For every test you archived in your ePortfolio Google drive, you should have a reflection that briefly discusses:

1) How and why the test demonstrates your work toward one, or more, of the course learning objectives. Be specific on the course objectives you decide to mention.

The test demonstrates my work toward the following course learning objectives:

- Define different modes of Heat Transfer.
  - This test includes convection, conduction and radiation components of Heat Transfer.

- Apply the concept of thermal circuit to solve one-dimensional combined mode of heat transfer problems.
  - This test required that I write out the thermal circuit of the problem to see what was happening.

- Solve simple convection heat transfer problems.
  - I had to solve the convective Heat Transfer between the air pocket and the glass of the solar panel in part 1 of the test.

2) A comparison of your test against the available solutions (soon after the test submission deadline, the solutions to the test will be available) and statement of the mistakes you made and what you will do next time to avoid making same mistakes. Please point out exactly where you made the mistake, say why you made the mistake, and how you should have done it. If you were taking this test again, what advice would you give yourself to ensure that you had a successful test?

- The first mistake I realized I made was in the thermal resistance circuit. My resistances were incorrect and that affected the rest of my calculations. One specific resistance calculation error that I found was for the resistance of the copper tube. To keep from making this mistake again, I can read more of the class text, ask for help from the professor, and refer to previous homework or in-class problems for guidance.

- After this I did the equations correctly to solve for the temperature of the air in the pocket between the glass and collector, and solving for Q1 and Q2 was also correct, but the values that I got were WAY off from the correct values given in the solution.

- For part 1-C), I did it exactly the way I should, but my value for Q2 was incorrect, so my answer for this part was also incorrect.

- For part 1-D), I used the following equation: $\mathcal{H} = \frac{Q_2}{Q_{initial}}$. The solution uses the following equation: $\mathcal{H} = \frac{Q_2}{Q_T}$, where QT = Q1 + Q2. I used the incorrect value of Qinitial when I should've used QT.
  - I did not think that my knowledge of the subject matter was weak, but it certainly could've been better. My lack of understanding can be seen in how little I write in the *Analysis* section of the test. There were elements that I got right, but my thermal resistance circuit was incorrect and that threw everything else off.

3) A grade that is based on the writing rubric provided in the test and the correctness of your solution.

- I give myself a grade of 36.7 out of 90 on this test. All of my calculations were done on pages 3 and 4 of this document.

4) A discussion in which you will answer the following questions:

a. What have you learned?

- I was fascinated to learn/re-learn (I remember hearing about this in class, but I had forgotten about it) how heat travels through air and is firstly absorbed by a solid such as planet Earth, or in the case of problem #1 of this test, silver. From there the heat "spills" over to the sides that are not as hot like a fountain overflows into its surroundings.

b. Where you think engineers use those concepts (provide specific examples)?

- Engineers use Heat Transfer concepts (convection, conduction, radiation, etc.) in so many things. They use them in solar panels (that's a given from this test), in water heaters in houses, in electric blankets, and in "hot-hands" (you know, those little packets that you use to warm up your hands when you are out in the cold). Heat Transfer concepts are also considered when designing spacesuits. The materials have to be very specific in order to keep the astronaut alive when he is out in space.

c. Where do you think you will be using everything you learned?

- I can use what I learned in this test in my job, AND in my everyday life outside of work and school. It depends on what

type of job I get that will determine how frequently I use these Heat Transfer concepts. Even if I get a modeling and simulation job designing things, I will have to account for Heat Transfer to some degree in all of the designs.

d. Do you think what you learn is important for your professional career?
- I have done these types of test reflections before. The number one thing that I learn from doing these reflections, but have yet to master, is being as detailed as possible in my process of solving the test problems. It is important for me to learn now, as much as I can, about being detail-oriented and knowing EVERYTHING about the subject matter. I know that this will take some time, but it is very important. I may not have enough time/ability to learn EVERYTHING that there is to know about Heat Transfer, but it is important that when I start a career I dedicate myself to learning EVERYTHING I can about my job and what I am doing.

e. How, when, where and why you might use this information or skill in the future?
- I could be using this knowledge/information when I am designing spacesuits for astronauts in ten years time when they are attempting to walk on the surface of Mars. They will need my unique spacesuit designs to help them survive the harsher temperatures on Mars.

f. Have you been able to apply concepts you have learned in the course to what you do at work or in other courses?
- I did some work about a year ago at an old job where we were testing the company's products in liquid nitrogen to see what effects the temperature had on the product's performance. I did some thermal analysis of the product on the computer to see the stresses that were occurring during the temperature drop. This is about the only experience that I have with Heat Transfer analysis.

g. What areas did you feel you were most successful, or improved the most?
- I honestly don't feel like I improved a lot with this test. The material is difficult for me to understand, and I often struggle with assignments in this class. So if I have successful at all, it is that I am still striving to do well in this class and understand the material as best I can.

h. How do you see this course's content intersecting with your field or career?
- I still have one more semester of courses before I graduate, so I don't expect that I will retain everything I learn in this class. However, when I start a job that has components in it that deal with Heat Transfer, I am sure that I will recognize/ remember the principles that I learned in this class.

In the reflection, you should describe the test using facts and feelings providing relevant details. You should identify strengths and weakness of the test and connect the test with experience. Finally, you should also clearly explain the quality of the artifact and give insight and state reason for judgment.

The course objectives are as follows:

After completing this course, the student should be able to:
- Define different modes of heat transfer,
- Discuss basic laws of conduction, convection and radiation heat transfer.
- Apply the concept of thermal circuit to solve one-dimensional combined mode of heat transfer problems.
- Solve steady one-dimensional heat conduction problems, multi-dimensional heat conduction problems, and unsteady heat conduction problems.
- Explain the physical meaning of dimensionless parameters and their relation to different heat transfer problems.
- Solve simple convection heat transfer problems.
- Differentiate between forced and natural convection heat transfer.
- Solve force convection problems using different experimental correlations.
- Describe heat transfer through tube banks and packed beds.
- Use LMTD and Effectiveness methods to analyze heat exchanger.
- Use commercial computer programs to numerically solve heat transfer systems.

Problem solution rubric

	Exceeds Standard	Meets Standard	Approaches Standard	Needs Attention
	4	3	2	1
	10 points	7 points	4 points	0 points
1. Purpose 5%	The purpose of the section to be answered is clearly identified and stated.	The purpose of the section to be answered is identified, but is stated in a somewhat unclear manner.	The purpose of the section to be answered is partially identified, and is stated in a somewhat unclear manner.	The purpose of the section to be answered is erroneous or irrelevant.
2. Drawings & Diagrams 10%	Clear and accurate diagrams are included and make the section easier to understand. Diagrams are labeled neatly and accurately.	Diagrams are included and are labeled neatly and accurately.	Diagrams are included and are labeled.	Needed diagrams are missing OR are missing important labels.
3. Sources 5%	Several reputable background sources were used and cited correctly.	A few reputable background sources are used and cited correctly.	A few background sources are used and cited correctly, but some are not reputable sources.	Background sources are cited incorrectly.
4. Design considerations (assumptions, safety, cost, etc.) 10%	Design is carried out with applicable assumptions and full attention to safety and cost, etc.	Design is generally carried out with assumptions and attention to safety, cost, etc.	Design is carried out with some assumptions and some attention to safety, cost, etc.	Assumptions, safety and cost were ignored in the design.
5. Data and variables 5%	All data and variables are clearly described with all relevant details.	All data and variables are clearly described with most relevant details.	Most data and variables are clearly described with most relevant details.	Data and variables are not described OR the majority lack sufficient detail.
6. Procedure 25%	Procedure is described in clear steps. The step description is in a complete and easy to understand short paragraph.	Procedure is described in clear steps but the step description is not in a complete short paragraph.	Procedure is described in clear steps. The step description is in a complete short paragraph but it is difficult to understand.	Procedure is not described in clear steps at all.
7. Calculations 20%	All calculations are shown and the results are correct and labeled appropriately. The units of all values are shown.	Some calculations are shown and the results are correct and labeled appropriately.	Some calculations are shown and the results labeled appropriately.	No calculations are shown OR results are inaccurate or mislabeled.
8. Summary 5%	Summary describes the design, the relevant information and some future implications.	Summary describes the design and some relevant information.	Summary describes the design.	No summary is written.
9. Materials 5%	All materials used in the design are clearly and accurately described.	Almost all materials used in the design are clearly and accurately described.	Most of the materials used in the design are clearly and accurately described.	Many materials are described inaccurately OR are not described at all.
10. Analysis 10%	The design is discussed and analyzed. Argumentative predictions are made about what might happen in case of change in the operation and how the design could be change.	The design is discussed and analyzed. Argumentative predictions are made about what might happen in case of change in the operation.	The design is discussed and analyzed. No argumentative predictions are made about what might happen in case of change in the operation and how the design could be change.	The design is not discussed and analyzed.

$3+4+4+3+4+3+1+1+3+2 = 28/40 = 70\%$

1. Purpose 0.5/10.0
2. Drawings 1.0/10.0
3. Sources 0.5/10.0
4. Design considerations 1.0/10.0
5. Data and variables 0.5/10.0
6. Procedure 2.5/10.0
7. Calculations 2.0/10.0
8. Summary 0.5/10.0
9. Materials 0.5/10.0
10. Analysis 1.0/10.0

TOTAL **10.0 out of 10.0**

28/40 = 70% on this part
= 70% of 10 = 7 out of 10

PROBLEM 1)

1. Thermal circuit
   a. 8 resistances 1/14 ✓
   b. Q from sun to correct node 1/14 ✗
2. Compute individual resistances Conservation of energy equation 1/14 ✓
   a. Correct areas in the convec resistances 1/14 ✓
   b. Shape factor (justification) 1/14 ✗
   c. Glass & tube resistance (right eq) 1/14 ✗
   d. Absorber resistance is negligible 1/14 ✓
3.
4. Solving for absorber temperature 2/14 ✗
5. Q to water 1/14 ✓ x
6. Temp of trapped air 1/14 ✓ x
7. Water mass flow rate 1/14 ✓ x
8. Collector efficiency 1/14 ✓ x
9. Final result 1/14 ✓ x

I solved for these values the correct way, but they were not correct in and of themselves, so I'm giving myself half credit for each one marked "✓x" = 2.5/14 + 4/14 = 6.5/14

TOTAL **14/14**

6.5/14

PROBLEM 2)

1. Justification to pick T equation 1/6 ✗
2. A=? P=? 1/6 ✓
3. m as a function of k 1/6 ✗
4. Solving for k 2/6 ✗
5. Final results 1/6 ✗

TOTAL **6/6**

I give myself 1/6 for this part

FINAL GRADE:

10.0 + 55*(14/14) + 25*(6/6) = 90

7 + 55(6.5/14) + 25(1/6) = 36.7

OUCH!

FINAL CALCULATED SCORE