

# Math-in-CTE Lesson Plan Template

Lesson Title: "More Than Just a Sunburn"	Lesson # 4
Occupational Area: Health Careers	
CTE Concept: Burn Classifications and Rule of Nines Standards: 4.2, 1.6, 1.9, 1.12  Math Concepts: estimating, addition/subtraction, multiplication/division, reducing, fraction/decimal/percentage conversions Standards: 4.2, 8.2, 3.6, 8.7, A1.9  Prerequisite Skills: Skin Anatomy & Physiology, estimating, addition/subtraction, multiplication/division, reducing, fraction/decimal/percentage conversion	Lesson Objective:  Student will demonstrate a basic knowledge of the anatomy & physiology of the Integumentary (skin) System. Student will demonstrate knowledge of burn classifications. Student will demonstrate the ability to apply presented CTE math concepts. Student will demonstrate the ability to calculate the percentage of area burned on various burn victims.  Supplies Needed: Medical Terminology Systems: A Body Systems Approach, 6 <sup>th</sup> ed., Gyllys, Barbara & Mary E. Wedding, FA Davis Co., 2009, Philadelphia, calculator, pencil, paper, worksheets, Power Point/projector, cup with fluid, (tape measure and manikin optional).
<b>THE "7 ELEMENTS"</b>	<b>TEACHER NOTES (and answer key)</b>
<p>1. Introduce the CTE lesson.</p> <p>Do you know anyone who has been badly burned? How are burn victims treated? Are all patients treated the same? Does age play a factor in how burn patients are treated?</p>	<p>1. Introduction</p> <p>Today we're going to discuss burns. After reviewing the integumentary system, we'll discover how the severity or degree of burns are classified; and how health care professionals determine the area or body percentage affected by the burn.</p>

**2. Assess students' math awareness as it relates to the CTE lesson.**

**Assessing Student CTE Math Awareness**

- A. Estimating-Teacher will ask students if they understand the concept of estimating.

- A. Is the cup half empty or half full?"
- B. "If I were burned on only the front of my body; how much of my body is burned?"
- C. "If I were burned from the waist up on the front of my body; how much of my body is burned?"
- D.  $7.2 + 3.6 = 7 + 4 = 11$  \*\*Where each number is rounded to the nearest whole number.

- B. Binary Operations-Teacher will ask students if they understand addition/subtraction and multiplication/division.

- $18\% + 9\% + 1\% =$
- $9\% \times 0.5 =$

- C. Percentage/Fraction/Decimal Conversions-Teacher will ask students if they understand how to convert percents to fractions; fractions to decimals; and decimals to percents.

$75\% = \frac{3}{4}$	$50\% = \frac{1}{2}$	$30\% = \frac{3}{10}$	$25\% = \frac{1}{4}$	$20\% = \frac{1}{5}$
$\frac{3}{4} = 0.75$	$\frac{1}{2} = 0.5$	$\frac{3}{10} = 0.3$	$\frac{1}{4} = 0.25$	$\frac{1}{5} = 0.2$
$0.75 = 75\%$	$0.5 = 50\%$	$0.3 = 30\%$	$0.25 = 25\%$	$0.2 = 20\%$

- D. Fraction Reduction-Teacher will ask students if they understand how to reduce fractions.

$\frac{9}{100}$ (does not reduce)
$18/100 = 9/50$
$36/100 = 18/50 = 9/25$
$54/100 = 27/50$

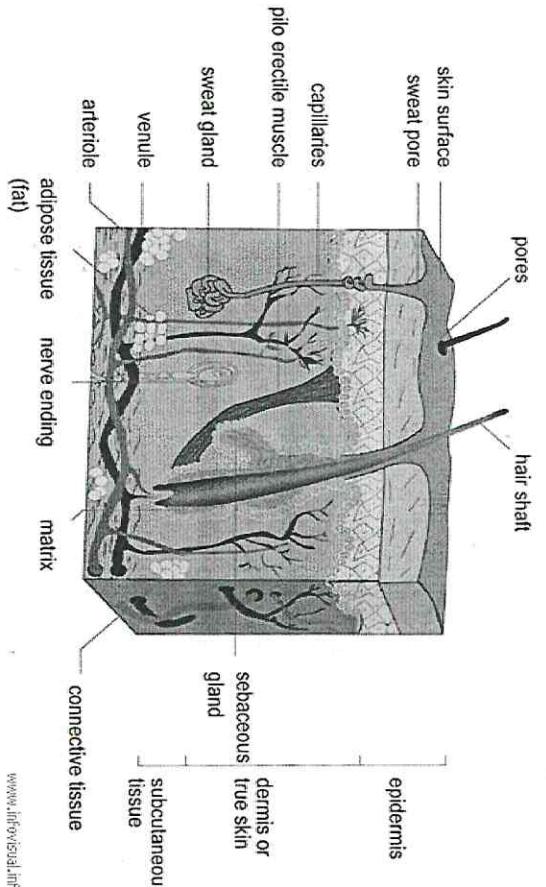
**Pre-Test**

Students will complete the linked Pre-Test without the use of a calculator.

**Pre-Test**

Let's first review the anatomy and physiology of the skin.

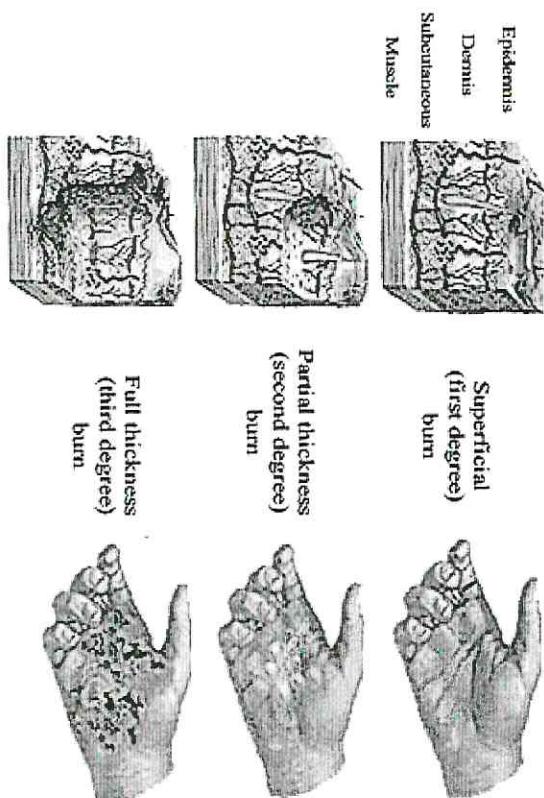
### CROSS SECTION OF SKIN



[www.infovisual.info](http://www.infovisual.info)

How do health care workers determine the severity/degree of burns?

[http://www.infovisual.info/03/036\\_en.html](http://www.infovisual.info/03/036_en.html)

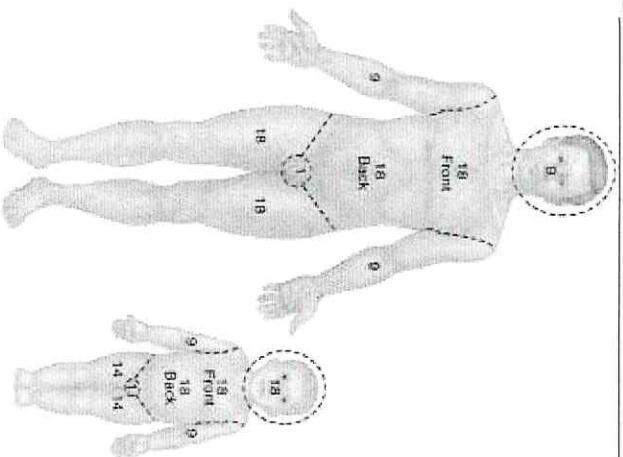


<http://www.burn-recovery.org/images/burn-classification.jpg>

The % of the burned area is estimated by using a method called the “Rule of 9’s”.

## Rule of 9's

### PowerPoint



### 3. Work through math examples embedded in the CTE lesson

A 54 yo male arrived in the ER per ambulance from a house fire. Pt. suffered burns on his entire head, both upper extremities and the entire thorax (front & back).

- A. Estimate the total percentage of body burned.
- B. Determine the total percentage of the body affected by the burns. \*note percentages of affected areas .(binary operations-addition)

C. Percentage/Fraction/Decimal Conversions- we now know that 63% of the patient's body is burned.

- 1. Convert this percentage to a fraction (reduce fraction to lowest terms, if possible)
- 2. Now convert the fraction  $63/100$  it's decimal representation.
- 3. Now convert the decimal to a percentage

<http://medical-dictionary.thefreedictionary.com/rule+of+nines>

### 3.CTE Math Examples

- A. Students may estimate 50-60% or approximately half of the body.

- B.  $9\% + 9\% + 9\% + 36\% = 63\% \text{ TOTAL}$

C.

- 1.  $63\% = 63/100$
- 2.  $63/100=0.63$
- 3.  $0.63=63\%$

**4. V**

*< through related, contextual math-in-CTE examples.*

- A. For lunch, if a resident ate their chicken, mashed potatoes, jello, and drank iced tea; estimate the percentage of the meal they ate?

- a. <50%    b. 50%    c. >50%

Now calculate the actual percentage (binary addition).

$$40\% + 10\% + 10\% = 60\%$$

- B. If a MD ordered a patient to receive 6 liters of IV fluid in a 24 hrs; how much fluid would the patient receive during the 3-11 shift? Also calculate the hourly rate in ccs.

\*\*Hint: 1L=1,000ml and 1 ml=1cc

- C. A local ER sees 2 male and 5 female patients every 15 minutes. How many total patients do they see during an 8 hr. shift and during one full day? Also, what's the ratio of male to female patients seen during that same 24 hr period (reduce answer if poss.)?

C.  $7 \text{ pts} \times 4 \text{ (15 min/hr)} = 28 \text{ pts/hr}$

$28 \text{ pts/hr} \times 8 \text{ hrs/shift} = 224 \text{ pts/shift}$

1 數  $\times$  8 週  $\times$  3 月  $\times$  1 日  $\times$  24 hrs = 72 pts./24 hrs.

Male pts. =  $2 \times 4 \times 24 = 192$  male pts./24 hrs

Female pts. =  $5 \times 4 \times 24 = 480$  female pts./24 hrs OR

672 (total pts.) - 192 (male pts.) = 480 female pts./24 hrs

Ratio of male/female =  $192/480=2/5$  (95) \*\*see initial statement\*\*

### 5. Work through *traditional math* example

Students will complete the attached worksheet demonstrating their understanding of traditional math (no calculators).

[Math Worksheet](#)

### 6. Students demonstrate their understanding.

Students will complete the linked Student Assessment using their Medical Terminology textbook (no calculators).

### 7. Formal assessment

- Students will calculate % of burns on various manikins with burn areas marked with red saran wrap.
- Students will complete linked Post-Test without aides.

### 5. Traditional Math Examples

#### CTE Math Examples

- A. main entrée = 40% or Casserole = 50% vegetable, fruit, starch, dessert = 10% each bread = 10%

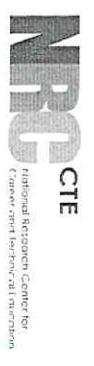
milk = 20%

40% + 10% +10% = 60%

B.  $6\text{L}=6\times1,000\text{ml}=6,000 \text{ ml (1liter=1,000ml or 1,000cc)}$

$6,000\text{ml} / 3 \text{ shifts} = 2,000\text{ml / shift}$

$2,000\text{ml} / 8 \text{ hrs} = 250 \text{ cc/hr}$



NOTES:

**Let's review the Skin:**

- Epidermis - second layer underneath the epidermis; palms of hands and soles of feet
- Dermis - deepest layer directly beneath the epidermis;
- Hypodermis - composed of living tissue; contains capillaries, lymph vessels, nerve endings, hair follicles, sudoriferous (sweat) glands, and sebaceous (oil) glands
- Chubs of skin contain connective tissue, elastic fibers, collagen, and elastin.
- Bind the dermis to underlying structures.

**Spring Break Packing List (cont.):**

- "What about...?"
- Cash
- Sunglasses
- Beach Towels
- Snacks
- Cooler
- Beverages
- Ping Pong anyone?
- Boyfriend/Girlfriend (?).....nah
- What about SUNSCREEN?

**Here's Some Burn Statistics:**

Seriously though:

- On average in the United States, someone died in a fire every 135 minutes, and someone was injured every 30 minutes (Krebs 2005).
- Each year in the United States, 1.1 million burn injuries require medical attention (Metreka Burn Association, 2002).
- Approximately 50,000 burn injuries require hospitalization.
- Approximately 20,000 are major burns involving at least 25 percent of the total body surface.
- Up to 10,000 people in the United States die every year of burn-related infections.
- Only 60 percent of Americans have an escape plan, and of those, only 25 percent have practiced it (NFPA, 1999).
- Smoke alarms cut your chances of dying in a fire in half (NFPA, 1999).

**Spring Break - "Let's Party!!!!"**

"Aren't there some things you need to take with you as you head to the beach?"

- Bikini/Trunks
- Cute/Macho Clothes
- Flip Flops (15 colors)
- I-Pod
- Cellphone
- Insurance Card (in case of an injury)

We don't want you to spend your week like this:

**The Rule of 9's**

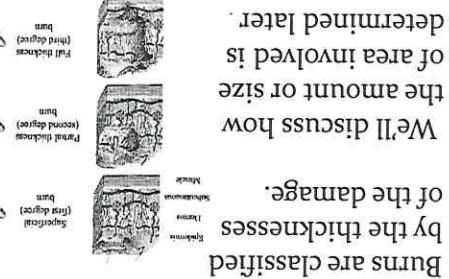
**More Than Just a Sunburn**

**Second-Degree Burns**

Symptoms:

- Glossy appearance from leaking fluid
- Pain
- Blisters
- Possible loss of some skin
- Deep reddening of the skin

Second-degree burns involve the first two layers of skin.



We'll discuss how burns are classified by the thicknesses of the damage. The amount or size of area involved is determined later.

## Classifications of Burns:

**Treatment: First-Degree Burns**

Symptoms:

- Applying cool, wet compresses, or immersing in cool, fresh water.
- Cover the burn with a sterile, non-adhesive bandage or clean cloth.
- Do not apply ointments or butter to burn; these may cause infection.
- Over-the-counter pain medications may be used to help relieve pain and reduce inflammation.
- First-degree burns usually heal without further treatment.
- However, if a first-degree burn covers a large area of the body or the victim is an infant or elderly, seek emergency medical attention.

**Basic Skin Pathology:**

Rash: is a change of the skin which affects its color, appearance or texture; may be localized in one part of the body, or affect the entire body. Skin may change color, itch, become warm, bumpy, dry, cracked or blistered, swell and may be painful.

Lesions-skin that have been pathologically altered by injury, wound, or infection.

Cancer-abnormal growths of new tissue classified as benign or malignant.

Burns-damage caused to skin by fire, heat, chemicals or electricity. This is what we're going to focus on.

**First-Degree Burns**

Symptoms:

- Redness
- Painful to touch
- Mild swelling

First-degree burns involve the top layer of skin. Sunburn is a first-degree burn.

**Functions of Skin:**

Protects the body from ultraviolet rays

Is a reservoir for food and water

Prevents dehydration

Helps regulate body temperature

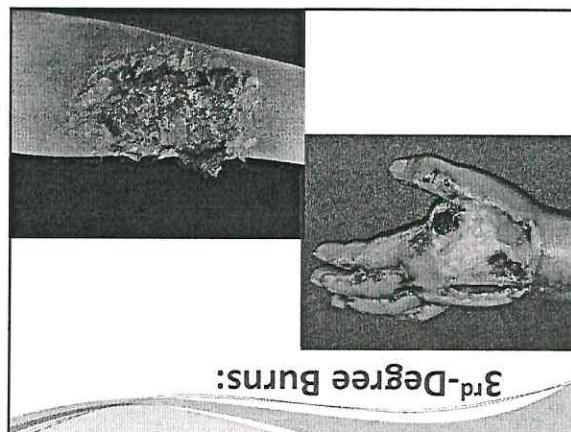
Registers sensations of temperature, pain, and pressure

Provides sensory information to and from the brain

Registers underlying structures from injury

**References:**

- CDC, National Center for Health Statistics (NCHS). (1998). National vital statistics system, Hyattsville, MD: U.S. Department of Health and Human Services, CDC, National Center for Health Statistics.
- Glynn, B., & Weddington, M. E. (2009). Medical Terminology Systems, 6th ed. FA Davis Co., Philadelphia (PA).
- Karter, M. J. (2005). Fire loss in the United States during 2004. Quincy (MA): National Fire Protection Association, Fire Analysis and Research Division.
- National Fire Escape Survey, Quincy (MA).
- National Fire Protection Association (1999). NFPA 1: National Fire Protection Association (NFPA).
- Wikipedia. (25, Feb, 2010). Rule of nines. [http://en.wikipedia.org/wiki/Rule\\_of\\_nines](http://en.wikipedia.org/wiki/Rule_of_nines)



## 3rd-Degree Burns:

**Rule of 9's:**

A method of estimating the extent of the body burned in victims. This is done by dividing the body into nineths. That has been burned in extent of the body surface and/or determining the area that has been burned in victims. This is done by dividing the body into nineths. Fluid needed to keep victims hydrated.

- Loss of skin layers
  - Often painless due to killed nerve endings. (Pain may be caused by patches of first- and second-degree burns which often surround third-degree burns).
  - Skin is dry and leather
  - Skin may appear charred or have patches which appear white, brown or black
- SigNS:**
- A thickened, raised, permanent scar.

## Third-Degree Burns

- Take steps to prevent shock: lay the victim flat, elevate the head, neck, or legs if injury is suspected, or if it makes the victim uncomfortable.
- Do not place a pillow under the victim in the shock position if a blanket Do not place the victim with a coat or treat serious burns unless you are a trained health professional.
- Further medical treatment is required. Do not attempt to treat serious burns unless you are a trained health professional.
- Infection
- Do not apply ointments or butter to burns; these may cause infection.
- Do not break blisters.
- Dry with clean cloth and cover with sterile gauze.
- Cover burn lightly with sterile gauze or clean cloth. (Do not use materials that can leave lint on the burn).
- Continue for 10 to 15 minutes.

## Treatment of 2nd-Degree Burns:

**Treatment of 3rd-Degree Burns**

- Cover burn lightly with sterile gauze or clean cloth. (Do not use materials that can leave lint on the burn).
- Do not apply ointments or butter to burns; these may cause infection.
- Take steps to prevent shock: lay the victim flat, elevate the feet about 12 inches.
- Have patient sit up if face is burned. Watch closely for possible breathing problems.
- Keep person warm and comfortable, and watch for signs of shock.
- Elevate burned area higher than the victim's head when possible.
- Do not place a pillow under the victim in the shock position if a blanket Do not place the victim with a coat or treat the victim uncomfotable.
- Do not place a pillow under the victim in the shock position if a blanket Do not place the victim with a coat or treat the victim uncomfotable.
- Do not apply ointments or butter to burns; these may cause infection.
- Do not break blisters.
- Dry with clean cloth and cover with sterile gauze.
- Continue for 10 to 15 minutes.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Pre-Test

“More Than Just a Number”

Estimate, and Calculate the Exact answer.

Hint: x is a times symbol

1.  $6.45 + 12.1 - 9.54$  Estimate \_\_\_\_\_ Exact \_\_\_\_\_

2.  $24 \div 6 \times 3 \div 2$  Estimate \_\_\_\_\_ Exact \_\_\_\_\_

3.  $(12.3 \div 2) \div (3.1 \div 1) \times 4.6$  Estimate \_\_\_\_\_

Convert to Decimal and Fraction (Lowest Terms)

4.  $52\% = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Convert to Percent and Fraction (Lowest Terms)

5.  $.27 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Convert to Decimal and Percent

6.  $18/50 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Pre-Test - KEY  
“More Than Just a Number”

$$1. \text{ Estimate}=8 \quad \text{Exact}=9.01$$

$$2. \text{ Exact}=6$$

$$3. \text{ Estimate}=10$$

$$5. 27\% = 27/100$$

$$4. 0.52 = 52/100 = 26/50 = 13/25$$

$$6. 0.36 = 36\%$$

$$(27 \div 3 + 6 \times 2) \div (30 \div 10 - 2) = \underline{\hspace{2cm}}$$

11. Simplify and reduce to lowest terms.

10. The Little family took a trip to New Albany, IN to visit Prosser School of Technology. The trip totals 150 miles. They stopped at Columbus, IN, after traveling 30 miles. Calculate the distance traveled thus far as a Fraction, Decimal (round to the nearest 100<sup>th</sup>), and Percent.

9. Bill invests \$2000 over a four year period. The first year her money doubles, the next year she loses half; the next year her money increased by 150%, then the last year her gain was 50%. What is his balance now?

8. A Football Running Back gains 11 yards, loses 4 yards, gains 7 yards and loses 13 yard on his first four carries in a game. What was the total gain/loss for these carries? \_\_\_\_\_

- A. a coffee cup    B. 3 Tablespoons    C. a juice glass    D. Sports Bottle

7. A recipe calls for 1 cup of sugar. Which of these best represents one cup?

$$6 \div 25 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Convert to Decimal and Percent

$$5. .72 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Convert to Percent and Fraction (reduce to lowest terms)

$$4. 25\% = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Convert to Decimal and Fraction (reduce to lowest terms)

$$3. (12.3 \div 2) \div (3.1 \div 1) \times 6.4 \text{ Estimate } \underline{\hspace{2cm}}$$

$$2. 42 \div 6 \times 3 \div 7 \quad \text{Exact } \underline{\hspace{2cm}}$$

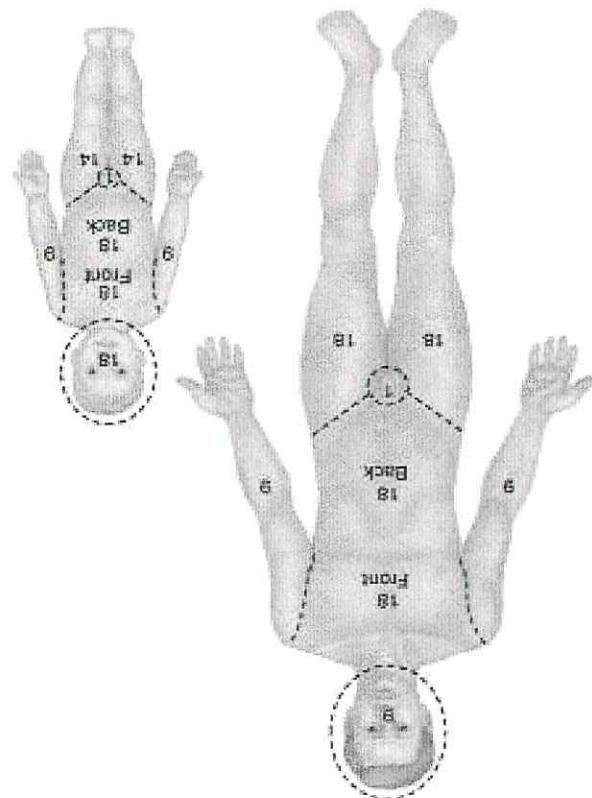
$$1. 4.54 + 10.2 - 9.54 = \text{Estimate } \underline{\hspace{2cm}} \quad \text{Exact } \underline{\hspace{2cm}}$$

Estimate and Calculate Exact Answers.

### Post-Test

“More Than Just a Sunburn”

12. Using the diagram above, determine the percent burned if one arm and the posterior surfaces of the child's head and back were burned? \_\_\_\_\_
13. Repeat the process used in problem 12 to determine the percent injured, if both sides of one leg, one arm and the groin of an adult were burned. \_\_\_\_\_
14. Compare the total burn percentages of a child who has burned both legs (front and back) and the front of the torso, to an adult who has burned the exact same areas. Write your answer as a Ratio (fraction) and reduce your answer if possible. \_\_\_\_\_



“More Than Just a Number”

Post-Test-Key

1. Estimate=5      Exact=5.20

2. Exact=3

3. Estimate=12

4.  $0.25 = 25/100 = 1/4$

5.  $72\% = 72/100 = 36/50 = 18/25$

6.  $6/25 = 24/100 = 0.24 = 24\%$

7. A.

8. +1

9. \$7,500.00

10.  $30/150 = 3/15 = 1/5; 0.2; 20\%$

11. 21

12. 36%

13. 28%

14.  $45/54 = 5/6$

1. A recipe calls for one tablespoon of baking soda. Which of these best represents one tablespoon?

- A. 8oz cup    B. Thimble    C. 2 Liter Bottle    D. Sports Bottle

2. A Football Running Back gains 12 yards, loses 3 yards, gains 5 yards and loses 1 yard on his first four carries in a game. What was the total gain/loss for these carries? Also, what was his average yards gained per carry?

3. Susie invests \$4000 over a four year period. The first year her money triples, the next year she loses half; the next year her money increased by 150%, then the last year her gain was 50%. What is her balance now?

4. The Cadle family took a trip to Panama City, Florida. The trip totals 950 miles. At their stop at Nashville, Tennessee, they had determined they had traveled 180 miles thus far. Calculate the distance traveled thus far as a Fraction, Decimal (round to the nearest 100<sup>th</sup>), and Percent.

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$$(24 \div 3 + 6 \times 2) / (1020 \div 10 - 2) =$$

5. Simplify and reduce to lowest terms.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. B

"More Than Just a Number",  
Math Worksheet - KEY

2. +13 yds. ; 3.25 yards/carry

3. \$22,500.00

4.  $180/950 = 18/95 = 0.19 = 19\%$

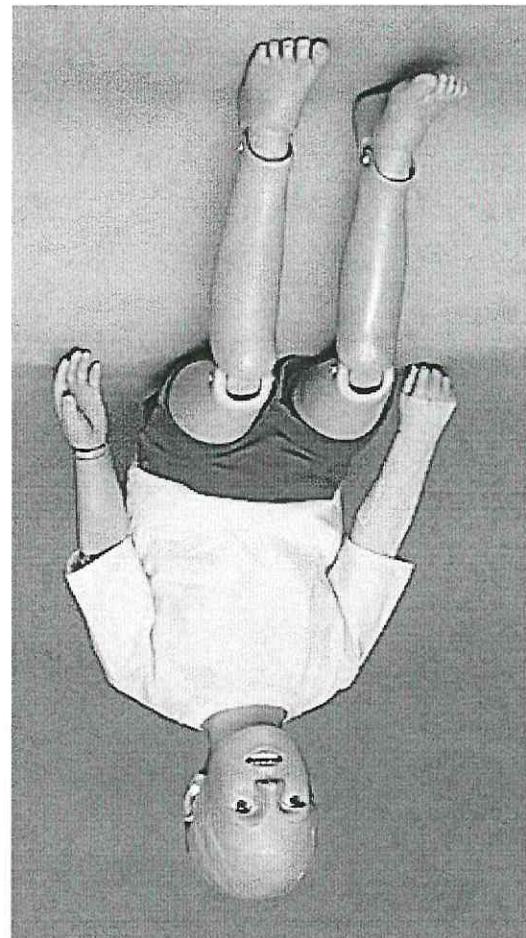
5.  $20/100 = 2/10 = 1/5$

3) Compare the total percent burned, of a child who burned both legs (front and back) and their back, to an adult who has burned the exact same areas. Write your answer as a Ratio (fraction) and reduce your answer if possible.

buried.  
2) Repeat the process used in  
percent injured, if both sides of  
the legs, the groin and the  
anterior chest were  
burned.

and chest were burned?  
1) Using the diagram in your  
text, determine the percent  
burned if the anterior surfaces  
of the child's head, both arms  
and chest were burned?

The Teacher will have the  
students demonstrate their  
understanding by doing the  
following:



Name:

Date:

1. 36%

2. 47%

3. 45/54=5/6

Student Assessment Sheet - KEY  
“More Than Just a Number”