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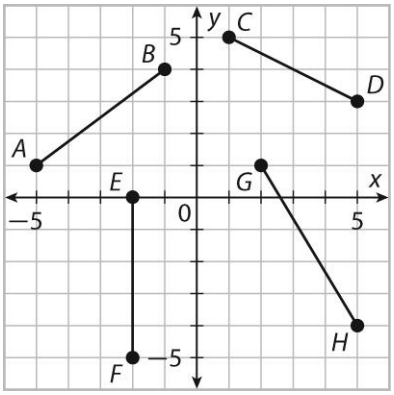
For 1–2, use the graph.



1. Which segment is congruent to $\overline{EF}$?

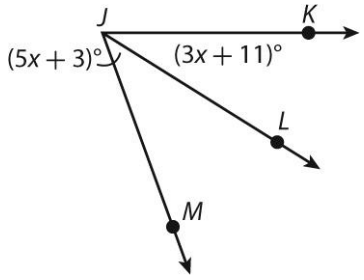
_____

2. What is the midpoint of $\overline{GH}$?

_____

Use the following information for 3–4.

In the figure, $m\angle KJL = 32°$.



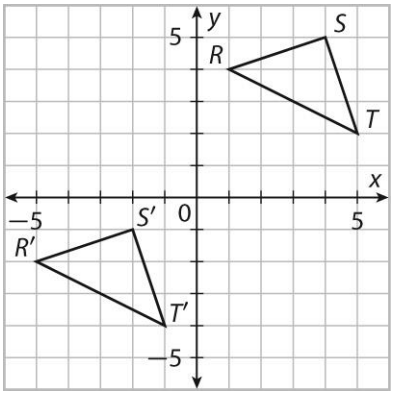
3. What is the value of x?

_____

4. What is $m\angle KJM$?

_____

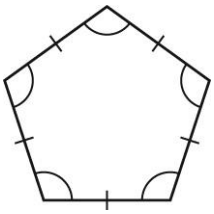
7. Use the graph.



Write the vector (transformation) that maps RST to $R'S'T'$.

_____

Use the figure for 8–9.



8. How many lines of symmetry does the figure have?

_____

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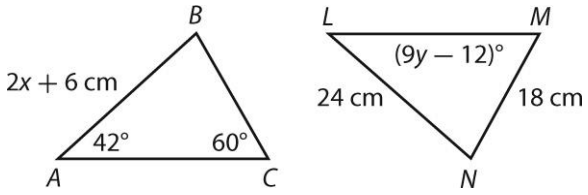
Use the following information for 10–11.
In the figures below, $\triangle ABC \cong \triangle LNM$.



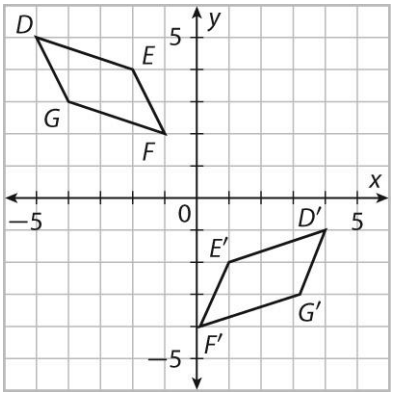
10. What is the value of x?

_____

11. What is the value of y?

_____

Use the graph for 12–13.

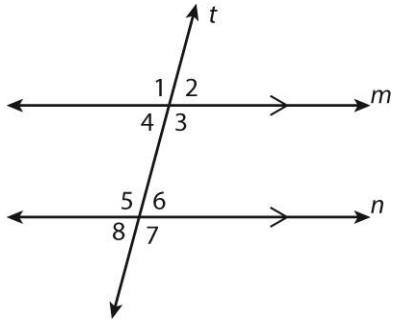


12. What transformations can you use to show that quadrilaterals *DEFG* and *D'E'F'G'* are congruent?

_____

_____

14. In the figure, m∠2 = 75°.



What is m∠7?

_____

15. The measures of two complementary angles are represented by the expressions $(3x + 16)°$ and $(5x + 18)°$. Find the value of x.

_____

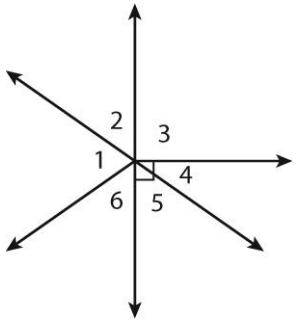
16. Write an equation for the line that passes through (1, −3) and is perpendicular to $y = \frac{1}{2}x + 5$.

_____

17. Write an equation for the line that passes through (3, 2) and is parallel to $2x + 3y = 3$.

_____

18. In the figure, the measure of ∠2 is 55°.



What is the measure of ∠4?

_____

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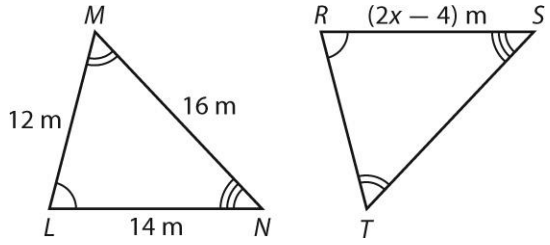
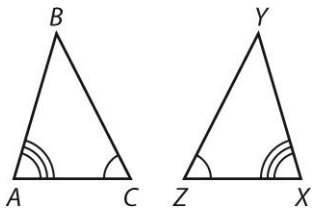
19. Use the figures.



Determine the value of x that ensures that the triangles are congruent.

_____

For 20–21, state the additional congruency statement or statements needed to prove $\triangle ABC \cong \triangle XYZ$ for the given theorem.



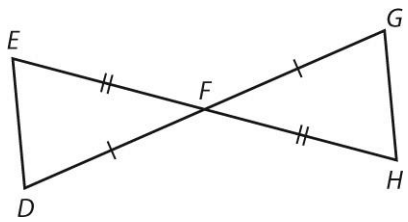
20. ASA Theorem

_____

21. AAS Theorem

_____

22. Look at the figure below.

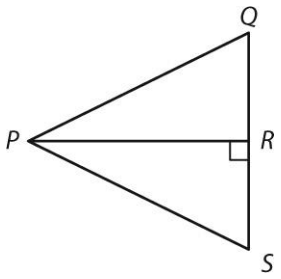


Are triangles DEF and FGH congruent? Explain why or why not. If the triangles are congruent, write a congruence statement.

_____

_____

23. In the figure, $\overline{PQ} \cong \overline{PS}$.

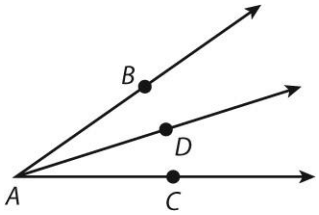


Explain why $\triangle PQR \cong \triangle PSR$.

_____

_____

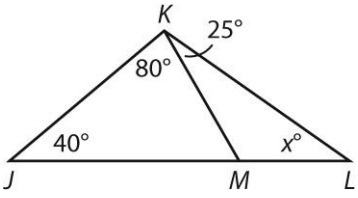
24. In the figure, $m\angle BAC = 9x + 4$ and $m\angle BAD = 3x + 8$.



What value of x indicates that $\overline{AD}$ is the angle bisector of $\angle BAC$?

_____

25. Use the figure.



What is the value of x?

_____

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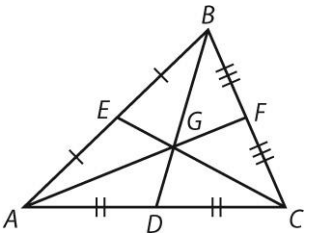
27. Triangle RST is an isosceles triangle with $m\angle R = 120°$. What is $m\angle S$? Explain your reasoning.

_____

_____

For 29–30, use the figure.



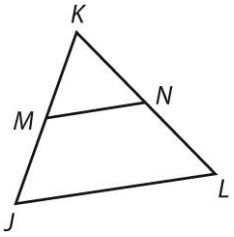
29. If $EG = 4$, what is GC?

_____

30. If $AF = 15$, what is AG?

_____

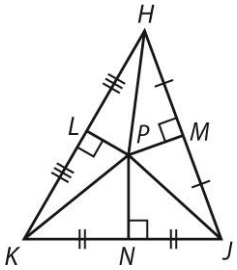
31. In the figure, $\overline{MN}$ is the midsegment of $\triangle JKL$.



If $KM = 11$ cm and $KL = 24$ cm, what is KN?

_____

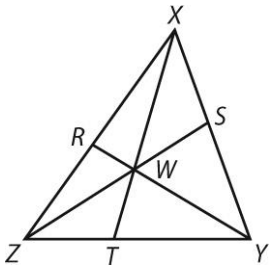
32. In the figure, $\overline{LP}$, $\overline{MP}$, and $\overline{NP}$ are perpendicular bisectors.



If $LP = 5$, $LH = 12$, $HP = 13$, and $PM = 6$, what is PJ?

_____

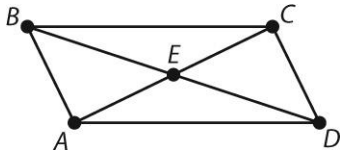
33. In the figure, point W is the incenter of the triangle XYZ.



If $RW = 5$ and $WY = 14$, what is WT?

_____

34. $ABCD$ is a quadrilateral with $\overline{BE} \cong \overline{ED}$ and $\angle BCD \cong \angle DAB$.



If $EC = 16$ cm, $m\angle ABC = 64°$, $AE = 3x - 5$, and $m\angle DAB = (4y - 12)°$, for what values of x and y is $ABCD$ a parallelogram?

_____

_____

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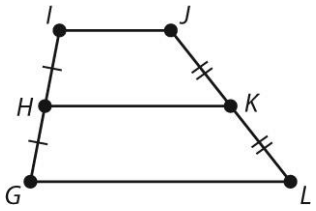
36. *GIJL* is a trapezoid with midsegment $\overline{HK}$.

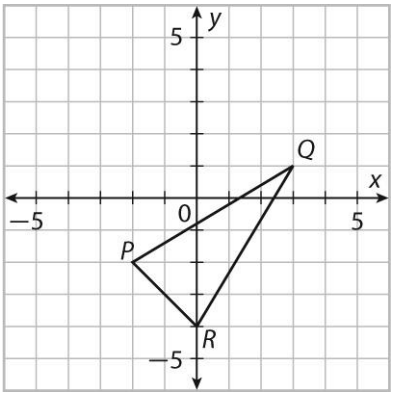


If $IJ = 18$ cm and $GL = 42$ cm, what is HK?

_____

_____

37. Triangle *PQR* is shown in the graph.



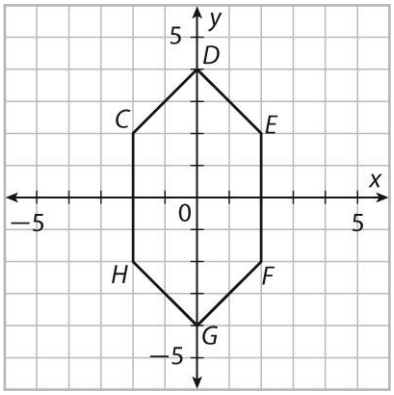
Classify the triangle. Explain your reasoning.

_____

_____

Use the following information for 40–41.

The figure is symmetric about the *x*-axis.



40. Find the perimeter of the figure. Round to the nearest tenth.

_____

41. What is the area of the figure?

_____

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Use the following information for 42–43. Triangle *ABC* has vertices *A*(–6, –2), *B*(–2, 2), and *C*(4, –8). Dilate $\triangle ABC$ using a factor of $\frac{1}{2}$ about the origin. Then dilate its image using a scale factor of 5 about the origin.

42. Determine the coordinates of the final image.

_____

43. Determine the scale factor you could use to dilate $\triangle ABC$ about the origin that would result in the final image in one step.

_____

44. $\triangle CDE$ maps to $\triangle LMN$ with the transformation

$(x, y) \rightarrow (x + 3, y - 2) \rightarrow \left(\frac{2}{3}x, \frac{2}{3}y\right)$.

If $CD = 9$, what is LM?

_____

Use the following information for 46–48. Polygons *BCDE* and *FGHI* are similar.

46. Write a proportion that contains BE and CD.

_____

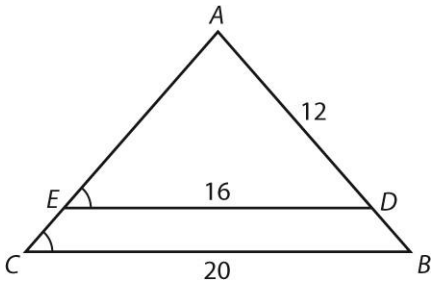
47. List any angles that are congruent to $\angle DEB$.

_____

48. If $CD = 8$, $FG = 12$, and $GH = 24$, what is the length of $\overline{BC}$?

_____

Use the figure for 49–50.



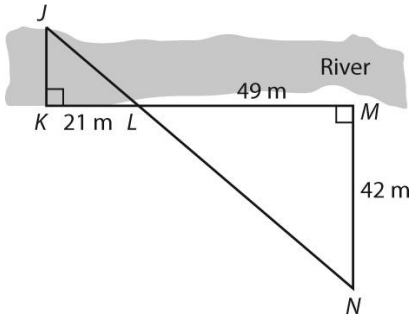
49. Which triangles are similar? Write a similarity statement.

_____

50. What is AB?

_____

51. Use the figure to find the unknown distance.



What is the distance across the river?

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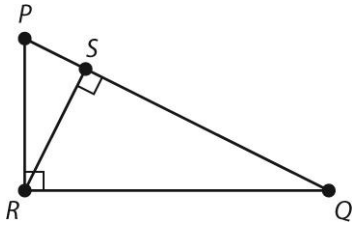
52. Rectangles *ABCD* and *EFGH* are similar. Rectangle *ABCD* has a length of 20 cm and a perimeter of 60 cm. Rectangle *EFGH* has a length of 32 cm. Find the area of rectangle *EFGH.*

_____

Use the following information for 53–55. In the figure, *PS* = 4 and *SQ* = 16. Find each length to the nearest tenth.



53. What is the length of $\overline{RS}$?

_____

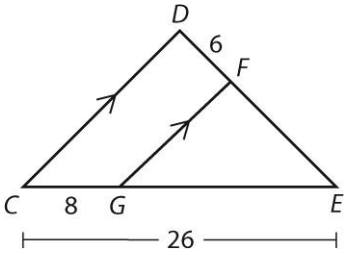
54. What is the length of $\overline{RP}$?

_____

55. What is the length of $\overline{RQ}$?

_____

56. Use the figure.



What is the length of $\overline{FE}$?

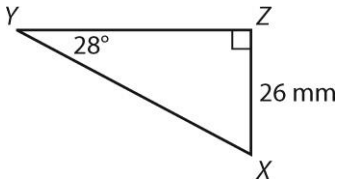
_____

_____

57. Find the coordinate that divides the directed line segment from $A(-2, -4)$ to $B(8, 1)$ in the ratio of 2 to 3.

_____

Use triangle *XYZ* for 58–59. Round to the nearest tenth.



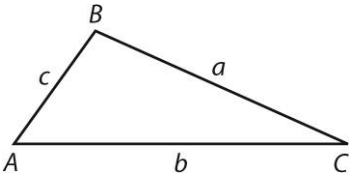
58. What is *YX*?

_____

59. What is *YZ*?

_____

Use the triangle below for questions 60–61. Round to the nearest tenth.



60. If $m\angle A = 50°$, $m\angle B = 100°$, and $b = 15$ cm, what is a?

_____

61. If $a = 12$ cm, $b = 18$ cm, and $c = 8$ cm, what is $m\angle A$?

_____

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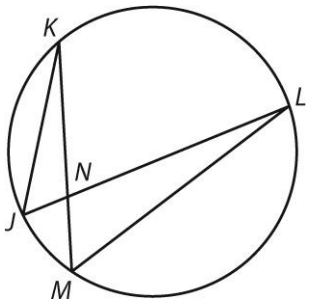
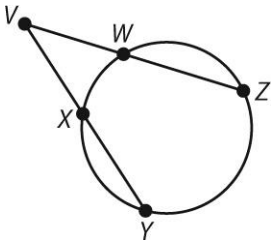
62. In the figure, $m\angle KJL = (12x + 8)$ and $m\angle KML = (10x + 16)$.



What is the value of x?

_____

63. In the circle, $mWX = 50$ and $mYZ = 130$.

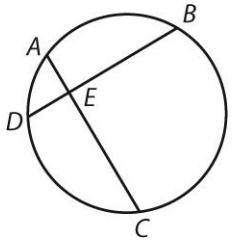


What is $m\angle V$?

_____

Use the circle for 64–65.

In the circle, $mAD = 38$ and $mBC = 162$.



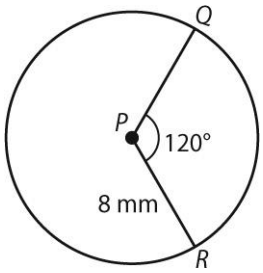
64. What is $m\angle AED$?

_____

65. If $DE = 3$, $EB = 16$, and $AE = 4$, what is EC?

_____

Use the circle for 66–68.



66. Find the exact arc length of QR.

_____

67. Convert the central angle to radians.

_____

68. What is the area of the sector formed by $\angle RPQ$ to the nearest tenth?

_____

69. Write an equation of a circle with center (3, –4) and radius 2.

_____

70. Find the center and radius of the circle with the following equation.

$$x^2 - 6x + y^2 + 4y - 3 = 0$$

_____

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Use the information for 73–74.

A prism has 6-inch square bases and a height of 10 inches. A cylinder has a diameter of 10 inches and a height of 6 inches.

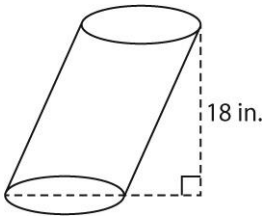
73. Which solid has the greater volume?

_____

74. Which solid has the greater surface area?

_____

75. The oblique cylinder shown below has a volume of 36π cubic inches. What is the radius of the base of the cylinder to the nearest tenth of an inch?

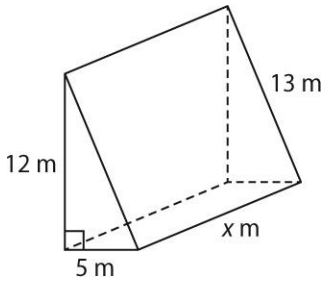


_____

76. A right cone has a slant length of 9 centimeters and a radius of 4 centimeters. What is the surface area of the cone? Round to the nearest tenth of a square centimeter.

_____

77. The triangular prism has a surface area of 510 square meters. Find the missing value for *x*.



_____

78. A square pyramid and a cube have equal volumes. The side length of the base of each figure is 16 millimeters. How many times taller is the pyramid than the cube?

_____

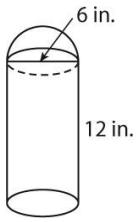
79. A cylinder has a radius of 8 inches and a height of 16 inches. The radius of a cone is half the length of the radius of the cylinder.

If the cylinder and the cone have equal volumes, how many times greater is the height of the cone than the height of the cylinder?

_____

Use the following information for 80–81.

A company sells several sizes of the same design of trash cans. The trash cans consist of a cylinder and a hemisphere. The smallest size trash can has the dimensions shown.



80. What is the volume of the trash can to the nearest tenth of a cubic inch?

_____

81. The largest size trash can is 3 times larger than the smallest trash can. Use the scale 1:3 to find the volume of the largest size trash can to the nearest tenth of a cubic inch.

_____

82. A town is shaped like a rectangle that is 4 miles long and 3 miles wide. The population of the town is 288,000. What is the average population density of the town?

_____

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83. A school assigns each student an identification number. The number consists of 3 digits out of 10 possible digits and no digits are repeated.

    How many different identification numbers are possible?

    _____

84. There are 15 students on the debate team. The team advisor randomly chooses 4 students to debate in the next competition.

    How many different ways can a team that includes Joseph, Malena, Carlos, and Abby be chosen?

    _____

85. Nina has 3 quarters, 2 dimes, 4 nickels, and 1 penny in her pocket. Nina needs a quarter, so she randomly chooses a coin from her pocket.

    What is the probability that she randomly chooses a dime, does not replace it, and then chooses a quarter?

    _____

Use the following information for 86–88.

A jar contains 12 red marbles, 8 yellow marbles, 4 blue marbles, and 16 green marbles. One marble is taken from the jar and replaced. Then a second marble is taken from the jar.

86. What is the probability of choosing a blue marble followed by a red marble?

    _____

87. What is the probability of choosing two yellow marbles?

    _____

88. What is the probability of **not** choosing a green marble?

    _____

89. Mr. Martin surveyed the students in his class about whether they had a sibling or a pet. The results are shown in the table.

	Has Pet	No Pet	Total
Has Sibling	7	8	15
No Sibling	3	6	9
Total	10	14	24

    What is the probability that a student has a pet if he or she also has a sibling? Round to the nearest hundredth.

Use the following information for 90–93.

A standard deck of 52 playing cards has 4 suits: hearts, diamonds, spades, and clubs. Each suit has 13 cards that include numbers 2–10, jack, queen, king, and ace. Find the probability of randomly selecting each of the following cards.

90. What is the probability of drawing an ace or a 2?

    _____

91. What is the probability of drawing a card that is a 5 or a diamond?

    _____

92. Find the probability that a black card drawn from the deck is a queen.

    _____

93. Find the probability that a king drawn from the deck is a diamond.

    _____

94. In a contest, five students are chosen to win tickets to a football game. To choose the winners, a teacher picks five students who went to the last football game. Is this contest fair to all students in the school? Explain why or why not.

    _____

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Answer Key

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1. $\overline{AB}$
2. (3.5, −1.5)
3. $x = 7$
4. 70°
5. (1, −1)
6. If two angles are congruent, then they are vertical angles. The converse is not true, since any two angles that have the same measure are congruent.
7. $\langle -6, -6 \rangle$
8. 5
9. 72°, 144°, 216°, 288°
10. 9
11. 8
12. a reflection over the *y*-axis, then a translation 1 unit left and 6 units down
13. $(x, y) \rightarrow (-x - 1, y - 6)$
14. 105°
15. 7
16. $y = -2x - 1$
17. $y = -\frac{2}{3}x + 4$
18. 35°
19. $x = 9$
20. $\overline{AC} \cong \overline{XZ}$
21. $\overline{AB} \cong \overline{XY}$ or $\overline{BC} \cong \overline{YZ}$
22. Yes; the figure shows that $\overline{DF} \cong \overline{GF}$ and $\overline{EF} \cong \overline{HF}$. $\angle DFE$ and $\angle GFH$ are vertical angles, so $\angle DFE \cong \angle GFH$. Therefore, $\triangle DEF \cong \triangle GHF$ by SAS.
23. It is given that $\triangle PQR$ and $\triangle PSR$ are right triangles and $\overline{PQ} \cong \overline{PS}$. $\overline{PR} \cong \overline{PR}$ by the Reflexive Property, so $\triangle PQR \cong \triangle PSR$ by HL Theorem.
24. $x = 4$
25. $x = 35$
26. 7 sides
27. $m\angle S = 30°$; the base angles of an isosceles triangles are congruent. Since $\angle R$ is an obtuse angle, the unknown angles are the acute base angles of the triangle. The sum of the base angles is $180 - 120 = 60°$; so each base angle is equal to 30°.
28. In a triangle, the length of any side must be less than the sum of the lengths of the other two sides and greater than the difference between the lengths of the other two sides. Therefore, the third side must be greater than $8 - 5 = 3$ meters or less than $8 + 5 = 13$ meters.
29. 8
30. 10
31. 12 cm
32. 13
33. 5
34. $x = 7, y = 32$
35. A No B No C Yes D Yes E No
36. 30 cm
37. isosceles triangle; using the distance formula, $PQ = \sqrt{34}, QR = \sqrt{34}, RP = 2\sqrt{2}$. Since the triangle has two congruent sides, it is isosceles.
38. rectangle; using the distance formula, $DE = FG = 6\sqrt{2}, EF = DG = 2\sqrt{2}$, so the figure has opposite sides that are congruent. The slope of $\overline{DE}$ = slope of $\overline{GF} = 1$ and slope of $\overline{EF}$ = slope of $\overline{DG} = -1$, so the figure has two pairs of parallel sides, and consecutive sides are perpendicular. Therefore, the figure is a rectangle.
39. $2a + b$
40. 19.31 units
41. 24 square units
42. $A'(-15, -5)$, $B'(-5, 5)$, and $C'(10, -20)$
43. $\frac{5}{2}$
44. 6
45. reflection over the *y*-axis, then a dilation

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about the origin of $\frac{1}{2}$

46. $\frac{BE}{FI} = \frac{CD}{GH}$

47. $\angle HIF$

48. 4

49. $\triangle ACB \sim \triangle AED$

50. 15

51. 18 m

52. 512 cm^2

53. 8

54. 8.9

55. 17.9

56. 13.5

57. (2, −2)

58. 55.4 mm

59. 48.9 mm

60. 11.7 cm

61. 32.1°

62. $x = 4$

63. 40°

64. 100°

65. 12

66. $\frac{16\pi}{3}$

67. $\frac{2\pi}{3}$

68. 67.0 mm^2

69. $(x-3)^2 + (y+4)^2 = 4$

70. center: (3, −2); radius: 4

71. $y = -\frac{x^2}{8} + 2$

72. $y = \frac{1}{10}(x-4)^2 - \frac{1}{2}$

73. cylinder; volume of prism = 360 in^3; volume of cylinder ≈ 471.2 in^3

74. cylinder; S.A. of prism = 312 in^2; S.A. of cylinder ≈ 471.2 in^2

75. Proof: $36\pi = \pi r^2(18)$, $2 = r^2$, $r = \sqrt{2}$

76. 163.4 in^2; Proof: SA is $\pi rs + \pi r^2$ $= \pi(4)(9) + \pi(16) = 52\pi \approx 163.4$ in^2

77. S.A. = (12 • 5) + 13x + 5x + 12x = 510, 450 = 30x, x = 15 m

78. The height of the pyramid is three times greater than the height of the square.

79. The height of the cone is 192 times greater than the height of the cylinder.

80. $V \approx 395.8$ in^3

81. $V \approx 10{,}687.7$ in^3

82. 24,000 people per square mile

83. 720

84. $\frac{1}{1365}$

85. Total of 10 coins, so probability $= \left(\frac{2}{10}\right)\left(\frac{3}{9}\right) = \frac{1}{15}$

86. 40 marbles total, probability $= \left(\frac{4}{40}\right)\left(\frac{12}{40}\right) = \frac{3}{100}$

87. 40 marbles total, probability $= \left(\frac{8}{40}\right)\left(\frac{8}{40}\right) = \frac{1}{25}$

88. 40 marbles total, probability $= \frac{(40-16)}{40} = \frac{3}{5}$

89. $\frac{7}{15}$

90. 0.15

91. 0.31

92. 0.04

93. 0.02

94. No; the teacher is only choosing from students who went to the last football game and not from all students in the school