CTE Math Assessment Answer Key

Part 1: Short Answer

You may use a scientific calculator (a calculator that has parentheses) for this test. For each question, use equations, complete sentences, and pictures or charts (where appropriate) to explain your solution.

1. You receive a gift card for $100 for a local sandwich shop. You always order the same thing, and the total cost of each lunch is $7.34. How many completely free lunches can you get with your gift card? How much money will be left on the card?

   13 free lunches with $4.58 left over on the gift card.

2. On Monday, you start work at 8:50 AM and finish work at 4:05 PM. Your rate of pay is $11.75 per hour. How much money should you be paid for Monday's work?

   About $85.19 for 7.25 hours of work (rounded up from $85.1875).

3. You currently pay $500 per month to rent a rectangular office space for your small business. Your office is 8 yards long and 12 yards wide. You recently heard that a new office complex is offering space for small businesses at a rate of $7 per square foot per year. If you rent an office in the new complex which is the same size as your current office, what would your monthly rent be? Would it be worthwhile to move?

   There are many ways to figure this out. One way is to calculate the total cost per year for the current office space and the new office complex space. The current cost per year is $\$500 \times 12 = \$6000$. Comparable space in the new office complex would be $(12 \times 3) \times (8 \times 3) \times 7 = \$6048$ per year, or $504 per month. This is $48 more per year, so it is not worthwhile to move unless the new location is worth the extra money.

4. Tom wants to buy items costing $17.13, $58.25, and $93.17. He earns $9.25 an hour doing odd jobs. If fifteen percent of his income is put aside for other purposes, how many hours must he work to earn the money he needs for his purchases?

   Tom wants to purchase items costing a total of $168.55. After setting aside 15% of his hourly salary, he earns $7.86 per hour which can be used towards his purchases. He must work about 22 hours to earn the money he needs (rounded up from 21.44 hours).

5. It costs $6.72 for a whole box of Cheerios containing 32 cups of cereal. You use $\frac{5}{8}$ of a cup of Cheerios in your trail mix. What is the cost of the Cheerios that you used in your mix?

   The cost of the Cheerios in the mix is about $0.13. (One way to figure this out is to find the price per cup by dividing $6.72 by 32, and then multiply by $\frac{5}{8}$ to find the price for the amount used. This could also be solved using a proportion.

6. Create a situation described by $24x - 162 = 246$. Include a question whose answer is x. Solve the problem and explain what your answer means in the context of the problem you wrote.

   There are many reasonable answers for this problem. Here is one example. "Carl purchased some bags of resistors last week. Each bag contained 24 resistors. Carl used 162 resistors to create robot toys, and then he had 246 resistors left. How many bags of resistors did he buy?" $\mathbf{x = 17}$ is the solution. This answer means that Carl purchased 17 bags of resistors.

7. Use a scientific calculator to work the following problems. You should be able to use operations and parentheses so that you enter the entire expression and only press the equal or enter button once. Round each answer to two decimal places.

   (a) $\sqrt{15^2 - 5^2} \approx \mathbf{14.14}$

   (b) $\dfrac{\frac{872}{123}}{7} \approx \mathbf{1.01}$

   (c) $\dfrac{872}{\frac{123}{7}} \approx \mathbf{49.63}$

   (d) $\pi \left(5\frac{1}{4}\right)^2 \left(13\frac{7}{16}\right) \approx \mathbf{1163.56}$

   (e) $\dfrac{0.04 \cdot 987.25}{1 - (1 + 0.04)^{-7}} \approx \mathbf{164.49}$

Part 2: Performance Assessments

For this portion of the exam, you will need access to a computer with a spreadsheet, metric and U. S. customary length measuring devices (meter sticks / yard sticks / tape measures / rulers), scissors, tape, and scrap paper.

1. **Write a Memo.** Your boss at a local bank branch wants to give away free promotional t-shirts to everyone who comes into the bank next month. She wants you to figure out how much this will probably cost and how many t-shirts she should order.

   Begin by explaining what assumptions you need to make to figure this out. Choose numbers that are appropriate for your assumptions. Explain your computations and your answer.

   There are many reasonable solutions for this performance task. There is a sample on the next page.

Dear Mrs. BossyBoss,

You asked me to estimate the cost of giving out free t-shirts to all customers who come into our branch next month.

To find out the number of customers who visit each month, we should take the average number of customers who visit the branch each day, and multiply it by the number of business days. There are approximately 4 weeks in a month, with 5 business days per week. I estimate that 200 customers visit each day, so there will be about $200 \cdot 4 \cdot 5 = 4000$ visitors during the month.

According to the T-shirt Forums website at
http://www.t-shirtforums.com/general-t-shirt-selling-discussion/t46849.html
the typical ratio of sizes needed (small to medium to large to extra large to XXL) is 1 to 2 to 3 to 3 to 1. However, this distribution of sizes is for adults, and customers are likely to want t-shirts for their kids. Also XXLs cost an additional amount. Therefore, I think we should order twice as many small shirts and not order the XXLs, changing the ratio to 2 to 2 to 3 to 3 to 0. Since $2 + 2 + 3 + 3 = 10$, this means that 20% should be small, 20% should be medium, 30% should be large, and 30% should be extra large. Since we are ordering 4000 t-shirts overall, this means we should order 800 smalls, 800 mediums, 1200 larges, and 1200 XLs.

The company Discount T-shirts offers shirts with a white background for $2.97 each plus a $39 set up fee. (See the page at **http://www.discounttshirts.com/product/g64000-wholesale-custom-printed-gildan-softstyle-adult-tees/)** This would bring the total cost to $\$2.97 \cdot 4000 + 39 = \$11,919$. With 7% sales tax, the grand total would be $\$11,919 + \$834.33 = \$12,753.33$.

If we ordered another color of t-shirt instead of white, the cost per t-shirt would go up to $3.92 per shirt, and so the total cost would be $\$3.92 \cdot 4000 + 39 = \$15,719$. With tax, the total would be $\$15,719 + \$1,100.33 = \$16,819.33$.

Please let me know if you have any additional questions.

Sincerely,

Your Hard Working Employee

2. **Create an Invoice.** You own a landscaping service company, and you need to send an invoice for all the work your company did for a fancy hotel during the month of July. Make up an invoice with at least 5 different service occasions. In your spreadsheet, include a column for the date the service was provided, the service description, the rate for each kind of service, the quantity of time or items provided, and the subtotal listing the cost of each service date. At the bottom of the spreadsheet, include a total of all items, taxes, and the grand total. Invent a name and find a clip art logo for your company. Your invoice should also include a (fictitious) address, phone number, and email address so that your client can contact you with questions.

   There are many reasonable solutions for this performance task. There is a sample PDF on the next page. All of the numbers in the Total Price column should be obtained using formulas – none of those numbers should be entered by hand. See the spreadsheet document to view the formulas.

Green Acres Landscaping

10524 Autumn Glen
South Bend, IN 46614
greenacres@gmail.com
1-888-555-1255

Courtyard Marriott
4825 N Main St
Mishawaka, IN 46545

INVOICE # 138
Date: May 31, 2014

Date	Description	Rate	Units	Quantity	Total Price
04/01/14	Design / Planning	$50.00	per hour	5	$250.00
04/05/14	Grading	$250.00	per hour	5	$1,250.00
04/06/14	Install Pond	$250.00	per hour	8	$2,000.00
04/07/14	Install Pond	$250.00	per hour	6	$1,500.00
04/08/14	Install Sprinkler System	$50.00	per hour	8	$400.00
04/08/14	Sprinkler System	$4,500.00	components	1	$4,500.00
04/09/14	Soil Preparation	$50.00	per hour	6	$300.00
04/12/14	Sod Installation	$2.50	per sq. ft.	200	$500.00
04/13/14	Perennial Flowers	$30.00	per flat	20	$600.00
04/13/14	Flowering Shrubs	$50.00	per shrub	6	$300.00
04/13/14	Trees	$100.00	per tree	10	$1,000.00
04/13/14	Planting	$50.00	per hour	8	$400.00
04/14/14	Planting	$50.00	per hour	8	$400.00
04/15/14	Planting	$50.00	per hour	8	$400.00
04/16/14	Planting	$50.00	per hour	8	$400.00
05/15/14	Weeding	$50.00	per hour	8	$400.00
05/20/14	Mowing	$50.00	per hour	8	$400.00
				Subtotal	$15,000.00
				Sales Tax (7%)	$1,050.00
				Invoice Total	$16,050.00

3. **Measurement Challenge.** Measure and cut out paper rectangles with the dimensions indicated below. You may need to tape pieces of paper together.

   (You should be able to select appropriate measuring tools for each challenge.)

   Challenge 1. Length: $\frac{15}{6}$ foot.

   To find $\frac{15}{6}$ foot, we first calculate $\frac{1}{6}$ foot. Since one foot has twelve inches, $\frac{1}{6}$ foot is 2 inches. This means that $\frac{15}{6}$ foot is fifteen copies of 2 inches for a total of 30 inches. As long as the cut string is within 1/8 inch of the correct length, it is close enough.

   Challenge 2. Length: 15.42 centimeters.

   15.42 centimeters is very close to 15.4 centimeters (4 millimeters past 15 centimeters). As long as the cut string is within 3 millimeters of the correct length, it is close enough.

   Challenge 3. Length: 0.3 meters.

   0.3 meters is equal to 30 centimeters. As long as the cut string is within 3 millimeters of the correct length, it is close enough.

   Challenge 4. Length: $4\frac{5}{8}$ inches.

   $4\frac{5}{8}$ inches is just one eighth of an inch more than $4\frac{1}{2}$ inches. As long as the cut string is within 1/8 inch of the correct length, it is close enough.

   Challenge 5. Length: $\frac{5}{12}$ yard.

   To find $\frac{5}{12}$ yard, we first calculate $\frac{1}{12}$ yard. Since one yard has thirty-six inches, $\frac{1}{12}$ yard is 3 inches. This means that $\frac{5}{12}$ yard is five copies of 3 inches for a total of 15 inches. The cut string should be within 1/8 inch of the correct length.

   Challenge 6. Length: 49 millimeters.

   Note that 49 millimeters is equal to 4.9 centimeters, or 1 millimeter less than 5 centimeters. The cut string should be within 3 millimeters of the correct length.