Digital SAT Math

Data Analysis — Practice Set III

Hard and Very Hard Module 2 Questions

6 Questions | Full Solutions | Mistake-Pattern Analysis

Question 1 [VERY HARD]

A price increases by 25% and then decreases by 20%. What is the net percent change from the original price?

(Student-produced response)

Shortcut: Successive Percent Change: multiply factors (1.25×0.80=1.00), never add

Solution: The combined factor is 1.25 × 0.80 = 1.00, which means there is no net change at all, 0%.

Mistake: Concept gap: student assumes the two percent changes must produce some nonzero net change, without multiplying the two factors to check.

Question 2 [VERY HARD]

Five machines can complete a job in 12 days. How many days would it take 3 machines to complete the same job, assuming a constant total work rate?

(Student-produced response)

Shortcut: Inverse Proportion: total work = machines × days; solve for unknown

Solution: Total work is 5 × 12 = 60 machine-days. With 3 machines, the time is 60/3 = 20 days.

Mistake: Overcomplication: student tries to find the work rate of a single machine first and then scale up, instead of working directly with the total machine-days, adding unnecessary steps.

Question 3 [VERY HARD]

If a:b = 2:3 and b:c = 4:5, and c = 45, what is the value of a?

(Student-produced response)

Shortcut: Ratio Chain: find common term b, scale both ratios, read off a:c

Solution: Scale b:c = 4:5 so that c = 45: multiply by 9 to get 36:45. Now b = 36. Scale a:b = 2:3 to match b = 36: multiply by 12 to get 24:36. So a = 24.

Mistake: Overcomplication: student tries to solve for all three variables using separate equations and substitution instead of chaining the two ratios through their shared term b.

Question 4 [VERY HARD]

Group A has 10 students with a mean score of 70. Group B has 15 students with a mean score of 80. What is the mean score of all 25 students combined?

(Student-produced response)

Shortcut: Weighted Mean: compute total points per group, then divide by total n

Solution: Total points = (10 × 70) + (15 × 80) = 700 + 1200 = 1900. Combined mean = 1900/25 = 76.

Mistake: Concept gap: student averages the two group means directly ((70+80)/2 = 75) without weighting by each group's size, which only works when the groups are equal in size.

Question 5 [VERY HARD]

A bag contains 4 red and 6 blue marbles. Two marbles are drawn without replacement. What is the probability that both are red?

(Student-produced response)

Shortcut: Without Replacement: second draw has 1 fewer marble, use conditional count

Solution: P(first red) = 4/10. After removing one red marble, P(second red) = 3/9. P(both red) = (4/10) × (3/9) = 12/90 = 2/15, approximately 13.3%.

Mistake: Concept gap: student uses 4/10 for both draws, treating the marbles as if they were replaced between draws instead of accounting for the reduced count on the second draw.

Question 6 [VERY HARD]

A survey of students is summarized by grade and whether they play a sport. Among all students who play a sport, 30 are ninth-graders and 80 are tenth-graders. Given that a student plays a sport, what is the probability that the student is a tenth-grader?

(Student-produced response)

Shortcut: Restricted Denominator: given condition changes which total to divide by

Solution: The total who play a sport is 30 + 80 = 110. Of these, 80 are tenth-graders: 80/110 ≈ 0.727, or about 72.7%.

Mistake: Concept gap: student uses the total number of tenth-graders overall as the denominator instead of restricting to only the students who play a sport, since the condition changes which group the probability is taken over.