Ratios, Rate, and Proportions Answer Key

1. **B**. The $30.00 spent included a $5.00 room charge, so Tony spent $25.00 on songs. The following equation can be used to find n, the number of songs Tony sang: $5n=250$. Note that 250 minutes is equivalent to 4 hours and 10 minutes. From the above equation, $n=50,$ so Tony spent $\$25.00$ on 50 songs. Let x be the cost per song. Solve the following equation to answer the question:

$$50x=25.00$$
$$x=0.50$$

Tony paid $0.50 per song to sing. Choices A, C, and D are incorrect and may result from algebra errors, or an incorrect equation set up.

2. **C**. First, find how many words Jamie can type in 1 minute (words per minute) by reducing the fraction: $\frac{1386 words}{21 minutes}=\frac{66 words}{1 minute}$. Jamie's typing rate is 66 words per minute. Next, find how many words Jamie can type in 1.5 hours. There are 90 minutes in 1.5 hours, so multiply the rate by the time (in minutes) to find the answer. Note that the units cancel. $\frac{66 words}{1 \cancel{minute}} \times 90 \cancel{minutes} = 5940 words$. Assuming a constant rate, Jamie can type 5940 words in an hour and a half. Choice A is incorrect because it is Jamie's typing rate. Choice B is incorrect and comes from multiplication 60*66. Choice D is incorrect and is much larger than the actual value.

3. **A**. The ratio of square diagonal A to square diagonal B should be equal to $\sqrt{3} \approx 1.73$, and we know that $A=9 inches$.

$$\frac{A}{B}=\frac{9}{B}=\sqrt{3} \approx 1.73$$
$$B=\frac{9}{\sqrt{3}} \approx 5.19$$

The ratio of square diagonal B to square diagonal C should also equal $\sqrt{3} \approx 1.73$.

$$\frac{B}{C}=\frac{\frac{9}{\sqrt{3}}}{\sqrt{3}}=\frac{9}{3}=3$$

The designer should make the square diagonal C 3 inches tall. Choices B, C, and D are incorrect because they do not give the correct value of C.

4. **C**. The number of orange trees with more than 10 oranges is 285. Then the number of orange trees with less than 10 oranges must be $375-285=90$. So, the ratio of orange trees with more than 10 oranges to orange trees with less than 10 oranges must be $285:90=19:6$,after dividing both sides by 15. Choices A, B, and D are all incorrect because none of them give the correct ratio of orange trees with more than 10 oranges to orange trees with less than 10 oranges. Choice A is the ratio of total orange trees with full grown oranges to orange trees with more than 10 oranges. Choice B is the same ratio as choice A, just not fully simplified. Choice D is the ratio of orange trees with full grown oranges to orange tree with less than 10 oranges.

5. **B**. Let x be the number of grams in 100 grams of turkey breast. To solve the problem, solve the ratio:

$$\frac{3}{2}=\frac{grams\ of\ protein\ in\ chicken\ breast}{grams\ of\ protein\ in\ turkey\ breast}=\frac{31}{x}$$
$$x=\frac{31}{1.5}=20.67$$

Note that $1.5=\frac{3}{2}$. There are 20.67 grams of protein in 100 grams of turkey breast.

Choices A, C, and D are incorrect and do not give the correct number of grams of protein in 100 grams of turkey breast.

6. **C**. Multiply the rate of water flow by the time (in minutes) to find the answer. $\frac{5\,liters}{\cancel{minute}}\times\frac{60\,\cancel{minutes}}{1\,\cancel{hour}}\times 0.583\,\cancel{hours}=174.9\approx 175\,liters$. Choices A, B, and D are incorrect and do not give the correct liters of water in the tank after 0.583 hours.

7. **C**. It is given that $density=\frac{mass}{volume}$. Plugging in the given numbers, we get the equation $\frac{3\,grams}{1\,milliliter}=\frac{21\,grams}{v}$, v being the volume of the object. Solving the equation, we get $v=\frac{21}{3}=7\,milliliters$. To convert to liters, we know that there are 1000 milliliters in 1 liter, so : $\frac{1\,liter}{1000\,milliliters}=\frac{x\,liters}{7\,milliliters}$. Solving the equation, we get $x=0.007\,liters$. Choice A is incorrect because it is the number of milliliters, not liters. Choices B and D are incorrect and may result from algebra errors.

8. **B**. Since we know that $\angle BAC$ and $\angle CED$ have the same measure, and $\angle BCA$ and $\angle ECD$ have the same measure by vertical angles, we can conclude that triangle ABC is similar to triangle EDC because the triangles have two pairs of congruent corresponding angles by the angle-angle criteria for the similarity of triangles. Since the triangles are similar, then the corresponding sides are in the same proportion, thus we can solve the problem by solving the equation: $\frac{AB}{x}=\frac{BC}{CD}$. Substituting the values given, we get: $\frac{600}{x}=\frac{800}{1200}$. Solving for x we get $x=\frac{(600)(1200)}{800}=900$. Choices A, C, and D are incorrect because none of them give the correct value for x and may result from improper equation set ups.

9. **C**. The distance the truck traveled over the 2.5 hours is $\frac{(50\,miles)}{1\,\cancel{hour}}\times(2.5\,\cancel{hours})=125\,miles$. The truck consumes diesel at a rate of 19 miles per gallon, so the truck uses $\frac{125\,\cancel{miles}}{24\,\cancel{miles}\,/\,gallon}=5.21\,gallons\approx 5\,gallons$. Choices A, B, and D are incorrect because none of them give the correct approximation of gallons used during the 2.5-hour trip.

10. **B**. To solve this, solve the ratio $\frac{400}{500}=\frac{x}{600}$, x being the number of high school seniors who plan to attend university after high school. Solving for x : $x=\frac{(600)(400)}{500}=480\,students$. Choices B, C, and D are incorrect because none of them give the correct number of high school seniors who plan to attend university after high school. Choice A results from the setting up the incorrect ratio of $\frac{400}{500}=\frac{600}{x}$.