

Solutions to Newsletter 3 Ratio Rate Rhythm! Problems

1. In a math competition, Grace's team attempted 36 problems and correctly answered 28 of them. What is the ratio of the team's correct answers to incorrect answers, in simplest terms?

Solution: If Grace's team answered 28 correctly out of 36, that means it answered $36 - 28 = 8$ incorrectly. The ratio of correct to incorrect answers is 28:8, or 7:2. This can also be written $\frac{7}{2}$.

2. For every 3 math problems Alicia solves, she gets to stay up 7 minutes past her bedtime. If she solves 24 problems, how many minutes past her bedtime does she get to stay up?

Solution: Set up a proportion,

$$\frac{3 \text{ math problems}}{7 \text{ minutes}} = \frac{24}{?}$$

You see that you can multiply the numerator and denominator of the 1st fraction by 8 to get an equivalent 2nd fraction. So the answer is 56 minutes.

3. The 260 kids at the science fair each did a project in either ecology, robotics, or math. The ratio of projects in these areas was 6:2:5. How many students did a project in math?

Solution: One set of students in the 3 subjects would be $6 + 2 + 5 = 13$ students. So with 260 kids, there are 20 sets of 13. Within each set, 5 students did a math project. So with 20 sets, we have 100 kids who did a math project.

4. Chien-Shiung gets ice cream 4 out of every 9 times she goes to the grocery store. If she got ice cream 32 times this past year, how many times did she go to the grocery store and NOT buy any ice cream?

Solution: There are multiple ways to tackle this problem. Let's write a proportion with the numbers that we have, and then go back and answer the question.

$$\frac{\text{ice cream visits}}{\text{total visits}} = \frac{4}{9} = \frac{32}{?}$$

You can see that the missing value is 72 total visits, so if Chien-Shiung got ice cream 32 times out of those 72, she must not have gotten ice cream $72 - 32 = 40$ times.

5. Alicia can run 15 kilometers in 2 hours. At this rate, how many minutes does it take her to run 1 kilometer?

Solution: An hour is 60 minutes. So if she runs 15 kilometers in $2 \times 60 = 120$ minutes, then she must run 1 kilometer in $120 \div 15 = 8$ minutes.

6. If $2 : x^2 = 2x : 125$, then what is the value of x?

Solution: Write these ratios as fractions and cross-multiply.

$$\frac{2}{x^2} = \frac{2x}{125}$$

$$2 \times 125 = 2x \times x^2$$

$$250 = 2x^3$$

$$125 = x^3$$

$$5 = x$$

So 5 is the value of x.

7. **Ellen runs twice as fast as she walks. She left home and walked for 20 minutes on her way to Grace's house. Then she ran the rest of the way. If she started running at the halfway point, how long did it take her to get to Grace's house?**

Solution: Before doing any math, we have to do some logical reasoning. If it takes Ellen 20 minutes to walk a certain distance, then it's going to take her half as long to run the same distance since she runs twice as fast as she walks. So it will take her 10 minutes to run the other half of the way to Grace's house. Therefore, it took a total of $20 + 10 = 30$ minutes to get to Grace's house.

8. **After Chien-Shiung's plant started sprouting leaves, each leaf doubled its length and width every day for the next 3 days. If one leaf had an area of 2 square millimeters on Sunday, what was its area 3 days later?**

Solution: Area is proportional to the square of length (or width). So if a leaf doubles its length and width one day, it multiplies its area by 4. Over 3 days, we have to multiply by 4 three times.

$$2 \times 4 \times 4 \times 4 = 128 \text{ square millimeters.}$$