find the measurements of the two numbered angles in the diagram below, clearly and completely explaining your reasoning for each.



-1 vert. -1 no mention 55°.

-1 compl.

there is a 55° angle inside the triangle, (2) because it's vertical with the given 55° angle. Then ∠1 measures 75° due to the required (2) 180° total for a triangle.

∠2 is a corresponding (2) angle with the supplement (2) to the 55° angle. That supplement measures 125°, so ∠2 does also.

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6. *[16 pts - 2 each]* Write the letter corresponding to the term being defined in the appropriate blank. Some terms will not be used!

m two angles whose measurements total 180°
j an angle whose measurement is less than 90°
o a pair of opposing angles formed by two intersecting lines
q a polygon having 9 sides
t a quadrilateral having two pairs of parallel sides
u a quadrilateral having two distinct pairs of congruent sides
e the common endpoint shared by the two rays forming an angle
a three or more lines intersecting in the same point

(a) concurrent lines	(b) perpendicular lines
(c) skew lines	(d) bisector of an angle
(e) vertex of an angle	(f) side of an angle
(i) reflex angle	(j) acute angle
(k) obtuse angle	(l) complementary angles
(m) supplementary angles	(n) adjacent angles
(o) vertical angles	(p) heptagon
(q) nonagon	(r) dodecagon
(s) trapezoid	(t) parallelogram
(u) kite	(v) rhombus

7. *[8 pts - 2 each]* Referring to the diagram given (additional copies are available up front), use correct notation to *name* the object created in each part below.

(-1) seg.

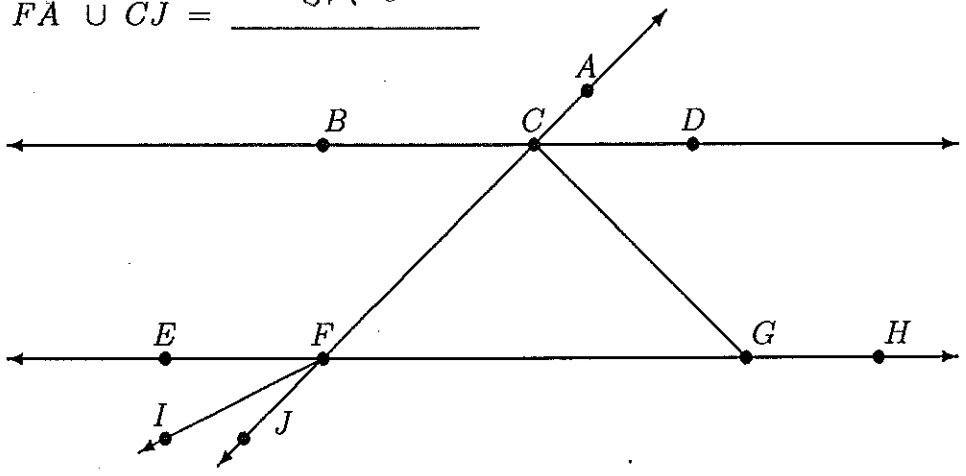
(a) $\angle CFG \cap \angle JFH =$ $\overrightarrow{FG}$ or $\overrightarrow{FH}$

(b) $\angle EFC \cap \angle DCJ =$ $\overline{CF}$ or $\overline{FC}$

(c) $\overrightarrow{FA} \cup \overrightarrow{FH} =$ $\measuredangle AFH$ or various

(-2) line

(d) $\overrightarrow{FA} \cup \overline{CJ} =$ $\overrightarrow{JA}$ or $\overrightarrow{JF}$ or $\overrightarrow{JC}$



8. *[5 pts]* Determine the number of diagonals in a regular 11-gon, explaining thoroughly how you know. (If you use a memorized formula, you must explain how this formula is derived.)

Each of the 11 vertices can be connected to 8 others — only 8 because it can't connect via a diagonal to itself or either of the 2 vertices nearest, so that knocks out 3. That's $11 \cdot 8 = 88$ diagonals, but each has been counted twice — once for each endpoint — so divide by 2.

44 diagonals

-1) n = sides, not vertices?
-1) why multiply?

9. *[4 pts]* What does the acronym ASA *mean*? (Note: I am **not** just asking what words the letters stand for.)

If two triangles have two pairs of congruent angles and the pair of included sides is also congruent, then the triangles themselves are congruent.

-1) incl
-1) conclude

10. *[5 pts]* Two rectangles are similar. The perimeter of one is 18 while that of the other is 90. If the area of the smaller is 18.81 square units, find the area of the larger. Show clear work, but you need not explain.

-3) 94.05

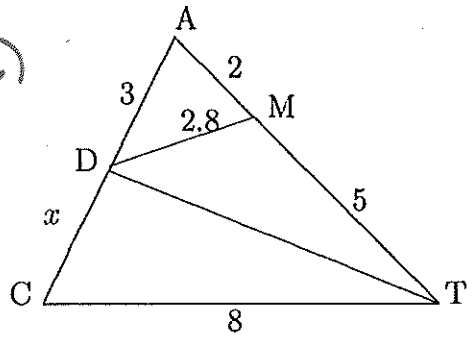
s.f. $= 5$

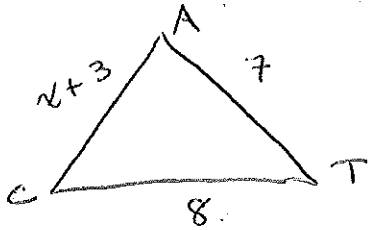
new area $= (5)^2 \cdot$ old area

$= (5)^2 \cdot 18.81$

$= 470.25$ square units

11. *[8 pts]* In the figure, $\triangle CAT \sim \triangle TMD$. Show work in finding the missing length x, rounded to the nearest tenth.





-3) weak ratio (right #s, wrong position)
-1) correct redraws.
-2) random prop, no diagram.
-5)

$$\frac{x+3}{5} = \frac{7}{2.8}$$

$$2.8x + 8.4 = 35$$

$$2.8x = 26.6$$

$x = 9.5$

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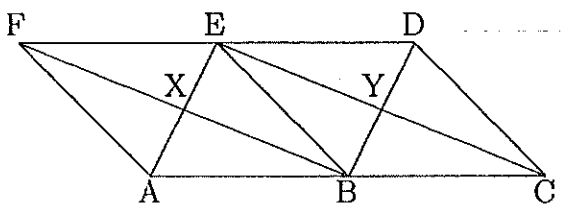
12. *[8 pts]* Given that $\triangle XEB \cong \triangle YEB$ and $\overline{AE} \cong \overline{CE}$ in the diagram below, specify a *second* pair of congruent triangles. Thoroughly explain how you arrived at your conclusion.

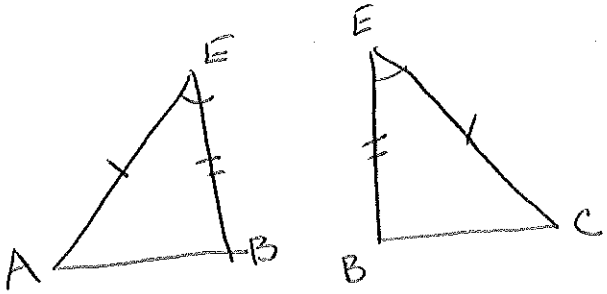


(2) ∠XEB ≅ ∠YEB by CPCTC

(1) $\overline{AE} \cong \overline{CE}$ given

(1) $\overline{BE}$ is shared / ≅ itself

(2) $\triangle AEB \cong \triangle CEB$ by SAS



(2) ASA
(2) CPCTC
smart

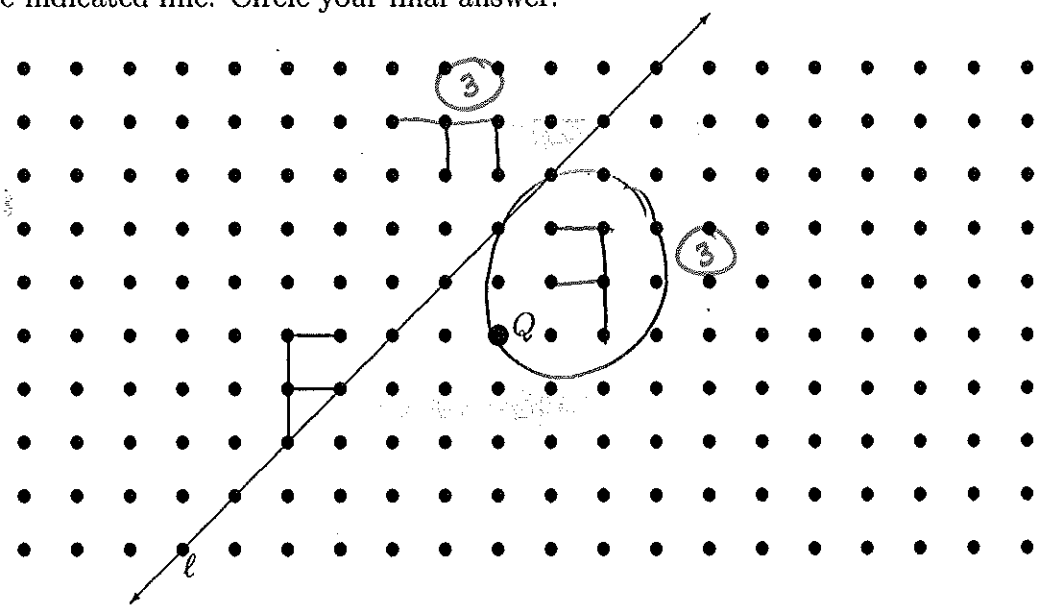
(2) $\triangle AXB \cong \triangle CYB$ SAS (1)

$\overline{AX} \cong \overline{CY}$ by CPCTC or $\overline{XE}$, $\overline{YE}$ & "subtraction" (3)

$\overline{BX} \cong \overline{BY}$ " "

$\angle AXB \cong \angle CYB$ by CPCTC + suppl. (2) (3)

13. (a) *[6 pts]* Rotate the "F" 90° clockwise around point Q, then reflect the result through the indicated line. Circle your final answer.



(b) *[2 pts]* Name the other two rigid motions that were *not* required in the problem above.

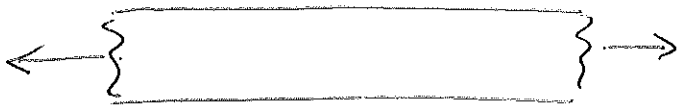
translation, glide reflection

14. Draw examples of the following, if possible. If not, explain why not.

(a) *[3 pts]* a shape that has rotational symmetry but not reflectional symmetry

(pinwheel)

(b) *[3 pts]* a shape that has both translational and reflectional symmetry



(c) *[3 pts]* a shape that has at least two lines of symmetry

H (etc.)

(d) *[2 pts]* Does your shape in part 14c have rotational symmetry? Explain.

Yes. Any shape with more than one such line must have rotational symmetry.

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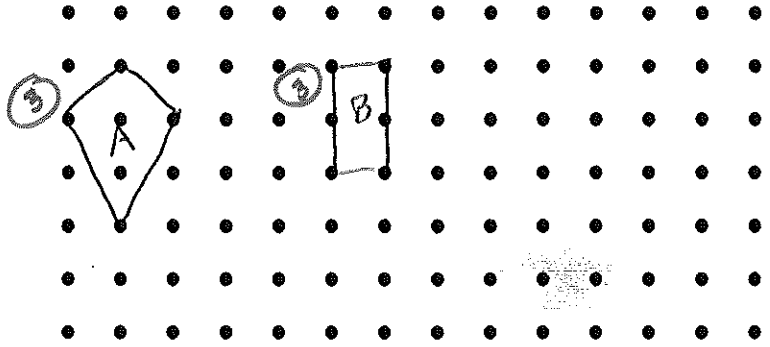
15. *[6 pts - 3 each]* Draw and label examples on the grid of the following, if possible. If not, explain why not.

(a) a kite that is not a rhombus (label with an "A" inside)

(b) a quadrilateral that is equiangular but not equilateral (label with a "B" inside)



16. (a) *[4 pts]* Let $A = (3,5)$ and $B = (0,-1)$. Find the coordinates of a point C on $\overleftrightarrow{AB}$ for which $\overline{AC}$ is twice as long as $\overline{AB}$. Clearly indicate your answer! (Grid paper is available up front.)

-1) (-6,-13) too far

-1) right pt, misread coords

A to B: back 3, down 6
repeat from B

$\boxed{(-3,-7)}$

or B to A: fwd 3, up 6
repeat twice from A

$\boxed{(9,17)}$

(b) *[8 pts]* Let $A = (3,5)$ and $B = (0,-1)$. Find the coordinates of a point R for which $\triangle ABR$ is an isosceles right triangle. You may position the right angle at any vertex you like. Clearly indicate your answer! (Grid paper is available up front.)

-5) not $\perp$
-6) only 1 $\perp$

A to B: $\frac{-6}{-3}$ perp: $-\frac{3}{6}$

$\frac{-3}{6}$ from A: ~~(0,11)~~ $(9,2)$

$\frac{3}{-6}$ from A: ~~(6,-1)~~ $(-3,8)$

$\frac{-3}{6}$ from B: $(6,-4)$

$\frac{3}{-6}$ from B: $(-6,2)$