Solutions for Rumack's Preparation Workbook: 2.3

1. To find the characteristics of two circles with equal area, use the formulas for area and circumference or draw a picture. The area of Circle 1 is $Area_1 = \pi r_1^2$, and the area of Circle 2 is $Area_2 = \pi r_2^2$. Since the two circles have the same area, $\pi r_1^2 = \pi r_2^2$, $r_1 = r_2$. Both circles have the same radius, and since diameter is double the radius, both circles also have the same diameter. If the circumference of Circle 1 is πd_1 and the circumference of Circle 1 is πd_2, then the circles have the same circumference, since $d_1 = d_2$. The answer is (E).

2. To calculate the volume of the rectangular prism, multiply the length, width, and height. $Volume = length \times width \times height = 4\ units \times 3\ units \times 5\ units = 60\ units^3$. The answer is (E).

3. To find closest expression for the area of the circle, use the formula and rearrange it to look similar to the answer choices. $Area = \pi r^2 = 3.14 \times s \times s$. This looks similar to the answer choices, and 3.14 is closest to 3.

4. To discover which letter does not have a line of symmetry, draw each one and add lines of symmetry. You can confirm these lines of symmetry by folding the paper along the lines and holding it up to the light. The answer is (D), since it has 0 lines of symmetry.

5. To find the closest volume, calculate the volume by multiplying the length, width, and height, with numbers rounded to the nearest whole or half number. $Volume = length \times width \times height = 8.1\ units \times 4.9\ units \times 2.5\ units \cong 8\ units \ \times 5\ units \ \times 2.5\ units = 40\ units^2 \times 2.5\ units = 100\ units^3$. The answer is (B).

6. To find the closest area, determine the radius and use the formula for area of a circle. Estimating and rounding are okay because the question asks for the "closest" answer. The radius is approximately 6 units, (3 squares with 2 units each square). $Area = \pi r^2 = 3.14 \times 6^2 = 3.14 \times 36 = 113.04$. This is closest to 115, answer (E).

7. To find the volume of the 3D shape, multiply the area of the end (the base area) by the length of the rectangles (the height). Use cm for all calculations because all answer choices are in cm. $Volume = Area\ of\ one\ end \times distance\ between\ ends = 18\ cm^2 \times 50\ mm = 18\ cm^2 \times 5\ cm = 90\ cm^3$. The answer is (C).

8. To find out which pair of points has the dotted line as a line of symmetry, compare the distance from each point to the line. Two points with the same distance and same horizontal orientation (not to the right or left) will be symmetrical. The answer is (A), since both points A and a are at an equal distance from the dotted line, and they both have the same horizontal orientation.

9. To find the volume of the rectangular prism, multiply the volume of the cube by 3. $Volume = Volume\ of\ cube \times 3 = 8\ mm^3 \times 3 = 24\ mm^3$. The answer is (C).

10. To find the diagram with fewer than two lines of symmetry, draw as many lines of symmetry as possible in each one. The answer is (D), since it has 1 line of symmetry.

11. To find out which two triangles will have the same slope, draw the described shift. The triangles AEC and BDC will have the same shape after the shift. The answer is (D).

12. To find the perimeter of the large white square, first find the length of one side by adding up the side lengths of the shaded squares. Then, multiply this sum by 4 because the square has 4 sides.
$White\ square\ side\ length = sum\ of\ shaded\ square\ side\ lengths = 1\ cm + 2\ cm + 3\ cm = 6\ cm.$
$Perimeter = 4 \times white\ square\ side\ length = 4 \times 6\ cm = 24\ cm.$ The answer is (D).

13. To find the distance from A to B, add up the side lengths of the squares within this vertical range.
$AB\ Distance = Sum\ of\ side\ lengths\ of\ squares\ between\ A\ and\ B = 1.5 + 3 + 4.5 + 3 = 12.$ The answer is 12.0 units.

14. To find out which two triangles will no longer have the same shape, draw the described shift. After the shift, BDC and AEC no longer have the same shape. The answer is (D).

15. To find the area of the centre square, find the side length by subtracting the side length of the small squares twice from the side length of the outer square. Then, multiply this centre square side length by itself. $Centre\ square\ side\ length = Outer\ square\ side\ length - small\ square\ side\ length - small\ square\ side\ length = 8\ units - 2\ units - 2\ units = 4\ units.\ Area\ of\ centre\ square = side\ length \times side\ length = 4\ units \times 4\ units = 16\ units^2.$ The answer is (A).

16. To find out which shapes can be used to create a rectangular prism, try each answer choice by listing the shapes and finding common edges that could connect in a prism. Three connections using all different sides are required. The answer is (E) None of the above.

17. To find the pair of shapes with the smallest perimeter, consider each possibility. Since the question and answer choices do not give specific measurements, we can assign measurements to the triangle, for example, with side lengths of $4, 5$ and 6 units. This is a scalene triangle because all angle measurements are different. The side opposite the largest angle has the longest length, and the side opposite the smallest angle has the shortest length. The measurements are not necessarily true, but they follow the rules for shortest and longest sides. The answer is (A), since the perimeter of the pair reflected in GH has the smallest perimeter.

18. To find the true statement, consider each fact separately. The answer is (D), since both statements are true.

19. To find the distance from A to B, add up the side lengths of the squares within this vertical range.
$AB\ distance = sum\ of\ side\ lengths\ of\ squares\ between\ A\ and\ B = 3 + 6 + 9 + 6 + 3 = 27.$ The answer is (C).

20. To find the shortest distance, figure out the length of each hypotenuse, and add them together. $Shortest\ distance\ from\ A\ to\ G = \overline{AC} + \overline{CE} + \overline{EG}. \overline{AC} = 5\ cm. \overline{CE} = twice\ the\ length\ of\ \overline{AC} = 2 \times 5\ cm = 10\ cm. \overline{EG} = three\ times\ the\ length\ of\ \overline{AC} = 3 \times 5\ cm = 15\ cm. \overline{AG} = \overline{AC} + \overline{CE} + \overline{EG} = 5\ cm + 10\ cm + 15\ cm = 30\ cm.$ This is not an answer choice, so convert to another unit that appears in the answer choices. $30\ cm = (30 \times 10)mm = 300\ mm.$ The answer is (D).

21. To find the diagram after the described reflections, do the reflections one at a time. After reflecting in the vertical line, the object is in the upper right quadrant. After reflecting in the horizontal line, the object in in the lower right quadrant. The answer is (C).

22. To find the longest possible pathway, write given measurements into the diagram, and draw out some possible pathways. Then, add up the lengths of the line segments within each possible pathway. The answer is (D), since $153.2\ units$ is the longest distance.

23. To find the true statement, consider each fact separately. The answer is (E), since both statements are true.

24. To find the diagram with the rotated image, draw the original diagram and then draw the new diagram. The answer is (D).

25. To find the volume of the box, calculate all required measurements step-by-step. Given that the side length of the small squares is 5 units and the outer perimeter is 4 times the length of the perimeter of each small shaded square, $Outer\ perimeter = 4 \times Perimeter\ of\ small\ shaded\ square = 4 \times (5 + 5 + 5 + 5) = 4 \times 20 = 80. Side\ length\ of\ outer\ square = Perimeter \div 4 = 80 \div 4 = 20. Length\ of\ white\ rectangle = side\ length\ of\ outer\ square - side\ length\ of\ small\ shaded\ square - side\ length\ of\ small\ shaded\ square = 20 - 5 - 5 = 10.$ Given that the shaded corners are cut out and a box is formed, $Volume = length \times width \times height = 10\ units \times 10\ units \times 5\ units = 500\ units\ cubed.$ The answer is (C).