MATHCOUNTS® Problem of the Week Archive

Shaping Up – January 14, 2019

Problems & Solutions

Jayden started a new exercise program that includes running, cycling, yoga and aerobics. Jayden has a chart that shows how many calories he burns by doing these exercises. Using Jayden's chart, answer the questions that follow.

EXERCISE	DURATION	CALORIES BURNED
Aerobics	30 minutes	206
Cycling	1 hour	504
Running	15 minutes	120
Yoga	1 hour	236

The ratio of the number of calories Jayden burns per minute cycling to the number of calories he burns per minute running can be expressed as the common fraction a/b. That is the value of $a + b$?

*If Jayden can burn 504 calories in one hour of cycling, it follows that, in one minute, he can burn 504/60 = 8 ⅖ calories. If Jayden can burn 120 calories in 15 minutes of running, it follows that, in one minute, he can burn 120/15 = 8 calories. The ratio of calories burned per minute cycling to the calories burned per minute running is (8 ⅖)/8. Written as a common fraction, we have (42/5)/8 = 42/5 × 1/8 = 42/40 = 21/20. Therefore, a = 21, b = 20 and a + b = 21 + 20 = **41**.*

Every Monday, Wednesday and Friday, Jayden's workout routine consists of a 30-minute aerobics session, a 30-minute run and an hour of yoga. Based on the chart, what is the total number of calories Jayden burns each week by doing his Monday, Wednesday and Friday workout?

*We are told that Jayden burns 206 calories in 30 minutes of aerobics, 120 calories in 15 minutes of running and 236 calories in 1 hour of yoga. It follows then, that each Monday, Wednesday and Friday, Jayden burns a total of 206 + 120 × 2 + 236 = 206 + 240 + 236 = 682 calories. Therefore, on Monday, Wednesday and Friday, Jayden burns a total of 682 × 3 = **2046** calories.*

Every Tuesday, Thursday and Saturday, Jayden's workout routine lasts one hour, includes only running and cycling, and burns a total of 496 calories per day. If Jayden does not cycle on any other days except Tuesdays, Thursdays and Saturdays, how many minutes does he cycle each week?

*From the first problem, we know that Jayden burns 8 calories per minute running, and he burns 8 ⅖ = 42/5 calories per minute cycling. Let r and c represent the number of minutes Jayden spends running and cycling, respectively, each Tuesday, Thursday and Saturday. We are told that, on each of these three days, Jayden exercises for 1 hour = 60 minutes and burns, a combined, 496 calories running and cycling. That means the total minutes of exercise and total calories burned on Tuesday, Thursday and Saturday is 60 × 3 = 180 minutes and 496 × 3 = 1488 calories. Using this information, we can write the following equations: 8r + (42/5)c = 1488 and r + c = 180. Solving the second equation for r, we get r = 180 − c. Substituting for r in the first equation and solving, we get 8(180 − c) + (42/5)c = 1488 → 1440 − 8c + (42/5)c = 1488 → 1440 + (2/5)c = 1488 → (2/5)c = 48 → c = 48(5/2) → c = 120. So, each week, the total amount of time Jayden spends cycling is **120** minutes.*

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Every Monday, Wednesday and Friday, Jayden's workout routine consists of a 30-minute aerobics session, a 30-minute run and an hour of yoga. Based on this, what is the total number of calories Jayden burns each week by doing his Monday, Wednesday and Friday workouts?

Every Tuesday, Thursday and Saturday, Jayden's workout routine lasts one hour, includes only running and cycling, and burns a total of 496 calories per day. If Jayden does not cycle on any other days except Tuesdays, Thursdays and Saturdays, how many minutes does he cycle each week?