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| **TYPE POS MATH DESCRIPTOR HERE** | **=** | **Use units as a way to understand problems and to guide the****solution of multi‐step problems** |
| **Program POS Task:** **:** Enter POS task here | **PA Core Standard:** CC.2.1.HS.F.4 **Description:** Use units as a way to understand problems and to guide the solution of multi-step problems. |
| **Program Associated Vocabulary**ENTER PROGRAM AREA VOCABULARY HERE | **Math Associated Vocabulary**RATE, PERCENT, DECIMAL, PROPORTION, RATIO, DIMENSIONAL/UNIT ANALYSIS |
| **CTE Program Formulas and Procedures**Display program example of math concept by entering text, graphic, and formulas in this column. | **Formulas and Procedures**Dimensional or Unit Analysis can be used to solve problems using operations because by analyzing the units, one can determine whether or not the equation was set up correctly. **Basic Steps:**1. Determine the unit given and the unit needed (answer).
2. Write the number with the unit you are given as a fraction over one on the left hand side and write an equal sign followed by the unit you need on the far right hand side.
3. Multiply by the rates you are given or conversion factors (write as fractions), making sure that the unit that was given (in numerator) is also on the bottom (denominator) of the given rate or conversion factor.
4. Remember, units cancel out just like numbers do! Continue to multiply by rates or conversion factors until the unit needed is the only unit that does not cancel.
5. Perform the indicated operations.

**Example 1: A snail can crawl 13 feet in 2.5 hours. How far can it crawl in 240 minutes?**1. unit given = 240 minutes, unit needed = feet
2. = feet
3. = feet
4. = feet
5.

**Example 2: A savings account earns a simple interest rate of 3% per year over 12 years. If $3,000 is invested, how much will the account earn?**  |

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| **Instructor's Script - Comparing and Contrasting**Math or program area instructor should fill in this area by comparing academic math problems to lab area problems. The teacher should describe ways that trade math is similar or different from the academic math that occurs in the common core or on Keystone related exams.  |

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| **Common Mistakes Made By Students***Use of incorrect conversion factors or omission of essential conversion factors.*For instance, in the problem shown below, a conversion factor (60 minutes = 1 hour) was omitted from the solution.If you have 500 tasks to complete and each task takes 3 minutes, how many hours will it take to complete all of the tasks?$$\frac{500 tasks}{1}×\frac{3 minutes}{1 task}=1500 minutes$$*Incorrectly setting up the problem.*For instance, in the problem shown below, the problem has been set up incorrectly. Instead of starting with the 500 tasks, the solution begins with the conversion factor. If you have 500 tasks to complete and each task takes 3 minutes, how many hours will it take to complete all of the tasks?$$\frac{1 tasks}{3 min}×\frac{1}{500 tasks}=\frac{1}{1500 minutes}$$ |

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| **CTE Instructor’s Extended Discussion**The CTE instructor may add comments here describing the importance of this math skill in relationship to the program task, or note common problems which students have when making the computations. |

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| **Problems Career and Technical Math Concepts Solutions** |
|  | Allow work space here |
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| **Problems Related, Generic Math Concepts Solutions** |
| 1. Since work equals force times distance, lifting 4 pounds (force) 5 feet off the ground (distance) equals 20 foot-pounds of work. If the same amount of work is applied to 10 pounds, how many feet off the ground will it be lifted?
 |  |
| 1. A worker has 6 gallons of a solution that is 50% water.

If she adds one gallon of water, is the new percentage of water in the solution? |  |
| 1. A worker unloads 9 crates every 36 minutes and is paid $2 per crate. How much money does he make in an 8 hour shift?
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| **Problems PA Core Math Look Solutions** |
| 1. Kathy and John are helping to create party favors for the school dance. Kathy can create 30 in one hour and Joe can create 40 in two hours. At that rate, how long will it take to create 500 party favors?
 |  |
| 1. Two trucks are plowing snow and moving in opposite directions. The first truck can plow snow at 23 mph and the other can plow at 17 mph. How long will it take them to plow 200 miles of road?
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| 1. A fuel-efficient car can drive 35 miles per gallon of gas. If the cost of gas is $3.97 per gallon, how much will it cost to make a 485-mile trip?
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| **Problems Career and Technicalinstructor Math Concepts Solutions** |
|  | Answers Here |
|  | Answers Here |
|  | Answers here |
| **Problems Related, Generic Math Concepts Solutions** |
| 1. Since work equals force times distance, lifting 4 pounds (force) 5 feet off the ground (distance) equals 20 foot-pounds of work. If the same amount of work is applied to 10 pounds, how many feet off the ground will it be lifted?
 |   |
| 1. A worker has 6 gallons of a solution that is 50% water.

If she adds one gallon of water, is the new percentage of water in the solution? | 6 \* 0.5 = 3 gallons of water in original solution6 + 1 = 7 total gallons in new solution3 + 1 = 4 known gallons of water in new solution4 / 7 = 57% water in new solution |
| 1. A worker unloads 9 crates every 36 minutes and is paid $2 per crate. How much money does he make in an 8 hour shift?
 |  |
| **Problems PA Core Math Look Solutions** |
| 1. Kathy and John are helping to create party favors for the school dance. Kathy can create 30 in one hour and Joe can create 40 in two hours. At that rate, how long will it take to create 500 party favors?
 | , total rate =  |
| 1. Two trucks are plowing snow and moving in opposite directions. The first truck can plow snow at 23 mph and the other can plow at 17 mph. How long will it take them to plow 200 miles of road?
 | Rate 1 + Rate 2 = 23mph + 17mph = 40 mph |
| 1. A fuel-efficient car can drive 35 miles per gallon of gas. If the cost of gas is $3.97 per gallon, how much will it cost to make a 485-mile trip?
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