

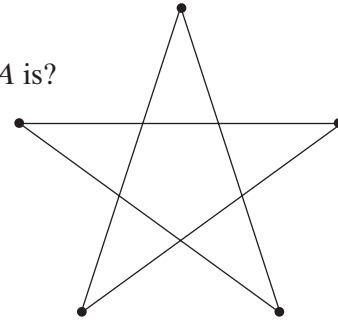
True–False. Mark as true any statement that is always true. Mark as false any statement that is never true or that is not necessarily true. Be able to justify your answers.

1. If triangle ABC and triangle DEF are both 30° – 60° triangles, then \overline{AB} must be congruent to \overline{DE} .
2. An angle of degree measure 180° is a reflex angle.
3. Postulates are statements we assume to be true without proof.
4. Any three points are contained in exactly one plane.
5. A right triangle has two acute angles.
6. An obtuse triangle has at least two obtuse angles.
7. All regular quadrilaterals have four lines of symmetry.
8. All regular polygons tessellate the plane.
9. The parallel sides in a trapezoid are called the legs of the trapezoid.
10. Regular polygons are polygons with all sides congruent and all angles congruent.
11. A soccer ball is a regular polyhedron.
12. The lateral faces of a rectangular prism meet at the apex of the prism.
13. The two opposite faces of a cone are called the bases of the cone and they can be oval (elliptically) shaped as well as truly circularly shaped.
14. A pyramid with rectangular faces is called a rectangular pyramid.
15. A sphere is a polyhedron.
16. The bases of a right regular prism may be congruent, parallel hexagons.
17. The lateral faces of a right square pyramid are isosceles triangles.
18. If there are 1.057 quarts in one liter and four quarts in one gallon, then there are 4.228 liters in one gallon.

Multiple Choice. Mark the letter of the single BEST response. Be sure to read all the choices for each problem before deciding.

19. The measure of an acute angle is a number, n , such that:
 - (a) $0^\circ \leq n \leq 90^\circ$
 - (b) $0^\circ < n \leq 90^\circ$
 - (c) $0^\circ \leq n < 90^\circ$
 - (d) $0^\circ < n < 90^\circ$
 - (e) $0^\circ < n < 180^\circ$
20. Which of the following are simple closed curves?
 - (a) A circle.
 - (b) A polygon.
 - (c) A cube.
 - (d) Both (a) and (b) are correct.
 - (e) Both (a) and (c) are correct.

21. Two segments are congruent if
- they intersect.
 - they are parallel.
 - they have the same length.
 - they share one endpoint.
 - None of these are correct.
22. If a triangle has two congruent sides and an angle with measure 90° , then it is called
- right.
 - scalene.
 - isosceles.
 - acute.
 - Both (a) and (c) are correct.
23. If all the angles in a quadrilateral are right angles, then the quadrilateral might be
- a trapezoid.
 - a kite.
 - a rectangle.
 - a square.
 - Both (c) and (d) are correct.
24. Assume the pentagon in the star is regular. The measure of $\angle A$ is?
- 36°
 - 54°
 - 72°
 - 108°
 - 144°
25. An equilateral triangle has how many lines of symmetry?
- 0
 - 1
 - 2
 - 3
 - 4
26. If a set of polygons forms a tessellation in the plane, then
- they cover the plane with no gaps.
 - they are all congruent polygons.
 - none of the regions overlap.
 - Both (a) and (c) are correct.
 - Both (a) and (b) are correct.
27. The measure of a vertex angle in a regular polygon with nine sides is
- 140°
 - 220°
 - 1260°
 - 20°
 - 40°
28. Two faces of a prism intersect in
- a vertex.
 - an edge.
 - a base.
 - a side.
 - Both (a) and (b) are correct.



12 Chapter 2

29. The slant height of a right regular pyramid is
- (a) the perpendicular distance from its apex to the base of the pyramid.
 - (b) the height of its lateral face.
 - (c) the length of a base edge.
 - (d) the length of a lateral edge.
 - (e) None of these is correct.
30. Which of the following are regular polyhedra?
- (a) An octahedron.
 - (b) A soccer ball.
 - (c) A right circular cylinder.
 - (d) A sphere.
 - (e) Both (a) and (b) are correct.
31. If there are 2.54 cm in one inch then, in one foot there are
- (a) 30.48 cm.
 - (b) 304.8 mm.
 - (c) 0.3048 meters.
 - (d) Both (a) and (b) are correct.
 - (e) Answers (a), (b) and (c) are all correct.

Fill in the Blanks. Complete each statement with a word or phrase that makes it true.

32. A line segment containing the center and with endpoints on a circle is called a _____.
33. A portion of a line that has one endpoint and extends indefinitely in one direction is called a(n) _____.
34. If the sum of the measures of two angles is 90° , then they are called _____.
35. The side of a right triangle that is opposite the right angle is called the _____.
36. If the sum of the vertex angles of a polygon is 540° , then it is called a(n) _____.
37. The faces of a right hexagonal prism are _____.
38. Name the five Platonic Solids. For each, give the name of the shape of the face and list the number of faces.
- a. Solid: _____ Shape of faces: _____ Number of faces: _____
 - b. Solid: _____ Shape of faces: _____ Number of faces: _____
 - c. Solid: _____ Shape of faces: _____ Number of faces: _____
 - d. Solid: _____ Shape of faces: _____ Number of faces: _____
 - e. Solid: _____ Shape of faces: _____ Number of faces: _____
39. For an oblique regular hexagonal pyramid, the name of the base is: _____ and the name of the lateral faces is: _____

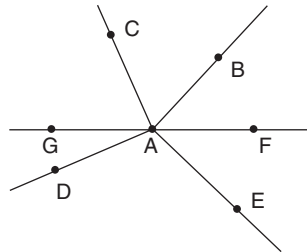
Writing. Write your answers concisely and completely. Feel free to use figures and/or tables to illustrate the points you are making.

40. Compare and contrast the following types of quadrilaterals: trapezoid, parallelogram, rhombus, rectangle and square.
41. How are sides and angle measures used to classify quadrilaterals?
42. Consider a regular polygon with n sides. Discuss its characteristics, including sides, angles and symmetries.

43. Which polygons can be used to make a regular tessellation? Explain why.

Exercises and Problems.

44. In the figure, $\angle FAB = 30^\circ$, $\angle CAB = 66^\circ$, $\angle GAD = 23^\circ$, $\overline{BA} \perp \overline{EA}$ and G and F are collinear.



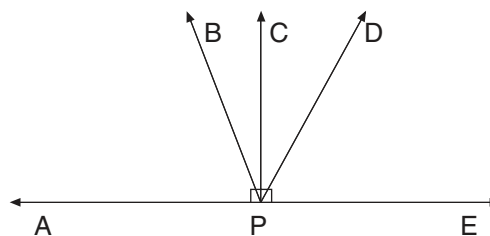
- (a) What is the measure of $\angle DAE$?
 (b) Name three pairs of supplementary angles in this figure.
 (c) Name all of the pairs of complimentary angles in this figure.
 (d) Name two adjacent angles in this figure.
45. Convert each of the following angle measure to degrees and minutes. Round to the nearest minute if necessary.
 (a) 43.7°
 (b) 113.67°
 (c) 56.4°
 (d) 29.11°
46. How many different rays have B as their initial point? Name them.



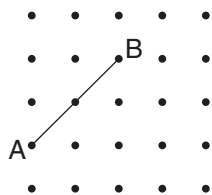
47. Points A , B , C and D are located on line l . Their corresponding coordinates are: $A = -2.35$, $B = -.4$, $C = .7$ and $D = 3.25$. Find each of the following distances:



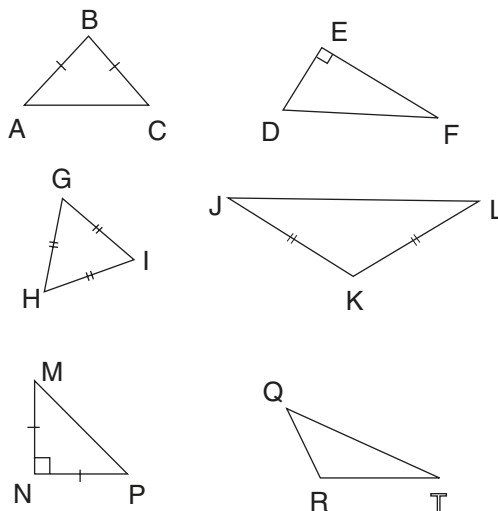
- (a) AC
 (b) BD
 (c) BC
 (d) AD
48. The measure of $\angle X$ is 12° more than three times $\angle Y$. If $\angle X$ and $\angle Y$ are supplementary; find the measure of $\angle X$ and classify it as acute, right, obtuse or straight.
49. On a standard clock, find the measure of the obtuse angle formed by the hour hand and the minute hand at 3:37 and 30 seconds.
50. In the figure, the measure of $\angle APB$ is 72° and the measure of $\angle DPE$ is 55° . What is the measure of $\angle BPD$?



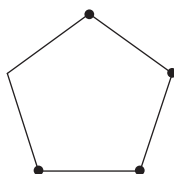
51. Given \overline{AB} on the square lattice.
- How many triangles can be drawn that have \overline{AB} as a side?
 - How many of these triangles are isosceles triangles?
 - How many of these triangles are acute triangles?
 - How many of these triangles are right triangles?
 - How many of these triangles are obtuse triangles?



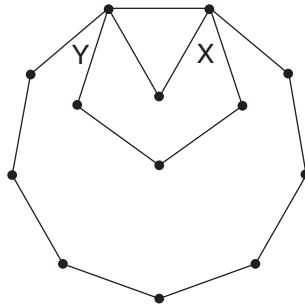
52. Several triangles are shown below with congruent sides, congruent angles and right angles shown.
- Which ones are scalene triangles?
 - Which ones are isosceles triangles?
 - Which ones are right triangles?
 - Which ones are equilateral triangles?
 - Which ones are obtuse triangles?



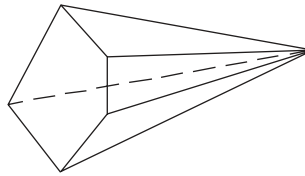
53. The measures of two angles of a triangle are 38° and 102° . What is the measure of the third angle?
54. Use a protractor **and** a ruler to draw a quadrilateral with two angles of 120° and 3 congruent sides. Name the shape that you have created.
55. Use a protractor and a ruler to draw a hexagon where all of the vertex angles are 120° but the hexagon is not a regular hexagon.
56. Use this diagram of a regular pentagon to explain how to determine the formula for finding the vertex angle in a regular polygon.



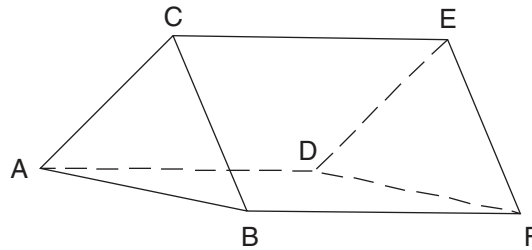
57. In the following figure, each polygon is regular. Find the angle measures X and Y.



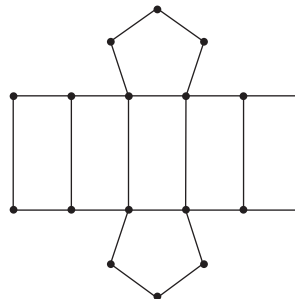
58. If the vertex angle of a regular polygon has measure 168° , how many sides does it have?
 59. Given the pyramid below, verify Euler's Formula: $F + V = E + 2$.



60. Answer the following questions about the given prism.



- Name the bases of the prism.
 - Name the lateral faces of the prism.
 - Name the faces that are hidden from view.
 - Name the edges of the prism.
 - Name the prism by type. Be as specific as possible.
61. When the following net is folded, what is the name of the resulting polyhedron? Give as complete a description as possible.

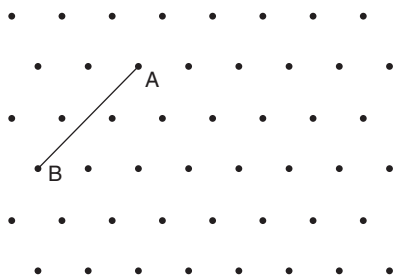


62. Use dimensional analysis to convert 0.3 days to minutes.
 63. Use dimensional analysis to convert 246 ft/sec to meters per minute. (Remember that one inch is 2.54 centimeters.)

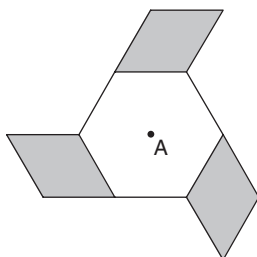
64. Georgi ran a mile in 4 minutes and 18 seconds.
- How fast did she run in miles per hour?
 - How fast did she run in miles per minute?
 - How fast did she run in kilometers per hour? (Remember there are 0.6214 miles in one kilometer)

Applications.

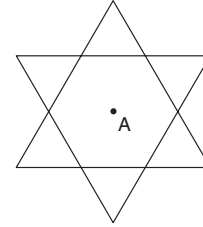
65. A surveyor measures an angle to be $13^{\circ}15'36''$. In order to use this measure in his calculations he must convert it to degrees. Express this angle measure in degrees and a decimal fraction of one degree.
66. The bearing of a line segment is the acute angle that the line segment makes with a north-south line. If the bearing of \overline{PQ} is N 70° E and the bearing of \overline{PR} is S 32° W, what is the measure of the obtuse angle; $\angle QPR$?
67. An airplane takes off from an airport at a bearing along \overline{AB} , of N 13° E, and a second plane leaves the same airport at bearing N 30° W along \overline{AC} . A third plane leaves the airport at S 87° W along \overline{AD} . What is the measure of the angle between the first and second planes? Between the first and third planes? (Remember: The bearing of a line segment is the acute angle that the line segment makes with a north-south line.)
68. In order to complete an edge in a tiling job, a builder needs an isosceles trapezoid with a base that fits along the side of the regular hexagonal tiles he is using. Can he form the trapezoid in one cut? If so, how might he do this? If not, why not?
69. Using the given triangle lattice, if possible, sketch the following shapes. If not possible, explain why.



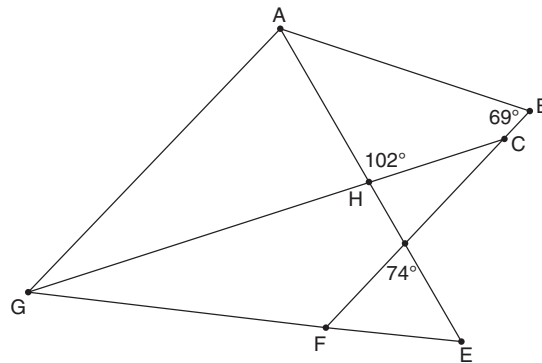
- Sketch four non-congruent non-right parallelograms with \overrightarrow{AB} as one side.
 - Sketch all of the squares with \overrightarrow{AB} as one side.
 - Sketch all of the non-square rectangles with \overrightarrow{AB} as one side.
 - Sketch an isosceles trapezoid with \overrightarrow{AB} as one side.
70. For the given figure the hexagon is regular and the shaded regions are rhombi.
- Describe the rotational symmetries of the figure or explain why none exist.
 - Sketch the lines of symmetries on the figure or explain why none exist.



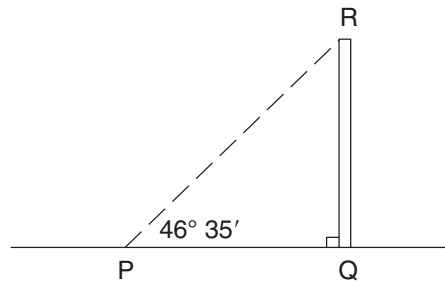
71. For the given figure both triangles are equilateral triangles.
- Describe the rotational symmetries of the figure or explain why none exist.
 - Sketch the lines of symmetries on the figure or explain why none exist.



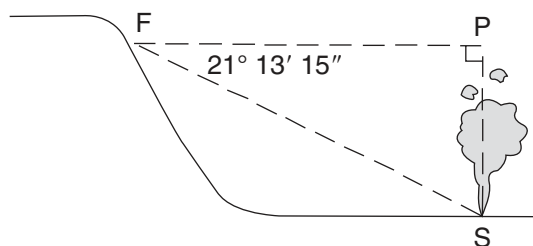
72. In the following figure: \vec{BF} and \vec{AG} are parallel and $\triangle DEF$ is an isosceles triangle.



- List two supplementary angles.
 - What shape is ABDEGHA?
 - What is the measure of $\angle DFG$?
 - What is the measure of $\angle BAH$?
 - How many obtuse interior angles are in the figure? List the angle names and measures.
 - List one set of vertices that form a pentagon.
 - List two sets of vertices that form scalene triangles
 - Which angles are congruent? List all congruent angle sets.
73. A contractor finds that the angle of elevation (the acute angle between the horizontal and the line of sight) to the top of a building is $46^\circ 35'$ as shown below. What is the measure of $\angle QRP$?

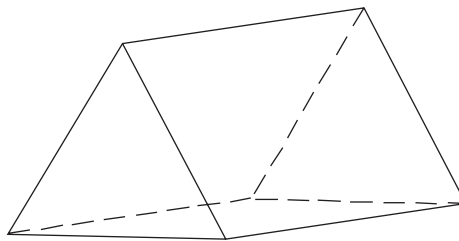


74. A forester from his vantage point on a hillside sees a puff of smoke in a valley below him. He measures the angle of depression (the acute angle between the horizontal and the line of sight) to the smoke from his position to be $21^\circ 13' 15''$ (see figure). Find the measure of $\angle PSF$ in degrees, minutes and seconds.



18 Chapter 2

75. A surveying party traversed the boundary of an area designated as a wetland. The interior angles formed were $90^{\circ}12'$, $132^{\circ}46'$, $102^{\circ}16'$, $120^{\circ}40'$ and 94° . Determine the error, if any, in this traverse. (Remember: A traverse is the measurement of a polygonal region, made in a series of legs so that one leg is the start of the next leg and the beginning of the first leg connects with the end of the last leg.)
76. A certain mail order outlet uses a container in the shape shown below. Ignoring the flaps used to secure the sides together, describe and sketch the shape of the box when it is unfolded.



77. A right regular n -gon pyramid has 28 edges.
- What n -gon is it? Show your work.
 - How many faces does the pyramid have?
 - How many vertices does the pyramid have?
78. A right regular n -gon prism has 64 vertices.
- What n -gon is it? Show your work.
 - How many faces does the prism have?
 - How many edges does the prism have?
79. A can of beans is in the shape of a right circular cylinder. To recycle the can, the top and bottom are cut out and the remaining part of the can is cut and laid flat. Describe the shapes of the pieces of metal that remain for recycling.
80. Water is flowing along a stream at the rate of 1200 gallons per minute. What is this rate in liters per second? Round to the nearest hundredth. (Remember: There are four quarts in a gallon and 1.057 quarts in a liter.)
81. A foreign car has a gas tank that holds 45 liters of gasoline. Assuming the tank is empty and gas is selling for \$1.23 a gallon, how much will it cost to fill this tank with gasoline? (Remember: There are four quarts in a gallon and 1.057 quarts in a liter.)
82. Light travels at 186,282 miles per second, one year is 365 days and Neptune is 2,697,000,000 miles from Earth. If a light year is the distance light travels in one year, how far is it from Neptune to Earth in light years?
83. If a car gets 32.6 miles to the gallon, what is its gas mileage in kilometers per liter? Round to the nearest hundredth. (Remember: There are four quarts in a gallon, 1.057 quarts in one liter, 2.54 centimeters in one inch and 5280 feet in one mile.)