

Kansas City Area Teachers of Mathematics
2013 KCATM Math Competition

GEOMETRY
GRADES 7-8

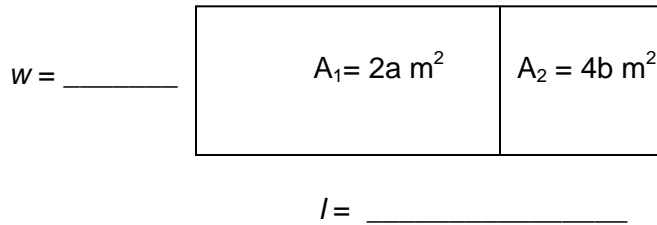
INSTRUCTIONS

- **Do not open this booklet** until instructed to do so.
- Time limit: **20 minutes**
- You **may use calculators**.
- Mark your answer on the Scantron sheet by **FILLING in the oval**.
- You **may not use rulers, protractors, or other measurement devices** on this test.
- Letter **“E” is “None of the above”**. It is a correct answer for some of the problems.
- Use the π key on your calculator.

Student Name _____ Student Number _____

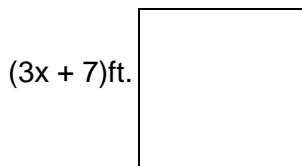
School _____

51. Given the **rectangles** with areas listed on the interior of the figures, what would be the width (w) and the length (l) of the outside rectangle?



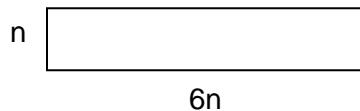
- A. $w = a, l = 2 + 4b$
- B. $w = 2a, l = a + 2b$
- C. $w = 2, l = a + 2b$
- D. $w = 2b, l = a + 2b$
- E. None of the above

52. What is the **perimeter of the square** with the side value of $(3x + 7)$?



- A. $(9x^2 + 42x + 49)$ ft.
- B. $(6x + 14)$ ft.
- C. $(9x + 21)$ ft.
- D. $(12x + 28)$ ft.
- E. None of the above

53. What is the **area of the rectangle**?

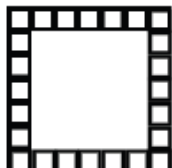


- A. $7n$
- B. $14n$
- C. $6n^2$
- D. $14n^2$
- E. None of the above

54. An equilateral triangle has a perimeter $(6n + 15)$. What is the side length?

- A. $2n + 5$
- B. $3n + 7.5$
- C. $6n + 5$
- D. $1.5n + 3.75$
- E. None of the above

55. Given the square pool with tiles around the perimeter. Which expression **CANNOT** be used to find the total number of tiles?

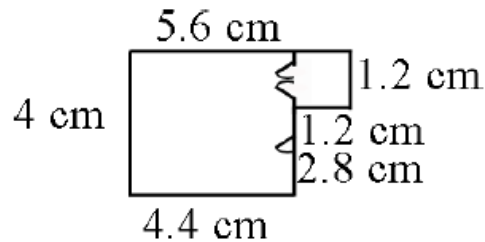


- A. 4×7
- B. $(2 \times 7) + (2 \times 5)$
- C. $(4 \times 5) + 4$
- D. $7 + 6 + 6 + 5$
- E. None of the above

56. Draw an isosceles triangle with the vertex angle of 80° . How many different isosceles triangles can be formed with this same characteristic of the vertex angle measure?

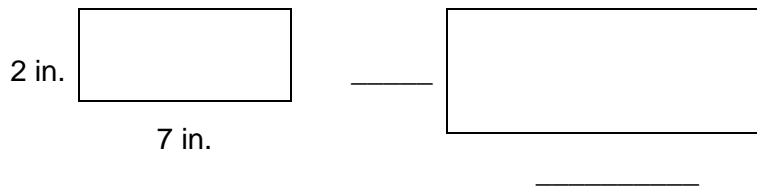
- A. None
- B. One
- C. Two
- D. Infinite
- E. None of the above

Use the blue print of a child's playhouse with a scale of 2 cm = 5 ft. for problems 57-58.



57. What is the perimeter of the playhouse?
 A. 45 ft. B. 48 ft. C. 52 ft. D. 55 ft. E. None of the above
58. What is the area of the playhouse?
 A. 81 sq. ft. B. 115 sq. ft. C. 121 sq. ft. D. 119 sq. ft. E. None of the above

Increase the sides of the rectangle below by a factor of 1.5. Use the new dimensions to answer questions 59-60.



59. Find the perimeter of the both figures. **How much larger** is the new perimeter than the original perimeter?
 A. 9 in. B. 11 in. C. 4.5 in. D. 5 in. E. None of the above
60. Find the **area of the new rectangle**.
 A. 18 sq. in. B. 29.75 sq. in. C. 31.5 sq. in.
 D. 34 sq. in. E. None of the above

61. Draw a quadrilateral with exactly one pair of parallel sides and no right angles. What is it?
 A. parallelogram B. square C. rhombus
 D. trapezoid E. None of the above
62. Which of these sets of sides would NOT form a triangle?
 A. 2, 3, 5 B. 3, 4, 5 C. 3, 5, 6 D. 4, 5, 6 E. None of the above
63. Identify the figure you would see if you were to look at the top view of a cylinder.
 A. sphere B. rectangle C. circle D. ellipse E. None of the above

Use the 3 square pyramid figures below for problems 64-66.



A



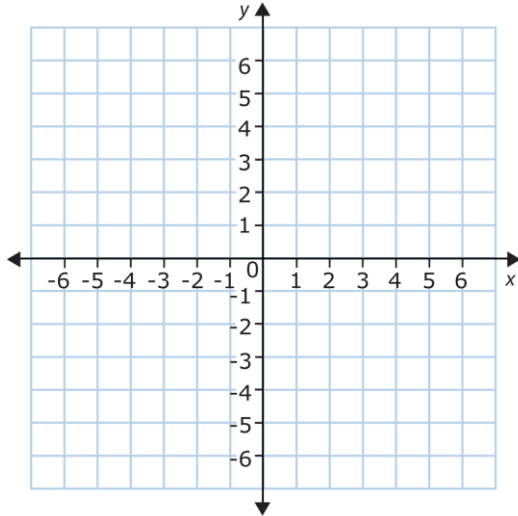
B



C

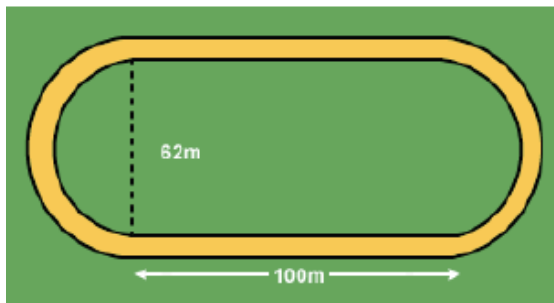
64. Figure A shows a pyramid that has been cut by a plane parallel to the base. If you had different bases with the same relationship between the plane and the pyramid (intersecting parallel to the base), which of the general rules below would be true? Figure A shows a slice of a square pyramid cutting the pyramid **parallel to the base**. If you had other bases, what is the general rule?
- It will always be a square.
 - It will always be the same figure as the original base.
 - It will always be a parallelogram.
 - It will always be a triangle.
 - None of the above
65. Figures B and C show perpendicular intersections with a pyramid. The vertex of the pyramid is on the intersecting plane in Figure B, whereas with Figure C it is not. Which general rule below fits all for all pyramids?
- Perpendicular to the base going through the vertex will always be a triangle, and perpendicular not going through the vertex will never be a triangle.
 - Perpendicular to the base going through the vertex will always be a rhombus, and perpendicular not through the vertex will be a triangle.
 - Perpendicular to the base going through the vertex will always be a trapezoid, and not going through the vertex will be a parallelogram.
 - Perpendicular to the base going through the vertex will always be a triangle, and not going through the vertex will also be a triangle.
 - None of the above
-
66. Find the circumference of a circle with a radius of 12 in. to the nearest tenth.
- 37.9 in.
 - 75.4 in.
 - 113.1 in.
 - 18.8 in.
 - None of the above
67. Find the area of circle with radius 5.5 ft. to the nearest hundredth.
- 95.03 sq. ft.
 - 34.56 sq. ft.
 - 54.28 sq. ft.
 - 380.13 sq. ft.
 - None of the above
68. What is the area of a semi-circle with diameter of 8 mi. to the nearest mile?
- 50 sq. mi.
 - 25 sq. mi.
 - 101 sq. miles
 - 13 sq. mi.
 - None of the above
69. Draw a quadrilateral with 4 right angles. What figure is it?
- Square
 - Rectangle
 - Parallelogram
 - Trapezoid
 - None of the above

70. Find the area of a circle with center at $(-5, 3)$ that goes through the point $(2, 3)$. Round your answer to the nearest tenth.



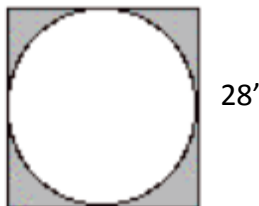
- A. 78.5 sq. units
- B. 28.3 sq. units
- C. 113.1 sq. units
- D. 153.9 sq. units
- E. None of the above

71. Find the perimeter of the track shown below. The width, 62 m, is the diameter of the semi-circular ends of the track. The length of the straightaway is 100 m.



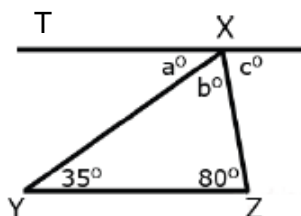
- A. 294.77 m
- B. 394.78 m
- C. 281.68 m
- D. 297.34 m
- E. None of the above

72. What is the area of the lawn **NOT** covered by the circular sprinkler if the center of the sprinkler is also the center of the square. The square has side lengths of 28 feet. Round to the nearest tenth of a foot.



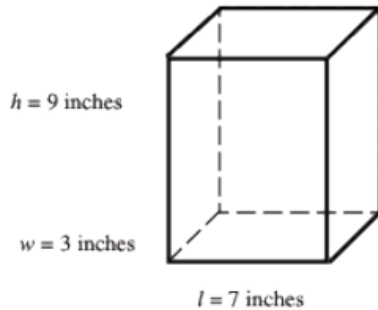
- A. 168.2 sq. ft.
- B. 760.0 sq. ft.
- C. 696.0 sq. ft.
- D. 60 sq. ft.
- E. None of the above

73. Given: $\overline{TX} \parallel \overline{YZ}$, find c .



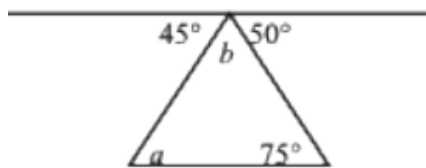
- A. 65°
- B. 35°
- C. 70°
- D. 180°
- E. None of the above

74. You want to wrap the surface the rectangular box shown. The cost is \$0.03 per sq. inch. What would be the **cost** of wrapping this package?



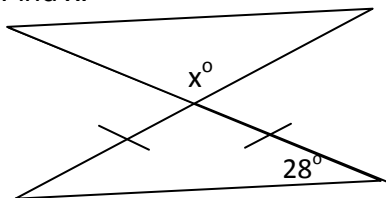
- A. \$4.86
- B. \$2.43
- C. \$3.33
- D. \$6.66
- E. None of the above

75. Find a and b.



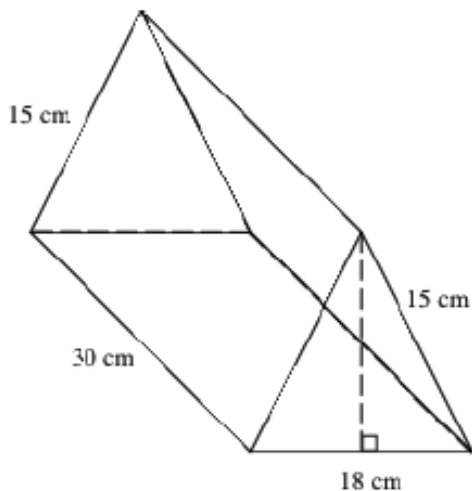
- A. $a = 30^\circ, b = 75^\circ$
- B. $a = 20^\circ, b = 85^\circ$
- C. $a = 20^\circ, b = 75^\circ$
- D. $a = 30^\circ, b = 85^\circ$
- E. None of the above

76. Find x.



- A. 128°
- B. 126°
- C. 124°
- D. 120°
- E. None of the above

Use the triangular prism for problems 77-78. The base is an isosceles triangle.



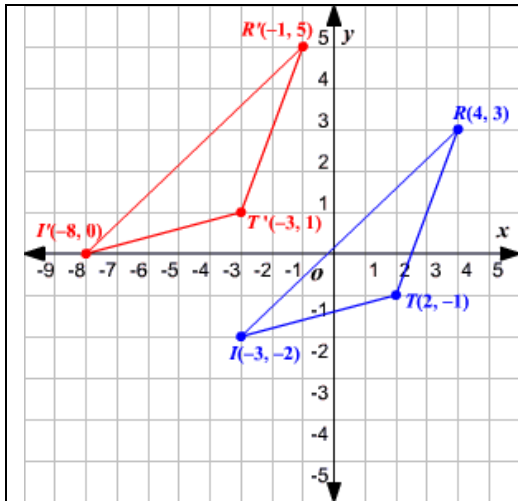
27. What is the **height of the triangular base**?

- A. 12 cm
- B. 13 cm
- C. 14 cm
- D. 9 cm
- E. None of the above

28. What is the **volume** of the prism? The formula is $V = Bh$, where B = Area of the Base and h = height of the prism.

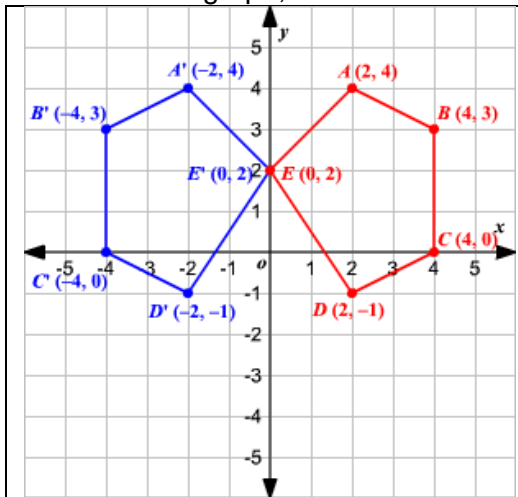
- A. 8100 cu. cm
- B. 3240 cu. cm
- C. 6480 cu. cm
- D. 2160 cu. cm
- E. None of the above

79. Given the graph, what is the transformation **rule** from preimage $\triangle RIT$ to image $\triangle R'I'T'$?



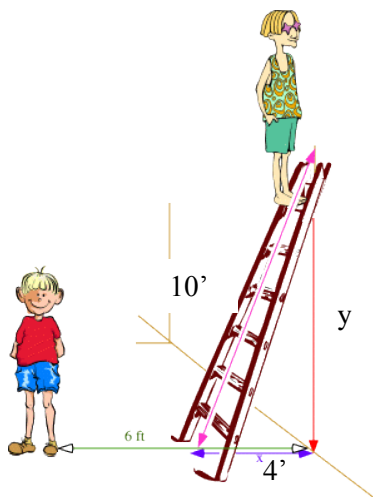
- A. $(x + 4, y + 2)$
- B. $(x - 3, y + 2)$
- C. $(x + 5, y - 2)$
- D. $(x - 5, y + 2)$
- E. None of the above

80. Given the graph, what is the transformation?



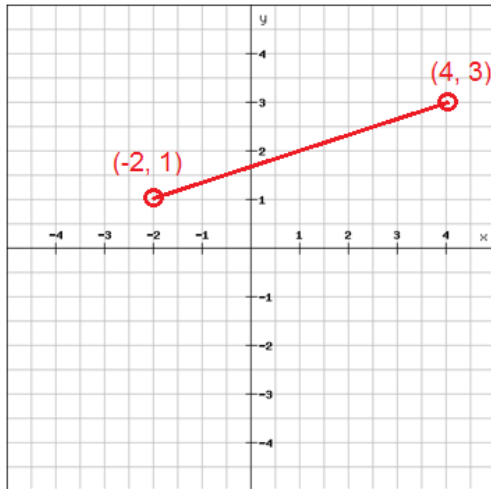
- A. Translation
- B. Reflection over the x axis
- C. Reflection over the y axis
- D. Rotation about (0,2)
- E. None of the above

81. A 10 foot ladder is placed against a wall as in the picture. If the horizontal distance, x , is 4 ft., how high up the wall, y , is the ladder? Round your answer to the nearest tenth.



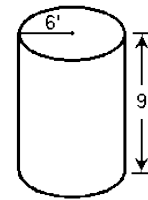
- A. 10 ft.
- B. 9.5 ft.
- C. 9.2 ft.
- D. 8.9 ft.

82. See the coordinate plane. Find the distance between (-2,1) and (4,3) to the nearest tenth.



- A. 6.3 units
- B. 12.5 units
- C. 4.5 units
- D. 8.3 units
- E. None of the above

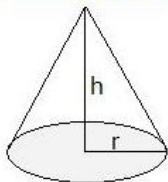
83. Find the volume of the cylinder with radius 6' and height of 9'. The formula is $V = Bh$, where $B = \text{area of the base}$, $h = \text{height}$. Round to the nearest hundredth.



- A. 54 cu. ft.
- B. 324 cu. ft.
- C. 339.29 cu. ft.
- D. 1017.88 cu. ft.
- E. None of the above

84. Find the volume of the cone if the radius is 2 cm and the height is 5 cm. Round your answer to the nearest tenth.

$V = (1/3)\pi r^2 h$



- A. 31.4 cu. cm
- B. 16.7 cu. cm
- C. 62.8 cu. cm
- D. 20.9 cu. cm
- E. None of the above

Use a regulation size basketball for high school boys for problems 35-36.

85. The basketball has a circumference of 29.5 inches. What is the **radius** to the nearest tenth of an inch?

- A. 9.4 in.
- B. 4.7 in.
- C. 3.1 in.
- D. 5.3 in.
- E. None of the above

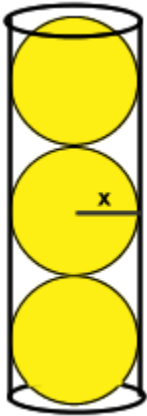


86. How much air is there in a basketball in a men's high school basketball? $V = 4/3 \pi r^3$

- A. 92.5 cu. in.
- B. 1739.7 cu. in.
- C. 623.6 cu. in.
- D. 434.9 cu. in.
- E. None of the above

87. If the **volume of a rectangular solid** is 840 cu. in, what is the **height** if the length is 12" and the width is 5"?

- A. 8 in. B. 11 in. C. 13 in. D. 14 in. E. None of the above
- Use the tennis ball packaging for problems 88-90.



diameter = 67 mm

$$\text{Cylinder: } V = \pi r^2 h$$

$$\text{Sphere: } V = \frac{4}{3} \pi r^3$$

88. What are the dimensions of the plastic container holding the three tennis balls?
- A. $r = 67$ mm, $h = 201$ mm B. $r = 33.5$ mm, $h = 100.5$ mm
C. $r = 33.5$ mm, $h = 201$ mm D. $r = 67$ mm, $h = 100.5$ mm
89. What is the volume of the cylinder to the nearest cubic millimeter?
- A. 708,656 cu. mm B. 2,834,624 cu. mm
C. 354,328 cu. mm D. 1,417,312 cu. mm
90. How much air is in the container around the tennis balls?
- A. 150,382 cu. mm B. 50,127 cu. mm
C. 37,575 cu. mm D. 157,479 cu. mm

Shade the correct answer!

Name _____

Example: A B C D E

School _____

51. A B C D E

52. A B C D E

53. A B C D E

54. A B C D E

55. A B C D E

56. A B C D E

57. A B C D E

58. A B C D E

59. A B C D E

60. A B C D E

61. A B C D E

62. A B C D E

63. A B C D E

64. A B C D E

65. A B C D E

66. A B C D E

67. A B C D E

68. A B C D E

69. A B C D E

70. A B C D E

71. A B C D E

72. A B C D E

73. A B C D E

74. A B C D E

75. A B C D E

76. A B C D E

77. A B C D E

78. A B C D E

79. A B C D E

80. A B C D E

81. A B C D E

82. A B C D E

83. A B C D E

84. A B C D E

85. A B C D E

86. A B C D E

87. A B C D E

88. A B C D E

89. A B C D E

90. A B C D E

Shade the correct answer!

Example: A ● C D E

Name _____

School _____

Answer Key

51. A B ● D E

52. A B C ● E

53. A B ● D E

54. ● A B C D E

55. ● A B C D E

56. A B C ● E

57. A ● C D E

58. A B C ● E

59. ● A B C D E

60. A B ● D E

61. A B C ● E

62. ● A B C D E

63. A B ● D E

64. A ● C D E

65. ● A B C D E

66. A ● C D E

67. ● A B C D E

68. A ● C D E

69. A ● C D E

70. A B C ● E

71. A ● C D E

72. ● A B C D E

73. A B C D ●

74. A B C ● E

75. A ● C D E

76. A B ● D E

77. ● A B C D E

78. A ● C D E

79. A B C ● E

80. A B ● D E

81. A B ● D E

82. ● A B C D E

83. A B C ● E

84. A B C ● E

85. A ● C D E

86. A B C ● E

87. A B C ● E

88. A ● C D E

89. ● A B C D E

90. A B C ● E