1987 Q21

21. Suppose n* means $\frac{1}{n}$, the reciprocal of n. For example, $5^* = \frac{1}{5}$.

How many of the following statements are true?

i) $3^* + 6^* = 9^*$ iii) $2^* \cdot 6^* = 12^*$

ii) $6^* - 4^* = 2^*$ iv) $10^* \div 2^* = 5^*$

A) 0 B) 1 C) 2 D) 3 E) 4

21. C Statements i and ii are false; iii and iv are true.

i. $3^* + 6^* = \frac{1}{3} + \frac{1}{6} \neq \frac{1}{9}$ iii. $2^* \cdot 6^* = \frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12} = 12^*$

ii. $6^* - 4^* = \frac{1}{6} - \frac{1}{4} \neq \frac{1}{2}$ iv. $10^* \div 2^* = \frac{1}{10} \cdot \frac{2}{1} = \frac{1}{5} = 5^*$

1991 Q21

21. For every 3° rise in temperature, the volume of a certain gas expands by 4 cubic centimeters. If the volume of the gas is 24 cubic centimeters when the temperature is 32°, what was the volume of the gas in cubic centimeters when the temperature was 20°?

(A) 8 **(B)** 12 **(C)** 15 **(D)** 16 **(E)** 40

21. (A) The rate of change is 4 cubic centimeters per 3°. The temperature change is $32° - 20° = 12°$. The corresponding change in volume is $12 \times \frac{4}{3} = 16$ cubic centimeters. Thus the initial volume of the gas was $24 - 16 = 8$.

OR

Work backwards, changing the volume of the gas by 4 cubic cm each time the temperature changes by 3°:

Temperature	Volume
32°	24 cm^3
29°	20 cm^3
26°	16 cm^3
23°	12 cm^3
20°	8 cm^3

Thus the initial volume of the gas was 8 cubic centimeters.

1999 Q22

22. In a far-off land three fish can be traded for two loaves of bread and a loaf of bread can be traded for four bags of rice. How many bags of rice is one fish worth?

(A) $\frac{3}{8}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) $2\frac{2}{3}$ (E) $3\frac{1}{3}$

22. **Answer (D):** One fish is worth $\frac{2}{3}$ of a loaf of bread and $\frac{2}{3}$ of a loaf of bread is worth $\frac{2}{3} \cdot 4 = \frac{8}{3} = 2\frac{2}{3}$ bags of rice.

OR

$$3F = 2B$$
$$\tfrac{3}{2}F = B = 4R$$
$$(\tfrac{2}{3})(\tfrac{3}{2}) = \tfrac{2}{3}(4R)$$
$$F = \tfrac{8}{3}R = 2\tfrac{2}{3}R.$$

2009 Q23

23. On the last day of school, Mrs. Wonderful gave jelly beans to her class. She gave each boy as many jelly beans as there were boys in the class. She gave each girl as many jelly beans as there were girls in the class. She brought 400 jelly beans, and when she finished, she had six jelly beans left. There were two more boys than girls in her class. How many students were in her class?

(A) 26 **(B)** 28 **(C)** 30 **(D)** 32 **(E)** 34

23. **Answer (B):** Mrs. Wonderful gave $400 - 6 = 394$ jelly beans to the class. Make a table, starting with a small, reasonable number of girls and boys.

Girls	Boys	Number of jelly beans
9	11	$(9 \times 9) + (11 \times 11) = 202$
10	12	$(10 \times 10) + (12 \times 12) = 244$
11	13	$(11 \times 11) + (13 \times 13) = 290$
12	14	$(12 \times 12) + (14 \times 14) = 340$
13	15	$(13 \times 13) + (15 \times 15) = 394$

The number of students is $13 + 15 = 28$.

1990 Q24

24. Three Δ's and a ◊ will balance nine •'s . One Δ will balance a ◊ and a • .

How many •'s will balance the two ◊'s in this balance?

A) 1 B) 2 C) 3 D) 4 E) 5

24. C The second balance shows each Δ balances ◊ •. Replace each Δ on the first balance with ◊ •. Then after removing three •'s from each side, the balance has ◊◊◊ on the left and •••••• on the right. Thus ◊◊ will be balanced by •••.

2006 Q25

25. Barry wrote 6 different numbers, one on each side of 3 cards, and laid the cards on a table, as shown. The sums of the two numbers on each of the three cards are equal. The three numbers on the hidden sides are prime numbers. What is the average of the hidden prime numbers?

(A) 13 **(B)** 14 **(C)** 15 **(D)** 16 **(E)** 17

25. **(B)** There are one odd and two even numbers showing. Because all primes other than 2 are odd and the sum of an even number and an odd number is odd, the common sum must be odd. That means 2 must be opposite 59 and the common sum is $2 + 59 = 61$. The other two hidden numbers are $61 - 44 = 17$ and $61 - 38 = 23$. The average of 2, 17 and 23 is $\frac{2+17+23}{3} = \frac{42}{3} = 14$.