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Hands on Academics

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

Understanding and Goals

Unit Understandings, Themes, and Concepts:

Enduring Understandings:

Students will learn how English, Math, Science, and Social Studies are directly related to their career choice.

Primary Learning Goals:

Essential questions:

- How could your future career relate to Science?
- How could your future career relate to Math?
- How could your future career relate to English?
- How could your future career relate to Social Studies?

Students with disabilities:

For students with disabilities, each instructor should refer to the student's IEP to be sure that the accommodations specified in the IEP are being provided within the classroom setting. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation within any given instructional activity or requirement.

Hands-On-Academics™

Helping students connect learning to real life

Entrepreneur

Entrepreneur

Career Pathway: Business and Administration

Correlated with the U.S. Department of Education Career Clusters

Educational Purpose

For all students: to explore careers, to think critically
For academic students: to connect academic theory with career skills
For career students: to connect careers with English, math, science, social studies

Student Issue - Table of Contents

Instructor's Guide - Table of Contents

Dream Maker

"Entrepreneurs come from every educational and social background. They often create their businesses in order to fulfill a dream, express their talent, or turn their innovative idea into a product or service. Some of the entrepreneurs in your community are scientists, inventors, artists, designers, and engineers who have developed a company around an idea."
- Entrepreneur

Career Information

What I do every day
Running my own company means I make the decisions that determine its success or failure. It's up to me to oversee all of the business operations - from the office, to production and sales, to the loading dock. Hiring the right people for the right jobs, developing marketing plans, and evaluating management strategies are also my responsibility. At the same time, I have to stay informed about changes in the marketplace and what my competitors are doing. Because my product is unique, my company has to do things in new ways. Trouble shooting the problems that arise takes a lot of my time.

The best part of my job
It is motivating to see my ideas working well. The successes I have along the way encourage me to create new products and methods that will expand my business.

The worst part of my job
Sometimes it seems like there are too many problems to be solved. I worry a lot that my ideas won't work. I put myself under enormous pressure to succeed. I also feel responsible for the people who depend on me for employment. If I'm not successful, they'll have to find new jobs.

How I prepared for my job
During high school, I had a part-time job in the industry that I work in now. After I graduated from high school, I served an internship and then was hired full time at the same company. While gaining experience and knowledge of the business, I began to have ideas about new products and better ways to do things. I decided to start a business of my own. I asked for advice from other successful entrepreneurs, and they helped me develop a business plan. My business plan persuaded people to invest in my company.

How I could have prepared better
People always tell me that I'm a dreamer. Coming up with ideas is easy for me, but until I started my company, I didn't realize how difficult it is to turn an idea into a profitable business. I know everything there is to know about my products, and my work experience gave me a strong understanding of the market. But I have to rely on other people to manage the finances of my company. I wish I had taken some accounting and economics courses.

Education required: **Minimum of a high school diploma to a graduate degree**

Suggested Courses: **Math, business, accounting, economics, computing, specialized training**

Entrepreneurs tend to have the following characteristics:

- **Initiative**
- **Self-motivation**
- **Imagination**
- **Desire to learn**
- **Problem solving ability**
- **Risk-taking personality**
- **Curiosity**

***Salary Range*:** **Less than $10,000 to $100,000 or more**

***Related Jobs*:** **Corporate research and development, designer, inventor, business advisor**

Occupational Outlook: **Small businesses account for the fastest-growing segment of the economy. Entrepreneurs are found in every field.**

Career Vocabulary

biotechnology - applying the principles of engineering and technology to the life sciences

business plan - a document prepared by a company's management detailing the past, present, and future of the company

DNA - the genetic material that determines individual hereditary characteristics

entrepreneur - a person who organizes, operates, and assumes the risk for a business venture

free enterprise - an economy in which businesses and consumers are free to invest their resources in any desired business activity without government restriction, regulation, or control

gross income - sales, or income, before taxes and operating expenses are paid

market - the organized exchange of goods and services

microchip -a small crystal of material, such as silicon, that conducts electricity, and is built to carry out a number of electronic functions. Also called a semiconductor, microchips are used in computers and other electronic devices such as telephone answering machines and video game machines.

monopoly - a market where a single seller of a product has no competition and is able to control the price and the quantity of a product

operating expenses - the day-to-day expenses of running a business such as utility bills, payroll, and office supplies

patent - the exclusive right, granted by the government, to make use of an invention or process for a specific period of time, usually 14 years

pharmaceuticals - drugs, medications

philanthropist - a person who seeks to promote the welfare of mankind through charitable activities

government subsidy - a payment from the government to individuals or businesses without any expectation of a return

Math Activity

After meeting while working for Acme Landscaping last summer, Jamal and Cheryl are considering starting their own lawn cutting business next summer. They think they will make more money working for themselves, but they aren't sure.

They have to consider the following factors:

- **What is the potential income for their business?**
- **What expenses will they have?**
- **How much money can each of them make from the business?**
- **Can they make more money as entrepreneurs or as employees of Acme Landscaping?**

Determine how much money Jamal and Cheryl can make working for themselves and compare this to their wages at Acme Landscaping. Make your recommendation about whether they should start a lawn cutting business.

Part I Potential Income

Based on their past experience at Acme Landscaping, Jamal and Cheryl believe they can work as a team at least 18 days per month and 6 hours per day. Though it is possible for them to work longer some days, common sense tells them that rain will interfere with their schedule and that they will need time to travel between jobs, take short breaks, and eat lunch.

How much potential income can Jamal and Cheryl's business generate in one month if they charge $20 per 1/4 acre and, mowing together, they can cut 1/4 acre in 20 minutes?

There are many ways to arrive at the answer. Follow the steps listed below or find a faster method using your own calculations. Show all of your work.

A. How many hours will the team spend cutting lawns in one month?

_____	X	_____	=	_____
Work days per month		Work hours per day		Work hours per month

B. How many acres can the team cut in one month?

_____	X	_____	=	_____
Work hours per month (From Part A)		Acres mowed in one hour (60 / 20 Minutes X 1/4 acre)		Acres per month

C. How much money can the team make before expenses in one month? This amount is called Gross Income.

$_____ X _____ = $_____

Income per acre ($20 X 4) | Acres per month (From part B) | Gross income per month

Part II Expenses

Owning a small business would be an easy way to make money if all the income could be kept. However, a major portion of the money that comes in must go back out to pay expenses. To determine whether Cheryl and Jamal's business will be profitable, they must first calculate their expenses.

A. Investment

1. Before starting their business, Jamal and Cheryl will have to invest money in equipment, supplies, and advertising. These are one-time expenses. What will their initial investment be?

Item	Price	Total per Item
2 Used professional power mowers	$285 each	$_____
2 Weedwhackers	$139 each	$_____
1 Leaf/grass blower	$179	$_____
500 Advertising flyers	$ .025 each	$_____
4 Pairs work gloves	$2.99 pair	$_____
150 Preprinted billing invoices (50 per box)	$6.99 box	$_____
	Total Investment	$_____

2. Jamal and Cheryl plan to pay for their initial investment expenses on a monthly basis over the 3 1/2 month cutting. What amount will they pay each month?

$_____ / 3.5 = $_____

Total Investment | Monthly repayment of investment

B. Operating Costs

The day-to-day costs of running a business are called Operating Expenses. These expenses are ongoing and must be paid every month.

1. Cheryl's family has offered to let the business rent its pickup truck to haul the equipment and to travel to jobs. Jamal and Cheryl have agreed to a rental fee that is 6% of their gross income (see Part I C). How much rent will be paid on the truck in one month?

Truck rental per month $_____

2. Jamal's family is allowing the team to use its telephone service, answering machine, and fax machine. In return, Jamal and Cheryl will contribute $15 toward the monthly telephone bill and $5 a month toward paper for the fax machine. How much money will Jamal and Cheryl pay for equipment use?

Equipment use per month $_____

3. Jamal and Cheryl have decided on the following monthly maintenance schedule for the lawnmowers.

Item	Cost
1 oil change per machine, 1 qt. of oil @ $6.99 per Qt.	$_____
1 oil filter per machine @ $7.79 each	$_____
2 blade sharpenings per machine @ $7.50	$_____
1 fuel filter per machine @ $5.99 each	$_____
Maintenance cost per month	$_____

4. Jamal and Cheryl estimate that they will travel 35 miles per day. The pickup truck can travel 15 miles on one gallon of gas (15 mpg). Currently, gasoline costs $1.19 per gallon. What will be the monthly fuel costs for the pickup truck?

_____ / _____ = _____
Miles traveled per day | Miles per gallon (mpg) | Gallons used per day (Round to two decimal places)

_____ x _____ = _____
Gallons used per day | Workdays per month | Gallons used per month (Round to two decimal places)

_____ x $_____ = $_____
Gallons used per month | Fuel price per gallon | Truck fuel costs per month

5. Each lawnmower uses 1/3 gallon of gasoline per hour. If gasoline costs $1.19 per gallon, how much will it cost to operate both lawnmowers for a month?

_____ x _____ x 2 = _____
Hours per day | Gallons used per hour | Gallons used per day

_____ x _____ = _____
Gallons used per day | Workdays per month | Gallons used per month

_____ x $_____ = $_____
Gallons used per month | Fuel price per gallon | Mower fuel costs per month

6. Calculate the total of the monthly operating expenses presented in Part II B1-5.

Truck Rental $_____

Telephone, Fax $_____

Lawn mower maintenance $_____

Truck fuel costs $ _____

Lawn mower fuel costs $_____

Monthly operating expenses $_____

Part III Jamal and Cheryl

A. Calculate the gross income for Jamal and Cheryl's business for the 3 1/2 months of the lawn-cutting season.

$_____ x 3.5 months = $_____
Gross monthly income (Part I C) — Gross income for 3.5 months

B. Calculate the expenses for Jamal and Cheryl's business for 3 1/2 months. Include both the monthly cost of their investment and their operating costs.

$_____ + $_____ x 3.5 months = $_____
Monthly cost of investment (Part II A2) — Operating costs (Part II B6) — Expenses for 3.5 months

C. Deduct these expenses from Jamal and Cheryl's gross income to determine how much money before taxes the team can make if they work for themselves this summer.

$_____ - $_____ = $_____
Gross income for 3.5 months — Expenses for 3.5 months — Team income for 3.5 months

D. Divide by two to determine how much money each person will make for the summer.

$_____ / 2 = $_____
Team income — Individual income for summer

E. Divide the individual income for summer by 3.5 to determine how much each person will earn before taxes each month.

$_____ / 3.5 = $_____
Individual income for summer — Individual income per month

Part IV Is It Worth It?

Acme Landscaping paid Jamal and Cheryl $12.00 an hour as employees. If they work the same number of hours for Acme as they plan to work for themselves, they will each earn $1296 per month before taxes. Compare their income as entrepreneurs with their income at Acme. Should they become their own bosses? What issues other than income should influence their decision?

(Note: Additionally, taxes of approximately 27% have to be paid, whether Jamal and Cheryl work for themselves or for Acme.)

Science Activity

In the U.S., scientists are often entrepreneurs as well. They may own or be a partner in a company that discovers a cure or treatment for a virus such as HIV, or they may discover a gene therapy that will eliminate a disease like Alzheimer's. They may create a material that resists earthquakes and explosions, or they may invent a new product.

Thomas Edison, who invented the light bulb, was an entrepreneur. Benjamin Franklin, who experimented with electricity, was a scientist and entrepreneur.

Part I The Ozone Layer - The Earth's Sunscreen

By now, almost everyone has heard about the hole that exists in the earth's ozone layer. Scientists agree that certain man-made chemicals have depleted the ozone layer to levels that present a danger to our environment.

One example is refrigerants, such as those found in air conditioners. Entrepreneurs in science are racing to discover, patent, and market new chemical compounds and materials to replace refrigerants.

Assume you are the owner of a start-up company that produces refrigerants. Your business activities are limited by international treaties governing the use of ozone-depleting agents. In order to comply with new international standards, you must make sure that your product does no harm to the ozone layer. Test your knowledge of the ozone layer by filling in the blanks below.

1. Describe the ozone layer and it's function.

_____

_____

2. Identify three natural phenomenons that affect the ozone layer.

a. _____

b. _____

c. _____

3. Depletion of the ozone layer allows more ultraviolet rays from the sun to reach the surface of the earth. List some of the harmful effects of ultraviolet rays on people, animals, plants, and materials.

a. People: _____

b. Animals: _____

c. Plants: _____

d. Materials: _____

4. Name the man-made chemical compound that has been found to be the most damaging to the ozone layer and describe how this damage occurs.

_____

_____

_____

5. Do scientists think the hole in the ozone layer can be fixed? Explain your answer.

_____

_____

_____

Web sites:

For information on the ozone layer and our environment, visit
http://www.epa.gov/docs/ozone/
The Environmental Protection Agency

Take the Ozone Hole Tour
http://www.atm.ch.cam.ac.uk/tour/
University of Cambridge Center for Atmospheric Science

How did the ozone layer form in the first place?
Formation of the ozone layer
http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/ATM_CHEM/ozone_formation.html

Part II Viruses – Wanted Dead or Alive

Entrepreneurs and government agencies spend millions of dollars to develop vaccines to fight deadly disease epidemics caused by viruses. Influenza, HIV, Ebola, smallpox, rabies, herpes, polio, and the common cold are caused by viruses. Successful treatments, when patented and marketed, are worth fortunes to their creators.

Though you may have earned many advanced degrees, as an entrepreneurial scientist you will often rely the on basic knowledge about viruses that you learned as a young student. After reading the statements below about viruses, write a T or F to indicate whether each statement is true or false.

1. Viruses live independently of other organisms. _____

2. All viruses appear to be harmful. _____

3. You can treat a virus with antibiotics. _____

4. A virus can infect every living thing, including bacteria. _____

5. The genetic material of all viruses is the same. _____

6. Viruses cannot copy themselves without a living host cell. _____

7. Viruses can adapt to their environment and copy themselves quickly, mutating into new strains. ____

8. Viruses can be used to destroy harmful cells. _____

9. Two or more viruses can exist together in a host cell, and, while copying themselves, resort their genetic material to form a new virus. ____

Web sites:

What the heck is a virus?
http://people.ku.edu/~jbrown/bugs.html
This very readable Web site includes
What the heck is the flu?
and many others
Kansas University

Harvesting Bugs
http://www.news.cornell.edu/releases/Sept97/BugPharm.bpf.html
Using viruses to create pharmaceuticals
Cornell University

Just for Fun

Scientist-entrepreneurs do things today that seemed like science fiction not long ago. For example, they've developed artificial "legs" so technologically advanced that athletes without limbs use them to run races; they've developed contact lenses that allow us to change our eye color in moments and hair color in not much longer.

One area of great entrepreneurial growth is gene therapy, an area that encourages some entrepreneurs to dream of stopping the aging process or allowing parents to select specific genes they want to pass on to their children. Through genetic research, they've already cloned a sheep named Dolly, who has exactly the same genetic makeup as her mother. If these scientist-entrepreneurs are successful in their genetic research, what might our descendants look like in five hundred years? How might they be different from us?

What problems will scientist-entrepreneurs solve and what problems will they create if they continue with genetic breakthroughs? Use your imagination to visualize the future.

Make a list of the possible characteristics of a human being in the year 2502. List what you believe would be the goals and challenges of this human.

Characteristics of a Human in 2502 A.D.	The Goals of a Human in 2502 A.D.	The Challenges of a Human in 2502 A.D.

Social Studies Activity

For Better or Worse

The Marriage of Government and Free Enterprise

Entrepreneurs thrive in a competitive environment. They are often the pioneers in their field, creating jobs and wealth for society. The U.S. is considered the greatest example in the world of a free enterprise system. The economic wealth of the U.S. appears to prove the point that countries flourish and prosper when entrepreneurs use their creative talents and then profit from their initiative.

One thing many entrepreneurs dislike is government interference and regulation. Our country struggles to maintain a balance between free enterprise and government restrictions that are designed to protect citizens and the environment.

Unchecked entrepreneurism has threatened U.S. society many times throughout history. During the industrial revolution, aggressive entrepreneurs, called "robber barons," built business empires that controlled important industries, such as the railways, banks, and the oil and coalmines. These empires grew so powerful that there was no opportunity for competition. Factories known as "sweat shops" had intolerable working conditions. Whole families labored in mines for barely enough money to exist, no medical care, and slim hopes of ever improving their lives.

Because of that era, the U.S. government started protective programs for workers, such as the minimum wage, child labor laws, and the social security retirement fund. Other laws assure that no single individual or company can monopolize an industry. The Environmental Protection Agency and the Food and Drug Administration are modern examples of government agencies designed to regulate and control companies in order to protect the people.

Some entrepreneurs believe this government protection is too much - that it tends to upset the balance between competition and government.

Part I

Following are some of the industries and resources that are vital in our daily lives. Divide into small groups of two or three. Choose one of the following industries or resources to research, and then present a short report on government restrictions and free enterprise in that industry.

Answering the following questions will help with your report:

- **Is this industry owned by entrepreneurs and for-profit companies or run by the government?**
- **Does the government regulate this industry? If so, list the types of regulations and the reasons for them. Identify the agencies that enforce these regulations.**
- **If this industry is privately owned, has the government ever provided financial subsidies or used taxpayer money to "bail out" the industry when it ran into difficulties? Give an example and the reason for government intervention.**

- **In your opinion, should the government exercise some control over this industry for the good of society?**
- **Identify at least one entrepreneur who is responsible for an important advancement in this industry and describe the contribution he or she made.**
- **In your opinion, is entrepreneurship necessary for progress in this industry?**
- **Would you want to be an entrepreneur in one of these areas? How would your business activities be affected by the government?**

Choose from the following Industries/Resource:
Education
Healthcare
Airlines
Roads, rivers, and airspace
Banking
Pharmaceuticals
The media - newspapers, radio, television and movies
Nuclear power plants
Water
Farming
Guns and military equipment
Computers and software
Automobiles
Telecommunications
Food and beverage
Mining
Biotechnology

Part II

After listening to the presentations, discuss the following items as a class and list the pros and cons of each:

- **Entrepreneurial and for-profit ownership of vital industries**
- **Government ownership of vital industries**
- **Government regulation of entrepreneurial and for-profit ownership of vital industries**

English/Business

Many people dream about starting their own business or creating a new product or technology that will make them rich or famous. Some people just want to be able to do the thing they enjoy the most and earn a living doing it. Entrepreneurs who make their dreams come true inspire us, entertain us, or make our lives or work easier in some way.

Successful entrepreneurs come from all social, political, and educational backgrounds. Pursuing a dream and turning it into reality takes energy, courage, self-confidence, and motivation. Here are some of the well-known entrepreneurs who have contributed to the lifestyle we enjoy.

Choose an entrepreneur from the list or choose an entrepreneur that you admire, and write a short report about the person's life and accomplishments.

Include the following information in your report.

- **A short biographical sketch of the entrepreneur**
- **A description of the entrepreneur's accomplishments**
- **A discussion about the challenges the entrepreneur faced**
- **Your opinion about whether the entrepreneur was driven more by the profit motive or by a personal passion. Explain why you formed this opinion.**
- **How the entrepreneur affected or contributed to society**
- **Whether the entrepreneur would be a good role model for others and why**

Debbi Fields

Mrs. Field's Cookies
Her husband told her she couldn't sell even $50 worth of cookies

Walt Disney

The Walt Disney Company
One man with one cartoon character created an entertainment giant

Oprah Winfrey

Harpo, Inc.
Once a victim of child abuse, she grew to become "America's first black billionaire" and was selected by *Time* magazine as one of the 25 most influential people in the world.

Bill Gates

Microsoft, Inc.
Entrepreneur, philanthropist - Business legend of the digital age

Martha Stewart

Martha Stewart Living
She turned a passion for making a home comfortable into a very comfortable business.

Wally Amos

Famous Amos Cookies

Entrepreneur, public speaker, literacy advocate, and author
"One person can truly make a difference. If one person has a commitment and belief in their idea, they can succeed. They can overcome anything." Wally Amos

Madam CJ Walker

Entrepreneur, philanthropist, and social activist
America's first self-made African-American woman millionaire
"I am a woman who came from the cotton fields of the south. From there, I was promoted to the washtub. From there, I was promoted to the cook kitchen. And from there, I promoted myself into the business of manufacturing hair goods and preparations... I have built my own factory on my own ground." Madame Walker, National Negro Business League Convention, July 1912

Ben Franklin

America's premiere entrepreneur, scientist, inventor, economist, printer and more
"We see success in our hearts as well as in our minds." Ben Franklin

Steven Spielberg

Amblin Productions
Dreamworks
E.T., Jaws, Schindler's List, Raiders of the Lost Ark and more. Film Director, producer, whose name has become a household word. If Spielberg made the movie, everyone wants to see it.

Buffalo Bill Cody

Wild West Legend, Union scout, author, prospector, buffalo hunter and showman. He put together the entertainment extravaganza of his time and brought the Wild West to Europe.

Web sites:

For information on these famous entrepreneurs and others,
visit
http://womenshistory.about.com/cs/business/
http://entrepreneurs.about.com/cs/entrepreneurs/

Business

Every entrepreneur who wants to start a business, whether small or large, needs a detailed plan to make the idea a reality. Business plans serve three purposes: (1) to provide a description of the business goals, (2) to explain how the goals will be achieved, and (3) to use as a proposal when attempting to obtain money from a bank or other investor.

One of the reasons new businesses fail is that the entrepreneur gets distracted by daily problems, such as filling in for employees who miss work and finding a way to pay bills when cash is low. By referring to the detailed business plan, entrepreneurs can regain their direction.

Identify a business or service that your community needs - or imagine a new video game, toy, or fashion design you might create - then write a business plan that explains how you will start a company around this idea. Follow the business plan outline below. If a topic in

the outline does not apply to your proposed business, eliminate the topic or substitute a more appropriate one. Since two heads are often better than one, you may select a classmate and write a plan for a partnership the two of you will run.

Business Plan Outline

Business Purpose

- **Summarize the key ideas about your business concisely.**
- **Use bullet points or short sentences and paragraphs.**

Part I - The Business

- **Describe the business you will start and the industry it is in.**

a. Will you start a partnership, sole proprietorship, or corporation?
b. What is your business experience?
c. What opportunities exist for expansion in the future?

- **Describe the product or service.**

a. What will you sell?
b. What are the benefits of your product or service?
c. How is your product or service different from the competition?

- **The market**

a. Who are your potential customers? How will your product or service fill their needs?
b. What it the size of the market?
c. Is the market growing?

- **Location**

a. Where will your business be and how will it look?
b. What other kinds of businesses will be located near you?
c. Why did you pick this location?

- **The competition**

a. How many competitors do you have and how large are they?
b. Are their businesses growing?
c. What advantages do you have compared to the competition?

- **Marketing strategy**

a. How will you introduce your product to the market?
b. Where and how will you advertise?
c. How will you make sure that customers are well served?

- **Management structure**

a. Who will be on the team?
b. What experience do team members have?
c. What are the duties and responsibilities of the managers?

- **Employees**

a. How many employees will you need?
b. What skills will your employees need?
c. Is there an available labor pool near your location?

- **Summary**

a. Summarize what you have written.
b. Project your probable success.

Part II Financial Proposal

- **Initial Costs**

a. What funds are available to you?
b. Will you need to borrow money? How much?
c. Where will you obtain the money?

- **How funds will be used**

a. Real Estate
b. Equipment
c. Opening Inventory

- **Provide an analysis of the best you can do and the worst you can do financially in one year.**

Part III Supporting Documents

- **Include materials that will explain your business further.**

a. Brochures and advertising materials
b. Magazine articles about your industry
c. Letters of support from interested customers

- **Add letters of reference from other business owners who know you.**

In the News

Dr. Richard Seelig is now wearing two computer chips implanted in the palm of his hand. Dr. Seelig said he was inspired by the New York firefighters and police officers on September 11, who used black magic markers to write their social security numbers and medical information on their bodies so they could be identified and treated if they were injured or killed.

Applied Digital Solutions is the entrepreneurial company that owns the technology for the microchips worn by Dr. Seelig. The chips are capable of holding about 60 words of information. They can be read by a patented scanner.

This device can contain medical information, emergency telephone numbers or personal identification. One of the applications that Dr. Seelig envisions is the use of these chips and scanners by airlines and airports. Scanners can be placed in doorframes to identify legitimate personnel, such as the pilots who enter the cockpits of planes.

Applied Digital Solutions has also created a chip that is read by a global positioning satellite. The system is known as "Digital Angel". The company is negotiating with prison systems and law enforcement agencies to explore the possibility of using microchips to track the location of convicted felons. Another application would be the placement of chips in children, so they could be located by satellite if they were lost or kidnapped.

As with other creators of new identification technologies, this entrepreneurial company and its potential customers are faced with legal and ethical challenges, especially the issue of privacy.

Classroom discussion: What are the advantages and disadvantages of identification and tracking technology? Should people convicted of a crime be forced to wear tracking devices? Should children and victims of Alzheimer's disease, who are legally not able to give informed consent, have chips implanted in them for their own protection? Would you feel safer if everyone, including you, wore a device like this and could be identified and tracked immediately?

Just for Fun

The Adventures of Applied Digital Solutions

Applied Digital Solutions is a company with innovative ideas, but it hasn't made a lot of money. Its entrepreneurs are willing to risk their money and their careers on the success or failure of their ideas.

Many small entrepreneurial companies sell shares of their business in the form of stocks. They need investors who are also willing to take a risk by helping them finance their business. Applied Digital Solutions is one of the companies that sells shares of its business.

You can find out about the interesting products being developed by Applied Digital Solutions, and you can check on it's success or failure by following the business news about the company and the price of it's stock.

On January 4, 2002, the stock of Applied Digital Solutions was selling for 43 cents a share. There were a number of interesting news articles about their products.

If you visit
http://finance.yahoo.com/
You can type the letters ADSX into the box that asks you to enter a symbol. These letters are the company symbol that has been assigned to Applied Digital Solutions. Yahoo! will provide you with the latest news on the adventures of Applied Digital Solutions.

Workplace Politics and Personalities

Your start-up business is gradually making money. Orders for your product have increased, and you feel confident that your company is headed in the right direction.

One stumbling block in the production has been bothering you. If you could solve this problem, you believe that you could cut the cost of production and improve profits. So far, you have not found a solution.

While you are at a social gathering with friends, you describe the problem to a new acquaintance who suggests an answer to the problem you have been struggling with. Within a week, you have the new idea in place and production is greatly increased.

Do you give credit for this improvement to your new acquaintance? Or do you ignore the fact that someone else gave you this idea?

Related Web Site

Are you cut out to be an entrepreneur?
http://baltimore.bcentral.com/baltimore/stories/1997/07/07/smallb2.html
Baltimore Business Journal
Seven questions to help you decide if you have the qualities of an entrepreneur

---

Challenge Level Activity

A Little Knowledge Can Be A Dangerous Thing

Genetic information about humans is increasing at phenomenal speed. Knowledge made available through genetic testing seems to grow faster than our laws and value systems are prepared to handle. Assume you are an entrepreneur who plans to start a business that gathers, interprets or provides genetic information. Read about each of the three companies described below, and then follow the instructions given.

Entrepreneur 1 - A business that maintains DNA databases

With DNA testing, crimes can be matched to specific individuals through blood or hair samples collected at the crime scene. Convicted felons, who have been imprisoned for years, are being released when new evidence proves that saliva or other DNA located at the crime scene doesn't match their DNA.

When a crime is committed, a tremendous amount of time and money are required for locating suspects and for collecting and comparing DNA samples that can lead to a conviction. Therefore, some experts believe a national database containing the DNA profile of all citizens should be established. The database would help law enforcement agencies identify suspects quickly and efficiently.

Concerned citizens, on the other hand, fear losing their privacy if a database is established. They believe that abuses and mistakes might occur if such a database existed.

As the prospective owner of a company that compiles and maintains the DNA records, prepare a list of guidelines you would insist all your employees follow. Here are some questions to help you get started:

- **Are you aware that DNA samples can be easily contaminated by something as simple as a sneeze?**
- **Who should have access to DNA information?**
- **How would this information be protected from theft and misuse?**
- **How accurate is DNA identification?**
- **What are your company's responsibilities to the public?**

Entrepreneur 2 - A laboratory that identifies genetic diseases in humans

You may have a family member, friend, or acquaintances in your community who has inherited a disease or disability that affects their daily life. Some of these disorders are visible, such as Down's syndrome, dwarfism, Muscular Dystrophy, or Cystic Fibrosis. Other disorders are not easily recognizable, such as the risk of certain cancers, Huntington's disease, or Alzheimer's.

Many entrepreneurial biotechnology companies are inventing tools and processes that can identify a parent's hidden disease and measure the probability of unborn children inheriting the disease. Some parents wish to learn this information so they can plan for children based on what they know. Others fear they will face a life of anxiety if they learn of a potential hidden disease that they may pass on to their children.

Before establishing your laboratory, decide how you feel about genetic testing. Here are some questions to help you get started. Prepare a list of pros and cons about starting this business.

- **Will expensive genetic testing be affordable for most people? What problems will this create?**
- **How do genetic disorders affect society in terms of education, economics, medicine, and personal interaction?**
- **What are the psychological, social, and economic challenges for parents who have children with genetic disorders?**
- **What is the effect of genetic counseling on the extended family, including grandparents, siblings, aunt, uncles, and cousins?**
- **What is the effect of genetic counseling on our religious beliefs and value systems?**
- **What are your company's responsibilities to the public?**

Entrepreneur 3 - Starting a company that develops gene therapies.

In April of 2000, Celera, a private for-profit biotechnology company, beat government scientists in decoding the genetic instructions that make up human beings. These instructions are called the human genome.

Since then, Celera has provided the information they discovered to other biotech and drug companies for a fee. These companies pay to be subscribers to Celera's database of information. Government scientists, whose work is known as the Human Genome Project, continue to decode genetic material, but their information is available free of charge.

Celera, has created an uproar in the scientific community by filing applications with the U.S. Patent office to obtain the rights to thousands of gene sequences that they decoded. Scientists fear that if scientist-entrepreneurs can obtain patents on genes, the free flow of information will be restricted and keep many new discoveries from being made.

Many gene patents have already been granted to a number of companies. Scientists with innovative ideas who want to access this information will have to gain permission, then pay a royalty to use the information. Otherwise, they will face patent infringement lawsuits.

You are the prospective owner of a small company that thinks it may have discovered a revolutionary treatment for a certain type of cancer. Funds are limited, but your scientists need the latest genetic information available.

Should you have to pay a company, or any number of companies, like Celera a fee to use their research results? Divide into two debate teams with your classmates. One team should debate the "No" side of this question, and the other team should debate the "Yes" side. Select a leader to organize each team's activities.

Here are some ideas and questions to consider:

- **All patented discoveries are published and become public knowledge. Without patent protection, private companies are likely to keep their genetic discoveries as trade secrets, making it much harder for scientists to share information and stay informed of advances.**
- **If your private for-profit entrepreneurial company is not allowed to patent genetic discoveries, what will be the incentive for you to continue to advance the science?**
- **If the government spends tax dollars on genetic research, do the discoveries belong to the taxpayers?**
- **Who should own or control genetic code information and how should this information be made available to the scientific community?**
- **Can genetic information and technologies be used as weapons? Who should be allowed access to genetic information?**
- **What are your company's responsibilities to the public?**

Entrepreneur 4 - What line of business are you in?

Assume that you will start a company related to a field of work that interests you. Create a list of the social issues that you will need to address; for example, a chef working in an ethnic restaurant must develop menus that appeal to the customer's cultural tastes, and an entrepreneur opening a video/CD game store in a family-oriented community would need to be selective about the displays.

Make a list of questions you would want to consider before starting your own business. What are your responsibilities to the public?

Instructor's Guide

Entrepreneur

Instructional Objectives

At the end of this Hands-On-Academics™ lesson, students will be able to:

- **Identify the characteristics of an entrepreneur**
- **Describe the process for determining an entrepreneur's income before taxes**
- **Relate career fields of all types, such as those in science, to owning a business**
- **Discuss how government regulations affect free enterprise and entrepreneurship**
- **Describe the accomplishments of one entrepreneur**
- **Write a basic business plan**
- **Examine the balance between personal ethics and business decisions**
- **Express an opinion about owning a company engaged in activities involving complex social issues**

Academic Prerequisites

Basic math, English, science, social studies

Curriculum Correlations

Math

- **Multiply whole numbers and fractions**
- **Divide by whole numbers and decimals**
- **Find percentage**
- **Determine gross income**
- **Calculate investment expenses**

Science

- **Describe the ozone layer**
- **Identify phenomena that affect the ozone layer**
- **Discuss harmful effects of ultraviolet rays**
- **Describe how damage to ozone layer occurs**
- **Show knowledge of viruses**

Social Studies

Basic Activity

- **Describe the impact of government regulation on industry**
- **Compare the balance between government regulation and private enterprise in one industry**
- **Discuss the pros and cons of ownership of vital industries by the government and private companies**

Challenge Level Activity

- **Examine complex issues relating to ownership of biotechnology companies**
- **Establish societal points to consider for the student's preference company**
- **Participate on a debate team**
- **Establish legal and ethical guidelines**

English/Business

- **Research a person**
- **Write a short report**
- **Choose a business to own and write a business plan**

Critical Thinking

- **Look into the future**
- **Identify characteristics of a human in 500 years**
- **Suggest challenges facing humans in 500 years**

In the News

- **Analyze advantages and disadvantages**
- **State opinions**

Workplace Politics and Personalities

- **Consider whether to take credit for another's idea**
- **Decide what is the right thing to do**

Instructional Suggestions

Math

Discuss the following concepts with students:
a. Gross Income – Income before deductions or expenses are taken
b. Net Income – Income remaining after all deductions or expenses and taxes are taken
c. Investment expense – One-time costs that will allow a business to start up or grow
d. Operations costs – The ongoing, day-to-day costs of running a business, including payroll, rent, supplies, utilities, and similar items.
Expand the activity by asking students to calculate the taxes on both their lawn cutting income and Acme income.

Expand the activity by asking students to calculate the percent of total expenses represented by investment expense and operating expense.
Use the formula: Investment Expense *or* Operating Costs divided by Total Expenses

Expand the activity by asking students to calculate the percent of Total Investment represented by each item in Part IIA – Investment.
Use the formula: Item divided by Total Investment.

Science

Ask students to prepare a model of the ozone layer, showing how refrigerants and other ozone-depleting substances endanger the layer.

Run a competition to see which individual student, pair, or team can develop the longest list of ozone-depleting substances. Expand the activity into an additional competition by swapping the lists with other individuals, pairs, or team. Ask the receiving group to provide a correction for the ozone-depleting substance. In each competition, the most correct answers win.

Challenge students to identify one or more viruses that were unknown ten years ago and to explain who made the discovery and what the discovery means to humans.

Ask students with higher-level science skills to complete the Challenge Level activity provided at the end of the student activities.

Just for Fun
Encourage your students to think creatively as part of this exercise. To help them understand what 500 years means in human time, ask them to calculate the number of generations that will be born in the next 500 years. You might require them to develop or draw a time line, with each generation placed on the line, then to write the genetic changes that might occur in each generation. At the end of the timeline, they will have their "new" human and will need to develop this person's goals and challenges.

Finally, ask the students to discuss whether they would prefer to live in the current time or 500 years from now. What are their reasons?

Social Studies

Invite, or ask designated students to invite, an entrepreneur or a panel of entrepreneurs to the classroom to discuss how government regulations affect their businesses positively and negatively.

Alternately, allow students to create a survey of several questions they would like to ask entrepreneurs, then have them mail the survey to a small group of business owners in your community. Make sure that one or more questions relates to government regulation. When the surveys are returned, have the students compile and analyze the information.

Ask students with higher-level science skills to complete the Challenge Level activity provided at the end of the student activities.

English/Business

Set aside time when students will present their entrepreneurial report to the class. Invite them to dress in costume or bring props to represent the entrepreneur's business. For example, a student presenting Famous Amos or Mrs. Field might bring cookies to class, or a student presenting Oprah might bring a few copies of her magazine "O' from the school library. They might also download and print information from the Internet.

Seek volunteers from the class to serve as "bankers" or "investors". Have other student volunteers present their business plan in oral form to the panel. Encourage the remainder of the class to take notes and make suggestions for how the presentation could be improved.

Require students to learn the meanings of "venture capitalist" and "angel investor." Encourage them to search the Internet for names of actual individuals who fall into these categories. A venture capitalist is an investor who places money in new or growing companies with the expectation of making a great deal of money if the companies do well. An angel investor serves the same purpose—providing cash to help with start-up expenses in return for a large payback at some point in the future. Angel investors frequently play a role in the oversight of the company by serving on a formal board of directors or acting as advisors.

In the News

During the discussion, ask a few provocative questions that will build enthusiasm for the topic, such as:

1. What questions would you want to ask before having a tracking device implanted under your skin?

2. Ask students who saw the movie "A Beautiful Mind" to describe how one scene in the movie relates to the issue of tracking devices. (The main character, played by Russell Crowe, thinks he wears an implanted identification chip. At one point during his schizophrenia, he cuts his arm to try to find the device.)

Workplace Politics and Personalities

Ask students to discuss whether taking credit for another's idea is dishonest if no one finds out. Is stealing an idea the same as stealing something tangible?

Related Web site:

The "Hole" in the ozone
Chevron Inc. distributes a FREE video to educators
Visit their Web site to learn about the details.
The Web site also contains printable activity worksheets related to the video.
http://www.chevron.com/community/education/ozone/ozone.shtml
video TG and worksheets

Answers to Hands-On-Academics™ Activities

Math

Part I
A. 108
B. 81
C. $6480

Part II
A 1.
$570
$278
$179
$12.50
$11.96
$20.97
Total $1072.43
2. 306.41 per month

B 1. $388.80
2. $20.00
3. $13.98
$15.58
$30.00
$11.98
Total $71.54
4. 2.33
41.94
$49.91
5. 4
72
$85.68
6. $615.93

Part III
A. $22,680.00
B. $3228.19
C. $19451.81
D. $9725.91
E. $2778.83

Science

The Ozone Layer

1. The ozone layer is a concentration of ozone molecules in the earth's stratosphere. The ozone layer absorbs a large amount of harmful ultraviolet rays from the sun, preventing them from reaching the surface of the planet.

2. a. sunspots

b. seasons
c. latitude

3. a. Cataracts and cancer may develop in humans.
b. Fish, shrimp, crabs, amphibians and other animals are damaged in their early developmental stage and reproduction rates drop; the production of phytoplankton, an important food source for fish, is lowered; eggs and larvae do not develop properly.
c. Crop damage and disruption of natural plant cycles may occur.
d. Polymers used for such things as window frames, siding, and pipes become discolored and their useful properties degrade faster than normal; wool, wood, and paper also become discolored and have a shorter service life.

4. Chlorofluorocarbons (CFC's) have been found to produce severe damage to the ozone layer. CFC's are very stable; they do not combine with water and cannot be broken down by rain. Because of their chemical stability, the atmospheric lifetime of CFC's is long enough for them to be carried by the wind into the stratosphere where they are broken down by ultraviolet rays and release ozone destroying chlorine.

5. Because ozone is constantly being created and destroyed in the stratosphere, scientists believe that the ozone layer can heal itself naturally if given enough time and if we stop contributing to the depletion of the ozone.

Viruses

1. F

2. T

3. F

4. T

5. F

6. T

7. T

8. T

9. T

Social Studies

Part I
The reports will vary depending on the industry selected and the complexity of the research. Check to see that each of the seven questions from the activity are answered.

Part II
The discussion should be well organized, focused, and cover the topic comprehensively.

English/Business

English
The six items of information required in the report should be covered in an organized, interesting manner. The reports should provide a clear understanding of the role the entrepreneur or his or her product or service provide for society.

Business
The type of business chosen will drive the content of the report. Check to see that all aspects of the outline are covered. Pay particular attention to the summary, as it should be succinct, yet informative of the content of the body of the report.

Challenge Activity

Entrepreneur I - The guidelines should be specific and detailed, taking into account the ways that employees could unknowingly create problems, such as switching DNA samples. Accept all guidelines that are thoughtful and relevant.

Entrepreneur 2- Starting a scientific company that deals with social issues carries a large responsibility, as the questions in this example show. The pros and cons should be well conceived, relevant, and thought provoking.

Entrepreneur 3 - The debate points should be well organized and specific. Pros and cons regarding paying a fee for using research results should be clearly communicated. Rambling speeches should not be allowed.

Entrepreneur 4 - A specific field should be identified for analysis of societal issues. The points should be relevant, timely, and thought provoking.

Assessment Plan

Math

From 100, deduct 2.5 points for each question in Parts I, II, and III, leaving approximately 20 points for Section IV. Assign the number of points you believe is appropriate for the answer, based on (1) complex thinking, (2) comprehensiveness of answer, and (3) wisdom of the recommendation.

Science

Basic Activity
From 100, deduct 4 points for each question in Parts I and II.

Social Studies

Basic Activity
Part I
Each of the seven questions in Part I accounts for approximately 14 points in the report. Give point value for each question based on the thoroughness of the answer, the organization of the report, and correct grammar, spelling, and punctuation.

- **Is this industry owned by entrepreneurs and for-profit companies or the government?**

- **Does the government regulate this industry? If so, list types of regulations and the reasons for them. Identify the agencies that enforce these regulations.**
- **If this industry is privately owned, has the government ever provided financial subsidies or use taxpayer's money to "bail out" this industry when it ran into difficulties? Give an example and the reason for government intervention.**
- **In your opinion, should the government exercise some control over this industry for the good of society?**
- **Identify at least one entrepreneur who is responsible for an important advancement in this industry and describe the contribution they made.**
- **In your opinion, is entrepreneurship necessary for progress in this industry?**

Part II
No points are assigned to the class discussion. If you wish to establish the discussion as a debate, use the point assignments from the Challenge Activity.

Challenge Activity

Entrepreneur 1, 2, 3, 4

Assign 100 points to each activity. Evaluate on the following basis allowing approximately 30 points for each item.

- **Thoughtful answers**
- **Points well made**
- **Clear, succinct presentation**

Entrepreneur 3

From 100, deduct 2 points for each mistake made by each debate team. Evaluate for the following items. Each item accounts for approximately 14 points.
Accuracy of information
Debate style
Ability to break a complex subject into simple and clear concepts
Ability to respond to the other's team points
Use of correct grammar
Ability to work as a team
Summary points

English/Business

English
Each of the six parts of the report accounts for approximately 15 points. Give point value for each part based on the completeness of the answer and the effective use of language.

- **A short biographical sketch of the entrepreneur**
- **A description of the entrepreneur's accomplishments**
- **Challenges the entrepreneur faced**
- **Your opinion about whether the entrepreneur was driven more by the profit motive or by a personal passion. Explain why you formed this opinion.**
- **How the entrepreneur affected or contributed to society**
- **Whether the entrepreneur would be a good role model for others and why**

Business
Part I and II of the business plan account for 40 points each. Part III accounts for 20 points. Give point value for each part based on the thoroughness of the answer for the items shown in the outline. Refer to the outline in the student section.

Evaluate for the following items:
Organization
Ability to communicate viewpoint effectively
Grammar
Spelling
Punctuation

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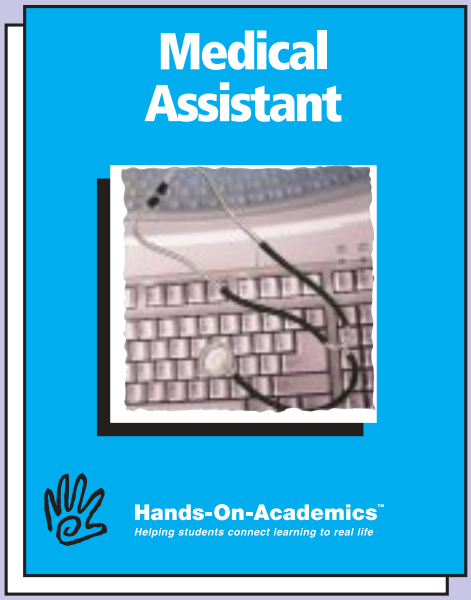

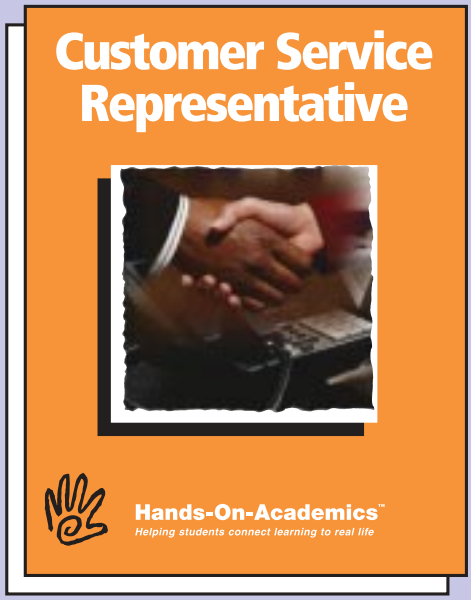

CONTINUE to next page for selected samples from the *Carpenter* Text-Workbook.
For the full content of the *Carpenter* lesson, examine the content of *Carpenter* on the Hands-On-Academics™ CD sample.

Carpenter

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Carpenter

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Table of Contents

Building Blocks

"Look for me where you see the construction of homes and office buildings, highways, bridges, docks, industrial plants, boats, and ships. I'll be using my creativity and skills to cut, fit, and assemble the wood and other materials."

— Carpenter

Career Information—Carpenter

What I do every day

Although my daily routine varies according to where I work, many carpentry tasks involve the same steps. After I review blueprints or receive instructions from my supervisor, I arrange, measure, and mark the materials. I cut and shape the pieces using hand and power tools, and I nail, screw, or staple the pieces together.

To build accurately, I use levels, rules, and framing squares. Without these tools, the finished products would be lopsided and uneven. Sometimes I work with prefabricated components, like stairs or wall panels, which don't require as much layout work and cutting. Specialized carpenters erect scaffolding or create forms for concrete construction, frame walls, install paneling, put in doors, or hang kitchen cabinets.

The best part of my job

I love the way wood looks, smells, and feels. To be part of a team that starts with a set of plans and ends with a great-looking home or building makes me proud.

The worst part of my job

Carpentry work is strenuous, and power saws and carpentry tools can be dangerous. Also, losing work because of bad weather lowers my income, and sometimes it's hard to support my family following big snow or ice storms. Working in tight underground passageways isn't much fun either.

What carpenters need to know and be able to do

Carpenters need a background in shop, mechanical drawing, and applied math. They should know how to lay out, frame, and finish carpentry jobs. They must be able to read blueprints and measure materials. Carpenters who work directly with people need a good personality and good communication skills.

How I prepared for my job

After graduating from a career center where I studied carpentry, I enrolled in an apprenticeship program. I knew an apprenticeship would give me on-the-job training and classroom instruction, so I could learn more about the carpentry trade.

How I could have prepared better

When I'm measuring and figuring how much wood I need, I'm lost without my calculator. I should have tried harder in math. Working with new clients is hard for me, too; so learning how to talk to different types of people would have been valuable experience.

Education required

Carpenters need an apprenticeship, associate's degree, or technical certificate in carpentry.

Carpenters tend to have the following characteristics:

- Manual dexterity
- Hand-eye coordination
- Physical fitness
- Good sense of balance
- Consciousness of safety
- Ability to solve problems

Salary range

$24,000–$47,000

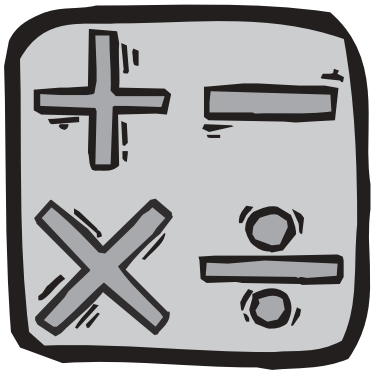
Related jobs

Concrete mason, electrician, plumber, woodworker, tile installer, carpet installer

Job outlook

The outlook is excellent to 2010, due to experienced workers who will leave the field. Well-trained carpenters will have the best opportunities.

Math Activities



Your employer, Randall Builders, has contracted with a homeowner to add a 12' x 16' den to her house. Your supervisor has asked you to calculate the number and cost of 2" x 6" spruce studs you will need for the room with studs 16" on center. The owner's blueprint shows that one wall of the existing home will account for one long side of the den. Therefore, you will need studs for one additional 16' wall and two 12' walls.

Part I Number of Studs

To calculate the number of studs for any wall of a room that can be divided evenly by four, use this formula: 3/4 times the length of the room plus 1. (One is always added for the beginning stud.)

A. Determine how many studs will be needed for each wall that measures 12'.

_____ ____ ___ = _____
Width of wall x 3/4 + 1

B. How many studs will be needed for all walls of this size?

_____ _____ = _____
Number of walls x Number of studs

C. Determine how many studs will be needed for each wall that measures 16'.

_____ ____ __ = _____
Width of wall x 3/4 + 1

Part II Cost of Studs

The building supply company's on-line catalog shows that 2" x 6" spruce studs are selling for $3.25 today. How much will the studs for the entire den addition cost?

_____ _____ x $3.25 = _____

No. of studs for two 12' walls + No. of studs for one 16' wall

Part III Keeping it Simple

Experienced carpenters use the fastest method possible to arrive at calculations for materials. A faster way of arriving at the number of studs needed in Parts I and II is to simplify the formula:

wall width divided by 4 times 3 plus 1 times cost of studs.

Try the simplified formula. If all walls are not the same width, you will use the formula more than once to arrive at the number of studs needed.

_____ x _____ x $3.25 = _____

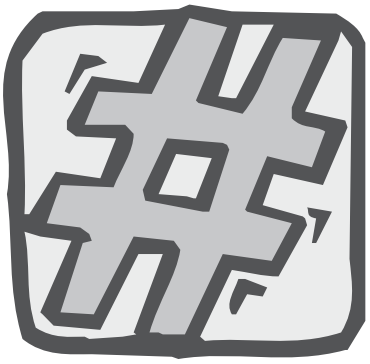
Short wall Wall width/4 x 3 + 1 No. of walls at this width

PLUS

_____ x _____ x $3.25 = _____

Long wall Wall width/4 x 3 + 1 No. of walls at this width

When using this formula, is the cost of the studs the same as shown in Part II? _____
Check your answer.



Science Activities

A carpenter's work involves more than being able to drive a nail straight and cut wood at the correct angle. When a customer asks a carpenter to renovate or build a home, the finished home must be environmentally friendly and comfortable.

Carpenters who take courses in Building Science learn how buildings function under various environmental conditions. They learn how to construct efficient, healthy, reasonably priced ventilation systems in different climates. They learn how to replace toxic substances with environmentally safe products. They solve problems caused to buildings by earthquakes, hurricanes, and similar environmental occurrences.

Two of the most important environmental factors that carpenters must know about are heat and moisture.

Science Web Sites

http://www.buildingscience.com/topten/default.htm
from Building Science Corporation

Comprehensive and readable Building Science site

Lots of information on climate-related home building techniques.

Take a look at "Joe's Top Ten Dumb Things to Do".

http://www.healthhouse.org/iaq/buildingscience.htm
American Lung Association Health House Program

Building Science Basics—moisture, heat flow and temperature

Part I Heat

As a carpenter, your job and the building you are constructing or renovating are affected by the climate. Heat and cold are of primary importance. You must have a basic knowledge of how to control heat and cold in order to do your job well and to satisfy your customer.

Three methods of heat transfer you should understand are (1) conduction, (2) convection, and (3) radiation. Describe the way heat is transferred by these three methods and give simple examples of each.

1. Conduction: _____

   _____

   _____

   Example of Conduction: _____

   _____

   _____

2. Convection:_____

   _____

   _____

   Example of Convection: _____

   _____

   _____

3. Radiation: _____

   _____

   _____

   Example of Radiation: _____

   _____

   _____

Part II Moisture

Some carpenters look at moisture as an enemy because of the damage it frequently causes. But they can have confidence in their buildings if they know how moisture travels. Answer the following questions about the characteristics of moisture that affect building projects.

1. Does hot air or cold air hold more water/moisture?

   _____

2. What is vapor pressure?

   _____

   _____

3. Would vapor pressure be higher in warm air or cold air?

   _____

4. Because moisture wants to move from areas of high vapor pressure to areas of low vapor pressure, where does moisture want to go when you heat a house? Where does moisture want to go when you air condition a house?

   _____

   _____

5. What is relative humidity?

   _____

   _____

6. What happens to relative humidity if you raise the temperature of a home?

   _____

7. What happens to relative humidity if you lower the temperature of a home?

   _____

8. List five of the unwanted effects of too much moisture in a home.

   _____ _____

   _____ _____

   _____

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