

## Section 7-2: Pairs of Angles

### Complementary Angles

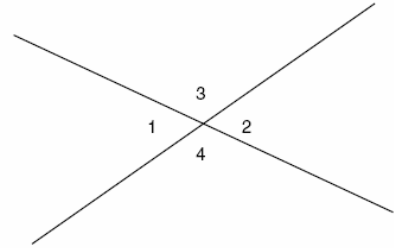
1. 010313a, 8.G.3  
If the measure of an angle is represented by  $2x$ , which expression represents the measure of its complement?  
[A]  $90 + 2x$  [B]  $88x$   
[C]  $180 - 2x$  [D]  $90 - 2x$
2. 010823a, P.I. 8.G.3  
Two angles are complementary. The measure of one angle is  $15^\circ$  more than twice the other. What is the measure of the *smaller* angle?  
[A]  $35^\circ$  [B]  $65^\circ$  [C]  $55^\circ$  [D]  $25^\circ$
3. 080431a, P.I. 8.G.3  
Two angles are complementary. One angle has a measure that is five times the measure of the other angle. What is the measure, in degrees, of the larger angle?
4. 060621a, P.I. 8.G.3  
The measures of two complementary angles are represented by  $(3x + 15)$  and  $(2x - 10)$ . What is the value of  $x$ ?  
[A] 35 [B] 19 [C] 37 [D] 17

### Supplementary Angles

5. 060414a, P.I. 8.G.3  
The ratio of two supplementary angles is 2:7. What is the measure of the *smaller* angle?  
[A]  $10^\circ$  [B]  $14^\circ$  [C]  $40^\circ$  [D]  $20^\circ$
6. 010624a, P.I. 8.G.3  
The ratio of two supplementary angles is 3:6. What is the measure of the *smaller* angle?  
[A]  $60^\circ$  [B]  $30^\circ$  [C]  $10^\circ$  [D]  $20^\circ$

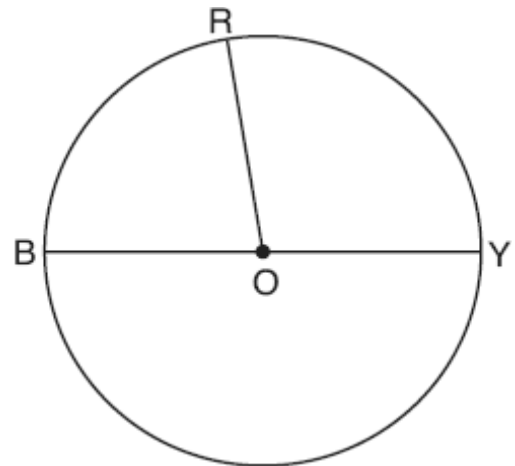
7. 010128a, P.I. 8.A.12

In the accompanying figure, two lines intersect,  $m\angle 3 = 6t + 30$ , and  $m\angle 2 = 8t - 60$ . Find the number of degrees in  $m\angle 4$ .



8. 010836a, P.I. 8.G.3

In the accompanying diagram,  $\overline{BY}$  is a diameter of circle  $O$ , the measure of central angle  $ROY$  is  $(x + 60)^\circ$ , and the measure of central angle  $ROB$  is  $(3x - 20)^\circ$ . Find the number of degrees in the measure of central angle  $ROY$ .



### Vertical Angles

9. 060601a, P.I. 8.A.12

In the accompanying diagram, line  $a$  intersects line  $b$ .



What is the value of  $x$ ?

- [A] 10 [B] 5 [C] -10 [D] 90

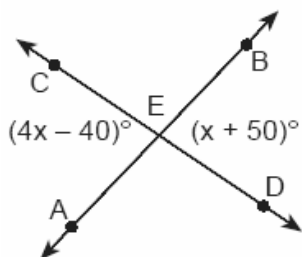
10. 080407a, P.I. 8.A.12

$\overrightarrow{AB}$  and  $\overrightarrow{CD}$  intersect at point  $E$ ,  
 $m\angle AEC = 6x + 20$ , and  $m\angle DEB = 10x$ .  
What is the value of  $x$ ?

- [A] 5 [B] 10 [C]  $21\frac{1}{4}$  [D]  $4\frac{3}{8}$

11. 010229a, P.I. 8.A.12

In the accompanying diagram,  $\overrightarrow{AB}$  and  $\overrightarrow{CD}$  intersect at  $E$ . If  $m\angle AEC = 4x - 40$  and  $m\angle BED = x + 50$ , find the number of degrees in  $\angle AEC$ .



12. 080638a, P.I. 8.A.12

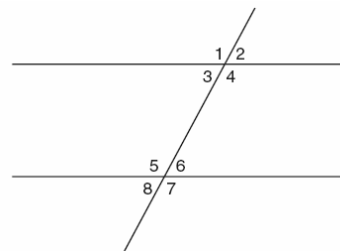
$\overrightarrow{AB}$  and  $\overrightarrow{CD}$  intersect at  $E$ . If  
 $m\angle AEC = 5x - 20$  and  $m\angle BED = x + 50$ ,  
find, in degrees,  $m\angle CEB$ .

### Section 7-3: Angles and Parallel Lines

#### Alternate Interior Angles and Parallel Lines

13. 010320a, P.I. 8.G.4

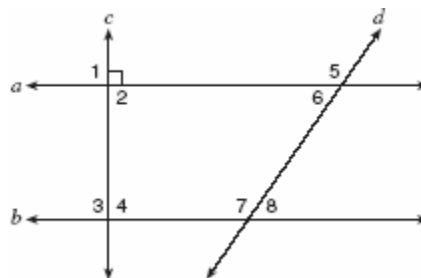
In the accompanying figure, what is one pair of alternate interior angles?



- [A]  $\angle 6$  and  $\angle 8$  [B]  $\angle 4$  and  $\angle 5$   
[C]  $\angle 4$  and  $\angle 6$  [D]  $\angle 1$  and  $\angle 2$

14. 010502a, P.I. 8.G.4

In the accompanying diagram, lines  $a$  and  $b$  are parallel, and lines  $c$  and  $d$  are transversals.

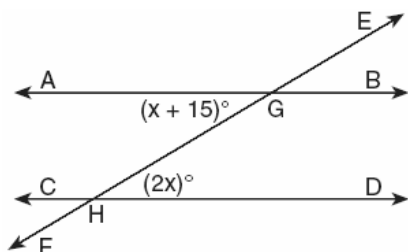


Which angle is congruent to angle 8?

- [A] 4 [B] 5 [C] 3 [D] 6

15. 010402a, P.I. 8.A.12

In the accompanying diagram, parallel lines  $\overleftrightarrow{AB}$  and  $\overleftrightarrow{CD}$  are intersected by transversal  $\overleftrightarrow{EF}$  at points  $G$  and  $H$ , respectively,  $m\angle AGH = x + 15$ , and  $m\angle GHD = 2x$ .

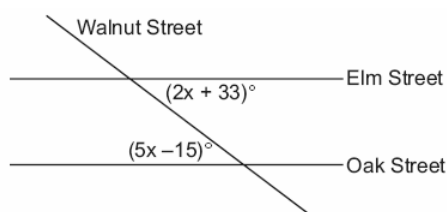


Which equation can be used to find the value of  $x$ ?

- [A]  $2x = x + 15$       [B]  $2x + x + 15 = 90$   
[C]  $2x + x + 15 = 180$   
[D]  $2x(x + 15) = 0$

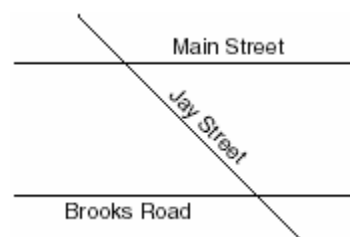
16. 060226a, P.I. 8.A.12

Two parallel roads, Elm Street and Oak Street, are crossed by a third, Walnut Street, as shown in the accompanying diagram. Find the number of degrees in the acute angle formed by the intersection of Walnut Street and Elm Street.



17. 080510a, P.I. 8.A.12

The accompanying diagram shows two parallel streets, Main Street and Brooks Road, intersected by Jay Street. The obtuse angle that Jay Street forms with Brooks Road is three times the measure of the acute angle that Jay Street forms with Main Street.



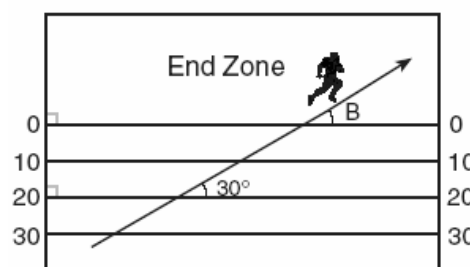
What is the measure of the acute angle formed by Jay Street and Main Street?

- [A]  $90^\circ$     [B]  $45^\circ$     [C]  $135^\circ$     [D]  $60^\circ$

### Corresponding Angles and Parallel Lines

18. 080421a, P.I. 8.G.5

The accompanying diagram shows a football player crossing the 20-yard line at an angle of  $30^\circ$  and continuing along the same path.

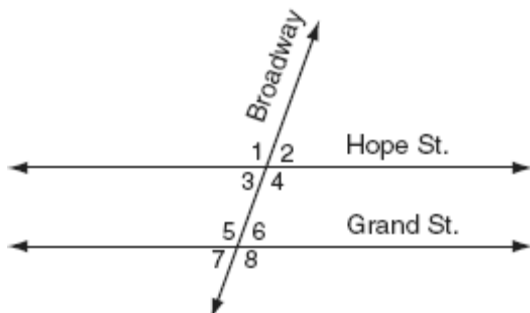


What is the measure of angle B, where the player crosses into the end zone?

- [A]  $30^\circ$     [B]  $180^\circ$     [C]  $60^\circ$     [D]  $150^\circ$

19. 010702a, P.I. 8.G.5

The accompanying diagram shows two parallel roads, Hope Street and Grand Street, crossed by a transversal road, Broadway.

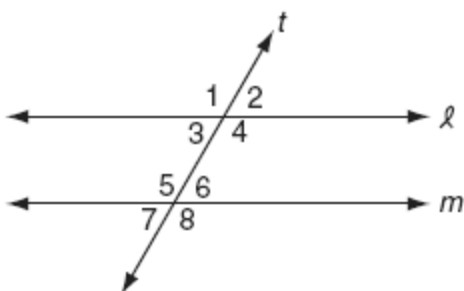


If  $m\angle 1 = 110$ , what is the measure of  $\angle 7$ ?

[A]  $70^\circ$  [B]  $40^\circ$  [C]  $180^\circ$  [D]  $110^\circ$

20. 080613a, P.I. 8.G.4

In the accompanying diagram, line  $\ell$  is parallel to line  $m$ , and line  $t$  is a transversal.

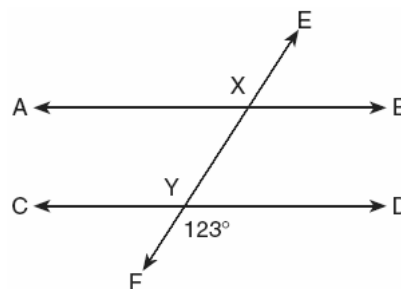


Which must be a true statement?

[A]  $m\angle 1 + m\angle 4 = 180$   
[B]  $m\angle 1 + m\angle 8 = 180$   
[C]  $m\angle 3 + m\angle 6 = 180$   
[D]  $m\angle 2 + m\angle 5 = 180$

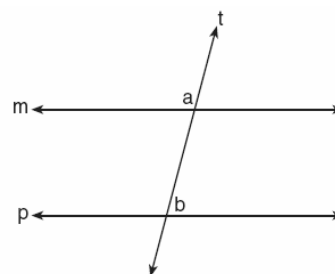
21. 060122a, P.I. 8.G.5

In the accompanying diagram, parallel lines  $\overline{AB}$  and  $\overline{CD}$  are intersected by transversal  $\overline{EF}$  at points  $X$  and  $Y$ , and  $m\angle FYD = 123$ . Find  $m\angle AXY$ .



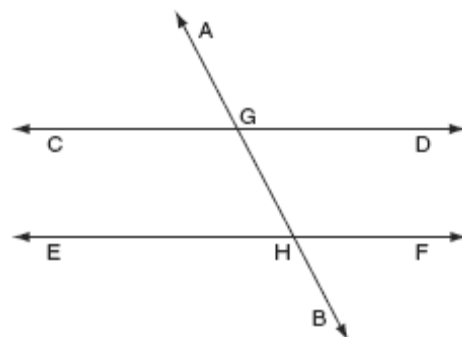
22. 060324a, P.I. 8.A.12

In the accompanying diagram, line  $m$  is parallel to line  $p$ , line  $t$  is a transversal,  $m\angle a = 3x + 12$ , and  $m\angle b = 2x + 13$ . Find the value of  $x$ .



23. 010639a, P.I. 8.A.12

In the accompanying diagram,  $\overleftrightarrow{CD} \parallel \overleftrightarrow{EF}$ ,  $\overleftrightarrow{AB}$  is a transversal,  $m\angle DGH = 2x$ , and  $m\angle FHB = 5x - 51$ . Find the measure, in degrees, of  $\angle BHE$ .

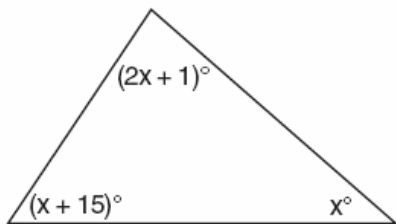


## Section 7-4: Triangles

### Sum of the Measures of the Angles of a Triangle

24. 080216a, P.I. G.G.30

What is the measure of the largest angle in the accompanying triangle?



- [A] 41      [B] 83      [C] 56      [D] 46.5

25. 010538a, P.I. G.G.30

In  $\triangle ABC$ , the measure of  $\angle B$  is 21 less than four times the measure of  $\angle A$ , and the measure of  $\angle C$  is 1 more than five times the measure of  $\angle A$ . Find the measure, in degrees, of *each* angle of  $\triangle ABC$ .

26. 010102a

In right triangle  $ABC$ ,  $m\angle C = 3y - 10$ ,  $m\angle B = y + 40$ , and  $m\angle A = 90$ . What type of right triangle is triangle  $ABC$ ?

- [A] equilateral      [B] scalene  
[C] isosceles      [D] obtuse

27. 010722a

If the measures of the angles of a triangle are represented by  $2x$ ,  $3x - 15$ , and  $7x + 15$ , the triangle is

- [A] a right triangle  
[B] an isosceles triangle  
[C] an equiangular triangle  
[D] an acute triangle

28. 010810a

If the measures, in degrees, of the three angles of a triangle are  $x$ ,  $x + 10$ , and  $2x - 6$ , the triangle must be

- [A] right      [B] isosceles  
[C] scalene      [D] equilateral

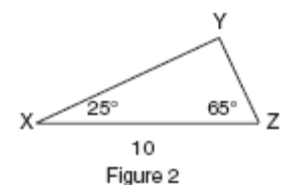
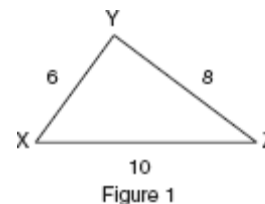
29. 060417a

Which phrase does *not* describe a triangle?

- [A] equilateral equiangular  
[B] isosceles right  
[C] obtuse right      [D] acute scalene

30. 010119a, P.I. G.G.30, G.G.48

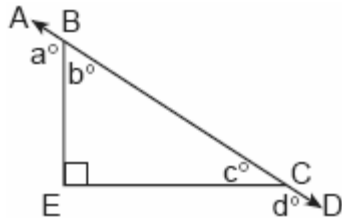
In which of the accompanying figures are segments  $XY$  and  $YZ$  perpendicular?



- [A] figure 1, only      [B] figure 2 only  
[C] both figure 1 and figure 2  
[D] neither figure 1 nor figure 2

31. 010216a, P.I. G.G.36

In the accompanying diagram,  $\overline{ABCD}$  is a straight line, and angle  $E$  in triangle  $BEC$  is a right angle.

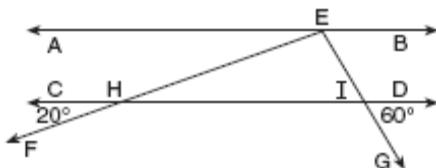


What does  $a^\circ + d^\circ$  equal?

- [A]  $180^\circ$  [B]  $270^\circ$   
[C]  $135^\circ$  [D]  $160^\circ$

32. 060606a, P.I. G.G.36

In the accompanying diagram,  $\overline{AB} \parallel \overline{CD}$ . From point  $E$  on  $\overline{AB}$ , transversals  $\overline{EF}$  and  $\overline{EG}$  are drawn, intersecting  $\overline{CD}$  at  $H$  and  $I$ , respectively.

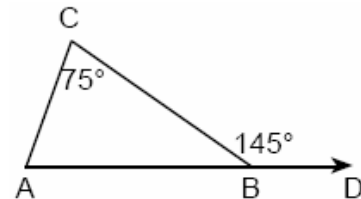


If  $m\angle CHF = 20$  and  $m\angle DIG = 60$ , what is  $m\angle HEI$ ?

- [A] 120 [B] 80 [C] 100 [D] 60

33. 069912a, P.I. G.G.32

In the accompanying diagram of  $\triangle ABC$ ,  $\overline{AB}$  is extended to  $D$ , exterior angle  $CBD$  measures  $145^\circ$ , and  $m\angle C = 75$ .

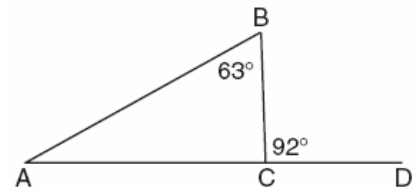


What is  $m\angle CAB$ ?

- [A] 35 [B] 220 [C] 110 [D] 70

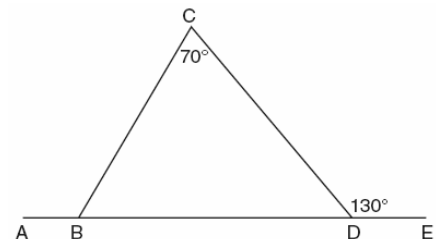
34. 080121a, P.I. G.G.32

Triangle  $ABC$ , with side  $\overline{AC}$  extended to  $D$ , is shown in the accompanying diagram. If  $m\angle ABC = 63$  and  $m\angle BCD = 92$ , what is  $m\angle BAC$ ?



35. 060431a, P.I. G.G.32

In the accompanying diagram of  $\triangle BCD$ ,  $m\angle C = 70$ ,  $m\angle CDE = 130$ , and side  $\overline{BD}$  is extended to  $A$  and to  $E$ . Find  $m\angle CBA$ .



Properties of Special Triangles

36. 060107a, P.I. G.G.30

In isosceles triangle  $DOG$ , the measure of the vertex angle is three times the measure of one of the base angles. Which statement about  $\triangle DOG$  is true?

- [A]  $\triangle DOG$  is an acute triangle.
- [B]  $\triangle DOG$  is a scalene triangle.
- [C]  $\triangle DOG$  is a right triangle.
- [D]  $\triangle DOG$  is an obtuse triangle.

37. 010223a, P.I. G.G.30

Vertex angle  $A$  of isosceles triangle  $ABC$  measures  $20^\circ$  more than three times  $m\angle B$ . Find  $m\angle C$ .

38. 080433a, P.I. G.G.31

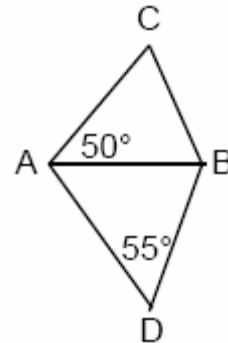
Dylan says that all isosceles triangles are acute triangles. Mary Lou wants to prove that Dylan is *not* correct. Sketch an isosceles triangle that Mary Lou could use to show that Dylan's statement is not true. In your sketch, state the measure of *each* angle of the isosceles triangle.

39. 060027a, P.I. G.G.31

Hersch says if a triangle is an obtuse triangle, then it cannot also be an isosceles triangle. Using a diagram, show that Hersch is incorrect, and indicate the measures of all the angles and sides to justify your answer.

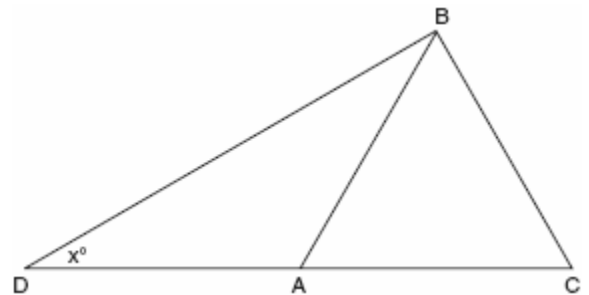
40. 069930a, P.I. G.G.31

In the accompanying diagram,  $\triangle ABC$  and  $\triangle ABD$  are isosceles triangles with  $m\angle CAB = 50$  and  $m\angle BDA = 55$ . If  $AB=AC$  and  $AB=BD$ , what is  $m\angle CBD$ ?



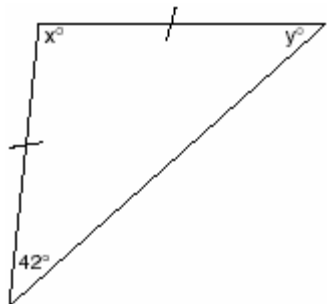
41. 080221a, P.I. G.G.31

In the accompanying diagram of  $\triangle BCD$ ,  $\triangle ABC$  is an equilateral triangle and  $AD = AB$ . What is the value of  $x$ , in degrees?



42. 060510a, P.I. G.G.31

Tina wants to sew a piece of fabric into a scarf in the shape of an isosceles triangle, as shown in the accompanying diagram.



What are the values of  $x$  and  $y$ ?

[A]  $x = 96$  and  $y = 42$

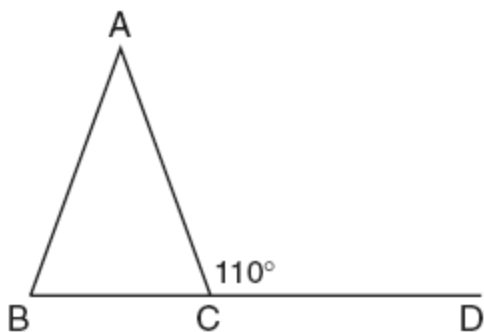
[B]  $x = 90$  and  $y = 48$

[C]  $x = 42$  and  $y = 96$

[D]  $x = 69$  and  $y = 69$

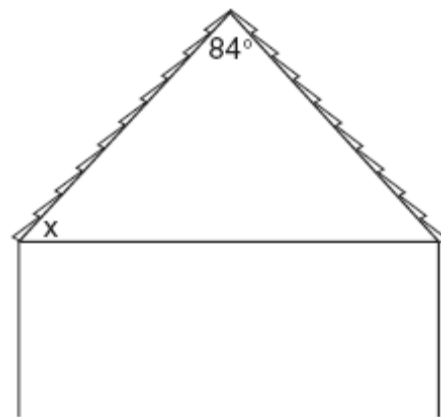
43. 080734a, P.I. G.G.31

In the accompanying diagram of isosceles triangle  $ABC$ ,  $\overline{AB} \cong \overline{AC}$ , and exterior angle  $ACD = 110^\circ$ . What is  $m\angle BAC$ ?



44. 060615a, P.I. G.G.31

The accompanying diagram shows the roof of a house that is in the shape of an isosceles triangle. The vertex angle formed at the peak of the roof is  $84^\circ$ .

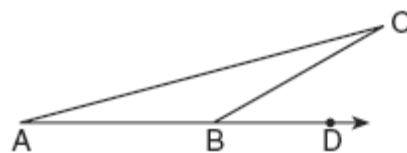


What is the measure of  $x$ ?

[A]  $48^\circ$  [B]  $84^\circ$  [C]  $138^\circ$  [D]  $96^\circ$

45. 010613a, P.I. G.G.31

In the accompanying diagram of  $\triangle ABC$ ,  $\overline{AB}$  is extended through  $D$ ,  $m\angle CBD = 30$ , and  $\overline{AB} \cong \overline{BC}$ .



What is the measure of  $\angle A$ ?

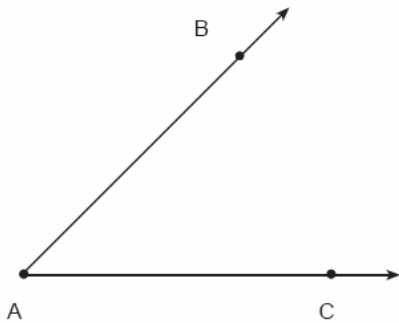
[A]  $75^\circ$  [B]  $150^\circ$  [C]  $30^\circ$  [D]  $15^\circ$



Hands-On Activities

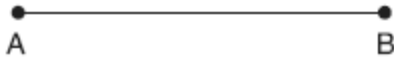
46. 060022a, P.I. G.G.17

Using only a ruler and compass, construct the bisector of angle  $BAC$  in the accompanying diagram.



47. 060734a, P.I. G.G.18

Using a compass and straightedge, construct the perpendicular bisector of  $\overline{AB}$  shown below. Show all construction marks.



48. 060435a, P.I. G.G.18

Using only a compass and a straightedge, construct the perpendicular bisector of  $\overline{AB}$  and label it  $c$ . [Leave all construction marks.]



Section 7-5: Quadrilaterals

Special Quadrilaterals

49. 080517a, P.I. G.G.39

In a certain quadrilateral, two opposite sides are parallel, and the other two opposite sides are *not* congruent. This quadrilateral could be a

- [A] trapezoid                      [B] rhombus  
[C] parallelogram                [D] square

50. 010404a, 5.G.4

Which statement about quadrilaterals is true?

- [A] All quadrilaterals have equal sides.  
[B] All quadrilaterals are parallelograms.  
[C] All quadrilaterals have four sides.  
[D] All quadrilaterals have four right angles.

51. 010721a, P.I. G.G.39

A set of five quadrilaterals consists of a square, a rhombus, a rectangle, an isosceles trapezoid, and a parallelogram. Lu selects one of these figures at random. What is the probability that both pairs of the figure's opposite sides are parallel?

- [A] 1      [B]  $\frac{3}{4}$       [C]  $\frac{4}{5}$       [D]  $\frac{2}{5}$

### Polygons and Angles

52. 080428a, P.I. G.G.36

What is the sum, in degrees, of the measures of the interior angles of a stop sign, which is in the shape of an octagon?

- [A] 1,080      [B] 1,440  
[C] 360      [D] 1,880

53. 080109a, P.I. G.G.36

The sum of the measures of the interior angles of an octagon is

- [A]  $360^\circ$       [B]  $180^\circ$   
[C]  $1,080^\circ$       [D]  $540^\circ$

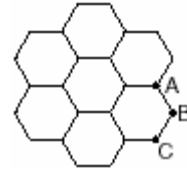
54. 010514a, P.I. G.G.36

What is the sum, in degrees, of the measures of the interior angles of a pentagon?

- [A] 540      [B] 900      [C] 360      [D] 180

55. 060516a, P.I. G.G.37

The accompanying figure represents a section of bathroom floor tiles shaped like regular hexagons.



What is the measure of angle  $ABC$ ?

- [A]  $60^\circ$       [B]  $90^\circ$   
[C]  $150^\circ$       [D]  $120^\circ$

### The Family of Parallelograms

56. 060106a, P.I. G.G.38

Which statement is *not* always true about a parallelogram?

- [A] The opposite angles are congruent.  
[B] The opposite sides are parallel.  
[C] The opposite sides are congruent.  
[D] The diagonals are congruent.

57. 010025a, P.I. G.G.39

Al says, "If  $ABCD$  is a parallelogram, then  $ABCD$  is a rectangle." Sketch a quadrilateral  $ABCD$  that shows that Al's statement is not always true. Your sketch must show the length of each side and the measure of each angle for the quadrilateral you draw.

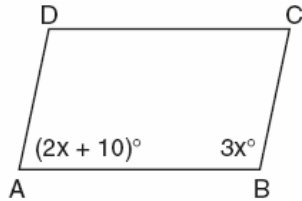
58. 080618a, P.I. G.G.38

The measures of two consecutive angles of a parallelogram are in the ratio 5:4. What is the measure of an obtuse angle of the parallelogram?

- [A]  $160^\circ$       [B]  $80^\circ$       [C]  $20^\circ$       [D]  $100^\circ$

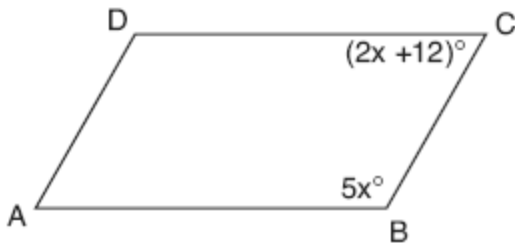
59. 060126a, P.I. G.G.38

In the accompanying diagram of parallelogram  $ABCD$ ,  $m\angle A = (2x + 10)$  and  $m\angle B = 3x$ . Find the number of degrees in  $m\angle B$ .



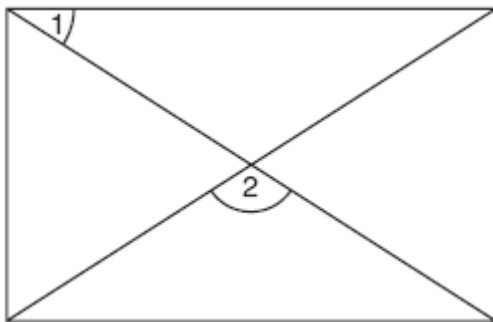
60. 060736a, P.I. G.G.38

In the accompanying diagram of parallelogram  $ABCD$ ,  $m\angle B = 5x$  and  $m\angle C = 2x + 12$ . Find the number of degrees in  $\angle D$ .



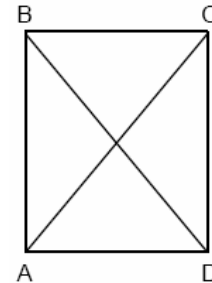
61. 010835a, P.I. G.G.38

As shown in the accompanying diagram, a rectangular gate has two diagonal supports. If  $m\angle 1 = 42$ , what is  $m\angle 2$ ?



62. 089909a, P.I. G.G.39

In the accompanying diagram of rectangle  $ABCD$ ,  $m\angle BAC = 3x + 4$  and  $m\angle ACD = x + 28$ .



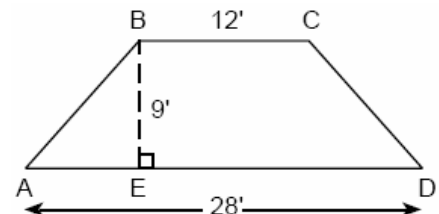
What is  $m\angle CAD$ ?

- [A] 12    [B] 50    [C] 37    [D] 40

### Trapezoids

63. 069933a, P.I. G.G.40

The cross section of an attic is in the shape of an isosceles trapezoid, as shown in the accompanying figure. If the height of the attic is 9 feet,  $BC = 12$  feet, and  $AD = 28$  feet, find the length of  $\overline{AB}$  to the nearest foot.



64. 010608a, P.I. A.G.1

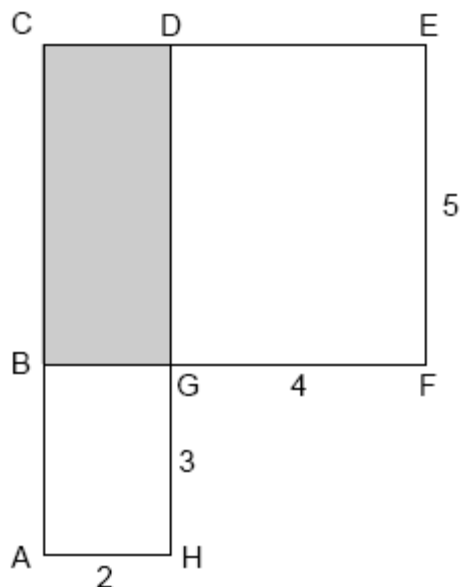
The equation  $A = \frac{1}{2}(12)(3 + 7)$  is used to find the area of a trapezoid. Which calculation would *not* result in the correct area?

- [A]  $0.5(12)(10)$     [B]  $\frac{12}{2} \times \frac{10}{2}$   
[C]  $\frac{12(3+7)}{2}$     [D]  $6(3+7)$

## Section 7-6: Areas of Irregular Polygons

65. 069916a, P.I. A.G.1

In the accompanying figure,  $ACDH$  and  $BCEF$  are rectangles,  $AH = 2$ ,  $GH = 3$ ,  $GF = 4$ , and  $FE = 5$ .

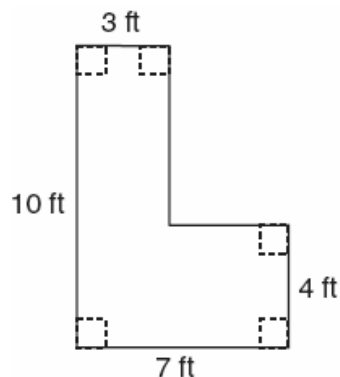


What is the area of  $BCDG$ ?

- [A] 20    [B] 10    [C] 6    [D] 8

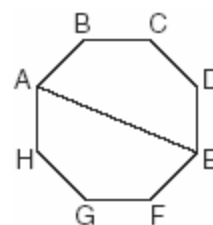
66. 060132a, P.I. A.G.1

Keesha wants to tile the floor shown in the accompanying diagram. If each tile measures 1 foot by 1 foot and costs \$2.99, what will be the total cost, including an 8% sales tax, for tiling the floor?



67. 010330b

A picnic table in the shape of a regular octagon is shown in the accompanying diagram. If the length of  $\overline{AE}$  is 6 feet, find the length of one side of the table to the nearest tenth of a foot, and find the area of the table's surface to the nearest tenth of a square foot.



## Section 7-8: Volumes of Solids

68. 010802a, P.I. A.G.2

A block of wood is 5 inches long, 2 inches wide, and 3 inches high. What is the volume of this block of wood?

- [A]  $25 \text{ in}^3$     [B]  $38 \text{ in}^3$   
[C]  $10 \text{ in}^3$     [D]  $30 \text{ in}^3$

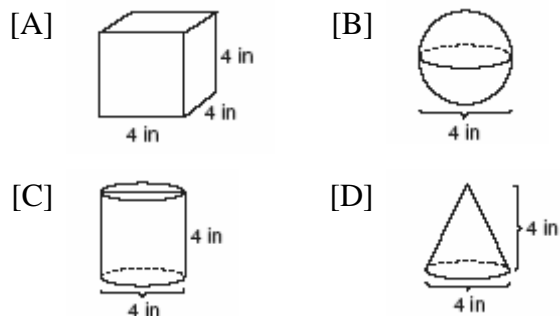
69. 060427a

A box in the shape of a cube has a volume of 64 cubic inches. What is the length of a side of the box?

- [A] 16 in                      [B]  $21\sqrt{3}$  in  
[C] 8 in                      [D] 4 in

70. 080403a

Which diagram represents the figure with the greatest volume?



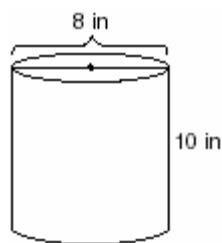
71. 080007a

The volume of a cube is 64 cubic inches. Its total surface area, in square inches, is

- [A] 576    [B] 96    [C] 16    [D] 48

72. 060530a, P.I. A.G.2

A storage container in the shape of a right circular cylinder is shown in the accompanying diagram.

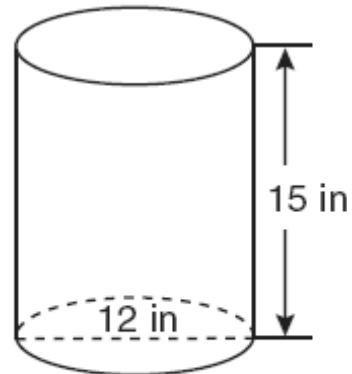


What is the volume of this container, to the nearest hundredth?

- [A]  $125.66 \text{ in}^3$                       [B]  $251.33 \text{ in}^3$   
[C]  $502.65 \text{ in}^3$                       [D]  $56.55 \text{ in}^3$

73. fall0712ia, P.I. A.G.2

A cylindrical container has a diameter of 12 inches and a height of 15 inches, as illustrated in the diagram below.



(Not drawn to scale)

What is the volume of this container to the nearest tenth of a cubic inch?

- [A] 4,241.2                      [B] 1,696.5  
[C] 6,785.8                      [D] 2,160.0

74. 060103a

If the length of a rectangular prism is doubled, its width is tripled, and its height remains the same, what is the volume of the new rectangular prism?

- [A] triple the original volume  
[B] nine times the original volume  
[C] six times the original volume  
[D] double the original volume

75. 010711a

A planned building was going to be 100 feet long, 75 feet deep, and 30 feet high. The owner decides to increase the volume of the building by 10% without changing the dimensions of the depth and the height. What will be the new length of this building?

- [A] 108 ft                      [B] 112 ft  
[C] 110 ft                      [D] 106 ft

76. 010123a, P.I. A.G.2

A cardboard box has length  $x - 2$ , width  $x + 1$ , and height  $2x$ .

a Write an expression, in terms of  $x$ , to represent the volume of the box.

b If  $x = 8$  centimeters, what is the number of cubic centimeters in the volume of the box?

77. 010030a

The volume of a rectangular pool is 1,080 cubic meters. Its length, width, and depth are in the ratio 10:4:1. Find the number of meters in each of the three dimensions of the pool.

78. 010324a

A fish tank with a rectangular base has a volume of 3,360 cubic inches. The length and width of the tank are 14 inches and 12 inches, respectively. Find the height, in inches, of the tank.

79. 069927a

The dimensions of a brick, in inches, are 2 by 4 by 8. How many such bricks are needed to have a total volume of exactly 1 cubic foot?

80. 060327a

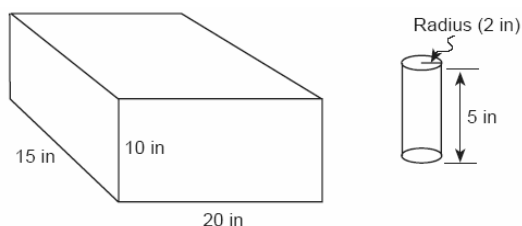
Tina's preschool has a set of cardboard building blocks, each of which measures 9 inches by 9 inches by 4 inches. How many of these blocks will Tina need to build a wall 4 inches thick, 3 feet high, and 12 feet long?

81. 060028a, P.I. G.G.16

Tamika has a hard rubber ball whose circumference measures 13 inches. She wants to box it for a gift but can only find cube-shaped boxes of sides 3 inches, 4 inches, 5 inches, or 6 inches. What is the *smallest* box that the ball will fit into with the top on?

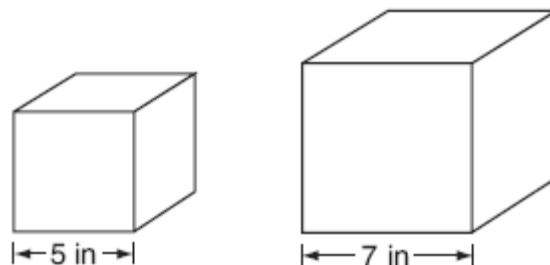
82. 010227a, P.I. A.G.2

In the accompanying diagram, a rectangular container with the dimensions 10 inches by 15 inches by 20 inches is to be filled with water, using a cylindrical cup whose radius is 2 inches and whose height is 5 inches. What is the maximum number of full cups of water that can be placed into the container without the water overflowing the container?



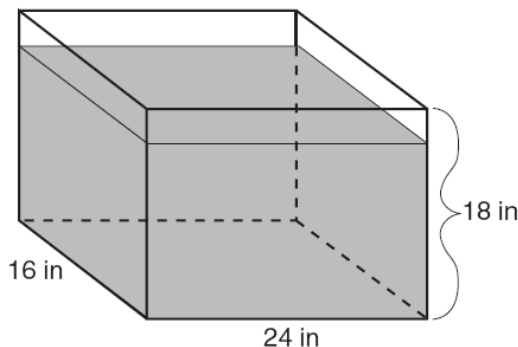
83. 060737a

Tracey has two empty cube-shaped containers with sides of 5 inches and 7 inches, as shown in the accompanying diagram. She fills the smaller container completely with water and then pours all the water from the smaller container into the larger container. How deep, to the *nearest tenth of an inch*, will the water be in the larger container?



84. 010537a

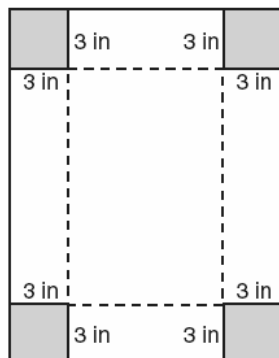
As shown in the accompanying diagram, the length, width, and height of Richard's fish tank are 24 inches, 16 inches, and 18 inches, respectively. Richard is filling his fish tank with water from a hose at the rate of 500 cubic inches per minute. How long will it take, to the *nearest minute*, to fill the tank to a depth of 15 inches?



(Not drawn to scale)

85. 060331a

Deborah built a box by cutting 3-inch squares from the corners of a rectangular sheet of cardboard, as shown in the accompanying diagram, and then folding the sides up. The volume of the box is 150 cubic inches, and the longer side of the box is 5 inches more than the shorter side. Find the number of inches in the shorter side of the *original* sheet of cardboard.



86. 080431b, P.I. A.A.8

A rectangular piece of cardboard is to be formed into an uncovered box. The piece of cardboard is 2 centimeters longer than it is wide. A square that measures 3 centimeters on a side is cut from each corner. When the sides are turned up to form the box, its volume is 765 cubic centimeters. Find the dimensions, in centimeters, of the original piece of cardboard.

87. 060724b

Denise is designing a storage box in the shape of a cube. Each side of the box has a length of 10 inches. She needs more room and decides to construct a larger box in the shape of a cube with a volume of 2,000 cubic inches. By how many inches, to the *nearest tenth*, should she *increase* the length of each side of the original box?

[1] D

[2] D

[2] 75, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

or [1] An incorrect equation of equal difficulty, such as  $x + 5x = 180$ , is solved appropriately, and an appropriate angle measure is found.

or [1] A correct equation is written and solved for  $x$ , but no further correct work is shown.

or [1] 75, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[3] incorrect procedure.

[4] D

[5] C

[6] A

[3] 120, and appropriate work is shown, such as  $6t + 30 + 8t - 60 = 180$ .

[2] The student finds correctly the unknown,  $t = 15$ , but does not find the measure of angle 4.

or [2] Appropriate work is shown, but one computational error is made.

[1] The student forms an incorrect equation, such as setting the two angles equal, and arrives at  $t = 45$  and an angle of 300.

or [1] 120, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[7] incorrect procedure.

[3] 95, and appropriate work is shown, such as  $3x - 20 + x + 60 = 180$ .

[2] Appropriate work is shown, but one computational error is made.

or [2] A correct equation is written and solved for  $x$ , but  $m\angle ROY$  is not found.

[1] Appropriate work is shown, but two or more computational errors are made.

or [1] Appropriate work is shown, but one conceptual error is made, such as writing the equation  $x + 60 = 3x - 20$ , but an appropriate answer is found.

or [1] A correct equation is written, but no further correct work is shown,

or [1] 95, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[8] incorrect procedure.

[9] A

[10] A

[3] 80, and appropriate work is shown.

[2]  $x = 30$  is shown, but the student fails to substitute to find  $m\angle AEC$ .

or [2]  $x = 30$  is shown, but the student states that the answer is  $100^\circ$ , by finding the supplement of  $\angle AEC$ .

or [2] The student makes one computational error in the solution of the correct equation  $4x - 40 = x + 50$  but appropriately substitutes the incorrect value to solve for  $m\angle AEC$ .

[1] The student makes one computational error in the solution of the correct equation  $4x - 40 = x + 50$  and fails to substitute to find  $m\angle AEC$ .

or [1] The student makes more than one computational error in the solution of the correct equation  $4x - 40 = x + 50$ , but appropriately substitutes the incorrect value to solve for  $m\angle AEC$ .

or [1] 80, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[11] incorrect procedure.



- [4] 112.5, and appropriate work is shown, such as solving the equation  $5x - 20 = x + 50$ .  
 [3] Appropriate work is shown, but one computational error is made.  
 or [3]  $m\angle BED = 67.5$  or  $m\angle AEC = 67.5$ , but no further correct work is shown.  
 [2] Appropriate work is shown, but two or more computational errors are made.  
 or [2] Appropriate work is shown, but one conceptual error is made, but an appropriate measure for  $\angle CEB$  is found.  
 or [2] A correct equation is written and solved for  $x$ , but no further correct work is shown.  
 [1] Appropriate work is shown, but one conceptual error and one computational error are made.  
 or [1] 112.5, but no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [12] \_\_\_\_\_
- [13] B
- [14] D
- [15] A
- [3] 65, and appropriate work is shown, such as setting the given angles equal to each other and determining the value of  $x$  to be 16, and correct substitution is shown.  
 [2] The given angles are set equal to each other, the correct value of  $x$  is determined, but no substitution is shown.  
 or [2] The given angles are set equal to each other, and substitution is shown, but one computational or substitution error is made.  
 [1] The given angles are set equal to each other, but no further work is shown.  
 or [1] An incorrect equation is solved appropriately, such as  $5x - 15 + 2x + 33 = 180$ .  
 or [1] 65, but no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [16] \_\_\_\_\_

- [17] B
- [18] A
- [19] A
- [20] D
- [2]  $57^\circ$ , and appropriate work is shown, such as determining that  $m\angle FYD \cong m\angle BXY$  and  $\angle AXY$  is supplementary to  $\angle BXY$ .  
 or [2]  $57^\circ$ , and a correctly labeled diagram with appropriate angles is shown.  
 [1]  $\angle CYX$  or  $\angle BXY$  is determined, but one computational error is made in subtracting to find  $m\angle AXY$ .  
 or [1] An angle is determined incorrectly, but an appropriate solution is found.  
 or [1]  $57^\circ$ , but no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [21] \_\_\_\_\_
- [2] 31, and appropriate work is shown, such as  $5x + 25 = 180$ .  
 [1] Appropriate work is shown, but one computational error is made.  
 or [1] Appropriate work is shown, but one conceptual error is made, such as setting the given angles equal to each other.  
 or [1] A correct equation is written, but no further correct work is shown.  
 or [1] 31, but no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [22] \_\_\_\_\_

- [4] 146, and appropriate work is shown, such as solving the equation  $2x = 5x - 51$ .  
 [3] Appropriate work is shown, but one computational error is made.  
 or [3] The measure of  $\angle FHB$  or  $\angle DGH$  is found to be 34, and appropriate work is shown, but no further correct work is shown.  
 [2] Appropriate work is shown, but two or more computational errors are made.  
 or [2] Appropriate work is shown, but one conceptual error is made, such as solving the equation  $2x + 5x - 51 = 180$ .  
 or [2] The correct equation is solved for  $x = 17$ , but no further correct work is shown.  
 [1] Appropriate work is shown, but one conceptual error and one computational error are made.  
 or [1] The correct equation is written, but no further correct work is shown.  
 or [1] 146, but no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
 [23] \_\_\_\_\_  
 [24] B \_\_\_\_\_

- [4]  $m\angle A = 20$ ,  $m\angle B = 59$ , and  $m\angle C = 101$ , and appropriate work is shown.  
 [3] Appropriate work is shown, but one computational error is made.  
 or [3] A correct equation is written and solved, and the correct measures for the angles are found, but they are not labeled or are labeled incorrectly.  
 [2] Appropriate work is shown, but two or more computational errors are made.  
 or [2] Appropriate work is shown, but one conceptual error is made.  
 or [2] A correct equation is written and solved for  $x$ , but the measures of the angles are not found.  
 or [2] An incorrect equation of equal difficulty is solved appropriately, and the three angles are found.  
 [1] Appropriate work is shown, but one conceptual error and one computational error are made.  
 or [1] A correct equation is written, but no further correct work is shown.  
 or [1]  
 $m\angle A = 20$ ,  $m\angle B = 59$ , and  $m\angle C = 101$ ., but no work is shown.  
 [0]  $m\angle A = 20$  or  $m\angle B = 59$  or  $m\angle C = 101$ , but no work is shown.  
 or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
 [25] \_\_\_\_\_  
 [26] B \_\_\_\_\_  
 [27] B \_\_\_\_\_  
 [28] C \_\_\_\_\_  
 [29] C \_\_\_\_\_  
 [30] C \_\_\_\_\_  
 [31] B \_\_\_\_\_  
 [32] C \_\_\_\_\_  
 [33] D \_\_\_\_\_

- [2] 29, and appropriate work is shown, such as  $92 - 63 = 29$ .  
[1] The correct application of the exterior angle theorem is shown, but one or more computational errors are made.  
or [1] The correct application of supplementary angles and the sum of the angles of a triangle are shown, but one or more computational errors are made.  
or [1]  $m\angle BCA$  is calculated incorrectly, but the sum of the angles in a triangle is used appropriately.  
or [1] 29, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [34] [2] 120, and appropriate work is shown, such as  $m\angle CDB = 180 - 130 = 150$  and  $m\angle CBA = 70 + 50 = 120$  or correctly labeled angles in a diagram.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1]  $m\angle CBD = 60$  is found, but no further correct work is shown.  
or [1] 120, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [35] incorrect procedure.
- 
- [36] D

- [2] 32, and appropriate work is shown, such as a diagram or “let” statements and an appropriate equation, such as  $5x + 20 = 180$ .  
or [2] 32, and an appropriate trial-and-error method with at least two trials and appropriate checks are shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] An incorrect equation set equal to  $180^\circ$  is shown, but it is solved appropriately, such as  $4x + 20 = 180$ ; or an incorrect equation set equal to  $360^\circ$  is shown, such as  $5x + 20 = 360$ .  
or [1] 32, and an appropriate trial-and-error method with less than two trials and appropriate checks are shown.  
or [1] 32, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [37] [2] An isosceles triangle that is not acute is drawn, and its three angles are labeled, such as 20, 20, 140 or 45, 45, 90.  
[1] An isosceles triangle is drawn that shows an angle that is not acute, but the base angles are not labeled.  
or [1] The three angles are stated correctly, but no triangle is drawn.  
[0] The triangle that is drawn and labeled is not isosceles or is acute.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [38] obviously incorrect procedure.

- [3] The student draws an obtuse triangle and all sides and all angles are correctly calculated, such as by using  $120^\circ$ ,  $30^\circ$ , and  $30^\circ$  and sides 4, 4, and 10.  
 [2] The student has the angles correctly indicated and the two congruent sides marked, but the length of the longest side is incorrect or is missing.  
 or [2] All sides are correctly marked, but the angles do not add to  $180^\circ$ , but an obtuse angle and two congruent angles are shown.  
 [1] Only the angles are correctly shown.  
 or [1] Only the sides are correctly shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [39] \_\_\_\_\_  
 [3] 135 and appropriate work is shown.  
 [2] The two correct angles of  $65^\circ$  and  $70^\circ$  are found, but their sum is not identified as the answer to the question.  
 or [2]  $65^\circ$  or  $70^\circ$  and an appropriate sum is found.  
 [1] Either the  $65^\circ$  or the  $70^\circ$  is correctly identified.  
 or [1] Two incorrect angle measures are found, but they are added correctly.  
 or [1] 135 and no work is shown.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [40] \_\_\_\_\_  
 [2] 30, and appropriate work is shown or an appropriate explanation is given.  
 [1] Angles of the equilateral triangle are shown to be  $60^\circ$ , but  $x$  is not determined or is determined incorrectly.  
 or [1] 30, but no work is shown or no explanation is given.  
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [41] \_\_\_\_\_  
 [42] A \_\_\_\_\_

[2] 40, and appropriate work is shown, such as  $x = 180 - (70 + 70)$  or correctly labeling all the angles in the diagram.

[1] Appropriate work is shown, but one computational error is made.  
 or [1] Appropriate work is shown, but one conceptual error is made.  
 or [1] A correct equation is written, but no further correct work is shown.  
 or [1] The measures of  $\angle ACB$  and  $\angle ABC$  are both found to be  $70^\circ$ , but no further correct work is shown.

or [1] An incorrect equation of equal difficulty is solved appropriately.

or [1] 40, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [43] \_\_\_\_\_

- [44] A \_\_\_\_\_

- [45] D \_\_\_\_\_

[2] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , showing both sets of arcs and a line connecting A with the midpoint.

[1] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , but the median is not drawn.  
 or [1] The construction is appropriate, but a compass and a straightedge are not used.

[0] No construction arcs are shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [46] \_\_\_\_\_

[2] A correct construction is drawn, showing the arcs intersecting above and below  $\overline{AB}$ , and the perpendicular line is drawn.

[1] All of the construction arcs are drawn, but the perpendicular line is not drawn.

[0] A drawing that is not an appropriate construction is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- [47] \_\_\_\_\_

- [2] A correct construction is drawn, showing the arcs intersecting above and below  $\overline{AB}$ , and line  $c$  is drawn.
- [1] A correct construction is drawn, but line  $c$  is not labeled.
- [0] A drawing that is not a construction is shown with arc marks sketched.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [48] \_\_\_\_\_
- [49] A
- [50] C
- [51] C
- [52] A
- [53] C
- [54] A
- [55] D
- [56] D
- [2] The student draws a parallelogram, which is not a rectangle, with four sides and four angles labeled, such as angles of 60, 120, 60, and 120 and sides of 4, 6, 4, and 6.
- [1] A parallelogram or rhombus, not a square, is drawn, which does not have measures for all lengths or angles.
- [0] Angles and/or lengths are not appropriate for a parallelogram.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [57] \_\_\_\_\_
- [58] D

- [3] 102, and appropriate work is shown, such as using the equation  $2x + 10 + 3x = 180$  or an equivalent equation.
- [2] The equation  $2x + 10 + 3x = 180$  is solved correctly for  $x$ , but  $m\angle B$  is not determined or is determined incorrectly.
- [1] Appropriate work is shown, but one computational error is made or  $x$  is not determined.
- or [1] The equation  $2x + 10 + 3x = 360$  is solved correctly, and an answer of 210 is found.
- or [1] 102, but no work is shown.
- [0] The equation  $2x + 10 = 3x$  where  $x = 10$  is given.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [59] \_\_\_\_\_
- [3] 120, and appropriate work is shown, such as solving the equation  $5x + 2x + 12 = 180$ .
- [2] Appropriate work is shown, but one computational error is made.
- or [2] The correct equation is solved for  $x$ , but no further correct work is shown.
- [1] Appropriate work is shown, but two or more computational errors are made.
- or [1] Appropriate work is shown, but one conceptual error is made.
- or [1] A correct equation is written, but no further correct work is shown.
- or [1] An incorrect equation of equal difficulty is solved appropriately, and an appropriate measure is found for  $\angle D$ .
- or [1] 120, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [60] \_\_\_\_\_

[2] 96, and appropriate work is shown, such as an algebraic solution or a correctly labeled diagram.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] 96, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[61] incorrect procedure.

---

[62] B

---

[4] 12 and an appropriate method is shown, such as  $(AB)^2 = 9^2 + 8^2$ .

[3] An incorrect length is found for AE, but then it is used to correctly complete the problem.

or [3] An appropriate method is shown, but one computational mistake is made.

or [3] An appropriate method is shown, but the answer is not given to the nearest foot, such as  $\sqrt{145}$ .

[2] AE = 8 and one computational mistake is made using the Pythagorean theorem.

or [2] An incorrect length is found for AE, but then it is used to complete the problem correctly, but the answer is not rounded.

[1] AE = 8 is found, but the Pythagorean theorem is not used.

or [1] 12 and no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[63] incorrect procedure.

---

[64] B

---

[65] B

---

[4] \$148.54, and appropriate work is shown.

[3] The correct pre-tax amount of \$137.54 is found, but no tax or an incorrect tax is shown.

or [3] Appropriate work is shown, but one computational error is made.

[2] The correct area of  $46 \text{ ft}^2$  is found, but no cost is shown.

or [2] Appropriate work is shown, but more than one computational error is made.

or [2] An incorrect area is determined, such as by adding or multiplying all sides, but then a final cost including tax is determined appropriately.

[1] An incorrect area is shown, and one computational error is made.

or [1] \$148.54, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[66] incorrect procedure.

---

[4] The side equals 2.3 and the area equals 25.5, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but one incorrect formula is used, such as using an incorrect trigonometric function, but appropriate answers are found.

or [2] Appropriate work is shown to find the correct side, but no further correct work is shown.

[1] The radius equals 3 and the central angle equals  $45^\circ$ , but no further correct work is shown.

or [1] The side equals 2.3 and the area equals 25.5, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[67] incorrect procedure.

---

[68] D

---

[69] D

---

[70] A

---

[71] B

---

[72] C

[73] B

[74] C

[75] C

a [1] Either  $(x - 2)(x + 1)(2x) = V$  or the same expression without “ $= V$ ” is shown.

or [1]  $2x^3 - 2x^2 - 4x$  or an equivalent expression is shown.

b [1] 864

or [1] The student substitutes appropriately into an incorrect part a equation.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[76] incorrect procedure.

[3] 3, 12, and 30 and an appropriate arithmetic method or equation is shown, such as  $40x^3 = 1080$ .

[2] An appropriate equation or method is shown, but not all three dimensions are found.

or [2] An appropriate method is shown, and although one computational mistake is made, the student does find three dimensions based on this mistake, such as dividing 1080 by 40 incorrectly.

[1] The student shows that multiplication is required to find volume but sets up an incorrect method and does not find three dimensions.

or [1] 3, 12, and 30 and no work is shown.

[0] The sum is used instead of the product,

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[77] obviously incorrect procedure.

[2] 20, and appropriate work is shown, such as  $3,360 \div (14 \times 12)$ .

[1] Appropriate work is shown, but one computational error is made.

or [1] 20, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[78] incorrect procedure.

[3] 27 and an appropriate method or explanation is shown, such as

$(\frac{1}{6})(\frac{1}{3})(\frac{2}{3}) = \frac{1}{27}$  of a cubic foot, thus 27

bricks needed or, in inches,  $\frac{1728}{64} = 27$ . A

labeled drawing is an acceptable explanation.

[2] An appropriate method for finding volume is shown, but one computational mistake is made.

[1] Correct conversion into feet is shown.

or [1] The volume of 64 cubic inches is found.

or [1] 27 and no explanation is given.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[79] incorrect procedure.

[3] 64, and appropriate work is shown, such as calculating  $\frac{(36 \times 144)}{(9 \times 9)}$  or drawing a

labeled diagram.

[2] Appropriate work is shown, but one computational error is made.

[1] Appropriate work is shown, but more than one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] 64, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[80] incorrect procedure.

[3] 5-inch box and appropriate work is shown, including showing a diameter between 4 and 5.

[2] The correct diameter is shown, but the wrong box size is chosen.

or [2] The correct radius is shown, but the 3-inch box is chosen.

[1] The correct diameter or radius is shown, but no box is chosen.

or [1] An appropriate radius between 2 and 3 is shown, using the incorrect formula

$A = \pi r^2$ , and the 3-inch box is chosen.

or [1] An appropriate diameter, using

$A = \pi r^2$ , is shown, but the appropriate box is chosen.

or [1] An appropriate radius, using  $A = \pi r^2$ , is shown, but no box is chosen.

or [1] The 5-inch box is chosen, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[81] incorrect procedure.

---

[3] 47, and appropriate work is shown.

[2] Appropriate work is shown, but one computational or rounding error is made.

or [2] The correct numerical value of the volume of the cup ( $20\pi$  or its equivalent) and the volume of the tank (3,000) are shown, but the solution is not completed.

[1] The correct volume of only the cup or only the tub is shown.

or [1] 47, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[82] incorrect procedure.

---

[3] 2.6, and appropriate work is shown, such as  $(5 \bullet 5 \bullet 5) = (7 \bullet 7)h$ .

[2] Appropriate work is shown, but one computational or rounding error is made.

[1] Appropriate work is shown, but two or more computational or rounding errors are made.

or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect formula.

or [1] The volume of both of the cubes is found correctly, but no further correct work is shown.

or [1] 2.6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[83] incorrect procedure.

---

[3] 12, and appropriate work is shown, such as calculating volume = 5,760 in<sup>3</sup> and dividing by 500 in<sup>3</sup>.

[2] Appropriate work is shown, but one computational or rounding error is made.

or [2] The volume is found incorrectly by multiplying  $24 \times 16 \times 18$ , but it is divided by 500 and rounded appropriately, resulting in an answer of 14.

[1] Appropriate work is shown, but two or more computational or rounding errors are made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] The volume of 5,760 is found correctly, but no further correct work is shown.

or [1] 12, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[84] incorrect procedure.

---



- [4] 11, and appropriate work is shown, such as solving the quadratic equation  $3x(x+5) = 150$  or trial and error with at least three trials and appropriate checks.
- [3] Appropriate work is shown, but one computational error is made.
- or [3] Appropriate work is shown to determine that 5 is the shorter side of the box, but the shorter side of the original sheet is not found or is found incorrectly.
- or [3] An incorrect quadratic equation of equal difficulty is solved appropriately, and an appropriate shorter side of the original sheet is found.
- [2] Appropriate work is shown, but more than one computational error is made.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] An incorrect quadratic equation of equal difficulty is solved appropriately, but the shorter side of the original sheet is not found.
- or [2] A correct quadratic equation is set equal to zero, but no further correct work is shown.
- or [2] The trial-and-error method is used to find a correct solution, but only two trials and appropriate checks are shown.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made.
- or [1] One conceptual error is made in finding the shorter side of the box, and the corresponding shorter side of the original sheet is not found or is found incorrectly.
- or [1] A correct quadratic equation is written, but it is not set equal to zero, and no further correct work is shown.
- or [1] 11, but no work or only one trial with an appropriate check is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [85] incorrect procedure.
- [4] 21 by 23, and appropriate work is shown, such as solving the equation  $765 = 3(x-4)(x-6)$ .
- [3] Appropriate work is shown, but one computational error is made.
- or [3] Appropriate work is shown, but only one dimension is found.
- [2] Appropriate work is shown, but two or more computational errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] An incorrect equation of equal difficulty is solved appropriately, and appropriate dimensions are found.
- or [2] A correct quadratic equation is written in standard form, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made.
- or [1] An incorrect equation of equal difficulty is written, and one computational error is made, but appropriate dimensions are found.
- or [1] An incorrect equation of equal difficulty is solved appropriately, but one computational error is made when finding the length.
- or [1] 21 by 23, but no work is shown.
- [0] 21 or 23, but no work is shown.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [86] obviously incorrect procedure.

[2] 2.6, and appropriate work is shown, such as solving the equation  $(10 + x)^3 = 2000$ .

[1] Appropriate work is shown, but one computational or rounding error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] The equation  $(10 + x)^3 = 2000$  is written, but no further correct work is shown.

or [1] An incorrect equation of equal difficulty is solved appropriately.

or [1] 2.6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[87] incorrect procedure.