



Teaching Guide

For

Comcast Break Room Module

**Illinois Transportation, Distribution and Logistics
Math and Science Project
2008**

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Acknowledgements

We would like to recognize the following people for their contribution to this module:

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Scenario Focus

Primary Career Pathway: Science, Technology, Engineering, and Mathematics

Occupation/Job Titles Related to this Scenario: Drafter, Industrial Engineer, Project Manager, CAD Operator

Recommended Teaching Subject Areas: Math, Industrial Technology

Teacher/Writer Information

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Business/Industry/Government Partner(s)

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Scenario Problem Statement and Performance Elements

You are the Human Resources Director at Comcast Cable in Hickory Hills, Illinois. Your employees have been complaining to you about the condition of your break/lunch room. They believe that it needs to be updated and remodeled. In order to keep up company morale, your job is to determine how to modernize the break room to best please all of the employees as well as stay within your budget.

Cluster Knowledge and Skills and Performance Elements:

- Read, interpret, and analyze technical materials, discerning information and concepts
- Work effectively with others from diverse backgrounds
- Exercise the ability to lead or follow in a team environment
- Use systems of measurement
- Collect, manage, and display data
- Apply concepts of design
- Design a system, product or service
- Apply science and mathematical concepts and principles of inquiry
- Draw a conclusion from a series of observations
- Recognize measurable attributes of objects, units, systems and processes
- Organize projects into manageable parts
- Use effective critical thinking skills

Illinois Learning Standards:

Mathematics:

- Solve problems involving scale drawings, models, maps, or blueprints. (H-7C.5)
- Determine derived measurements. (H-7C.6)
- Discuss biased reporting of data and questions that should be asked when data is viewed. (H-10A.4)
- Solve problems using indirect measurement by choosing appropriate technology, instruments, and/or formulas. (I-7C.1)
- Check measurement computations using unit analysis. (I-7C.2)
- Calculate by an appropriate method the length, width, height, perimeter, area, volume, surface area, angle measures or sums of angle measures of common geometric figures, or combinations of common geometric figures. (I-7C.6)
- Solve problems involving multiple rates, measures, and conversions. (I-7C.7)

Science:

- Formulate issue-specific hypothesis, generating inquiry questions for an issue investigational premise, differentiating qualitative and quantitative data and their applicability, using conceptual/mathematical/physical models, or previewing associated research. (H-11A.1)
- Design scientific issue investigation which addresses proposed hypothesis(es), proposing applicable survey instruments, or selecting associated research, analysis, and communication components. (H-11A.2)
- Collect and record data accurately, using consistent metric measuring and recording techniques with necessary precision, recording data accurately in appropriate format, or graphing data appropriately according to the tested variables. (H-11B.3)
- Report the process and results of a design investigation, selecting graphs and charts that effectively report the design data, making oral and/or written presentations, proposing logical explanations of success or errors, or generating additional design modifications which can be tested later.

What I want students to Know	What I want student to be Able to Do
<ul style="list-style-type: none"> • Definitions for problem based learning. • The difference between a well constructed and poorly constructed survey • How to recognize and understand a blueprint • Appropriate times to use spreadsheets • Career opportunities in science, mathematics, technology, and engineering 	<ul style="list-style-type: none"> • Create and analyze different types of surveys • Calculate the surface area of a room by looking at a blueprint • Use the constraints of a budget to complete a project • Set up Excel spreadsheets and analyze data • Use the internet to research mathematics topics • Write a business report • Make a presentation with visuals

Objectives

- Learn about the concept of problem based learning and how it is different from traditional teaching
- Acquire the skills needed to furnish a room under budget constraints
 - Create and analyze different types of surveys
 - Calculate the surface area of a room by looking at a blueprint
 - Research cost of products and their installations
 - Set up Excel spreadsheets and analyze data
- Prepare a written business report
- Deliver an oral presentation of the Comcast break room

Measurement Criteria that would describe an acceptable solution

1. Survey created that adequately determines the preferences of Comcast employees.
2. Realistic blueprint of the break room created that incorporates what the employees want.
3. Break room furnished within the given budget constraints.
4. Model created of the proposed break room.
5. Correct formulas used and all calculations performed accurately.
6. Business report created that includes a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended break room plan.
7. Information presented with visual aids and/or handouts.

Teacher Notes

Students should have a good working knowledge of math and formulas. Additional content on reading blueprints, writing reports and making presentations may be necessary for some students. This can be done congruently with the scenario or prior to working on the scenario. Please review the materials needed prior to starting the problem solving activity so that you can make copies or obtain items needed. Notify students of the date that presentations will be made. Give students the opportunity to make their own cause and effect connections as various consequences present it.

Time Required to Complete Problem: 11 hours

Types of Materials included in this Module:

1. Instructional Plan for each topic with discussion questions and student activities
2. Copy of Student Handouts with Reading assignments and activities for Duplication
3. Copy of Material describing Problem for Student
4. Evaluation with measurement criteria and scoring guide
5. Teacher Materials to assist in Evaluation of problem and Possible Solution Steps
6. Glossary of Terms Related to this Module
7. Pre/Post Test

Support Materials and Resources Necessary for Completion of Scenario:

- Ruler, Measuring Tape
- Graph Paper
- Computer access to internet
- Excel or similar spreadsheet software
- Power Point or similar presentation software
- Handouts (see each lesson)
- Websites (see each lesson)

Lesson 1

TOPIC	Overview of PBL and the Comcast break	TIME ESTIMATE	75 minutes
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will be able to define the basic concepts of problem based learning. • Students will be able to explain the Comcast Break Room problem. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #1, "Fixing the Break Room" • PreTest in the Appendix • Three Ring Binders: Provide each group with a binder in which all elements of the module should be stored in chronological order. 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	15	- Introduction to Project <ul style="list-style-type: none"> • Discuss What is Problem Based Learning? (describe the concepts and roles students will be expected to play.)
2	10	- Distribute Handout 2, Fixing the Break Room. - Read with class and answer any immediate questions. - Divide the class into two groups.
3	20	- Allow time for students to brainstorm in groups. They are to identify at least ten pieces of information they will need to find out in order to solve the problem. - Lead a class discussion to review the ideas that were brainstormed.
3	30	Optional Activity: Have students complete the pre-test in the Appendix.

Lesson 2

TOPIC	Creating a Survey	TIME ESTIMATE	1 1/2 hours
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OBJECTIVES

- Students will be able to explain the difference between a well constructed and a poorly constructed survey.
- Students will be able to create a well constructed survey that is to be sent to Comcast employees.

MATERIALS & RESOURCES

- Handout #2, Survey Brainstorming Sheet
- Websites: www.zoomerang.com
<http://www.surveysystem.com/sdesign.htm#design>

Teacher Resources:

Questionnaire design tips from Creative Research Systems ([surveysystem.com](http://www.surveysystem.com))

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	25	<ul style="list-style-type: none"> - Take students to computer lab or access to computers. - Ask them go online and read article on Designing Questionnaires at: http://www.surveysystem.com/sdesign.htm#design - Have them take notes of information or outline information in Creative Research System article on web.
2	20	<ul style="list-style-type: none"> - Distribute Handout 2, Survey Brainstorming Sheet. - Have students complete the handout. - Lead a class discussion to review the ideas that were brainstormed on the handout.
3	45	<ul style="list-style-type: none"> - While working on computers, do a short tutorial for students as an overview of zoomerang.com. - Allow time for students to create an online survey to be sent by the teacher to the Comcast employees.

Survey Brainstorming Sheet

1. Read and discuss handout regarding survey design. (20 minutes)
2. Create a survey that could be given to employees at Comcast to determine what they want for their break room. The survey should be no more than 10 questions. (30 minutes)

Survey Questions

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Lesson 3

TOPIC	Analyzing a Floor Plan	TIME ESTIMATE	1 $\frac{1}{2}$ hours
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OBJECTIVES

- Students will be able to find area, surface area and perimeter of a room given a floor plan.
- Students will be able to create a scale drawing given a description and dimensions of a room.

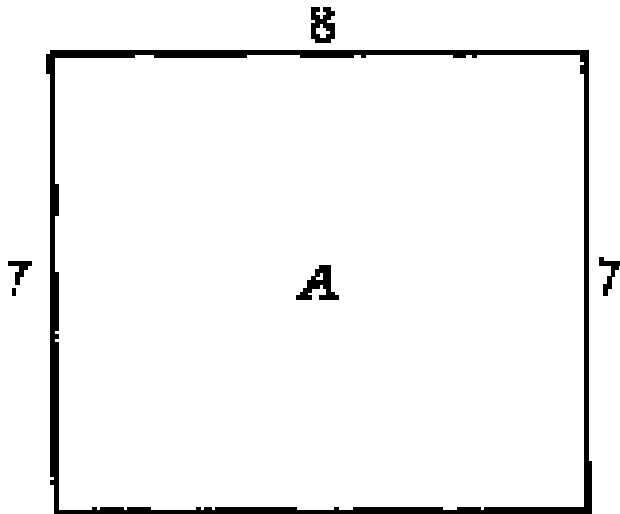
MATERIALS & RESOURCES

- Handout #3, Sample Floor Plan
- Handout #4, Comcast Break Room Dimensions
- Rulers, graph paper, tape measures

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	10	- Distribute Handout 3 and have them answer the various questions regarding the sample plan.
2	40	- Have students measure the classroom, including large items such as teachers desk, file cabinets, tables, etc. - Assign students to create a scale drawing of the classroom to be turned in including placement of furnishings. (These may be placed in a different place than currently placed.)
3	45	- Provide students with Handout 4, Comcast Break Room Dimensions. - Have students create a scale drawing of the Comcast break room based on the information given to them in Handout 4. - Have students determine the area of the Comcast Break room's floor and walls.

Figuring Area, Surface and Perimeter of the following room from a floor plan.



1. What is the perimeter of the room shown above?
2. You want to carpet the room, what is the area of the room to be carpeted?
3. Carpet is sold in square yards, how many square yards will you need to carpet this floor? (figure to the nearest square yard)
4. If there is a door on the wall to the right and corner window that takes up 2 feet on the wall to the left and the wall at the top, where would you put a cabinet that measures 6 ft long by 6 ft wide by 2 ft deep?
5. Considering the placement of the doors and windows in the previous questions, where would you place a 6 foot couch and 50 inch big screen TV?

Comcast Break Room Dimensions

1. Meet with your group and make a scale drawing of the Comcast break room. Here is the information given to me from Comcast:

"The lunch room measures 30 ft x 40 ft, more rectangle than square. There are 2 vending machines (which have to stay in the room) a sink, dishwasher, 2 new refrigerators, a microwave, and glass exit doors to the patio with picnic table. Approximately 55 employees use the room during the day at different times. There are 4 long tables with 8 chairs at each."

- a) Assume that the sink, dishwasher, and microwave are part of a large counter spanning half of one of the walls.
- b) Assume that the two refrigerators are on the same wall as the counter.
- c) Assume that the vending machines are standard size and are on a different wall from the items listed above.
- d) Use common sense to estimate the size of the 4 tables and chairs. Put them in any layout you see fit.

You have all period to complete this task. Include all items listed above in your drawing. Also include the total area of the room as well as the surface area of the walls, assuming there are 10 foot ceilings.

Lesson 4

TOPIC	Estimating and Calculating Costs	TIME ESTIMATE	2 ½ hours
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OBJECTIVES

- Students will be able to estimate costs.
- Students will be able to calculate the costs, shipping and labor charges and taxes on various items.
- Students will be able to use spreadsheet software to do basic calculations.

MATERIALS & RESOURCES

- Handout #5, Brainstorming Worksheet—Furnishing the Room
- Handout #6, Break Room Furnishing Expenditures
- Computers with access to internet and spreadsheet software
- Results of zoomerang.com surveys

Websites: various large chains such as Home Depot, Sears, Lowes, etc.

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	40	<ul style="list-style-type: none"> - Provide students with the results of their zoomerang.com surveys. - Distribute Handout 5, Brainstorming Worksheet and have students determine what they want in their room. They should consider their survey results and record their ideas on the handout. - Allow time for students to brainstorm ideas of where wall and floor coverings, furniture and other items could be placed and purchased. This should also be recorded on Handout 5. - Have students estimate the cost of all their items.
2	40	<ul style="list-style-type: none"> - Distribute Handout 6, Break room Furnishing Expenditures. - Allow time for students to research the price of the items that will go into their break room. Remind them to include any additional labor and shipping charges as well as taxes.

		- Have them record their costs on Handout 6.
3	45	<ul style="list-style-type: none">- Do short tutorial for students as an overview on Microsoft Excel or similar spreadsheet software.- Have students create a spreadsheet of expenses for their break room using Microsoft Excel.

Brainstorming Worksheet—Furnishing the Room

1. Read and discuss the results of your zoomerang.com survey (10 minutes)
2. Review your original ideas for the room design. Narrow down your items using your survey data (10 minutes)
3. Brainstorm about websites the items in your room can be purchased (10 minutes)

Possible Websites

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

4. Estimate the cost of each item you plan on putting in your room (10 minutes)

Lesson 5

TOPIC	Presenting a Business Report	TIME ESTIMATE	2 $\frac{1}{2}$ hours
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OBJECTIVES

- Students will put together all the previous lessons to create an overall design plan
- Students will prepare and present a business presentation on their recommendations for the Comcast Break Room.

MATERIALS & RESOURCES

- Handout #7, Scoring Grade Sheet
- Computers with access to presentation software
- Rulers, Graph Paper
- Projector for Presentations

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	45	- Allow time for students to complete their design plan with all the proper dimensions and scale.
2	10	- Distribute Handout 7, Scoring Grade Sheet and ask students to read. - Discuss any questions students may have.
3	45	- Conduct a short tutorial for students as an overview to PowerPoint and how to do basic slides for a presentation. - Allow time for students to create their business presentation.
4	45	- Have students make their business presentations to the rest of the class and to the Comcast Human Resources Director. - Students should provide copies of any handouts to the audience.

Your final project will be graded on the following criteria:

1. Group dynamics: (10 points)
 - a) Was everyone participating and using time wisely?
 - b) Did everyone have a job to do and did they do it within the time frame given?
 - c) Did everyone have an equal amount of work to do?

2. Product list (in a spreadsheet format): (25 points)
 - a) The vendor (store) where the materials could be purchased.
 - b) The cost of all materials, labor, and shipping, if applicable
 - c) MEASUREMENTS!
 - d) Total cost of project (calculations **MUST BE CORRECT!**)

3. Written description of your room. Make it sound like a place where people want to hang out!! (10 points)

4. Scale drawing of your room with all components labeled! (25 points)

5. Overall originality and neatness. (10 points)

Lesson 6

TOPIC	Exploring Career Opportunities	TIME ESTIMATE	1 hour (1 1/2 hours with optional activity)
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OBJECTIVES

- Students will be able to identify various careers performed in a large company such as Comcast.
- Students will understand the importance of math to various careers.

MATERIALS & RESOURCES

- Handout #8, Comcast Job Opportunities
- Handout #9 Student Survey
- Post Test in the Appendix

Websites: www.wikipedia.com www.google.com

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	45	<ul style="list-style-type: none"> - Distribute Handout 8, Comcast Job Opportunities. - Have students pick three of the jobs and research how math could be needed to perform them. - Have students write their findings. (Should be about three paragraphs)
2	10	<ul style="list-style-type: none"> - Distribute Handout 9, Student Survey and ask students to record their feelings about this project and problem based learning. •
3	30	<p>Optional Activity: Give students the Post Test in the Appendix.</p>

Comcast Job Opportunities

The following is a list of the types of jobs available at Comcast Cable Company. Please choose three jobs from this list and describe how math might be used to perform them.

1. Accounting and Finance
2. Acquisitions
3. Administration
4. Advertising Sales
5. Affiliate Finance
6. Affiliate Sales
7. Business Operations
8. Creative Services
9. Customer Service
10. Engineering
11. Executive
12. Facilities
13. Finance
14. Human Resources
15. Information Technology
16. Interactive Services
17. Internet
18. Legal and Government Affairs
19. Make-up
20. Marketing
21. Master Control
22. Network Operations
23. New Business Development
24. Post Production
25. Production
26. Program Planning
27. Public Relations
28. Publicity
29. Research
30. Sales
31. Talent
32. Technical Operations
33. Television - Original Programming
34. Training and Development
35. Wardrobe

Teacher

Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

You are the Human Resources Director at Comcast Cable in Hickory Hills, Illinois. Your employees have been complaining to you about the condition of your break/lunch room. They believe that it needs to be updated and remodeled. In order to keep up company morale, your job is to determine how to modernize the break room to best please all of the employees as well as stay within your budget.

Measurement Criteria that would describe an acceptable solution

1. Survey created that adequately determines the preferences of Comcast employees
2. Realistic blueprint of the break room created that incorporates what the employees want
3. Break room furnished within the given budget constraints
4. Model created of the proposed break room
5. Correct formulas used and all calculations performed accurately
6. Business report created that includes a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended break room plan
7. Information presented with visual aids and/or handouts

Suggested Scoring Guide

- Group dynamics: (10 points)
 - a) Was everyone participating and using time wisely?
 - b) Did everyone have a job to do and did they do it within the time frame given?
 - c) Did everyone have an equal amount of work to do?
- Product list (in a spreadsheet format): (25 points)
 - a) The vendor (store) where the materials could be purchased.
 - b) The cost of all materials, labor, and shipping, if applicable
 - c) MEASUREMENTS!
 - d) Total cost of project (calculations **MUST BE CORRECT!**)
- Written description of your room. Make it sound like a place where people want to hang out!! (10 points)
- Scale drawing of your room with all components labeled! (25 points)
- Overall originality and neatness. (10 points)
- Business presentation (20 points)

Solution Checker

Please see the suggested scoring guide for examples of what should be included in your problem solution. There is not one correct answer to the problem, but all solutions should include a scale drawing of the room, a list of items in the room and their costs, and a written description of the room. Your business presentation will also be considered part of your solution.

A P P E N D I X

GLOSSARY of TERMS Related to the Comcast Break Room Problem

Area

A quantity expressing the two-dimensional size of a defined part of a surface, typically a region bounded by a closed curve

Blueprint

A type of paper-based reproduction usually of a technical drawing documenting an architecture or an engineering design. More generally, the term "blueprint" has come to be used to refer to any detailed plan.

Brainstorming

A group creativity technique designed to generate a large number of ideas for the solution to a problem

Expenditure

An amount of money spent, as a whole or on a particular thing

Perimeter

The distance around a given two-dimensional object. The word perimeter is a Greek root meaning measure around, or literally "around measure".

Spreadsheet

A computer application that superseded paper worksheets. It displays multiple cells that together make up a grid consisting of rows and columns, each cell containing either alphanumeric text or numeric values.

Surface area

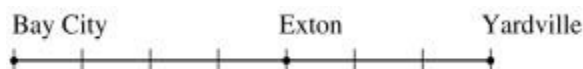
The measure of how much exposed area an object has. It is expressed in square units. If an object has flat faces, its surface area can be calculated by adding together the areas of its faces.

Survey

Determines the public opinion from a particular sample. Surveys are usually designed to represent the opinions of a population by conducting a series of questions and then extrapolating generalities in ratio or within confidence intervals.

Pre Test/Post Test

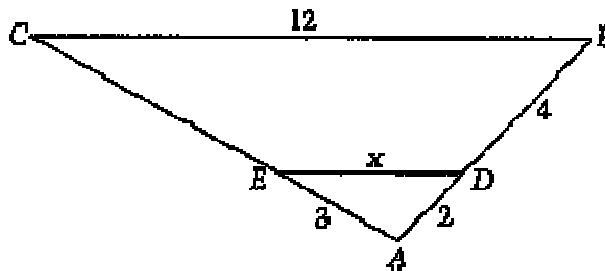
Please answer the following 20 questions to the best of your ability. While this will NOT count toward your current average, it is very important that you try your best on this test. You may write on the test! Please put your answers on the provided scantron sheet.



- On the road shown above, the distance from Bay City to Exton is 60 miles. What is the distance from Bay City to Yardville?
a) 45 miles b) 75 miles c) 90 miles
d) 105 miles e) None of these
- Length can be measured to within 0.05 centimeter accuracy by using a certain type of measuring instrument. A reading of 3.7 centimeters on this instrument means that the actual length is at least
a) 3.20 cm b) 3.65 cm c) 3.69 cm
d) 3.70cm e) 3.75 cm
- The cruise ship Titanic was 882 feet long. Which of the following is closest to that length?
a) Two moving vans
skateboards b) 50 cars c) 100
d) 500 school buses e) 1000 bicycles
- In a group of 1,200 adults, there are 300 vegetarians. What is the ratio of nonvegetarians to vegetarians in the group?
a) 1 to 3 b) 1 to 4 c) 3 to 1
d) 4 to 1 e) 4 to 3

5. A car odometer registered 41,256.9 miles when a highway sign warned of a detour 1,200 feet ahead. What will the odometer read when the car reaches the detour? (5, 280 feet = 1 mile)

- a) 42,456.9 b) 41,279.9 c) 41,261.3
 d) 41,259.2 e) 41,257.1



6. If triangles ADE and ABC shown in the figure above are similar, what is the value of x ?

- a) 4 b) 5 c) 6 d) 8 e) 10

7. In the figure above, a circle with center O and radius of length 3 is inscribed in a square. What is the area of the shaded region?

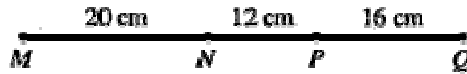
- a) 3.86 b) 7.73 c) 28.27
 d) 32.86 e) 36.00

8. Ken bought a used car for \$5,375. He had to pay an additional 15 percent of the purchase price to cover both sales tax and extra fees. Of the following, which is closest to the total amount Ken paid?

- a) \$806 b) \$5510 c) \$5760
 d) \$5940 e) \$6180

9. Chris wishes to carpet the rectangular room shown above. To the nearest square yard, how many square yards of carpet are needed to carpet the floor of the room if the closet floor will not be carpeted? (1 square yard = 9 square feet)

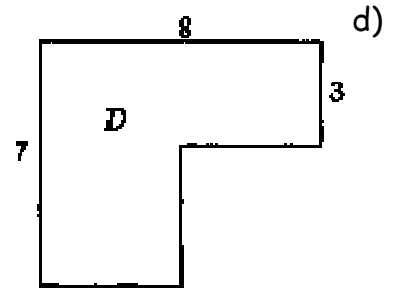
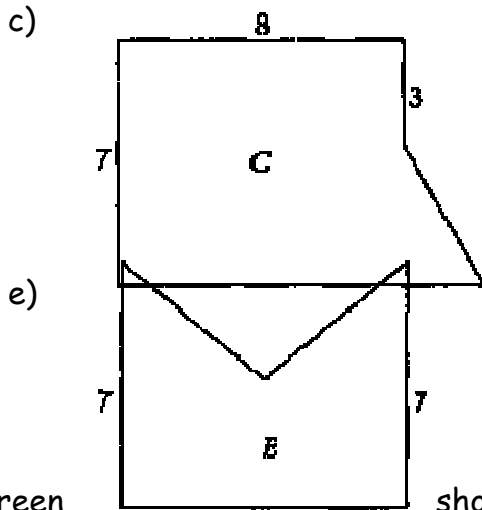
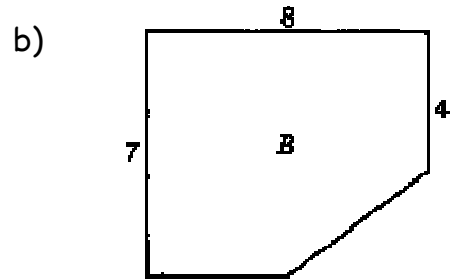
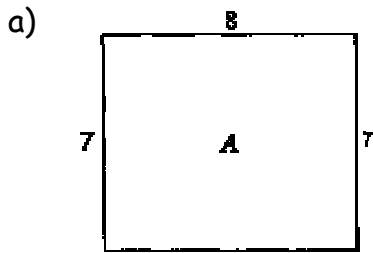
- a) 8 b) 10 c) 11 d) 19 e) 22



10. What is the distance between the midpoint of MN and the midpoint of PQ shown above?

- a) 18 cm b) 24 cm c) 26 cm
d) 28 cm e) 30 cm

11. For each figure below, the lengths of 3 sides are given. Which figure could have a perimeter of 28?



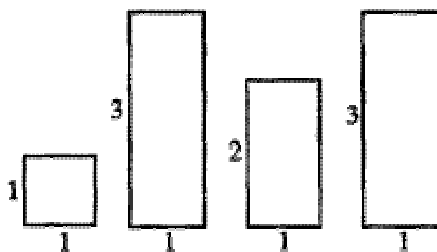
12. TV screen

What is the diagonal measurement of the shown in the figure above?

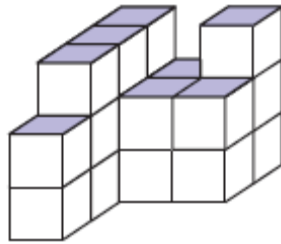
- a) 25 inches b) 35 inches c) 50 inches
 d) 70 inches e) 1200 inches

13. If the price of a can of beans is raised from 50 cents to 60 cents, what is the percent increase in the price?

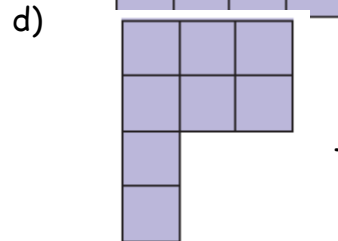
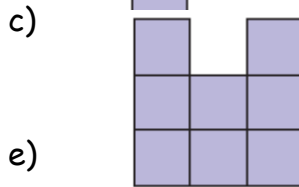
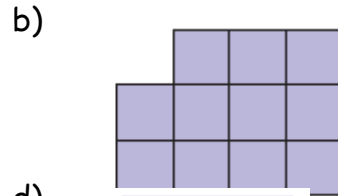
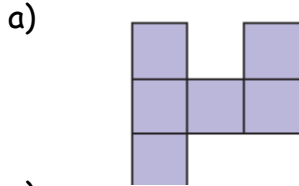
- a) 83.3% b) 20% c) 18.2% d) 16.7% e) 10%



14. A certain rectangle has area equal to the sum of the areas of the four rectangles shown above. If its length is 4, what is its width?
- a) 2 b) $2\frac{1}{4}$ c) $2\frac{1}{2}$ d) 3 e) $3\frac{1}{2}$
15. A contractor is building 5 different model homes on 5 adjacent lots on one side of a street. If 1 house is to be built on each lot, how many different arrangements of the 5 houses are possible?
- a) 120 b) 60 c) 25 d) 10 e) 5
16. The postal rate is 25 cents for the first ounce and 20 cents for each additional ounce or part of an ounce. What would it cost to mail a package that weighs 6.8 ounces?
- a) \$1.25 b) \$1.40 c) \$1.45
 d) \$1.70 e) \$1.75
17. A square garden measuring 8 feet on a side is surrounded by a 1-foot-wide path. What is the area of the path?
- a) 8 ft^2 b) 9 ft^2 c) 28ft^2
 d) 36 ft^2 e) 64 ft^2



18. Which drawing represents the top view of this solid?



None of

these

19. How many faces does this box have?

a) 12

b) 10

c) 8

d) 6

e) 4



20. Jill plans to put ribbon around the rim of a flower pot and attach a bow onto the ribbon. The bow itself will take 18 inches of the ribbon. What is the least amount of ribbon needed for one pot if the pot is 8 inches in diameter?

a) About 18 inches

b) About 44 inches

c) About 56 inches

d) About 96 inches

e) About 144 inches