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Resources: Please visit the SchoolsNEXT website: Design Competition Resources, Teacher/ Mentor Resources and Additional Resources for enrichment materials.

UNIT 4: Designing the Floor Plan II

STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: Precision Tools

Math Standard(s) Addressed: Understands the concepts of precision and significant digits as they relate to measurement (e.g., how units indicate precision); selects and uses appropriate units and tools depending on degree of accuracy required.

Approximate Time Needed for Lesson:
30 – 45 minutes

Students will engage in:

- ☐ independent activities
- ☐ cooperative learning
- ☐ peer tutoring
- ■ visuals
- ■ pairing
- ■ hands-on activities
- ☐ centers
- ☐ lecture
- ☐ whole group instruction
- ☐ technology integration
- ■ creating a project
- ☐ guest speakers

Class Starter: Brainstorm with students different units of measure and what they are used to measure (i.e. volume, area, perimeter).

Objectives: Using the appropriate tools to measure.

Materials:
rulers
yard sticks
inch cubes
tape measures
measuring cups
thermometer

Step-By-Step Procedures:

- Lead a discussion looking at items (furniture, walls, equipment) in the classroom and what would be the appropriate unit of measurement used to define that object.
- Complete lesson of effective use of living space (www.iit.edu/~smile/ma9103.html).

Guided/Independent Practice: Instructor will model measuring an item using one correct tool and one incorrect tool.

Assessment: Students will submit drawings including all furniture which must fit in the classroom.

Differentiation Ideas:

- Have students work in pairs to complete measurements and lesson.
- Have students put different pre-determined items within classroom.

Adaptations & Extension Ideas:

- Determine the measuring tools necessary to measure the schools area, perimeter, classrooms, hallways, bathrooms, and all other rooms housed within the school.

Closure: Create a class list of all instruments that the class will be using to create the blueprint of the school building project.

Connections to other Content Areas:

Additional Resources:

The following lesson plan is available on the internet at
http://www.iit.edu/~smile/ma9103.html

Effective Use of Living Space

William L. Brown

Parkside Community Academy
6938 South East End
Chgo., Il. 60649
(312)-535-0940 or 0941

Objectives:

Students will be able to measure the area of a room.
Students will be able to measure various objects in this room.
Students will be able to place scale model furniture in a room and determine the area occupied.
Students will be able to calculate the percentage of space used.

Materials needed:

Students will need a yardstick, scissors, glue, scrap paper, quad paper and pencil.

Strategy:

Students will use the yardstick and measure the length and width of the room, table, teacher's desk and cabinets.

Instructor will pass out sheets of paper containing shapes resembling living room furniture that has been drawn to scale. The students will place certain pieces on the quad paper and measure the area occupied by the furniture.

Students will determine the amount of the space used and compare it to the total amount of space available and calculate percentage.

STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: Ratios

Math Standard(s) Addressed: Understands the basic concept of a rate as a measure.

Approximate Time Needed for Lesson:
30-45 minutes

Students will engage in:

- ☐ independent activities
- ☒ cooperative learning
- ☐ peer tutoring
- ☒ visuals
- ☒ pairing
- ☒ hands-on activities
- ☐ centers
- ☐ lecture
- ☒ whole group instruction
- ☐ technology integration
- ☐ creating a project
- ☐ guest speakers

Class Starter: Discuss the ratio between girls to boys, girls to the class, and boys to the class with the class. Go over how a ratio is determined.

Objectives: To understand and be able to compute ratios.

Materials: paper and pencil
index cards

Step-By-Step Procedures:

- Brainstorm in cooperative learning groups other applications of the concept of ratios.
- Share and discuss these ratios.
- Write 3-5 ratio problems on index cards and trade with each other.
- Introduce Fibonacci sequence : 1,1,2,3,5,8,13,… (add previous two to get next i.e. 1+1=2, 1+2=3).
- Have students write Fibs (poems based on Fibonacci sequences) using 1 *syllable* for first line, 1 *syllable* for the second line, 2 *syllables* for the third line, 3 *syllables* for the fourth line, 5 *syllables* for the fifth line, etc.
- An example of a Fib is:

Put	your	thinking	cap on now.	Enter my classroom	to learn, have fun, and just say WOW!
1	1	2	3	5	8

Guided/Independent Practice: Show students how ratios are related to any two numbers.

Assessment: Informal assessment of students' participation in discussions and involvement with activity.

Differentiation Ideas:
Have students work in pairs.

Adaptations & Extension Ideas:

- Create ratio of windows to your classroom and project ratio of windows to the entire school. Physically count all windows to check for accuracy of ratio.
- Using poetry magnet boards, students can make other patterns of poems or stories using different number sequences.

Closure: Share answers to various ratio problems by putting them on the board for class consideration. Correct and remediate as necessary.

Connections to other Content Areas: Poetry

Additional Resources: Walt Disney's "Donald Duck in Mathemagic Land" is a good movie for middle school students to learn about the Golden Ratio.

Vocabulary

A **ratio** is a comparison of two numbers. For example; 1 to 3, $\frac{1}{2}$, 5:7.
A **proportion** is two equal ratios. For example; 1:2 = 5:10, 3/4 = 6/8.

The following related activity can be found on the internet at:
http://www.iit.edu/~smile/ma9419.html

"The Golden Rectangle"

Edwina R. Justice
Gunsaulus Academy
4420 South Sacramento Ave.
Chicago IL 60632
(312)535-7215

Objectives (Staff):

Demonstrate a phenomenological approach to teaching mathematics.
Inspire others to use the approach.
Present new (to most participants) concepts.
Reinforce skills.

Objectives (Grades 6-8):

Measure using metric units.
Calculate averages.
Compare and round decimals.
Use calculators.
Examine Fibonacci Sequence and Golden Ratio relationship.
Relate mathematics to real-life situations.

Materials:

Measure in advance and select items whose sides are in the approximate ratio of 1:1.6.

file cards (assorted sizes) envelopes charge plates photos
greeting cards (assorted sizes) invitations pamphlets books
graph paper

Recommended Strategy:

Measure items and calculate the ratio of longer side divided by shorter side.

List quotients on the chalkboard and discuss similarities.

Calculate average.

Measure height and the distance from the top of the head to the middle finger tip with arm extended to one side and calculate the ratio of the two measurements.

Calculate group average.

Compare the ratio of body measurements to the ratio of measured items.

Determine a pattern and complete the sequence:

1, 1, 2, 3, 5, 8, 13, 21, ...
(Additional numbers are optional.)

Calculate the ratio of two successive numbers:

1/1, 2/1, 3/2, 5/3, 8/5, 13/8, 21/13

(The ratio 21/13 equals 1.6154 rounded to the nearest ten-thousandth and represents the ratio of the sides of a golden rectangle.)

Compare the ratio of a golden rectangle to ratios of body proportions and selected items.

Measure sections of layouts in magazines and newspapers and relate to golden rectangle.

Make spirals.

Look for golden rectangles at school, home, and other places.

Performance Assessment:

Groups should look for five pictures or sections of magazines whose dimensions appear to represent the sides of a golden rectangle. Measure and record length and width and calculate the ratio of the sides (to the nearest hundredth). Determine the average for the five items. The teacher should compare the groups' results to the golden rectangle ratio.

The following related lesson can be found on the internet at
http://score.kings.k12.ca.us/lessons/ratio.mars.html

SCORE Mathematics

Ratios, Mars, and the Internet

By

Michael Cragin

Grade Levels: 7th to 9th

Length of project: 3 to 5 days

I. Introduction

Ratios, Mars and the Internet is a simple project that attempts to integrate mathematics and technology. Students are involved in calculating real ratios that exist between the planets Earth and Mars. First, these calculations are completed and reviewed by the teacher. Then the student uses the internet or a simulated internet environment to check their work.

The telecommunication requirements for this project are simple. You will need a computer that has access to the internet. If this is not available you can use a computer that has Netscape and WebWhacker installed on the hard drive.

II. Student Learning

The objectives of this project are straightforward. The student will apply the use of mathematical ratios to a real life situation. They will check their work and develop skills using technology at the same time.

III. Activities

Prior Learning:

Students must have a solid understanding of ratios and how to calculate them before beginning this unit. This unit is recommended as a culminating activity. It should be used after a students have mastered the skills and concepts involving ratio.

Students should also have a basic understanding of how to access the internet. This unit could be used as compliment to an introduction to cyberspace.

Teacher Preparation:

The *Mars Fact Activity Sheet* file has been provided with this project. This activity sheet must be

edited prior to using it. One value from each parameter must be removed for the students to calculate. One option is to remove all *ratio* values. This would allow the students to make simple ratio calculations. The task can be made more challenging by removing a *Mars* or *Earth* value and have the student calculate that.

The *Mars Fact Activity Sheet* can be edited in two ways. The easiest way is probably print out the file and liquid paper the values you wish to remove before duplicating them for your students. You can also make a copy of the file and edit the copy and then print it out. Please be sure to copy of the original file!

Step One: Classroom Activity

Students should have a solid grasp of ratios before starting this activity. First review ratios and how to calculate them. Then pass out the edited copy of the *Mars Fact Activity Sheet* . Assist students and walk around the room as they compute the missing values. Students should not be allowed to go to the next step until they are finished. This can be used as a motivating tool. Students who do not finish or complete this work as homework will be require to finish these calculations *before* exploring the internet.

Step Two: Internet Activity

Students are to access the internet at: *http://nssdc.gsfc.nasa.gov/planetary/factsheet/marsfact.html* . This address is also on the *Mars Fact Activity Sheet* . They will see a complete data table and should check their work. This activity could be part introduction to the internet. If internet access is not available, then you can use Netscape and Webwhacker with the *Mars Facts WebWhacked* folder. This will create a simulated internet environment. Students will be able to check their work without an internet connection.

Extensions:

This activity could be easily integrated with science and/or metrics.

IV. Assessment

Assessment can be as simple as observing how many ratio calculations were correct. I would hope that you would also look at the amount of students who completed their work so they could check their answers on the internet. Was there an improvement in the amount of work completed? Did the use of real data improve student involvement? If you integrated this activity, did the students perform better than they would have otherwise.

V. Resources

You can find extensive information on Mars, Space, and other planets below.

Mars Facts
http://nssdc.gsfc.nasa.gov/planetary/factsheet/marsfact.html

JPL Home Page
http://www.jpl.nasa.gov/

Nasa Home page
http://www.nasa.gov/

European Space Agency Home Page
http://www.esrin.esa.it/

United Nations Space Affairs Home Page
http://ecf.hq.eso.org/~ralbrech/un/un-homepage.html

Canadian Space Agency Home Page
http://www.space.gc.ca

Britain's National Space Centre Home Page
http://www.open.gov.uk/bnsc/main001.htm

National Science Foundation Home Page
http://www.nsf.gov/

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STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: Proportions

Math Standard(s) Addressed: Understands the mathematical concepts of similarity (e.g., scale, proportion, growth rates) and congruency.

Approximate Time Needed for Lesson:
30-45 minutes

Students will engage in:

- ☐ independent activities
- ☐ cooperative learning
- ☐ peer tutoring
- ☒ visuals
- ☒ pairing
- ☒ hands-on activities
- ☐ centers
- ☐ lecture
- ☐ whole group instruction
- ☐ technology integration
- ☒ creating a project
- ☐ guest speakers

Class Starter: Explain the nature of direct relationships and proportions. Take two ratios from the lesson on ratios and test them to see if they are in proportion to one another. Discuss the reasons for wanting to create a ratio that is in proportion to the first one.

Objectives: To be able to understand and use proportion in creating a school building plan.

Materials: paper and pencil,
tape measure
Plastic dolls or action figures.

Step-By-Step Procedures:

- Have students pair up to the number of "dolls" you have available for your use.
- Hand out "How Big is Barbie?" worksheet from www.mathprojects.com/lessons.asp.

Guided/Independent Practice: Model at least two column calculations on worksheet given.

Assessment: Reviewing the "How Big is Barbie?" assignment.

Differentiation Ideas:

- Have students work in small groups if time becomes an issue.
- Have students do either male or female doll.

Adaptations & Extension Ideas:

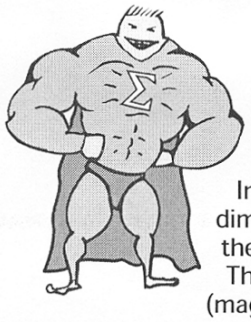
- Count the number of windows in your room, determine proportion of windows to room, extend calculation to school, and then physically count the windows to check your calculation.

Closure: Discuss worksheet results and how one proportion changes all the other measurements (i.e., change of head size changes all from change in height).

Connections to other Content Areas:

Additional Resources:

The following project information and student handout can be found on the internet at www.mathprojects.com/lessons.asp



How Big is Barbie?

Submitted by Greg Rhodes, Trabuco Hills High School, CA

In this activity students will measure various dimensions of a male and a female doll's body and scale them proportionally to average human measurements. They must calculate the appropriate scale factor (magnitude) to enlarge their doll and apply that scale factor to enlarge the other measurements. Once completed, the students will analyze and describe the enlargements, as well as explore the commercial and social implications of the dolls' designs.

Concepts
Ratios, proportions, similarity, measurement, Fundamental Theory of Similarity (optional)

Time: 1-2 days

Materials
An assortment of Barbie dolls and action figures (Batman™, G.I. Joe™, Power Rangers™, etc.) Student Handout

Preparation
Tell the students in advance to bring dolls and action figures on the day of the lab. It helps to offer an incentive for the students (extra credit, etc.) Each group will need one male and one female doll. It will be helpful to have extras on hand.

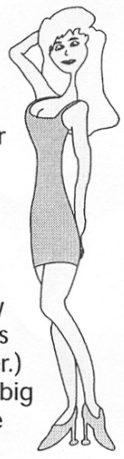
LESSON PLAN

Have students work with a partner or in groups. Instruct them to take the following measurements of both Barbie™ and one male action figure: height, head (circumference), chest, waist, inseam, and foot (length). The measurements are written in the first blank column of each of the charts. The numbers already given in the chart are the average measurements for females and males. The students will use these numbers to calculate their size change magnitudes.

Once students have completed the measurements, walk them through the first conversion, using height to be the first standard. For example, if Barbie is 12 inches tall and the average woman is 65 inches tall, what would the other enlarged measurements be? Divide 65 by 12, to get a ratio of 5.6, then multiply each of the measurements by this ratio. Emphasize that this represents one "possible" body shape. The next conversion will use 21 inches as the standard for the head. Calculate this new ratio and repeat the process. This represents another "possible" body shape.

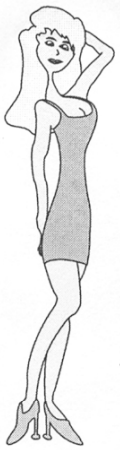
After the walk through, allow the students to complete the chart by calculating the conversions for the other standards. Reinforce that each column is one possible enlargement of the doll and that the body shape enlargements will not always come out looking the same.

To conclude the activity, the students should summarize their findings, and make conjectures in regards to why manufacturers chose the particular proportions of the dolls. There are four questions on the handout to guide the students in their analysis.



TEACHER COMMENTS

- Stress that each column in the chart is considered a different enlargement. Emphasize that for #1, you might be enlarging the doll to an average height, but for #2 you are enlarging the doll to an average head.
- It is helpful to model an example of the lab before the students begin. With a doll and tape measure, show them how to measure the doll's attributes, fill in the chart, calculate the magnitude, and enlarge all the measurements.
- The primary concept here is ratio and proportion, which can be dramatically demonstrated by comparing the bodies represented in each column. For example, at average height, Barbie has a large head with small feet, which means she cannot stand. (She could not at doll size, either.) Given an average foot size, her height is gargantuan, as is her head, yet her feet still are not big enough to support her. This is because each attribute of her body was multiplied by the same ratio; in other words, each body enlargement is proportional to the others.



How Big is Barbie?

If Barbie™ was the size of an average woman and Batman™ an average man, what would they look like?

First, find two dolls or action figures (one male, one female) and measure various attributes of their bodies (see charts below). Second, calculate an appropriate scale factor to enlarge a certain dimension to a certain size. For example, in the chart below, the height of the average male is listed as 72 inches. After you measure your male doll, multiply the figure's measurements by some factor in order to enlarge it to 72 inches. Then use that scale factor to determine the other enlarged measurements. You will perform this process several times for each figure. The numbers provided are the hypothetical average measurements for females and males.

DATA CHARTS

MALE	Doll	Height	Head	Chest	Waist	Inseam	Foot
Ratio							
Height		72"					
Head			23"				
Chest				40"			
Waist					32"		
Inseam						32"	
Foot							11"

FEMALE	Doll	Height	Head	Chest	Waist	Inseam	Foot
Ratio							
Height		65"					
Head			21"				
Chest				36"			
Waist					24"		
Inseam						30"	
Foot							9"

Remember: Each column represents a different possible enlargement of the doll. Look for their distinct characteristics. What makes one different from another?

ASSIGNMENT

Once you have the chart completed, answer the following questions about your data:

1. What are your initial impressions as you look at your results?
2. What would the figures look like if they were real people? Describe each possibility in detail.
3. How do the female's measurements in the height column compare to those in the foot column?
4. Why do you think the figures are designed with such measurements? Do these designs have social impact?

Extra Credit

Option #1: Take measurements of yourself and scale them backwards (reduce them) to determine the dimensions of a doll or action figure modeled after you. Write a paragraph describing what you would look like as a doll. You may also draw a picture to illustrate.

Option #2: Using the given measurements in one of the charts as the "average" male or female, scale the measurements backwards (reduce them) to determine the dimensions of a 12-inch doll or action figure with proportional measurements. Then compare the doll with your original doll's measurements and write a paragraph explaining the similarities and differences.

The following activities can be bound on the internet at
http://fcit.usf.edu/math/lessons/activities/basebalT.htm for the teacher notes and
http://fcit.usf.edu/math/lessons/activities/basebalS.htm for the student worksheet.

Baseball Proportion: Teacher Notes

Math Abilities

Conceptual Understanding

Proportional Reasoning
Scale Factor
Similarity

Procedural Knowledge

Solve Proportions

Process Standards

Problem Solving
Reasoning
Communication
Connections
Representation

Hook

Have one student model a batting stance with a regulation size baseball bat. Have another student model the batting stance with a souvenir miniature baseball bat. Ask the class, "Why does the student with the souvenir bat look so funny?"

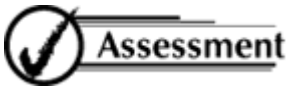
Group Arrangement

Students work in individually or in pairs

- 1 regulation-sized baseball bat
- 1 souvenir miniature baseball bat
- 1 piece of posterboard for each student
- 1 metric measuring tape for each student

1. Measure the length of the regular bat in centimeters.
2. Measure the length of the souvenir bat in centimeters.
3. Measure the height of the student holding the regular bat.
4. Determine how tall a person should be in order to be proportional to the souvenir bat.
5. Using the posterboard, draw a person the correct height.
6. Have students show their work and/or explain in words the process for determining the correct height of the figure on the posterboard.

As a result of this activity, students learn to use ratios and proportions to solve real world problems involving models and drawings.



Rubric (4 points):

- Assignment is completed on time.
- Figure's height measures within 0.5 cm of the correct height.
- Written explanation shows good thinking and calculations are correct.
- Poster board figure is neat and creative in design.

Baseball Proportion: Student Worksheet

Name: _____

Hook

Have one student model a batting stance with a regulation size baseball bat. Have another student model the batting stance with a souvenir miniature baseball bat. Ask the class, "Why does the student with the souvenir bat look so funny?"

Group Arrangement

Students work in individually or in pairs

Tools

- 1 regulation-sized baseball bat
- 1 souvenir miniature baseball bat
- 1 piece of posterboard for each student
- 1 metric measuring tape for each student

Procedure

1. Measure the length of the regular bat in centimeters.
2. Measure the length of the souvenir bat in centimeters.
3. Measure the height of the student holding the regular bat.
4. Determine how tall a person should be in order to be proportional to the souvenir bat.
5. Using the posterboard, draw a person the correct height.
6. Have students show their work and/or explain in words the process for determining the correct height of the figure on the posterboard.

Math Connection

As a result of this activity, students learn to use ratios and proportions to solve real world problems involving models and drawings.

Assessment

Rubric (4 points):

- Assignment is completed on time.
- Figure's height measures within 0.5 cm of the correct height.
- Written explanation shows good thinking and calculations are correct.
- Poster board figure is neat and creative in design.

STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: Energy and How It Is Measured

Math Standard(s) Addressed: Understands formulas for finding measures.

Approximate Time Needed for Lesson:
30-45 minutes

Students will engage in:

- ☒ independent activities
- ☐ cooperative learning
- ☐ peer tutoring
- ☐ visuals
- ☒ pairing
- ☐ hands-on activities
- ☐ centers
- ☐ lecture
- ☒ whole group instruction
- ☐ technology integration
- ☐ creating a project
- ☐ guest speakers

Class Starter: Brainstorm and create a web on energy and its many forms. See attachment of Intro to Energy from www.need.org/energyinfo.php.

Objectives: To learn about different types of energy and how to measure them.

Materials: pencils and paper
worksheet
web site attachments

Step-By-Step Procedures:

- Put major energy measuring terms on board.
- Using formulas to find different measurements, talk about measuring consumption.
- Complete worksheet attached using formulas discussed.

Guided/Independent Practice: Model formulas on board for students.

Assessment: Informal assessment based on group discussion participation and activity completion.

Differentiation Ideas:

- Have students work in small groups or in pairs.
- Reduce number of problems needed to be solved for completion.

Adaptations & Extension Ideas:

- Play the "Energy" game at: http://www.bpa.gov/corporate/kr/ed/sold/energy/45/nergy.pdf

Closure: Lead a discussion on energy conservation and how important that is in our world. See "Efficiency and Conservation" from www.need.org/energyinfo.php.

Connections to other Content Areas:

Additional Resources: The following information can be found on the Internet at http://www.need.org/energyinfo.php: Suggested selections for this lesson: Energy Smart Schools http://www.eere.energy.gov/buildings/info/publications.html Intermediate Intro to Energy, Intermediate Measuring Electricity; Intermediate Consumption; Intermediate Energy Efficiency http://www.energystar.gov

Solving for Variables in Formulas

Name:_____

Find the value of the variable requested in each problem.

1) $P = 2(l + w)$
Find P when *l* = 4.1 and *w* = 3.8

2) $P = 2(l + w)$
Find *l* when P = 20 and *w* = 2

3) $d = r \times t$
Find *d* when *r* = 35 and *t* = 2.5

4) $d = r \times t$
Find *t* when *r* = 11 and *d* = 38.5

5) $E = P \times t$ (Energy = Power × time)
Find *E* when *P* = 100 and *t* = 5

6) $E = P \times t$
Find *P* when *E* = 500 and *t* = 750

7) $A = l \times w$
Find *A* when *l* = 35 and *w* = 32

8) $A = l \times w$
Find *w* when *A* = 22220 and *l* =200

9) $E = \frac{1}{2} m \times v^2$ $(KineticEnergy = \frac{1}{2} mass \times velocity^2)$
Find E (measured in joules)
when *m* = 1.5 and *v* = 4

10) $E = \frac{1}{2} m \times v^2$
Find *m* when *E* = 27 and *v* = 3

Solving for Variables in Formulas

Name: ANSWER KEY

Find the value of the variable requested in each problem.

1) $P = 2(l + w)$

Find P when *l* = 4.1 and *w* = 3.8

P = 2(4.1 + 3.8)

P = 2(7.9) = **15.8 units**

2) $P = 2(l + w)$

Find *l* when P = 20 and *w* = 2

20 = 2(l + 2)

20 = 2 l + 4

16 = 2 *l*

l = **8 units**

3) $d = r \times t$

Find *d* when *r* = 35 and *t* = 2.5

d = 35 x 2.5

d = 87.5 units

4) $d = r \times t$

Find *t* when *r* = 11 and *d* = 38.5

38.5 =11 t

t = 38.5/11= **3.5 units**

5) $E = P \times t$ (Energy = Power × time)

Find *E* when *P* = 100 and t = 5

E = 100 x 5

E = 500 units

6) $E = P \times t$

Find *P* when *E* = 500 and t = 750

500= 750 *t*

t = 500/750 = .66 units (or 2/3 units)

7) $A = l \times w$

Find *A* when *l* = 35 and *w* = 32

A = 35 x 32 = 1120 square units

8) $A = l \times w$

Find *w* when *A* = 22220 and *l* =200

22220 = 200 w

W = 22220/200 = 111.1 units

9) $E = \frac{1}{2} m \times v^2$ $(KineticEnergy = \frac{1}{2} mass \times velocity^2)$

Find E (measured in joules)

when *m* = 1.5 and *v* = 4

E = $\frac{1}{2} * 1.5 * 4^2 = \frac{1}{2} * 1.5 * 16$ = 8 * 1.5 = 12 joules

10) $E = \frac{1}{2} m \times v^2$

Find *m* when *E* = 27 and *v* = 3

27 = $\frac{1}{2} m * 3^2$

$(\frac{2}{9})27 = \frac{1}{2} m * 9 (\frac{2}{9})$

$\frac{54}{9} = m$

m = 6 units

STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: Conversion of Measurement

Math Standard(s) Addressed: Solves problems involving units of measurement and converts answers to a larger or smaller unit within the same system.

Approximate Time Needed for Lesson:
30-45 minutes

Students will engage in:

- ☐ independent activities
- ☒ cooperative learning
- ☐ peer tutoring
- ☒ visuals
- ☐ pairing
- ☒ hands-on activities
- ☐ centers
- ☐ lecture
- ☐ whole group instruction
- ☐ technology integration
- ☐ creating a project
- ☐ guest speakers

Class Starter: Have students form small groups. Instruct them to measure the length of the one wall, the width of the door, the depth of a bookcase any way they want. Display result on board. Discuss and model converting all measurements to metric measurements and the algebraic process for this.

Objectives: To be able to understand and compute measurements using the metric system.

Materials: ruler with metric scale, thermometer, pencil and paper, index cards

Step-By-Step Procedures:

- Students in their groups will measure five items using both measuring systems.
- Students will put all information on an index card including identifying the item.
- Facilitator will draw cards and using measurement as the only descriptor, have the students guess the item.
- Students will take room temperature at four location (high and low temps in each of two classroom locations and compare the results.
- Discuss why the temps are different between the high and low spots
- Deciding what is an ideal recommended temperature of an occupied classroom, students will discuss how their classroom can be heated/ventilated to achieve the recommended temperatures.

Guided/Independent Practice: Model conversion formulas on board for students.

Assessment: Informal assessment of all students based on participation in activity above

Differentiation Ideas:

- Students may work in pairs with each student using a different measuring system.

Adaptations & Extension Ideas:

- Students will measure all components of the classroom using metric measurements and present them to the class prior to beginning their room sketches.

Closure: Lead discussion in the purpose of metric system and why it is necessary to be able to convert from one system to another.

Connections to other Content Areas:

Additional Resources:

http://math.about.com/gi/dynamic/offsite.htm?zi=1/XJ&sdn=math&zu=http%3A%2F%2Fwww.searchthingy.com%2Farea.htm
http://math.about.com/gi/dynamic/offsite.htm?zi=1/XJ&sdn=math&zu=http%3A%2F%2Fwww.aaamath.com%2Fmea.html
http://www.cehn.org

Conversion of Measurement Scales

Formula for converting between temperature scales: $F = \frac{9}{5} C + 32$

Substitute the Celsius (or Farenheit) temperature into the formula and solve for the value of the other.

Example 1
Convert 86° F to the equivalent temperature in degrees Celsius.

$F = \frac{9}{5} C + 32$

$86 = \frac{9}{5} C + 32$
$-32 \quad\quad -32$

$54 = \frac{9}{5} C$

$\frac{5}{9} \times \frac{54}{1} = \frac{5}{9} \times \frac{9}{5} C$

$\frac{270}{9} = C$

$30 = C$

Example 2
A comfortable classroom temperature is 25° C.
What is the equivalent Farenheit temperature.

$F = \frac{9}{5} C + 32$

$F = \frac{9}{5} \times 25 + 32$

$F = \frac{225}{5} + 32$

$F = 45 + 32$

$F = 77°$

****

To convert between inches and centimeters, use this conversion fact: 1 in = 2.54 cm

****

Use this conversion strip to convert between metric units:

kilo- 1000	hecto- 100	deka- 10	UNIT 1 meter, liter, gram	deci- 0.1	centi- 0.01	milli- 0.001

Example 1: 2.5 km = _____ m Since you have to "jump" 3 spaces to the RIGHT on the conversion strip, the decimal point In the number 2.5 must "jump" 3 spaces to the right also, resulting in the number 2500.

Example 2: 8,000 mg = _____g Since you have to "jump" 3 spaces to the LEFT on the conversion strip, the decimal point in the Number 8000 has to "jump" 3 spaces to the LEFT also, resulting in the number 8.

Example 3: 580,000 cm = _____km Since you "jump" 5 spaces to the LEFT on the strip, move the decimal point 5 spaces to the LEFT also, resulting in the number 5.8

STEM and Visual Arts Connections To Green Schools

Grades 5-8

LESSON TITLE: How to make a 3D Model

Math Standard(s) Addressed: Understands the defining properties of three-dimensional figures; understands the relationship between two- and three-dimensional representations of a figure.

Approximate Time Needed for Lesson:
30 – 45 minutes

Students will engage in:

- ☒ independent activities
- ☒ cooperative learning
- ☐ peer tutoring
- ☐ visuals
- ☐ pairing
- ☒ hands-on activities
- ☐ centers
- ☐ lecture
- ☒ whole group instruction
- ☐ technology integration
- ☒ creating a project
- ☐ guest speakers

Class Starter: Begin by showing students a two-dimensional drawing followed by a three-dimensional object. (This could be as simple as a picture of a ball and a real ball). Discuss the differences between two- and three-dimensional objects.

Objectives: To make a three dimensional model from a two dimensional drawing.

Materials: picture of ball, ball, paper pencil, Styrofoam, cardboard, any building/art materials, craft items (i.e., wood sticks).

Step-By-Step Procedures:

- Using any and all materials available for use, build a three dimensional model of the two dimensional drawing.
- Keep in mind both scale and accuracy in making your model.
- Review and check your model for proportions and attention to detail.

Guided/Independent Practice: Take wood sticks and create a cube from a drawing of a square.

Assessment: Completion and review of three-dimensional model.

Differentiation Ideas:

- Have students work in pairs or small groups.
- Have students working in groups work on one project at a time to completion.

Adaptations & Extension Ideas:

- Have students complete their narratives on the planning process, learning environment, physical environment and have them start a narrative on the community's involvement in the project.

Closure: Display all three dimensional models for viewing by all students.

Connections to other Content Areas:

Additional Resources:

Middle School Math Connections To School Building Week

Grades 5-8

LESSON TITLE:

Math Standard(s) Addressed:

Approximate Time Needed for Lesson:

_____

Students will engage in:

- ☐ independent activities
- ☐ cooperative learning
- ☐ peer tutoring
- ☐ visuals
- ☐ pairing
- ☐ hands-on activities
- ☐ centers
- ☐ lecture
- ☐ whole group instruction
- ☐ technology integration
- ☐ creating a project
- ☐ guest speakers

Class Starter:

Objectives:

Materials:

Step-By-Step Procedures:

Guided/Independent Practice:

Assessment:

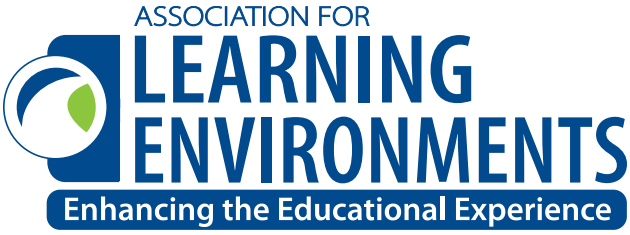
Differentiation Ideas:

Adaptations & Extension Ideas:

Closure:

Connections to other Content Areas:

Additional Resources:



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Enhancing the Educational Experience

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