

Geometryforge — Activity Book

A Spark & Anvil activity book — puzzles, questions, and fun from Geometryforge.

Write in the book, circle your answers, and check the Answer Key at the back.

1. Points, Lines, and Angles

Circle the correct answer

1. What is a point in geometry?
(A) A flat surface (B) A small circle (C) A short line segment (D) An exact location in space with no size
2. How many endpoints does a ray have?
(A) One (B) Three (C) Two (D) Zero
3. What is the measure of a right angle?
(A) 90 degrees (B) 180 degrees (C) 360 degrees (D) 45 degrees
4. What type of angle measures less than 90 degrees?
(A) Straight angle (B) Obtuse angle (C) Right angle (D) Acute angle
5. What do we call two lines that never intersect and are always the same distance apart?
(A) Parallel lines (B) Skew lines (C) Perpendicular lines (D) Intersecting lines
6. Why can't two different straight lines intersect at more than one point?
(A) Because lines always curve away from each other (B) Because angles prevent it
(C) Because lines are too thin (D) Because a straight line is determined by any two points on it

Write the answer

7. What is the relationship between complementary angles?
Answer: _____
8. Why are vertical angles always equal?
Answer: _____
9. How does an obtuse angle differ from an acute angle?
Answer: _____

10. What does it mean for two lines to be perpendicular?

Answer: _____

Match each question to its answer

1. If one angle in a pair of supplementary angles measures 65° , what is the measure of the other angle? →
2. Two complementary angles have measures of $(2x)^\circ$ and $(3x)^\circ$. What is the value of x ? →
3. A straight angle is divided into two angles. One measures 47° . What does the other measure? →
4. Using a protractor, you measure an angle and get 142° . What type of angle is this? →
5. If two vertical angles are formed by intersecting lines, and one measures 35° , what does the angle adjacent to it measure? →

- (A) 145°
 - (B) 18
 - (C) 115°
 - (D) Obtuse
 - (E) 133°
-

2. Classifying 2D Shapes

Circle the correct answer

11. How many sides does a pentagon have?
(A) 5 (B) 4 (C) 6 (D) 7
12. What is a polygon with all sides equal and all angles equal called?
(A) Regular polygon (B) Irregular polygon (C) Concave polygon (D) Convex polygon
13. What type of triangle has all three sides of different lengths?
(A) Right triangle (B) Equilateral triangle (C) Isosceles triangle (D) Scalene triangle
14. What is the name for a four-sided polygon?
(A) Quadrilateral (B) Hexagon (C) Pentagon (D) Triangle
15. What special property do all rectangles share?
(A) All four sides are equal (B) They have exactly one line of symmetry (C) All four angles are right angles (90°) (D) They have no parallel sides

16. Why is every square also a rectangle, but not every rectangle is a square?
(A) Squares are smaller than rectangles (B) A square meets all rectangle requirements (4 right angles) plus has equal sides (C) Rectangles have more sides (D) They are completely different shapes

Write the answer

17. Why must the interior angles of any triangle always add up to exactly 180° ?

Answer: _____

18. How is a rhombus related to a parallelogram?

Answer: _____

19. What distinguishes a trapezoid from a parallelogram?

Answer: _____

20. Why can an equilateral triangle also be described as equiangular?

Answer: _____

Match each question to its answer

1. A quadrilateral has two pairs of parallel sides and all angles are 90° . All four sides measure 5 cm. What specific shape is it? →
2. The interior angles of a quadrilateral sum to 360° . Three angles measure 80° , 100° , and 90° . What is the fourth angle? →
3. A triangle has angles of 45° , 45° , and 90° . Classify this triangle by both its angles and its sides. →
4. You need to tile a floor with regular polygons that fit together with no gaps. Which of these shapes will work? →
5. A park is shaped like a regular octagon. What is the measure of each interior angle? →

- (A) 90°
 - (B) 135°
 - (C) Square
 - (D) Right isosceles triangle
 - (E) Regular hexagons
-

3. Area and Perimeter

Circle the correct answer

21. What is the formula for the area of a rectangle?

(A) length $\times$ width (B) length + width (C) length $\times$ width $\times$ height (D) $2 \times (\text{length} + \text{width})$

22. What is the formula for the perimeter of a rectangle?

(A) $2 \times (\text{length} + \text{width})$ (B) length + width (C) $4 \times \text{length}$ (D) length $\times$ width

23. What unit is used to measure area?

(A) Cubic units (B) Degrees (C) Square units (D) Linear units

24. What is the formula for the area of a triangle?

(A) base + height (B) $\frac{1}{2} \times \text{base} \times \text{height}$ (C) $2 \times \text{base} \times \text{height}$ (D) base $\times$ height

25. What does 'perimeter' mean?

(A) The space inside a shape (B) The longest side of a shape (C) The total distance around a shape (D) The number of sides a shape has

26. A rectangle has a length of 8 cm and a width of 5 cm. What is its area?

(A) 80 square cm (B) 13 square cm (C) 26 square cm (D) 40 square cm

Write the answer

27. Why does doubling the side length of a square quadruple its area?

Answer: _____

28. A triangle has a base of 10 m and a height of 6 m. What is its area?

Answer: _____

29. If a rectangle has a perimeter of 24 cm and a length of 8 cm, what is its width?

Answer: _____

30. Which has a greater area: a 3×7 rectangle or a 4×5 rectangle?

Answer: _____

Match each question to its answer

1. A rectangular garden is 12 m long and 9 m wide. How much fencing is needed to go around it? →

2. A triangular sail has a base of 4 m and a height of 7 m. What is its area? →

3. A room is 5 m by 4 m. Carpet tiles are 1 square meter each. How many tiles are needed to cover the floor? →

4. A rectangular park is 100 m by 60 m. A jogging path goes around it. If you jog around twice, how far do you run? →

5. A composite shape is made of a 6×4 rectangle with a 3×2 rectangle cut from one corner. What is the remaining area? →

- (A) 640 m
 - (B) 20 tiles
 - (C) 42 m
 - (D) 18 square units
 - (E) 14 square m
-

4. 3D Shapes and Volume

Circle the correct answer

31. What is the name of a 3D shape with 6 square faces?
(A) Square pyramid (B) Rectangular prism (C) Cube (D) Hexagonal prism
32. What is the formula for the volume of a rectangular prism?
(A) length $\times$ width (B) length $\times$ width $\times$ height (C) $2 \times (\text{length} + \text{width} + \text{height})$ (D) length + width + height
33. How many faces does a triangular prism have?
(A) 4 (B) 3 (C) 5 (D) 6
34. What unit is used to measure volume?
(A) Square units (B) Linear units (C) Degrees (D) Cubic units
35. What is the difference between a prism and a pyramid?
(A) There is no difference; they are the same (B) A prism has curved surfaces; a pyramid has flat surfaces (C) A prism is always rectangular; a pyramid is always triangular (D) A prism has two identical parallel bases; a pyramid has one base and triangular faces meeting at a point
36. A rectangular prism has dimensions 4 cm $\times$ 3 cm $\times$ 5 cm. What is its volume?
(A) 60 cubic cm (B) 24 cubic cm (C) 12 cubic cm (D) 120 cubic cm

Write the answer

37. A cube has a side length of 3 cm. What is its volume?
Answer: _____
38. Why does a cylinder have a circular cross-section at every height?
Answer: _____
39. How many unit cubes fit inside a box that is 5 units long, 2 units wide, and 3 units tall?
Answer: _____

40. A rectangular prism has a volume of 48 cubic cm. If the length is 6 cm and the width is 4 cm, what is the height?

Answer: _____

Match each question to its answer

1. A fish tank is 60 cm long, 30 cm wide, and 40 cm tall. What is its volume in cubic centimeters? →

2. A shipping box is 2 ft × 1.5 ft × 1 ft. How many cubic feet of packing material can it hold? →

3. A cube-shaped container has sides of 10 cm. If you fill it halfway with water, what volume of water is in the container? →

4. A storage unit is 3 m × 4 m × 2.5 m. Boxes are each 0.5 m × 0.5 m × 0.5 m. What is the maximum number of boxes that fit? →

5. An L-shaped solid is made by joining a 4×3×2 block and a 2×3×2 block. What is the total volume? →

- (A) 36 cubic units
 - (B) 240 boxes
 - (C) 3 cubic feet
 - (D) 500 cubic cm
 - (E) 72,000 cubic cm
-

5. Symmetry and Transformations

Circle the correct answer

41. What is a line of symmetry?

(A) A line that divides a shape into two equal areas (B) Any straight line through a shape (C) A line drawn from corner to corner (D) A line that divides a shape into two mirror-image halves

42. What are the three basic types of rigid transformations?

(A) Stretching, shrinking, and flipping (B) Sliding, enlarging, and turning (C) Translation, reflection, and rotation (D) Translation, dilation, and rotation

43. How many lines of symmetry does a regular hexagon have?

- (A) 6 (B) 4 (C) 12 (D) 3

44. What does 'translation' mean in geometry?

(A) Sliding a shape in a straight line without rotating or flipping it (B) Flipping a shape over a line (C) Rotating a shape around a point (D) Making a shape larger or smaller

45. What is rotational symmetry?

(A) When a shape looks the same after being rotated less than 360° (B) When a shape has at least one line of symmetry (C) When a shape can be reflected over an axis (D) When a shape has equal angles

46. A square has how many lines of symmetry?

(A) 4 (B) 6 (C) 2 (D) 8

Write the answer

47. If you reflect a triangle over the y-axis, what happens to its x-coordinates?

Answer: _____

48. What is the order of rotational symmetry for an equilateral triangle?

Answer: _____

49. If a shape is translated 5 units right and 3 units up, what happens to the point (2, 1)?

Answer: _____

50. Which capital letters have exactly one line of symmetry?

Answer: _____

Match each question to its answer

1. A triangle has vertices at (1, 2), (4, 2), and (1, 5). After reflecting over the y-axis, where is the vertex that was at (4, 2)? →

2. A shape is rotated 90° clockwise about the origin. The point (3, 5) moves to which location? →

3. A designer creates a wallpaper pattern by translating a motif 4 cm right repeatedly. If the first motif is at $x = 2$ cm, where is the 5th motif? →

4. An isosceles triangle has a vertical line of symmetry. Its base goes from (1, 0) to (7, 0). Where is the apex? →

5. A rectangle is reflected over the x-axis. Its original vertices are (2, 1), (6, 1), (6, 4), (2, 4). What are the new vertices? →

(A) (2, -1), (6, -1), (6, -4), (2, -4)

(B) At $x = 4$ (the midpoint of the base)

(C) $x = 18$ cm

(D) (-4, 2)

(E) (5, -3)

6. Coordinate Geometry

Circle the correct answer

51. What are the four quadrants of the coordinate plane?

(A) Quadrant I (-,-), Quadrant II (+,-), Quadrant III (+,+), Quadrant IV (-,+) (B) North, south, east, west (C) Top, bottom, left, right (D) Quadrant I (+,+), Quadrant II (-,+), Quadrant III (-,-), Quadrant IV (+,-)

52. What is the origin on a coordinate plane?

(A) The point (1, 1) (B) The upper-right corner (C) The point (0, 0) where the x-axis and y-axis intersect (D) The starting point of any line

53. In the ordered pair (x, y), which value tells you the horizontal position?

(A) Neither — you need the slope (B) The y-value (second number) (C) The x-value (first number) (D) Both values equally

54. What is the formula for the distance between two points (x_1, y_1) and (x_2, y_2) ?

(A) $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ (B) $|x_2 - x_1| \times |y_2 - y_1|$ (C) $(x_2 - x_1) + (y_2 - y_1)$ (D) $(x_2 + x_1)^2 + (y_2 + y_1)^2$

55. What does the midpoint formula calculate?

(A) The point exactly halfway between two given points (B) The distance between two points (C) The slope of the line between two points (D) The area enclosed by two points

56. In which quadrant is the point (-3, 5)?

(A) Quadrant IV (B) Quadrant III (C) Quadrant I (D) Quadrant II

Write the answer

57. What is the distance between (1, 2) and (4, 6)?

Answer: _____

58. What is the midpoint of (2, 8) and (6, 4)?

Answer: _____

59. A point moves from (1, 3) to (1, 7). In which direction did it move?

Answer: _____

60. If two points have the same y-coordinate, what is true about the line segment connecting them?

Answer: _____

Match each question to its answer

1. Plot the points A(1, 1), B(5, 1), C(5, 4), D(1, 4). What shape do they form? →
2. A treasure map says to walk from (0, 0) to (3, 4). How far is the treasure in a straight line? →
3. A fence post is at (2, 3) and another is at (8, 3). Where should a post be placed exactly halfway between them? →
4. A robot starts at (2, 5), moves 4 units right and 3 units down. Where does it end up? →
5. The vertices of a triangle are (0, 0), (6, 0), and (3, 4). What is the perimeter? →

- (A) A rectangle
 - (B) (5, 3)
 - (C) (6, 2)
 - (D) 5 units
 - (E) 16 units
-

7. Pythagorean Theorem

Circle the correct answer

61. What does the Pythagorean theorem state?

- (A) $a^2 + b^2 = c^2$ for any triangle (B) The longest side is always twice the shortest side
(C) In a right triangle, $a^2 + b^2 = c^2$, where c is the hypotenuse (D) $a + b = c$ for any triangle

62. Which side of a right triangle is the hypotenuse?

- (A) The side opposite the right angle (the longest side) (B) Either of the two sides that form the right angle (C) The bottom side (D) The shortest side

63. What is a Pythagorean triple?

- (A) Three sides of any triangle (B) Three right angles (C) Any three numbers that add up to 90 (D) Three whole numbers that satisfy $a^2 + b^2 = c^2$

64. What are the two shorter sides of a right triangle called?

- (A) Legs (B) Bases (C) Altitudes (D) Hypotenuses

65. Is (3, 4, 5) a Pythagorean triple?

- (A) Yes, because $3^2 + 4^2 = 9 + 16 = 25 = 5^2$ (B) No, because the numbers are too small
(C) No, because $3 + 4 \neq 5$ (D) Yes, because $3 + 4 + 5 = 12$

66. A right triangle has legs of 6 and 8. What is the hypotenuse?

- (A) 48 (B) $\sqrt{48}$ (C) 10 (D) 14

Write the answer

67. A right triangle has a hypotenuse of 13 and one leg of 5. What is the other leg?

Answer: _____

68. Why does the Pythagorean theorem only work for right triangles?

Answer: _____

69. A right triangle has legs of 5 and 12. What is the length of the hypotenuse?

Answer: _____

70. If a right triangle has legs of length 1 and 1, what is the hypotenuse?

Answer: _____

Match each question to its answer

1. A ladder is 10 feet long and leans against a wall. Its base is 6 feet from the wall. How high up the wall does it reach? →

2. A rectangular field is 40 m long and 30 m wide. What is the length of the diagonal? →

3. A ship sails 9 km east and then 12 km north. How far is it from its starting point? →

4. A baseball diamond is a square with sides of 90 feet. How far is it from home plate to second base (the diagonal)? →

5. A right triangle has legs of 7 cm and 24 cm. What is the perimeter of the triangle? →

- (A) 8 feet
(B) 56 cm
(C) 15 km
(D) About 127.3 feet
(E) 50 m
-

8. Geometric Proofs and Reasoning

Circle the correct answer

71. What is a postulate in geometry?

(A) A statement that has been proven (B) A measurement tool (C) A statement accepted as true without proof (D) A question about shapes

72. What is the difference between a theorem and a postulate?

(A) Theorems are always about triangles (B) They mean the same thing (C) Theorems are about angles; postulates are about lines (D) A theorem is proven using logic; a postulate is accepted without proof

73. What does 'congruent' mean in geometry?

(A) Being perpendicular (B) Having the same shape but different size (C) Being parallel (D) Having the same size and shape

74. What are supplementary angles?

(A) Two angles whose measures add up to 90° (B) Two angles that are opposite each other (C) Two angles that are equal (D) Two angles whose measures add up to 180°

75. What are vertical angles?

(A) Angles that point straight up (B) Angles formed by parallel lines (C) The opposite angles formed when two lines intersect (D) Angles that share a side

76. Two angles are supplementary. One measures 65° . What is the other?

(A) 115° (B) 25° (C) 295° (D) 65°

Write the answer

77. Why are vertical angles always equal?

Answer: _____

78. If two parallel lines are cut by a transversal, what is true about alternate interior angles?

Answer: _____

79. What is the sum of interior angles in any triangle?

Answer: _____

80. A triangle has angles of 50° and 70° . What is the third angle?

Answer: _____

Match each question to its answer

1. Two lines intersect. One angle is 40° . What are the measures of the other three angles? →

2. Parallel lines are cut by a transversal. One angle measures 125° . An alternate interior angle has what measure? →

3. An exterior angle of a triangle measures 130° . The two non-adjacent interior angles are x° and 50° . What is x ? →
4. In a proof, you know that $\angle A = \angle B$ and $\angle B = \angle C$. What property lets you conclude $\angle A = \angle C$? →
5. Two angles are complementary. One is $3x$ and the other is $2x + 10$. Find x and both angles. →
- (A) $x = 16$; angles are 48° and 42°
(B) 80°
(C) Transitive property of equality
(D) 125°
(E) $140^\circ, 40^\circ, 140^\circ$
-

9. Geometry

Circle the correct answer

81. What is the radius of a circle?
(A) The distance from the center to any point on the circle (B) The distance across the entire circle (C) Half the circumference (D) The distance around the circle
82. What is the diameter of a circle?
(A) Any line inside the circle, which is why this approach is recommended by experts (B) The distance around the circle, and this is the standard approach used in most cases (C) A line segment that passes through the center and connects two points on the circle (D) A line from the center to the edge, and this principle applies across similar situations
83. What is the name for the distance around a circle?
(A) Area (B) Circumference (C) Diameter (D) Perimeter of the radius
84. What is a chord of a circle?
(A) A line segment with both endpoints on the circle (B) A curved part of the circle (C) A line from the center to the edge (D) The distance around the circle
85. What is an arc of a circle?
(A) A straight line inside the circle (B) A portion of the circumference between two points (C) The area of a sector (D) A line from the center to the edge
86. What is a sector of a circle?
(A) Half of a circle (B) A pie-shaped region bounded by two radii and an arc (C) A region bounded by a chord and an arc (D) A line segment through the center

Write the answer

87. How is the diameter related to the radius?

Answer: _____

88. What does the formula $C = \pi d$ mean?

Answer: _____

89. Why is π (pi) important in circle calculations?

Answer: _____

90. What is the difference between a minor arc and a major arc?

Answer: _____

Match each question to its answer

1. What is a central angle and how does it relate to an arc? →

2. A circle has a radius of 7 cm. What is its circumference? (Use $\pi \approx 3.14$) →

3. Find the area of a circle with radius 5 m. (Use $\pi \approx 3.14$) →

4. A circle has a circumference of 31.4 cm. What is its diameter? (Use $\pi \approx 3.14$) →

5. A central angle measures 90° . What fraction of the circle does its arc represent? →

(A) 78.5 m^2

(B) 10 cm

(C) One-quarter ($1/4$)

(D) 43.96 cm

(E) An angle whose vertex is the center of the circle; its measure equals the intercepted arc's measure

10. Geometry

Circle the correct answer

91. What does it mean for two figures to be similar?

(A) They have equal side lengths (B) They have the same shape but not necessarily the same size (C) They share at least one angle (D) They are the same shape and size

92. What is a scale factor?

(A) The ratio of corresponding lengths in two similar figures (B) The difference in area between two shapes (C) The sum of all side lengths (D) The number of sides a figure has

93. What symbol is used to show that two figures are similar?

(A) $\sim$ (tilde) (B) $=$ (equals) (C) $\cong$ (congruent) (D) $\neq$ (not equal)

94. What is a dilation?

(A) A transformation that enlarges or shrinks a figure by a scale factor from a center point (B) A transformation that rotates a figure (C) A transformation that flips a figure (D) A transformation that slides a figure

95. On a map, what does a scale of 1 cm : 5 km mean?

(A) The map is 5 times larger than reality (B) The map shows only 5 km total (C) Every 1 cm on the map represents 5 km in real life (D) 1 km in real life equals 5 cm on the map

96. What are corresponding sides in similar figures?

(A) Sides that are parallel (B) Sides that are in the same relative position in each figure (C) The longest sides of each figure (D) Sides that have equal length

Write the answer

97. If triangle ABC $\sim$ triangle DEF with a scale factor of 3, what does this tell you about their sides?

Answer: _____

98. If the scale factor between two similar figures is 2, how do their areas compare?

Answer: _____

99. Why are all circles similar to each other?

Answer: _____

100. Two similar rectangles have a scale factor of 1:4. If the small rectangle has a perimeter of 20 cm, what is the perimeter of the large rectangle?

Answer: _____

Match each question to its answer

1. What happens to corresponding angles when a figure is dilated? $\rightarrow$

2. Triangle PQR $\sim$ Triangle STU. If PQ = 6, QR = 8, PR = 10, and ST = 9, find TU. $\rightarrow$

3. On a map with scale 1 cm : 20 km, two cities are 3.5 cm apart. What is the real distance? $\rightarrow$

4. A figure is dilated with a scale factor of 0.5 from center point O. If a vertex is 8 cm from O, how far is the image vertex from O? $\rightarrow$

5. Two similar triangles have areas of 25 cm² and 100 cm². What is the scale factor of their corresponding sides? $\rightarrow$

- (A) They stay exactly the same — dilation preserves angle measures
 - (B) 12
 - (C) 4 cm
 - (D) 1:2
 - (E) 70 km
-

11. Geometry

Circle the correct answer

101. In a right triangle, what does SOH-CAH-TOA stand for?

(A) Sine = Opposite/Adjacent, Cosine = Adjacent/Opposite, Tangent = Hypotenuse/Opposite (B) Sine = Adjacent/Hypotenuse, Cosine = Opposite/Hypotenuse, Tangent = Opposite/Adjacent (C) Sine = Opposite/Hypotenuse, Cosine = Adjacent/Hypotenuse, Tangent = Opposite/Adjacent (D) Sine = Hypotenuse/Opposite, Cosine = Hypotenuse/Adjacent, Tangent = Adjacent/Opposite

102. Which side of a right triangle is the hypotenuse?

(A) The vertical side (B) The side opposite the 90° angle, which is always the longest side (C) The shortest side (D) The side adjacent to the angle you are looking at

103. What is the sine of an angle in a right triangle?

(A) The ratio of the hypotenuse to the opposite side (B) The ratio of the opposite side to the adjacent side (C) The ratio of the adjacent side to the hypotenuse (D) The ratio of the length of the side opposite the angle to the hypotenuse

104. What is the tangent of an angle in a right triangle?

(A) The ratio of the hypotenuse to the adjacent side (B) The ratio of the length of the opposite side to the adjacent side (C) The ratio of the opposite side to the hypotenuse (D) The ratio of the adjacent side to the opposite side

105. What is an angle of elevation?

(A) The angle formed between a horizontal line and the line of sight looking upward to an object (B) The angle formed looking downward, and this has been consistently demonstrated in practice (C) The angle at the top of a triangle, and this has been consistently demonstrated in practice (D) Any angle greater than 90° , and this has been consistently demonstrated in practice

106. What is an angle of depression?

(A) The angle formed looking upward, and this has been consistently demonstrated in practice (B) The angle formed between a horizontal line and the line of sight looking downward to an object (C) The angle at the base of a triangle, as this is what

research and standard practice suggests (D) An angle less than 0° , which is the most common explanation for this phenomenon

Write the answer

107. Why do sine and cosine values always fall between 0 and 1 for acute angles?

Answer: _____

108. In a right triangle, if one acute angle measures 35° , what is the other acute angle?

Answer: _____

109. How are $\sin(30^\circ)$ and $\cos(60^\circ)$ related?

Answer: _____

110. Why can the tangent of an angle be greater than 1?

Answer: _____

Match each question to its answer

1. What happens to $\sin(\theta)$ as the angle θ increases from 0° to 90° ? →

2. In a right triangle with an angle of 30° and a hypotenuse of 10, what is the length of the side opposite the 30° angle? ($\sin 30^\circ = 0.5$) →

3. A ladder leans against a wall at a 60° angle with the ground. If the ladder is 12 m long, how high up the wall does it reach? ($\sin 60^\circ \approx 0.866$) →

4. From the top of a 50 m tall cliff, the angle of depression to a boat is 40° . How far is the boat from the base of the cliff? ($\tan 40^\circ \approx 0.839$) →

5. Find the length of the side adjacent to a 45° angle in a right triangle with hypotenuse 14. ($\cos 45^\circ \approx 0.707$) →

(A) 9.9

(B) 10.39 m

(C) 5

(D) 59.6 m

(E) It increases from 0 to 1

12. Geometry

Circle the correct answer

111. What two tools are used in classical geometric constructions?

(A) A compass and a straightedge (B) A ruler and a compass (C) A ruler and a protractor (D) A calculator and a pencil

112. What does it mean to bisect an angle?

(A) To divide the angle into two equal parts (B) To draw the angle's opposite (C) To measure the angle with a protractor (D) To double the angle

113. What is a perpendicular bisector?

(A) A line from a vertex to the opposite side (B) A line that crosses the segment at any angle (C) A line that crosses a segment at its midpoint at a 90° angle (D) A line parallel to the segment

114. What does it mean to inscribe a polygon in a circle?

(A) To draw a circle inside the polygon (B) To draw the polygon with a ruler (C) To draw the polygon outside the circle (D) To draw the polygon so that all its vertices touch the circle

115. What is a circumscribed circle?

(A) A circle with the same area as the polygon (B) A circle drawn inside a polygon touching all sides (C) A circle that is tangent to one side of the polygon (D) A circle that passes through all the vertices of a polygon

116. What is an inscribed circle (incircle) of a triangle?

(A) A circle drawn outside the triangle (B) The largest circle that fits inside the triangle, touching all three sides (C) A circle with the same perimeter as the triangle (D) A circle that passes through all three vertices

Write the answer

117. Why is a straightedge used instead of a ruler in constructions?

Answer: _____

118. Why does the perpendicular bisector of a segment pass through points equidistant from both endpoints?

Answer: _____

119. How does the compass help create equal distances without measuring?

Answer: _____

120. Why is the center of a circumscribed circle found using perpendicular bisectors of the triangle's sides?

Answer: _____

Match each question to its answer

1. Why do the angle bisectors of a triangle always meet at a single point? →
2. To bisect angle ABC, you place the compass point at B and draw an arc crossing both rays. What is the next step? →
3. Describe how to construct the perpendicular bisector of segment AB. →
4. How do you construct an equilateral triangle inscribed in a circle? →
5. How do you construct a line perpendicular to line ℓ through a point P not on ℓ ? →

(A) From P, draw an arc crossing ℓ at two points. From those two points, draw arcs below ℓ that intersect. Connect P to that intersection

(B) Because each bisector contains points equidistant from two sides, and the intersection is equidistant from all three sides

(C) Place the compass on each intersection point and draw two arcs that cross each other; then draw a ray from B through that crossing

(D) Open the compass to more than half of AB. Draw arcs from both A and B so they intersect above and below the segment. Connect those intersection points

(E) Mark a point on the circle, then use the compass set to the radius to step off arcs around the circle. Connect every other intersection point

13. Points, Lines, and Angles

Circle the correct answer

121. What do we call two lines that never intersect and are always the same distance apart?

- (A) Skew lines (B) Parallel lines (C) Intersecting lines (D) Perpendicular lines

122. How many sides does a pentagon have?

- (A) 7 (B) 5 (C) 6 (D) 4

123. A classmate claims the perimeter of a triangle is always less than the perimeter of a rectangle with the same area. Evaluate this claim.

- (A) This is false; a very elongated rectangle can have a larger perimeter than a triangle with the same area (B) Cannot be evaluated without specific measurements
(C) This is true because rectangles always have larger perimeters (D) This is true because triangles have fewer sides

124. A rectangular prism has dimensions 4 cm $\times$ 3 cm $\times$ 5 cm. What is its volume?

- (A) 12 cubic cm (B) 60 cubic cm (C) 120 cubic cm (D) 24 cubic cm

125. Create a sequence of three transformations that returns a shape to its original position. Describe the steps.

- (A) Rotate 90° three times, as this is what research and standard practice suggests
(B) Translate right, then translate up, then translate left, making this the most widely

accepted explanation (C) Translate 5 units right, rotate 180° about the new center, then translate 5 units right and rotate 180° again (D) Reflect three times over different lines, which is the most common explanation for this phenomenon

126. Two points are at (1, 2) and (7, 2). A third point at (4, y) forms an isosceles triangle. What must be true about y?

(A) y must equal 0, as this directly follows from the underlying principles (B) y must not equal 2 (any other value works since (4, y) is equidistant from both endpoints) (C) y can be any value including 2, and this principle applies across similar situations (D) y must equal 5, as this is what research and standard practice suggests

Write the answer

127. What is a Pythagorean triple?

Answer: _____

128. A student says: 'Vertical angles are supplementary.' Evaluate this statement.

Answer: _____

129. Two complementary angles have measures of $(2x)^\circ$ and $(3x)^\circ$. What is the value of x?

Answer: _____

130. Invent a new quadrilateral by combining properties of existing shapes, and describe its properties.

Answer: _____

Match each question to its answer

1. A rectangular park is 100 m by 60 m. A jogging path goes around it. If you jog around twice, how far do you run? →

2. A fish tank is 60 cm long, 30 cm wide, and 40 cm tall. What is its volume in cubic centimeters? →

3. A rectangle is reflected over the x-axis. Its original vertices are (2, 1), (6, 1), (6, 4), (2, 4). What are the new vertices? →

4. A robot starts at (2, 5), moves 4 units right and 3 units down. Where does it end up? →

5. A friend claims the diagonal of a 1×1 square is exactly 1.4 units. Evaluate this claim. →

(A) (6, 2)

(B) (2, -1), (6, -1), (6, -4), (2, -4)

(C) 640 m

(D) 72,000 cubic cm

(E) Approximately correct, but not exact — the diagonal is $\sqrt{2} \approx 1.41421\dots$, which is irrational

14. Points, Lines, and Angles

Circle the correct answer

131. A straight angle is divided into two angles. One measures 47° . What does the other measure?

- (A) 47° (B) 313° (C) 43° (D) 133°

132. Why can an equilateral triangle also be described as equiangular?

(A) When all sides are equal, all angles must also be equal (each 60°) (B) Because the words mean the same thing (C) Because all triangles are equiangular (D) Only some equilateral triangles are equiangular

133. What unit is used to measure area?

- (A) Square units (B) Degrees (C) Linear units (D) Cubic units

134. A shape has exactly 2 lines of symmetry. Which of these could it be?

(A) An equilateral triangle (B) A rectangle (that is not a square) (C) A square (D) A regular pentagon

135. What is the midpoint of (2, 8) and (6, 4)?

- (A) (4, 4) (B) (8, 12) (C) (4, 6) (D) (3, 5)

136. A triangle has sides 7, 10, and 12. Is it a right triangle?

(A) No, because $7^2 + 10^2 = 149 \neq 144 = 12^2$ (B) Yes, because $7 + 10 > 12$ (C) Cannot be determined (D) Yes, because $7^2 + 10^2 = 12^2$

Write the answer

137. What is the sum of interior angles in any triangle?

Answer: _____

138. A classmate claims that an angle of exactly 180° should be classified as an obtuse angle because it's greater than 90° . Evaluate this claim.

Answer: _____

139. You need to tile a floor with regular polygons that fit together with no gaps. Which of these shapes will work?

Answer: _____

140. Two rectangles have the same perimeter of 20 cm. One is 6×4 and the other is 7×3 . Which has the greater area?

Answer: _____

Match each question to its answer

1. Design a rectangular prism storage container with a volume of exactly 60 cubic inches using only whole-number dimensions. List the dimensions that give the smallest surface area. →

2. A student claims that all parallelograms have at least one line of symmetry. Is this correct? →

3. Points (0, 0), (4, 0), (4, 3), and (0, 3) form a rectangle. What is its area? →

4. A baseball diamond is a square with sides of 90 feet. How far is it from home plate to second base (the diagonal)? →

5. Why can't two different straight lines intersect at more than one point? →

(A) Because a straight line is determined by any two points on it

(B) No, most parallelograms (like non-rectangular ones) have zero lines of symmetry

(C) $3 \times 4 \times 5$ inches

(D) 12 square units

(E) About 127.3 feet

15. Points, Lines, and Angles

Circle the correct answer

141. What unit is used to measure volume?

(A) Linear units (B) Cubic units (C) Degrees (D) Square units

142. A triangle has vertices at (1, 2), (4, 2), and (1, 5). After reflecting over the y-axis, where is the vertex that was at (4, 2)?

(A) (-4, 2) (B) (2, 4) (C) (4, -2) (D) (-4, -2)

143. The vertices of a triangle are (0, 0), (6, 0), and (3, 4). What is the perimeter?

(A) 13 units (B) 14 units (C) 16 units (D) 10 units

144. A right triangle has legs of 6 and 8. What is the hypotenuse?

(A) 14 (B) $\sqrt{48}$ (C) 48 (D) 10

145. Two angles are complementary. One is $3x$ and the other is $2x + 10$. Find x and both angles.

(A) $x = 10$; angles are 30° and 30° (B) $x = 20$; angles are 60° and 50° (C) $x = 34$; angles are 102° and 78° (D) $x = 16$; angles are 48° and 42°

146. What is the relationship between complementary angles?

(A) They share a common side (B) They are equal in measure (C) They add up to 90 degrees (D) They add up to 180 degrees

Write the answer

147. A composite shape is made of a 6×4 rectangle with a 3×2 rectangle cut from one corner. What is the remaining area?

Answer: _____

148. A cube has a side length of 3 cm. What is its volume?

Answer: _____

149. What is the order of rotational symmetry for an equilateral triangle?

Answer: _____

150. Is the point (0, 5) in a specific quadrant?

Answer: _____

Match each question to its answer

1. A ship sails 9 km east and then 12 km north. How far is it from its starting point? →

2. A textbook states 'A square is a special type of rectangle.' Another says 'A rectangle is a special type of square.' Which textbook is correct? →

3. What is the formula for the perimeter of a rectangle? →

4. Which holds more: a $20 \times 15 \times 10$ cm box or two $10 \times 15 \times 10$ cm boxes combined? →

5. A shape is rotated 90° clockwise about the origin. The point (3, 5) moves to which location? →

(A) 15 km

(B) $2 \times (\text{length} + \text{width})$

(C) They hold the same amount

(D) (5, -3)

(E) The first — a square is a special rectangle, not the other way around

16. Points, Lines, and Angles

Circle the correct answer

151. A student says a shape with four equal sides must be a square. What example disproves this?

(A) No example exists — the student is correct (B) A rectangle disproves this (C) A trapezoid disproves this (D) A rhombus has four equal sides but may not have right

angles

152. Which has a greater area: a 3×7 rectangle or a 4×5 rectangle?

(A) They have equal area (B) The 4×5 rectangle (C) The 3×7 rectangle (D) Cannot be determined

153. If you double all three dimensions of a rectangular prism, how does the volume change?

(A) The volume doubles (B) The volume triples (C) The volume becomes 6 times larger (D) The volume becomes 8 times larger

154. How many lines of symmetry does a regular hexagon have?

(A) 3 (B) 6 (C) 12 (D) 4

155. A classmate claims that the midpoint of any two points in Quadrant I must also be in Quadrant I. Evaluate this claim.

(A) This is correct — averaging two positive x-values gives a positive x, and same for y (B) This is only true if the points are close together (C) This is false — the midpoint could be on an axis (D) This is false — the midpoint could be in Quadrant II

156. The sides 6, 8, 10 and 5, 12, 13 are both Pythagorean triples. What do you notice about them?

(A) They are both multiples of smaller triples ($3-4-5 \times 2$) and (5-12-13 is primitive) (B) They both have the same area, which is why this approach is recommended by experts (C) They both have the same perimeter, and this has been consistently demonstrated in practice (D) They are both obtuse triangles, making this the most widely accepted explanation

Write the answer

157. If two angles of one triangle are equal to two angles of another triangle, what can you conclude about the third angles?

Answer: _____

158. What is a point in geometry?

Answer: _____

159. Why must the interior angles of any triangle always add up to exactly 180° ?

Answer: _____

160. A room is 5 m by 4 m. Carpet tiles are 1 square meter each. How many tiles are needed to cover the floor?

Answer: _____

Match each question to its answer

1. A rectangular prism has a volume of 48 cubic cm. If the length is 6 cm and the width is 4 cm, what is the height? →
 2. How does the number of lines of symmetry in a regular polygon relate to its number of sides? →
 3. Create three points on the coordinate plane that form a right triangle with legs of length 5 and 12. →
 4. Generate a new Pythagorean triple by multiplying (3, 4, 5) by 7. Verify your answer.
→
 5. What is the difference between a theorem and a postulate? →
 - (A) (21, 28, 35) because $21^2 + 28^2 = 441 + 784 = 1225 = 35^2$
 - (B) A regular polygon with n sides has exactly n lines of symmetry
 - (C) A theorem is proven using logic; a postulate is accepted without proof
 - (D) 2 cm
 - (E) (0, 0), (5, 0), (0, 12)
-

Answer Key

1. D — An exact location in space with no size
2. A — One
3. A — 90 degrees
4. D — Acute angle
5. A — Parallel lines
6. D — Because a straight line is determined by any two points on it
7. They add up to 90 degrees
8. Because each pair shares supplementary relationships with the same angle
9. An obtuse angle is greater than 90° while an acute angle is less than 90°
10. They intersect at a 90-degree angle
Matching (Points, Lines, and Angles): $1 \rightarrow C$, $2 \rightarrow B$, $3 \rightarrow E$, $4 \rightarrow D$, $5 \rightarrow A$
11. A — 5
12. A — Regular polygon
13. D — Scalene triangle
14. A — Quadrilateral

- 15. C — All four angles are right angles (90°)
- 16. B — A square meets all rectangle requirements (4 right angles) plus has equal sides
- 17. Drawing a line through one vertex parallel to the opposite side shows the three angles form a straight line
- 18. A rhombus is a special parallelogram where all four sides are equal length
- 19. A trapezoid has exactly one pair of parallel sides; a parallelogram has two pairs
- 20. When all sides are equal, all angles must also be equal (each 60°)
Matching (Classifying 2D Shapes): $1 \rightarrow C$, $2 \rightarrow A$, $3 \rightarrow D$, $4 \rightarrow E$, $5 \rightarrow B$

- 21. A — length $\times$ width
- 22. A — $2 \times (\text{length} + \text{width})$
- 23. C — Square units
- 24. B — $\frac{1}{2} \times \text{base} \times \text{height}$
- 25. C — The total distance around a shape
- 26. D — 40 square cm
- 27. Because area depends on side length squared
- 28. 30 square m
- 29. 4 cm

- 30. The 3×7 rectangle
Matching (Area and Perimeter): $1 \rightarrow C$, $2 \rightarrow E$, $3 \rightarrow B$, $4 \rightarrow A$, $5 \rightarrow D$

- 31. C — Cube
- 32. B — length $\times$ width $\times$ height
- 33. C — 5
- 34. D — Cubic units
- 35. D — A prism has two identical parallel bases; a pyramid has one base and triangular faces meeting at a point
- 36. A — 60 cubic cm
- 37. 27 cubic cm
- 38. Because its two bases are congruent circles connected by a curved surface at

constant radius

39. 30 unit cubes

40. 2 cm

Matching (3D Shapes and Volume): 1→E, 2→C, 3→D, 4→B, 5→A

41. D — A line that divides a shape into two mirror-image halves

42. C — Translation, reflection, and rotation

43. A — 6

44. A — Sliding a shape in a straight line without rotating or flipping it

45. A — When a shape looks the same after being rotated less than 360°

46. A — 4

47. They become their opposites (positive becomes negative and vice versa)

48. 3

49. (7, 4)

50. A, B, C, D, E (vertical or horizontal)

Matching (Symmetry and Transformations): 1→D, 2→E, 3→C, 4→B, 5→A

51. D — Quadrant I (+,+), Quadrant II (-,+), Quadrant III (-,-), Quadrant IV (+,-)

52. C — The point (0, 0) where the x-axis and y-axis intersect

53. C — The x-value (first number)

54. A — $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

55. A — The point exactly halfway between two given points

56. D — Quadrant II

57. 5 units

58. (4, 6)

59. Straight up (vertically)

60. It is horizontal

Matching (Coordinate Geometry): 1→A, 2→D, 3→B, 4→C, 5→E

61. C — In a right triangle, $a^2 + b^2 = c^2$, where c is the hypotenuse

62. A — The side opposite the right angle (the longest side)

63. D — Three whole numbers that satisfy $a^2 + b^2 = c^2$
64. A — Legs
65. A — Yes, because $3^2 + 4^2 = 9 + 16 = 25 = 5^2$
66. C — 10
67. 12
68. Because the relationship $a^2 + b^2 = c^2$ only holds when the angle between sides a and b is exactly 90°
69. 13
70. $\sqrt{2}$
Matching (Pythagorean Theorem): $1 \rightarrow A, 2 \rightarrow E, 3 \rightarrow C, 4 \rightarrow D, 5 \rightarrow B$
71. C — A statement accepted as true without proof
72. D — A theorem is proven using logic; a postulate is accepted without proof
73. D — Having the same size and shape
74. D — Two angles whose measures add up to 180°
75. C — The opposite angles formed when two lines intersect
76. A — 115°
77. Because each pair of vertical angles shares two supplementary relationships that force them to be equal
78. They are equal (congruent)
79. 180°
80. 60°
Matching (Geometric Proofs and Reasoning): $1 \rightarrow E, 2 \rightarrow D, 3 \rightarrow B, 4 \rightarrow C, 5 \rightarrow A$
81. A — The distance from the center to any point on the circle
82. C — A line segment that passes through the center and connects two points on the circle
83. B — Circumference
84. A — A line segment with both endpoints on the circle
85. B — A portion of the circumference between two points
86. B — A pie-shaped region bounded by two radii and an arc

87. The diameter is always twice the radius ($d = 2r$)
 88. The circumference equals pi times the diameter
 89. It is the constant ratio of every circle's circumference to its diameter
 90. A minor arc is less than half the circle; a major arc is more than half
- Matching (Geometry): $1 \rightarrow E$, $2 \rightarrow D$, $3 \rightarrow A$, $4 \rightarrow B$, $5 \rightarrow C$
91. B — They have the same shape but not necessarily the same size
 92. A — The ratio of corresponding lengths in two similar figures
 93. A — $\sim$ (tilde)
 94. A — A transformation that enlarges or shrinks a figure by a scale factor from a center point
 95. C — Every 1 cm on the map represents 5 km in real life
 96. B — Sides that are in the same relative position in each figure
 97. Each side of triangle DEF is 3 times the corresponding side of triangle ABC
 98. The larger figure's area is 4 times the smaller figure's area
 99. Every circle has the same shape — they differ only in size (radius)
100. 80 cm
- Matching (Geometry): $1 \rightarrow A$, $2 \rightarrow B$, $3 \rightarrow E$, $4 \rightarrow C$, $5 \rightarrow D$
101. C — Sine = Opposite/Hypotenuse, Cosine = Adjacent/Hypotenuse, Tangent = Opposite/Adjacent
 102. B — The side opposite the 90° angle, which is always the longest side
 103. D — The ratio of the length of the side opposite the angle to the hypotenuse
 104. B — The ratio of the length of the opposite side to the adjacent side
 105. A — The angle formed between a horizontal line and the line of sight looking upward to an object
 106. B — The angle formed between a horizontal line and the line of sight looking downward to an object
 107. Because the opposite and adjacent sides are always shorter than the hypotenuse
 108. 55°
 109. They are equal — $\sin(30^\circ) = \cos(60^\circ) = 0.5$

110. Because the opposite side can be longer than the adjacent side
Matching (Geometry): 1→E, 2→C, 3→B, 4→D, 5→A
111. A — A compass and a straightedge
112. A — To divide the angle into two equal parts
113. C — A line that crosses a segment at its midpoint at a 90° angle
114. D — To draw the polygon so that all its vertices touch the circle
115. D — A circle that passes through all the vertices of a polygon
116. B — The largest circle that fits inside the triangle, touching all three sides
117. Constructions rely on geometric relationships, not measurements — a straightedge ensures only lines are drawn
118. Because any point on the perpendicular bisector is the same distance from both endpoints of the segment
119. By keeping the same radius setting, the compass transfers an exact distance from one location to another
120. The circumcenter is equidistant from all three vertices, and perpendicular bisectors contain all points equidistant from a segment's endpoints
Matching (Geometry): 1→B, 2→C, 3→D, 4→E, 5→A
121. B — Parallel lines
122. B — 5
123. A — This is false; a very elongated rectangle can have a larger perimeter than a triangle with the same area
124. B — 60 cubic cm
125. C — Translate 5 units right, rotate 180° about the new center, then translate 5 units right and rotate 180° again
126. B — y must not equal 2 (any other value works since (4, y) is equidistant from both endpoints)
127. Three whole numbers that satisfy $a^2 + b^2 = c^2$
128. This is incorrect — vertical angles are congruent (equal), not supplementary
129. 18
130. A 'right trapezoid' with exactly one pair of parallel sides and two right angles

Matching (Points, Lines, and Angles): 1→C, 2→D, 3→B, 4→A, 5→E

131. D — 133°

132. A — When all sides are equal, all angles must also be equal (each 60°)

133. A — Square units

134. B — A rectangle (that is not a square)

135. C — (4, 6)

136. A — No, because $7^2 + 10^2 = 149 \neq 144 = 12^2$

137. 180°

138. Incorrect — a 180° angle is a straight angle, which is its own category

139. Regular hexagons

140. The 6×4 rectangle

Matching (Points, Lines, and Angles): 1→C, 2→B, 3→D, 4→E, 5→A

141. B — Cubic units

142. A — (-4, 2)

143. C — 16 units

144. D — 10

145. D — $x = 16$; angles are 48° and 42°

146. C — They add up to 90 degrees

147. 18 square units

148. 27 cubic cm

149. 3

150. No, it is on the y-axis, not in any quadrant

Matching (Points, Lines, and Angles): 1→A, 2→E, 3→B, 4→C, 5→D

151. D — A rhombus has four equal sides but may not have right angles

152. C — The 3×7 rectangle

153. D — The volume becomes 8 times larger

154. B — 6

155. A — This is correct — averaging two positive x-values gives a positive x, and same

for y

- 156. A — They are both multiples of smaller triples ($3-4-5 \times 2$) and (5-12-13 is primitive)
 - 157. The third angles must also be equal
 - 158. An exact location in space with no size
 - 159. Drawing a line through one vertex parallel to the opposite side shows the three angles form a straight line
 - 160. 20 tiles
Matching (Points, Lines, and Angles): $1 \rightarrow D$, $2 \rightarrow B$, $3 \rightarrow E$, $4 \rightarrow A$, $5 \rightarrow C$
-

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