

# TEACHER GUIDE

High School

Geometry



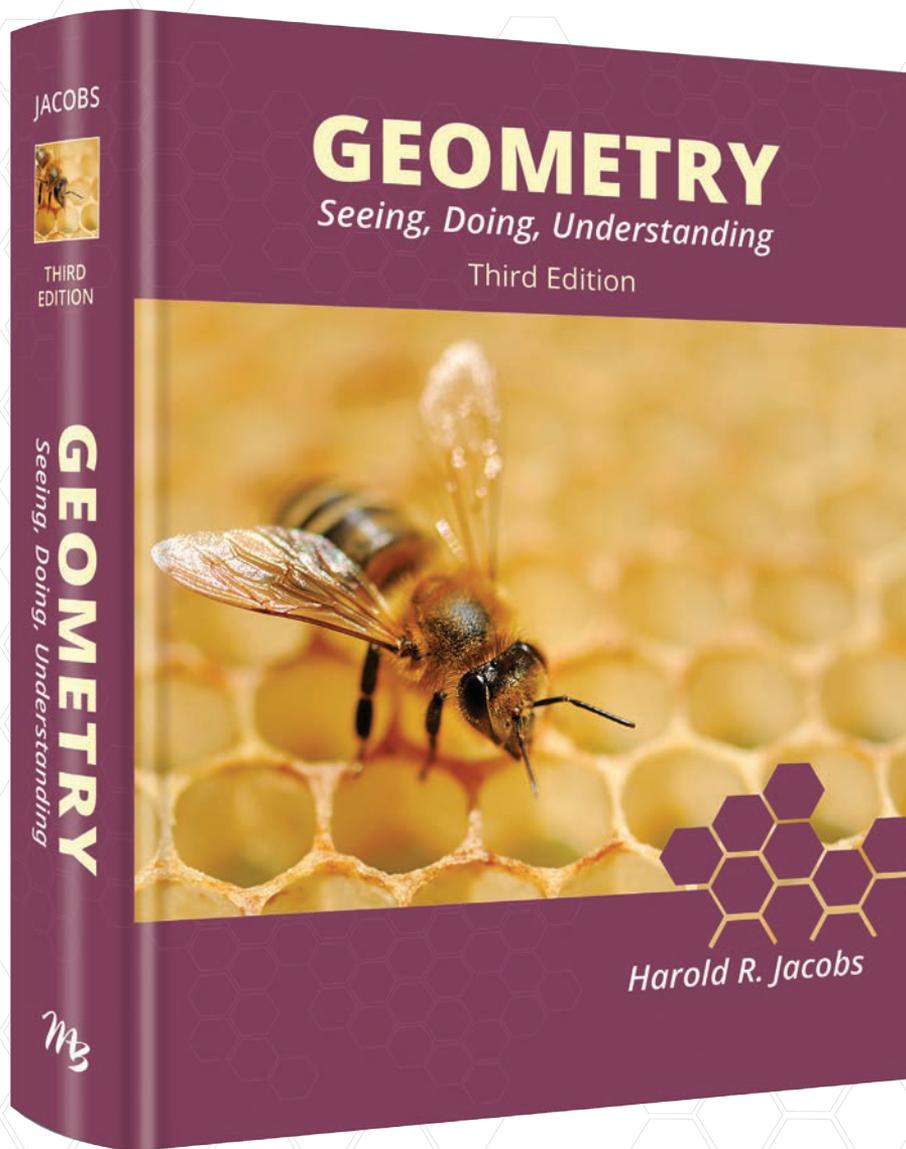
Weekly Lesson Schedule



Chapter Tests, Mid-term Exam  
& Final Exam



Test Answer Keys



# TEACHER GUIDE

High School

Geometry



Weekly Lesson Schedule



Chapter Tests, Mid-term Exam  
& Final Exam



Test Answer Keys

# Geometry Seeing, Doing, Understanding



Master Books® Edition

First printing: February 2017

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This book consists of chapter tests, a midyear examination, and a final examination that may be used with *Geometry: Seeing, Doing, Understanding*, Third Edition. The chapter tests are designed for an examination period of approximately 45 minutes; the midyear and final are designed for an examination period of approximately 100 minutes. Complete answers for all the tests are in a separate section at the end of this book.

## Author Bio:

HAROLD R. JACOBS is teacher of mathematics and science, writer, and well-respected speaker. He received his B.A. from U.C.L.A. and his M.A.L.S from Wesleyan University. His other publications include *Mathematics: A Human Endeavor*, *Elementary Algebra* and articles for *The Mathematics Teacher* and the *Encyclopedia Britannica*. Mr. Jacobs has received the Most Outstanding High School Mathematics Teacher in Los Angeles award, the Presidential Award for Excellence in Mathematics Teaching, and was featured in the book *101 Careers In Mathematics* published by the Mathematical Association of America.

## Using This Teacher Guide

**Features:** The suggested weekly schedule enclosed has easy-to-manage lessons that guide the reading, course exercises, and all assessments. The pages of this guide are perforated and three-hole punched so materials are easy to tear out, hand out, grade, and store. Teachers are encouraged to adjust the schedule and materials needed in order to best work within their unique educational program.

**Lesson Scheduling:** Students are instructed to read the pages for each lesson in the student textbook and then complete the corresponding sets of exercises. Assessments include lesson exercises, chapter tests, a mid-term review, and final exam given at regular intervals with space to record each grade. Space is provided on the weekly schedule for assignment dates, and flexibility in scheduling is encouraged. Teachers may adapt the scheduled days per each unique student situation. As the student completes each assignment, this can be marked with an “X” in the box.



Approximately 60 to 75 minutes per lesson, five days a week



Includes answer keys for chapter tests, mid-term and final exams



The mid-term and final exam are included to help reinforce learning and provide assessment opportunities



Designed for grades 9 to 12 in a one-year course to earn 1 math or Geometry credit

### Course Objectives:

- ✓ *Geometry: Seeing, Doing, Understanding* is designed to prepare students who already have a foundational understanding of Algebra to understand and illustrate the principles of Geometry. With the use of innovative discussions, cartoons, anecdotes, and vivid exercises, students will not only learn but will also find their interest growing with each lesson. The full-color student book focuses on guided discovery to help students develop geometric awareness. Geometry is all around us. Prepare to understand its dynamic influence so much better!

### How To Use This Course:

- ✓ There is some flexibility in how the course is structured for the student, where the teacher can assign all of the suggested problems, or choose portions from each set if time is limited. Both the student textbook and the *Solutions Manual* are crucial in completing the course.

# Course Description

Lessons are divided into 16 chapters, covering deductive reasoning, congruence and similarity, transformations, coordinate geometry, area, geometric solids and non-Euclidean geometries, with helpful summaries and reviews. As the student works through the textbook, selected answers to problems are available in the textbook, with full solutions to all of the exercises available in the *Solutions Manual* for the *Geometry: Seeing, Doing, Understanding* course.

## Additional Materials Needed

- ✓ *Geometry: Seeing, Doing, Understanding* (student textbook).
- ✓ A notebook and graph paper are essential. It is highly recommended that students use a 3-ring binder, loose-leaf paper, and graph paper to complete the coursework. Tab dividers to separate your work by lesson are also recommended.

## Reference Pages

These are included from the student text, and can be removed for ease of use by the students completing the course.

## Testing

There are exams provided for each chapter in this *Teacher Guide*. Also included are a mid-term and a final exam. Answers for these are available in the back of this book.

## Grading

It is always the prerogative of an educator/parent to assess student grades however he or she might deem best. The following is only a suggested guideline based on the material presented through this course:

- ✓ Each lesson's coursework is worth 100 points.
- ✓ All tests within the course are worth 100 points each.

To calculate the percentage of the worksheets, chapter tests, mid-term or final exam, the parent/educator may use the following guide.

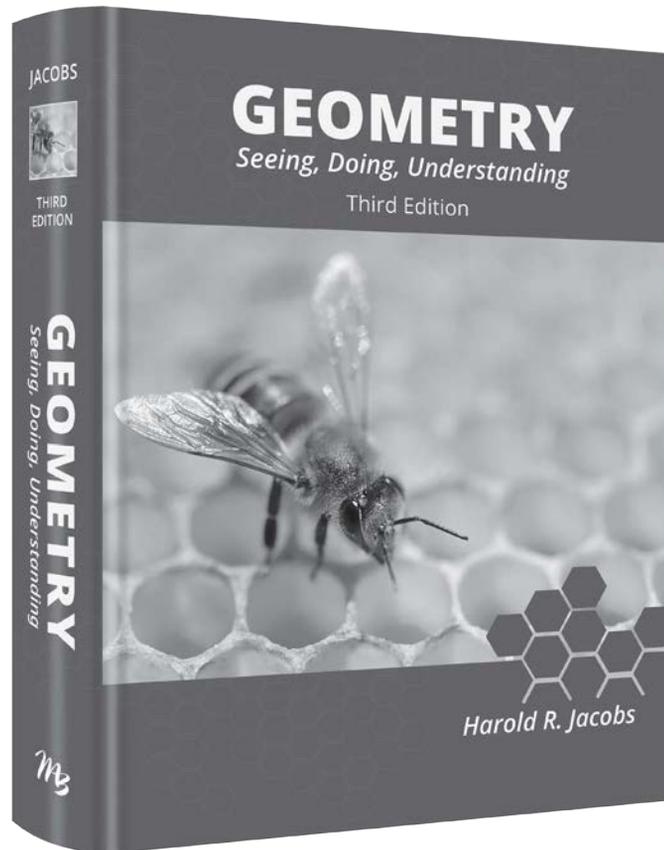
Divide total number of questions correct (example: 43) by the total number of questions possible (example: 46) to calculate the percentage out of 100 possible.  $43/46 = 93$  percent correct. The suggested grade values are noted as follows:

90 to 100 percent = A  
80 to 89 percent = B  
70 to 79 percent = C  
60 to 69 percent = D  
0 to 59 percent = F

## First Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
First Semester-First Quarter					
Week 1	Day 1	Read pages xi–2 of <i>Geometry</i> textbook (GEO) Complete the exercise on pages 2–6 See this <i>Teacher Guide</i> (TG) for exams.			
	Day 2	Read Chapter 1: An Introduction to Geometry and Chapter 1, Lesson 1: Lines in Designing a City, pages 7–9 (GEO) Complete Exercise Sets I, II, and III, pages 10–12			
	Day 3	Read Chapter 1, Lesson 2: Angles in Measuring the Earth, pages 13–15 (GEO) Complete Exercise Sets I, II, and III, pages 15–17			
	Day 4	Read Chapter 1, Lesson 3: Polygons and Polyhedra: Pyramid Architecture, pages 18–20 (GEO) Complete Exercise Sets I, II, and III, page 21–23			
	Day 5	Read Chapter 1, Lesson 4: Constructions: Telling Time with Shadows, pages 24–25 (GEO) Complete Exercise Sets I, II, and III, page 26–29			
Week 2	Day 6	Read Chapter 1, Lesson 5: We Can't Go On Like This, pages 30–31 (GEO) Complete Exercise Sets I, II, and III, pages 31–34			
	Day 7	Read Chapter 1, Summary and Review, pages 35–36 (GEO) Complete Exercise Sets I, II, and III, pages 36–38			
	Day 8	Read Chapter 1, Algebra Review, page 39 Complete Exercises, page 40			
	Day 9	Chapter 1 Test Study Day			
	Day 10	Chapter 1 Test, pages 41–44 (TG)			
Week 3	Day 11	Review test and work for Chapter 1. Use this time to build your skills or work on concepts that you may be struggling to understand or master.			
	Day 12	Read Chapter 2, The Nature of Deductive Reasoning, and Lesson 1: Conditional Statements, pages 41–43 (GEO) Complete Exercise Sets I, II, and III, pages 43–45			
	Day 13	Read Chapter 2, Lesson 2: Definitions, pages 46–47 (GEO) Complete Exercise Sets I, II, and III, pages 47–49			
	Day 14	Read Chapter 2, Lesson 3: Direct Proof, pages 50–51 (GEO) Complete Exercise Sets I, II, and III, pages 52–54			
	Day 15	Read Chapter 2, Lesson 4: Indirect Proof, pages 55–57 (GEO) Complete Exercise Sets I, II, and III, pages 57–59			
Week 4	Day 16	Read Chapter 2, Lesson 5: A Deductive System, pages 60–61 (GEO) Complete Exercise Sets I, II, and III, pages 61–64			
	Day 17	Read Chapter 2, Lesson 6: Some Famous Theorems of Geometry, pages 65–67 (GEO) Complete Exercise Sets I, II, and III, pages 67–70			
	Day 18	Read Chapter 2, Summary and Review, page 71 (GEO) Complete Exercise Sets I and II, pages 71–74			
	Day 19	Read Chapter 2, Algebra Review, page 75 (GEO) Complete Exercises, page 76			
	Day 20	Chapter 2 Test Study Day			

Date	Day	Assignment	Due Date	✓	Grade
Week 5	Day 21	Chapter 2 Test, pages 45–48 (TG)			
	Day 22	Review test and work for Chapter 2. Use this time to build your skills or work on concepts that you may be struggling to understand or master.			
	Day 23	Read Chapter 3, Lines and Angles and Lesson 1: Number Operations and Equality, pages 77–79 (GEO) Complete Exercise Sets I, II, and III, pages 80–83			
	Day 24	Read Chapter 3, Lesson 2: The Ruler and Distance, pages 84–86 (GEO) Complete Exercise Sets I, II, and III, pages 86–90			
	Day 25	Read Chapter 3, Lesson 3: The Protractor and Angle Measure, pages 91–93 (GEO) Complete Exercise Sets I, II, and III, pages 93–97			
Week 6	Day 26	Read Chapter 3, Lesson 4: Bisection, pages 98–100 (GEO) Complete Exercise Sets I, II, and III, pages 100–104			
	Day 27	Read Chapter 3, Lesson 5: Complementary and Supplementary Angles, pages 105–106 (GEO) Complete Exercise Sets I, II, and III, pages 107–109			
	Day 28	Read Chapter 3, Lesson 6: Linear Pairs and Vertical Angles, pages 110–112 (GEO) Complete Exercise Sets I, II, and III, pages 112–116			
	Day 29	Read Chapter 3, Lesson 7: Perpendicular and Parallel Lines, pages 117–118 (GEO) Complete Exercise Sets I, II, and III, pages 119–122			
	Day 30	Read Chapter 3, Summary and Review, page 123 (GEO) Complete Exercise Sets I and II, pages 124–128			
Week 7	Day 31	Read Chapter 3, Algebra Review, pages 129–130 (GEO) Complete Exercises, page 130			
	Day 32	Chapter 3 Test Study Day			
	Day 33	Chapter 3 Test, pages 49–52			
	Day 34	Review test and work for Chapter 3. Use this time to build your skills or work on concepts that you may be struggling to understand or master.			
	Day 35	Read Chapter 4, Congruence and Lesson 1: Coordinates and Distance, pages 131–134 (GEO) Complete Exercise Sets I, II, and III, pages 134–138			
Week 8	Day 36	Read Chapter 4, Lesson 2: Polygons and Congruence, pages 139–141 (GEO) Complete Exercise Sets I, II, and III, pages 141–145			
	Day 37	Read Chapter 4, Lesson 3: ASA and SAS Congruence, pages 146–147 (GEO) Complete Exercise Sets I, II, and III, pages 148–150			
	Day 38	Read Chapter 4, Lesson 4: Congruence Proofs, pages 151–152 (GEO) Complete Exercise Sets I, II, and III, pages 153–156			
	Day 39	Read Chapter 4, Lesson 5: Isosceles and Equilateral Triangles, pages 157–159 (GEO) Complete Exercise Sets I, II, and III, pages 159–162			
	Day 40	Read Chapter 4, Lesson 6: SSS Congruence, pages 163–164 (GEO) Complete Exercise Sets I, II, and III, pages 165–168			

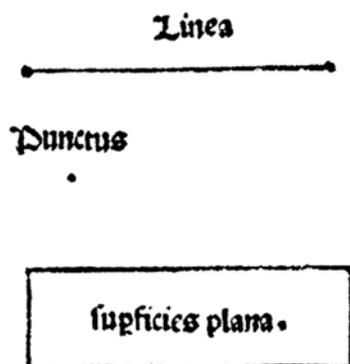


**Chapter Tests and Test Answer Sheets**  
**for Use with**  
***Geometry: Seeing, Doing, Understanding***

**Note:** This section of the teacher guide contains chapter tests and answer sheets. Special thanks to Donald M. Luepke for his contributions to the tests.



These figures appeared in the first printed version of the *Elements*.



1. Who wrote the *Elements*?
2. What does the figure labeled “punctus” represent?

The figure labeled “linea” looks like a line segment.

3. What is the difference between a *line* and a *line segment*?

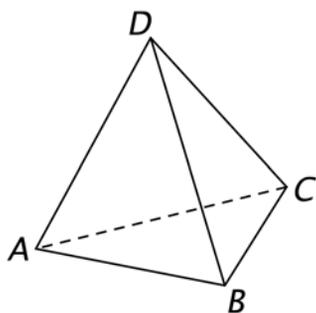
The figure labeled “supficies plana” looks like a rectangle.

4. What is the difference between a *rectangle* and a *plane*?

A *quadruped* is an animal with four legs.

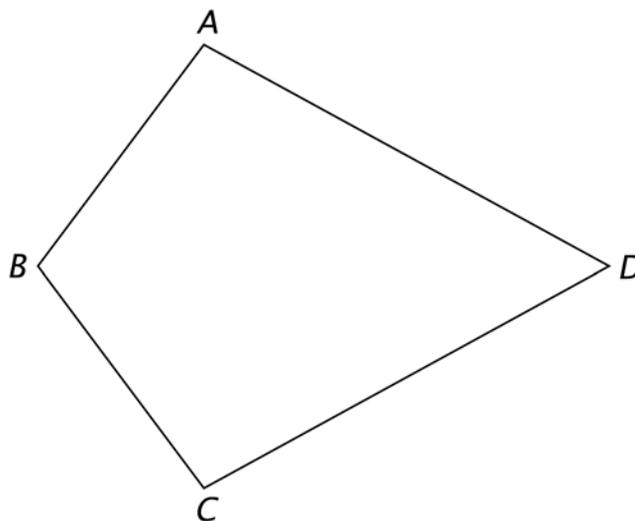
5. What is a *quadrilateral*?
6. Explain how the word *pentagon* would help someone figure out how many athletic events are in the *pentathlon*.
7. What do an *octopus* and an *octagon* have in common?

The figure below is a transparent view of a tetrahedron, a polyhedron that has four faces.



8. What kind of polygon are its faces?
9. How many edges meet at each corner of a tetrahedron?
10. Any three corners of a tetrahedron are noncollinear. What is another word that describes them?

Because of its shape, this quadrilateral is called a “kite.”



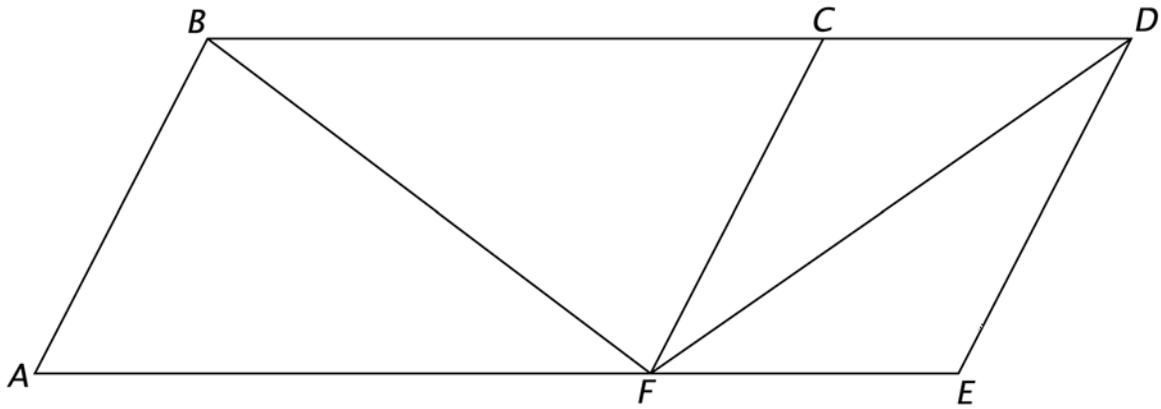
11. Use your straightedge and compass to bisect  $\angle A$ ,  $\angle B$ , and  $\angle C$ . Extend the three lines across the figure.
12. What relation do the three lines appear to have to each other?
13. What relation does the line that bisects  $\angle B$  appear to have to  $\angle D$ ?

The floors of two rooms are rectangular in shape. Their dimensions are as follows.

Room A: 15 feet wide, 18 feet long.

Room B: 10 feet wide, 24 feet long.

14. Which room has the greater perimeter? Explain.
15. Which room has the greater area? Explain.



The figure above contains an optical illusion. Use your ruler to measure the following segments, each to the nearest 0.1 cm.

16. FB.
17. FD.

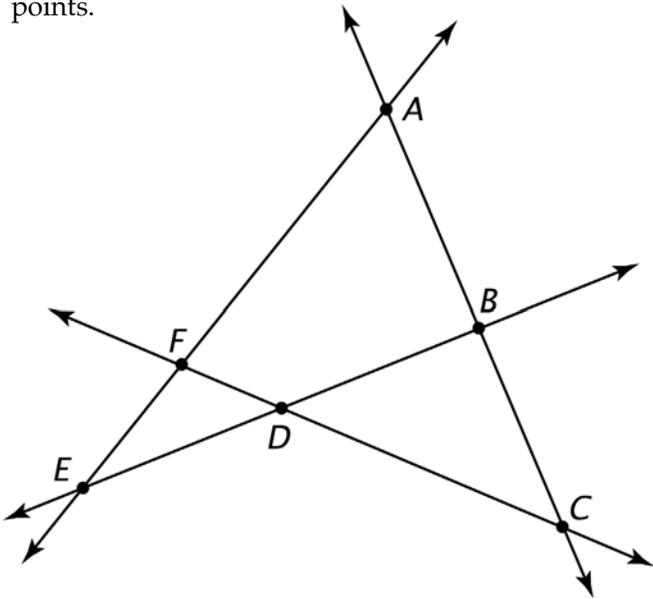
Use your protractor to measure each of the following angles. (You may extend the sides of the angles as necessary.)

18.  $\angle A$ .
19.  $\angle BFD$ .

Your measurements reveal something surprising about the figure.

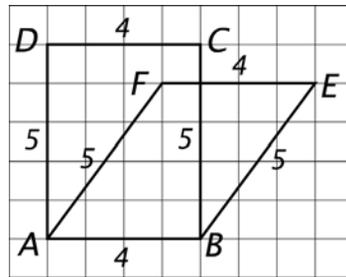
20. What is it?

This figure shows four lines that intersect in six points.



21. Draw AD, BF, and CE. Use your straightedge and compass to bisect these three line segments. Use the letter M to label the midpoint of AD, the letter N for the midpoint of BF, and the letter O for the midpoint of CE.
22. What seems to be true about points M, N, and O?

The figure below shows two quadrilaterals, ABCD and ABEF, drawn on the same grid;  $AB = DC = FE = 4$  and  $AD = AF = BC = BE = 5$ .



To find the area of a quadrilateral, the Egyptians used the formula

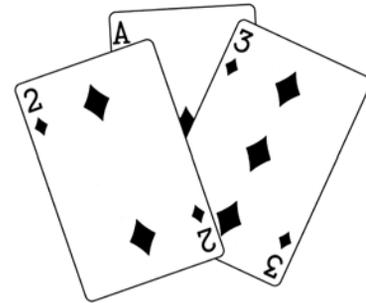
$$A = \frac{1}{4}(a + c)(b + d)$$

in which  $a$ ,  $b$ ,  $c$ , and  $d$  are the lengths of the consecutive sides.

23. Use the figure to show that the Egyptian formula does not always work correctly.

*Extra Credit.*

A magician takes the three cards shown below from an ordinary deck (containing clubs,  $\clubsuit$ , diamonds,  $\diamond$ , hearts,  $\heartsuit$ , and spades,  $\spadesuit$ ).



1. What cards do you think they are?
2. Can you explain how someone might be tricked with them?



1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

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4. \_\_\_\_\_

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5. \_\_\_\_\_

6. \_\_\_\_\_

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7. \_\_\_\_\_

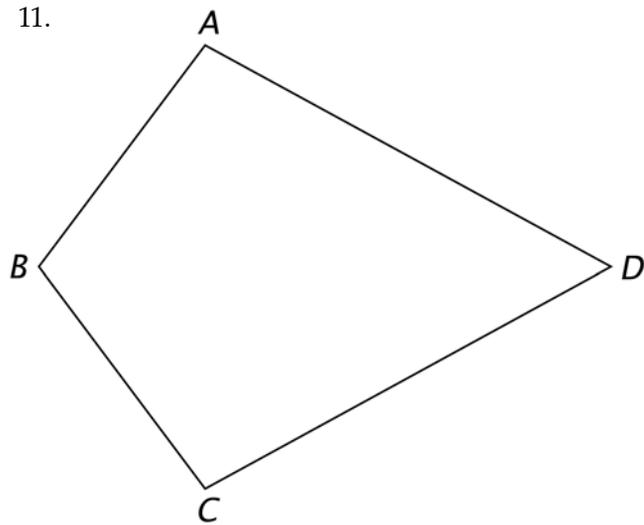
\_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11.



12. \_\_\_\_\_

13. \_\_\_\_\_

14. \_\_\_\_\_

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15. \_\_\_\_\_

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16. \_\_\_\_\_

17. \_\_\_\_\_

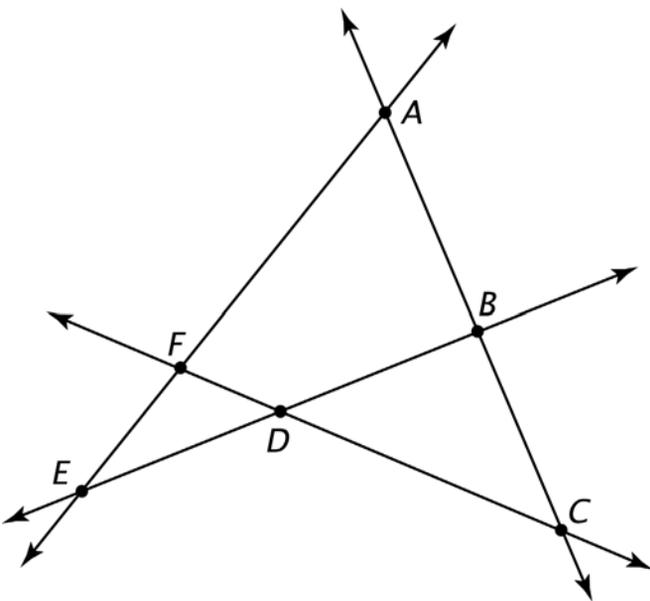
18. \_\_\_\_\_

19. \_\_\_\_\_

20. \_\_\_\_\_

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21.



22. \_\_\_\_\_

23. \_\_\_\_\_

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Extra Credit

1. \_\_\_\_\_

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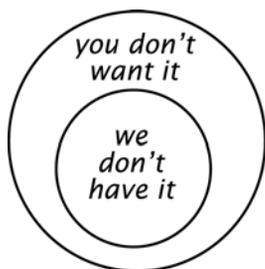
2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



- Name the property or definition illustrated by each of the following equations.
  - $2(3x) = (2 \cdot 3)x$
  - $4 + y = y + 4$
- Write each of the following expressions as a single integer.
  - $(13 - 5)^2$
  - $13^2 - 5^2$
- Simplify the following expressions.
  - $5x^2 - x^2$
  - $(6x - y) - (x - 7y)$
- Read the following statements carefully and mark them true or false.
  - If a conditional statement is true, its converse must also be true.
  - If the radius of a circle is  $r$ , its area is  $\pi r^2$ .
  - It is possible to define every word in terms of simpler words.
  - To prove  $a \rightarrow b$  indirectly, you begin by assuming *not a*.
  - A syllogism consists of two premises and a conclusion.
- This figure illustrates a claim that appeared in a newspaper ad.



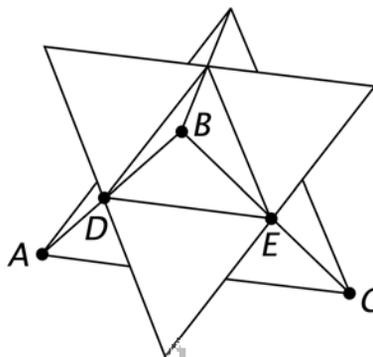
- What is this type of figure called?
  - Write the statement in "if  $a$ , then  $b$ " form.
  - Rewrite it in the form " $b$  if  $a$ ."
  - Which of the following statements is also illustrated by the diagram?
    - If you don't want it, we don't have it.
    - If you want it, we have it.
    - If we have it, you want it.
- Consider the following premises:  
If you watch Sesame Street, you are a kid at heart.  
If you are a kid at heart, you love Eskimo pies.
    - What conclusion follows from these premises?

- If one of the premises is false, does it follow that the conclusion must be false?
  - If both premises are true, does it follow that the conclusion must be true?
- The following statement is a whimsical definition of *egotist*:  
You are an egotist if you are always me-deep in conversation.
    - What does the abbreviation "iff" stand for?
    - Write the two conditional statements that are equivalent to the definition.
    - How is one of your statements related to the other?
  - The following sentence, from a Spanish geometry book, describes geometry as a deductive system:

Euclides construye la Geometría partiendo de definiciones, postulados y axiomas con los cuales demuestra teoremas.

Write the English equivalent of each of the following words *and* tell what the word means.

- definición.
  - postulado.
  - teorema.
  - Tell what you think the sentence says.
- In this figure of a polyhedron, ABC is a triangle.



Tell whether each of the following statements is true or false.

- Points A, D, and B are collinear.
- Points A and D determine a line.
- Points B, E, and C are coplanar.
- Points B, E, and C determine a plane.
- Points A, D, and C determine a plane.

10. After studying the relations of the statements given in the following proof, write the missing statements.

*Theorem.*

If there is a total eclipse of the sun, the temperature can be determined without a thermometer.

*Proof.*

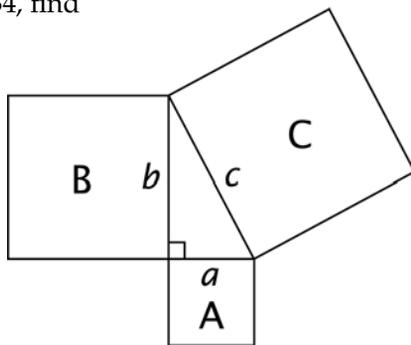
If there is a total eclipse of the sun, the sky becomes dark.

- a) (What is the second statement?)  
If the crickets think that it is night, they will start chirping.
- b) (What is the fourth statement?)  
If the temperature is estimated by counting cricket chirps, it can be determined without a thermometer.
- c) What kind of proof is this?

11. Mrs. Cook purchased a set of kitchen utensils advertised as a stainless steel product. After using the set for a few weeks, she discovered that some of the utensils were beginning to rust. She went back to the store, claimed that the set was not stainless steel, and asked for a refund.

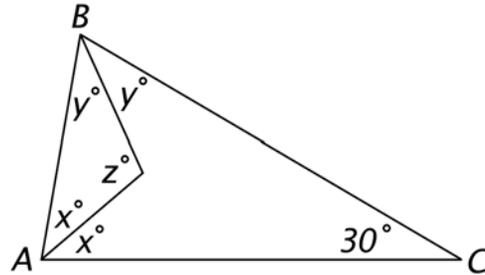
In her conversation with the store manager, she used an indirect proof. Identify each of the following.

- a) The statement she wanted to prove.  
b) The assumption made.  
c) The conclusion resulting from the assumption.  
d) The known fact contradictory to part c.
12. In this figure, squares have been drawn on the sides of a right triangle. Given that  $a = 16$  and  $c = 34$ , find



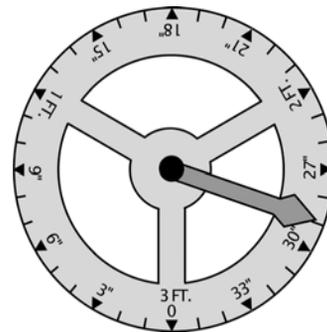
- a) the area of square A.  
b) the area of square C.  
c) the area of square B.  
d)  $b$ .

13. This figure appeared in a problem on an SAT exam.



Given that  $\angle BAC = 80^\circ$ , find each of the following:

- a)  $x$ .  
b)  $\angle ABC$ .  
c)  $y$ .  
d)  $z$ .
14. A trundle wheel can be used to measure distance along the ground. The distance traveled in one revolution of the wheel is equal to the circumference of the wheel.



Given that the circumference of a trundle wheel is 3 feet, find

- a) its diameter to the nearest 0.1 inch.  
b) the distance that the wheel travels in making five revolutions.



1. a) \_\_\_\_\_

\_\_\_\_\_

b) \_\_\_\_\_

\_\_\_\_\_

2. a) \_\_\_\_\_

b) \_\_\_\_\_

3. a) \_\_\_\_\_

b) \_\_\_\_\_

4. a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

e) \_\_\_\_\_

5. a) \_\_\_\_\_

b) \_\_\_\_\_

\_\_\_\_\_

c) \_\_\_\_\_

\_\_\_\_\_

d) \_\_\_\_\_

6. a) \_\_\_\_\_

\_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

7. a) \_\_\_\_\_

b) \_\_\_\_\_

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\_\_\_\_\_

c) \_\_\_\_\_

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8. a) \_\_\_\_\_

\_\_\_\_\_

b) \_\_\_\_\_

\_\_\_\_\_

c) \_\_\_\_\_

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d) \_\_\_\_\_

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\_\_\_\_\_

9. a) \_\_\_\_\_

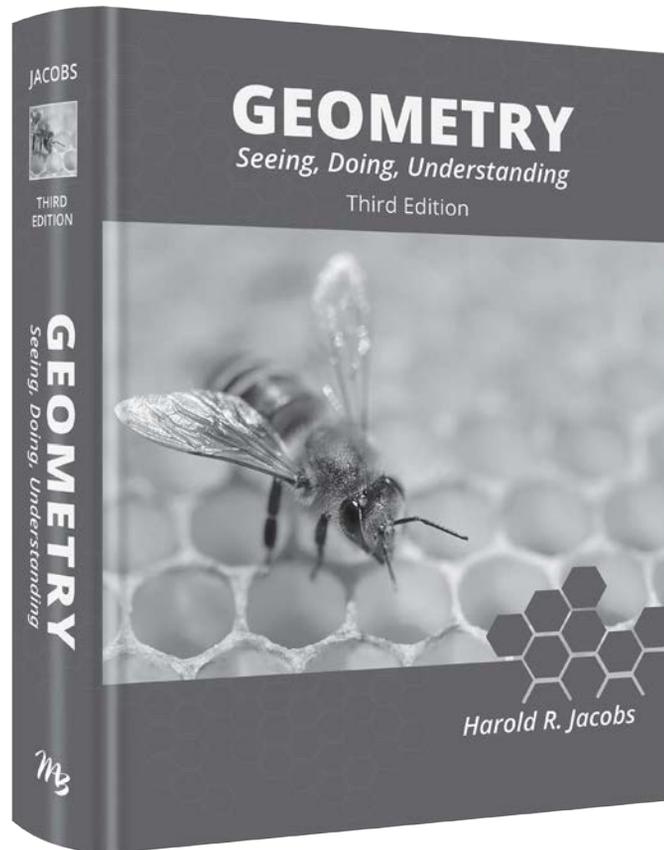
b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

e) \_\_\_\_\_

10. a) \_\_\_\_\_  
\_\_\_\_\_
- b) \_\_\_\_\_  
\_\_\_\_\_
- c) \_\_\_\_\_
11. a) \_\_\_\_\_  
\_\_\_\_\_
- b) \_\_\_\_\_  
\_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_
12. a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_
13. a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_
14. a) \_\_\_\_\_  
\_\_\_\_\_
- b) \_\_\_\_\_  
\_\_\_\_\_



**Mid-Term and Final Tests**  
**for Use with**  
***Geometry: Seeing, Doing, Understanding***



Write your answers to the following problems on your answer sheet.

1. Simplify:  $x + x + x$ .
2. Use the distributive rule to eliminate the parentheses:  $x^2(4 - x)$ .
3. Solve for  $x$ :  $3(x + 7) = -12$ .
4. Subtract:  $(9x + y) - (x - y)$ .
5. Factor:  $5x^2 + 14x - 3$ .
6. Reduce to lowest terms:  $\frac{x - 3}{x^2 - 9}$ .
7. Write as a single fraction in lowest terms:  
$$\frac{x + 2}{4} - \frac{x}{8}$$
8. Write  $\sqrt{72}$  in simple radical form.

Formulas are important in geometry as well as in algebra. Explain what each of these formulas means.

9.  $c = \pi d$ .
10.  $A = s^2$ .

The following questions refer to this statement:

All porcupines have long quills.

11. Write the statement in “if-then” form.
12. Does it follow that an animal that has long quills is a porcupine?
13. What relation does this idea have to the original statement?

Write the letter of the correct answer on your answer sheet.

14. If two angles of one triangle are equal to two angles of another triangle,
  - a) the triangles must be congruent.
  - b) the sides opposite them are equal.
  - c) the triangles are equiangular.
  - d) the third pair of angles must be equal.
15. If  $a > b$ , which one of the following inequalities must be true?
  - a)  $a^2 > b^2$ .
  - b)  $a + c > b + c$ .
  - c)  $ac > bc$ .
  - d)  $a + b > 0$ .

16. If a quadrilateral is equiangular,
  - a) it is also equilateral.
  - b) it is a square.
  - c) it is a rectangle.
  - d) it is concave.
17. Two angles are a linear pair. Which of the following must be true?
  - a) The angles are equal.
  - b) The angles are right angles.
  - c) The angles are supplementary.
  - d) All of these must be true.
18. If the legs of one right triangle are equal to the legs of another right triangle, which one of the following could be used to prove the triangles congruent?
  - a) SAS.
  - b) ASA.
  - c) SSS.
  - d) HL.
19. Which of the following could be the lengths of the sides of a triangle?
  - a) 3, 7, 11.
  - b) 4, 4, 8.
  - c) 5, 12, 13.
  - d) 6, 9, 15.
20. Two lines are parallel if the interior angles that they form on the same side of a transversal
  - a) are right angles.
  - b) are equal.
  - c) are complementary.
  - d) form a linear pair.
21. If all of the exterior angles of a triangle are obtuse, the triangle must be
  - a) obtuse.
  - b) equiangular.
  - c) acute.
  - d) scalene.
22. Which one of the following statements about the diagonals of a parallelogram is always true?
  - a) They are equal.
  - b) They are longer than the sides.
  - c) They are perpendicular.
  - d) They bisect each other.

23. If the sides of a triangle have lengths  $x$ ,  $x$ , and  $y$ , its perimeter is
- $x^2 + y$ .
  - $2xy$ .
  - $x^2 y$ .
  - $2x + y$ .

Read the following statements carefully. If a statement is always true, write *true*. If not, *do not write false*. Instead, write a word or words that could replace the underlined word to make the statement true. Some of the questions in this section may have more than one correct answer; do not make a change in any statement that is always true however.

- An obtuse triangle has two obtuse angles.
- Three noncollinear points determine a plane.
- The base angles of an isosceles trapezoid are equal.
- The converse of every theorem is true.
- The points on a line can be numbered so that positive number sums measure distances.
- The diagonals of a rhombus are equal.
- The word line is an undefined term in geometry.
- If the  $x$ -coordinate of a point is 0, the point is on the  $x$ -axis.
- A pentagon is a polygon that has eight sides.
- Two angles are vertical angles if the sides of one angle are opposite rays to the sides of the other.
- If  $\angle A$  and  $\angle B$  are supplementary and  $\angle B$  and  $\angle C$  are supplementary, then  $\angle A$  and  $\angle C$  are supplementary.
- According to the Betweenness of Points Theorem, if  $A$ - $B$ - $C$ , then  $AB = BC$ .
- To prove a theorem indirectly, we begin by assuming that the opposite of its conclusion is true.
- If a triangle has two equal sides, it must be equilateral.
- Two lines that do not intersect must be parallel.
- The supplement of an acute angle is acute.
- Through a point not on a line, there is exactly one line parallel to the given line.

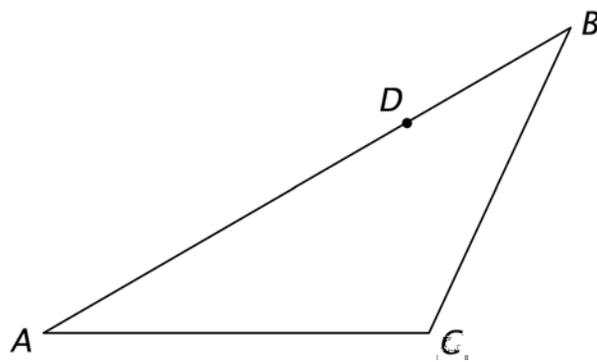
- The "Whole Greater than Part" Theorem says that if  $a > 0$ ,  $b > 0$ , and  $a + b = c$ , then  $a > c$  and  $b > c$ .
- In a right triangle, the hypotenuse must be the longest side.
- A square has two lines of symmetry.

Use your straightedge and compass to make the following constructions on your answer sheet.

- Bisect  $\angle A$ .
- Through  $D$ , construct a line perpendicular to  $BC$ .



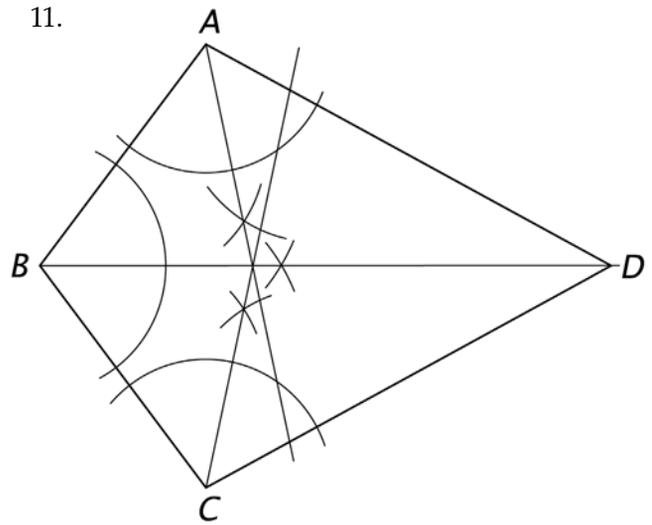
- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 9. \_\_\_\_\_
- 10. \_\_\_\_\_
- 11. \_\_\_\_\_
- 12. \_\_\_\_\_
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- 37. \_\_\_\_\_
- 38. \_\_\_\_\_
- 39. \_\_\_\_\_
- 40. \_\_\_\_\_
- 41. \_\_\_\_\_
- 42. \_\_\_\_\_
- 43. \_\_\_\_\_
- 44/45.



**Answers for  
Chapter, Mid-Term and Final Tests**

## Chapter Test 1

1. Euclid.
2. A point.
3. A line extends without end in both directions.  
A line segment is part of a line bounded by two endpoints.
4. A rectangle is bounded by four line segments.  
A plane has no boundaries.
5. A polygon that has four sides.
6. A pentagon has five sides, so the pentathlon has five events.
7. An octopus has eight arms and an octagon has eight sides.
8. Triangles.
9. Three.
10. Coplanar.



12. They seem to be concurrent.
13. It also appears to bisect  $\angle D$ .
14. The perimeter of room A is  
 $2(15 \text{ ft}) + 2(18 \text{ ft}) = 66 \text{ ft}.$   
The perimeter of room B is  
 $2(10 \text{ ft}) + 2(24 \text{ ft}) = 68 \text{ ft}.$   
Room B has the greater perimeter.
15. The area of room A is  
 $(15 \text{ ft})(18 \text{ ft}) = 270 \text{ sq ft}.$   
The area of room B is  
 $(10 \text{ ft})(24 \text{ ft}) = 240 \text{ sq ft}.$   
Room A has the greater area.
16. 7.3 cm.

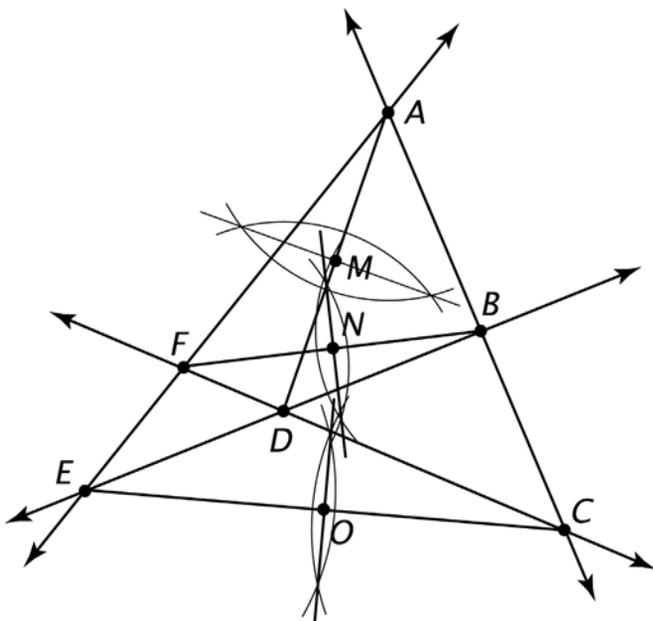
17. 7.8 cm.

18. 62°.

19. 109°.

20. FB appears to be longer than FD,  
but it is shorter.

21.



22. They seem to be collinear.

23. According to the formula used  
by the Egyptians for the area of  
a quadrilateral, the area of both  
quadrilaterals is  
$$\frac{1}{4}(4 + 4)(5 + 5) = \frac{1}{4}(8)(10) =$$
  
20 square units.

This is correct for rectangle ABCD,  
whose area is 20 square units.

If quadrilateral ABEF is cut by a  
vertical line through point F, the  
two pieces can be rearranged to  
form a square with sides of 4  
units, so its area is actually  
16 square units.

Extra Credit

1. (Student answer.) Two of the  
cards are clearly the 2 and 3 of  
diamonds. The card in back  
could be the ace of diamonds.
2. Someone might think that the  
card in back is the ace of  
diamonds whereas it is actually  
the ace of hearts.

## Chapter Test 2

1. a) Associative property of  
multiplication.
- b) Commutative property  
of addition.
2. a)  $(13 - 5)^2 = 8^2 = 64.$
- b)  $13^2 - 5^2 = 169 - 25 = 144.$
3. a)  $4x^2.$
- b)  $6x - x - y + 7y = 5x + 6y.$
4. a) False.
- b) True.
- c) False.
- d) False.
- e) True.
5. a) An Euler diagram.
- b) If we don't have it,  
you don't want it.
- c) You don't want it if  
we don't have it.
- d) Statement 2.
6. a) If you watch Sesame Street,  
you love Eskimo pies.
- b) No.
- c) Yes.
7. a) If and only if.
- b) If you are an egotist,  
you are always me-deep in  
conversation.
- c) One statement is the  
converse of the other.
8. a) Definition. A statement that  
gives the meaning of a word.
- b) Postulate. A statement  
assumed true without proof.
- c) Theorem. A statement proved  
by reasoning deductively.

- d) Euclid constructed the  
Geometry starting from  
definitions, postulates and  
axioms with which he  
demonstrated theorems.
9. a) True.  
b) True.  
c) True.  
d) False.  
e) True.
10. a) If the sky becomes dark,  
the crickets think that it is night.  
b) If the crickets start chirping,  
the temperature is estimated  
by counting cricket chirps.  
c) Direct.
11. a) The utensils are not stainless  
steel.  
b) The utensils are stainless  
steel.  
c) They will not rust.  
d) They are rusting.
12. a)  $16^2 = 256.$   
b)  $34^2 = 1,156.$   
c)  $1,156 - 256 = 900.$   
d)  $\sqrt{900} = 30.$
13. a)  $2x = 80, \text{ so } x = 40.$   
b)  $\angle ABC = 180^\circ - 80^\circ - 30^\circ = 70^\circ.$   
c)  $2y = 70, \text{ so } y = 35.$   
d)  $z = 180 - 40 - 35 = 105.$
14. a)  $c = \pi d, 36 = \pi d,$   
 $d = \frac{36}{\pi} \approx 11.5. 11.5 \text{ inches.}$   
b)  $5(3 \text{ feet}) = 15 \text{ feet}$   
 $(\text{or } 180 \text{ inches}).$