tcore 122: Midterm

Key

1. True/False: If true, explain briefly why the statement is true. If false, provide an example that contradicts the statement.

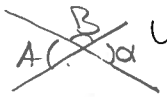
   (a) [2] (Wheater §1.4) Given the statements "If I eat a big lunch, then I get sleepy in the afternoon." and "I took an afternoon nap.", we can conclude that "I ate a big lunch".

   start +.5
   false +.5
   reasoning +1

   False. The logic would be analogous to the following:
   Since "If I'm good at everything, then I'm good at math"
   "I'm good at math",
   thus "I'm good at everything" This faulty logic comes my mixing up a conditional statement w/ the converse.

   (b) [2] (Wks #1) If A and α are vertical angles, then $A \cong \alpha$.

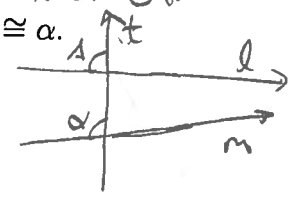
   start +.5
   true +.5
   reasoning +1

   True. This was discovered in Worksheet 1 by comparing the 2 angles directly. The result was also presented in Ch1 of Wheater.
   

   We can also prove the result:
   Since $B+\alpha = 180° = A+B$ we can subtract B from both sides

   (c) [2] (Quiz3 #1) If A and α are corresponding angles, then $A \cong \alpha$.

   start +.5
   false +.5
   reasoning +1

   False. Consider lines ℓ and m with a line t transversing them. Note that A and α are corresponding but $A \neq \alpha$.
   

   (d) [2] (Week 3) The origami pattern I presented did not use a base. (Please specify which origami pattern you presented!)

   start +.5
   pattern presented +.5
   correct +.5
   Name base that exists +.5

   F Frog used the frog base (also preliminary)
   F Penguin used the fish base
   T Samurai did not use a base listed in lang
   F Crane used the bird base (also the preliminary)
   F Lily used the frog base (also the preliminary)
   F Balloon used the water bomb base

2. [2] (Quiz1 #5) Lang claimed you can let "dead people do you work for you." What particular results from dead people was Lang interested in and how did it help with the design of new origami shapes?

   answer +.5
   +.5 Packing circles
   +1 In order to make/reserve space for a flap when designing an origami piece one needs to make/reserve a circle on the paper. So to create a piece with multiple flaps corresponds to arranging packing circles.

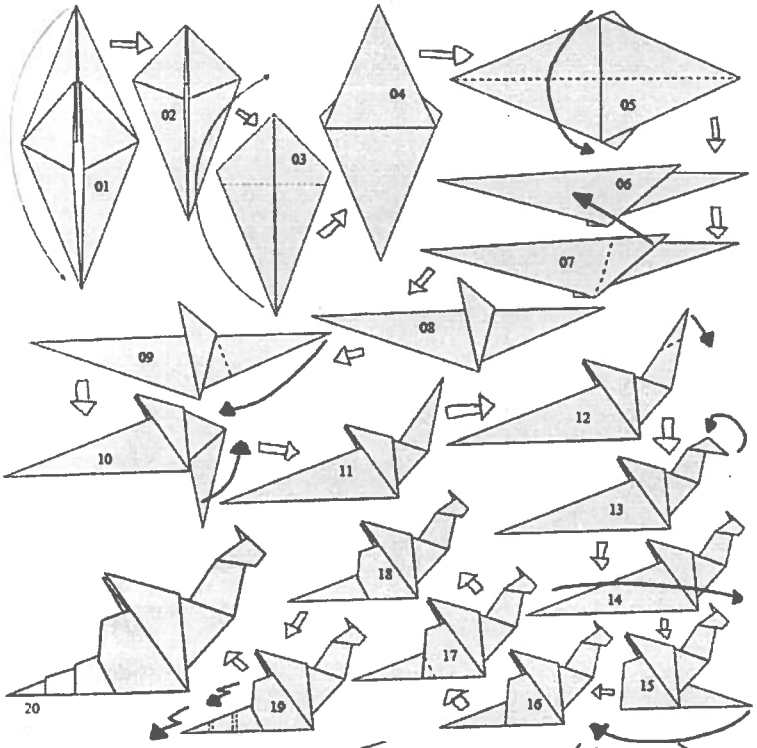
3. [3] (Lang) Identify what the origami symbols below mean.

Valley fold

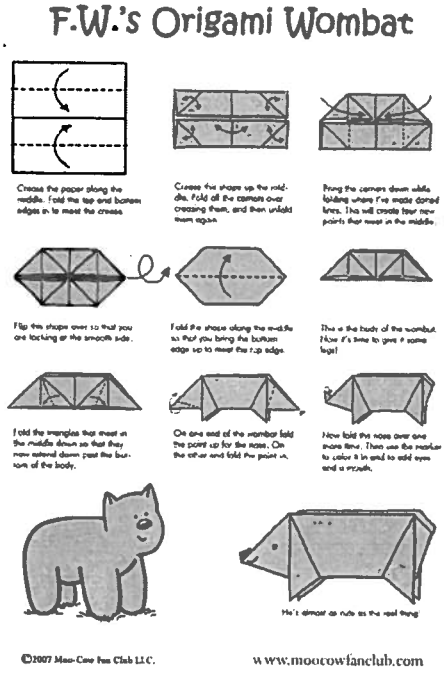
push

turn over (face up side becomes face down)

4. [4] (Lecture 4/25) Identify the base each of the origami directions below make use of.



Fish base (Step 1)



Cupboard (Step 1 & 2)

5. [5] (viHart video 4/2) Explain *carefully* how to make a 22.5° "angle-a-tron" in a Patty Paper worksheet setting. That is, explain how you can build an angle of 22.5° using only ~~patty~~ paper, a pencil, your senses, and logic.

started (+.5)
working toward method (+.5)

Notice that patty paper is square so the corner forms 90°

notation (+1)

Steps:

clear/precise (+1)

1)

Fold over the corner so adjacent sides line up & unfold. Note: we've created a 45° "angle-a-tron".

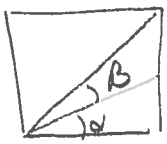
refined work (+1)

understandable (+1)

2)

Fold the bottom edge of the paper up to the new crease created in step 1.

Notice our paper looks like:



Both α and β have measure $22.5° = \frac{45}{2}°$ and can be our "angle-a-tron"

6. [4] (Quiz3 #3) Explain the difference between how Pythagorus thought/worked with numbers and how people today think/work with numbers.

in our lecture (+1)
on hw (+1)
true (+1)
sense (+1)

Pythagorus didn't 'think of numbers on a number line' The number 2 was no more closer to 3 than it was to 30.

Pythagoras also didn't know about algebra (& thus couldn't always 'solve' for a number in the same way we do).

7. (Technical Communication Today) Richard Johnson-Sheehan gave a long list of suggestions to authors of instruction sets.

(a) [1] Identify one of his suggestions that you use well.

(+.5) if sense but not in reading

List of possible suggestions

1) order steps sequentially
2) use command voice
3) put only 1 action per step
4) Number the steps
5) add comments, notes + examples
6) provide feedback
7) refer to graphics

(b) [1] Identify one of his suggestions that you think *if you used this suggestion*, it would improve your write-ups for the worksheets.

Same list of possible suggestions

8. [2] (Mathematician's Lament) What is Paul Lockhart's thesis/point in "A Mathematician's Lament"?

in reading (+1)
thesis (+1)

Mathematics is an art in the same way that music and painting are arts but it is rarely (if ever) presented in this way. Instead math is presented as dead, a skill to practice (like scales in music or paint by number in painting) and students are not encouraged to investigate & create with it.

9. [3] (Between the Folds) There is a "Great Debate" amongst those who fold origami about the whether the recent, more technical, folding techniques developed constitute art. Explain your position.

start (+.5)
state position (+1)
sense/understand (+.5)
reason (+1)

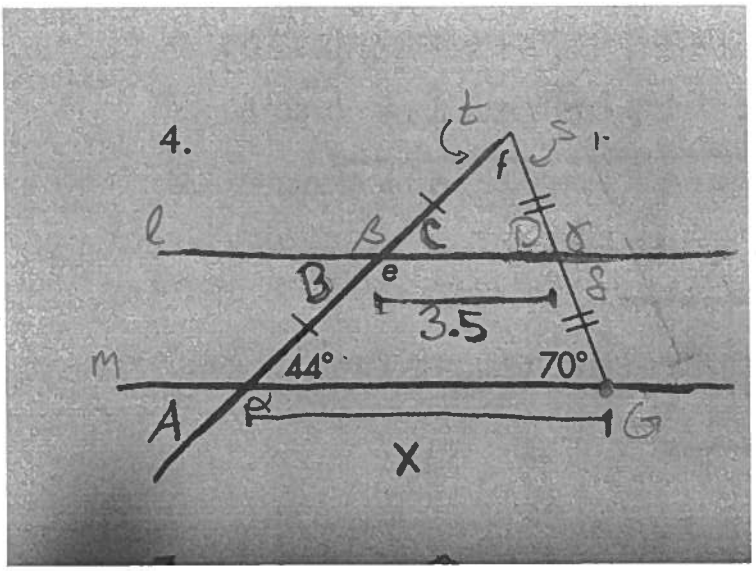
technical folding is art

- allows for more variety of creative pieces
- analogous to technical scales made by musicians that were later incorporated into new music

technical folding is not art

- art should not be repeatable
- art should have emotion of some kind in it.

10. Consider the diagram on the right. Show your work and find:



(a) [1] a pair of alternating exterior angles,

thinking of transversing l and m { A and C, α and β } { β and δ, B and γ } thinking of l as transversing t and s.

(b) [1] the measure of $\angle E$,

(+.5) { $B \cong 44°$

(+.5) { $\Rightarrow e = 180° - 44°$

$= 136°$

(c) [2] the ~~measure~~ of $\angle F$,

(+.5) { $C \cong 44°$ and $D \cong 70°$

(+1) { Since the sum of angles in a Δ is 180°

alg (+.5) { $f = 180 - 44 - 70 = 66°$

(d) [1] a pair of similar triangles,

Δ's (+.5) correct angle order (+.5) { ΔCDf is similar to the large ΔAGf

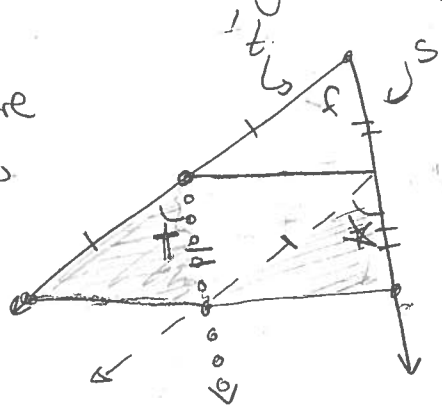
Note: you can use patty paper to trace the angles and confirm the answers are what are reported on the left

or

We'll show ΔCDf is similar to ΔAGf with geometric/algebraic rules

(e) [2] the measure of side x.

(+.5) { Since the Δ's described in (d) are similar we know



Create a dashed line // to t

Create a dotted line // to s

Since line s transverses the 2 // lines t + dashed f ≅ * (corresponding angles)

(+1) { $\frac{\overline{Cf}}{Af} = \frac{3.5}{x}$

ratio +.5 correct ratio +.5

$\frac{1}{2} = \frac{3.5}{x}$

alg (+.5)

$x = 2 \cdot 3.5 \Rightarrow x = 7$

Since line t transverses the 2 // lines s and dotted, f ≅ + (corresponding angles)

We can copy the side lengths & obtain 2 copies of the little ΔCDf & b/c of placement see the Δ's ΔCDf and ΔAGf have the same angles

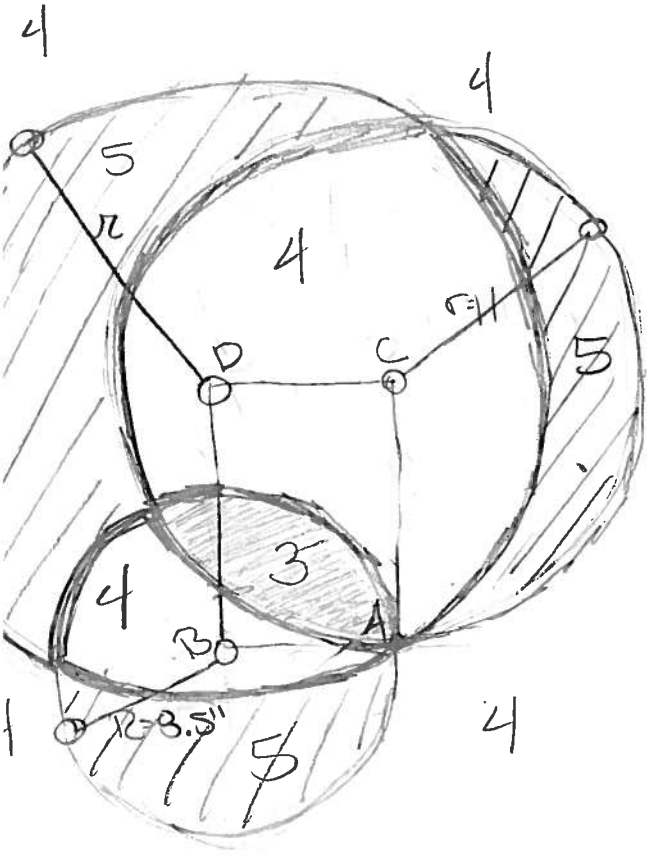
11. [10] Consider a standard 8.5" by 11" sheet of notebook paper. Identify the lower right hand corner of these piece of paper with a point/label A. Define the Turned-Up Part, (or TUP) as the part of the back side of the paper that becomes exposed when folding point A to meet another point B (that may or may not be on the paper).

Find an answer to the question "How can we tell how many edges a TUP will have *before* we fold the paper?"

Treat this is as a patty paper exercise so use paper(s), a pencil, and a calculator.

(+3) Clarity avoid pronouns/label +1 (+7) Reasoning actively trying things +1.5
sense +1. building off of past failures +1.5
picture/notation +1 building off of class knowledge +1.5
justification +1.5
Consider all cases (off paper too) +1

Process 5.5 Explanation 4.5 Correctness 0



Regions are created by drawing three circles with centers B, C + D and lengths 8.5", 11" and $\sqrt{8.5^2+11^2}$ respectively (corresponding to their respective distances from A).

If A is placed in the darkest shaded region the TUP will have 3 sides.

If A is placed in an unshaded region the TUP will have 4 sides.

If A is placed in a half shaded region (≡) then the TUP will have 5 sides.