2005 Q16

16. A five-legged Martian has a drawer full of socks, each of which is red, white or blue, and there are at least five socks of each color. The Martian pulls out one sock at a time without looking. How many socks must the Martian remove from the drawer to be certain there will be 5 socks of the same color?

(A) 6 **(B)** 9 **(C)** 12 **(D)** 13 **(E)** 15

16. **(D)** It is possible for the Martian to pull out at most 4 red, 4 white and 4 blue socks without having a matched set. The next sock it pulls out must be red, white or blue, which gives a matched set. So the Martian must select $4 \times 3 + 1 = 13$ socks to be guaranteed a matched set of five socks.

2003 Q17

17. The six children listed below are from two families of three siblings each. Each child has blue or brown eyes and black or blond hair. Children from the same family have at least one of these characteristics in common. Which two children are Jim's siblings?

Child	Eye Color	Hair Color
Benjamin	Blue	Black
Jim	Brown	Blond
Nadeen	Brown	Black
Austin	Blue	Blond
Tevyn	Blue	Black
Sue	Blue	Blond

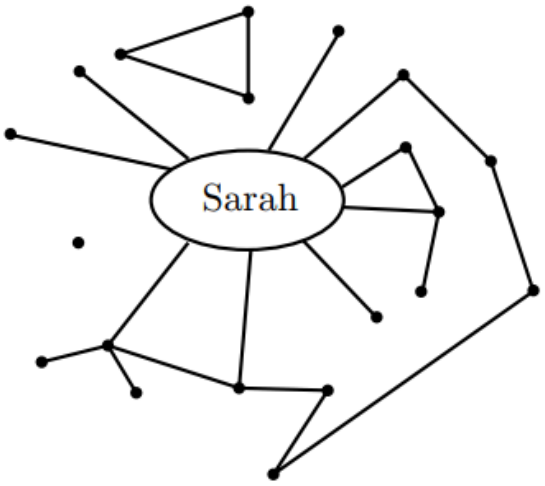
(A) Nadeen and Austin **(B)** Benjamin and Sue
(C) Benjamin and Austin **(D)** Nadeen and Tevyn
(E) Austin and Sue

17. **(E)** Because Jim has brown eyes and blond hair, none of his siblings can have both blue eyes and black hair. Therefore, neither Benjamin nor Tevyn can be Jim's sibling. Consequently, there are only three possible pairs for Jim's siblings – Nadeen and Austin, Nadeen and Sue, or Austin and Sue. Since Nadeen has different hair color and eye color from both Austin and Sue, neither can be Nadeen's sibling. So Austin and Sue are Jim's siblings. Benjamin, Nadeen and Tevyn are siblings in the other family.

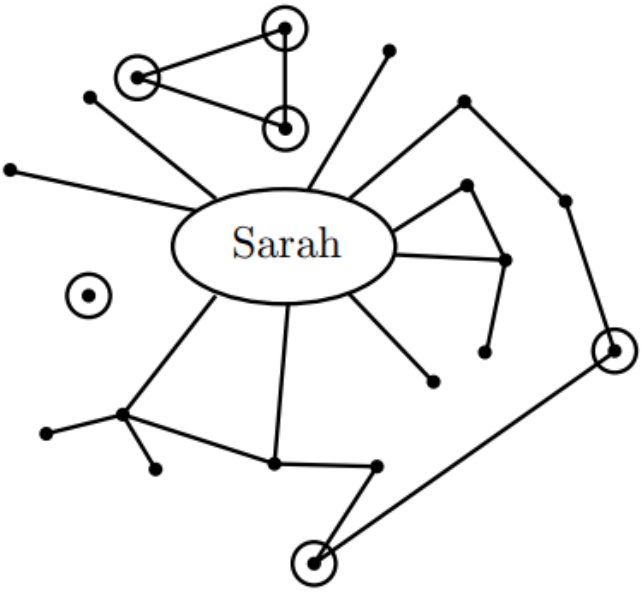
2003 Q18

18. Each of the twenty dots on the graph below represents one of Sarah's classmates. Classmates who are friends are connected with a line segment. For her birthday party, Sarah is inviting only the following: all of her friends and all of those classmates who are friends with at least one of her friends. How many classmates will not be invited to Sarah's party?

(A) 1 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** 7



18. **(D)** In the graph below, the six classmates who are not friends with Sarah or with one of Sarah's friends are circled. Consequently, six classmates will not be invited to the party.



2003 Q19

19. How many integers between 1000 and 2000 have all three of the numbers 15, 20 and 25 as factors?

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

19. **(C)** A number with 15, 20 and 25 as factors must be divisible by their least common multiple (LCM). Because $15 = 3 \times 5$, $20 = 2^2 \times 5$, and $25 = 5^2$, the LCM of 15, 20 and 25 is $2^2 \times 3 \times 5^2 = 300$. There are three multiples of 300 between 1000 and 2000: 1200, 1500 and 1800.

1987 Q19

19. A calculator has a squaring key $\boxed{x^2}$ which replaces the current number displayed with its square. For example, if the display is $\boxed{3}$ and the $\boxed{x^2}$ key is depressed, then the display becomes $\boxed{9}$. If the display reads $\boxed{2}$, how many times must you depress the $\boxed{x^2}$ key to produce a displayed number greater than 500?

A) 4 B) 5 C) 8 D) 9 E) 250

19. A The next four numbers displayed are 4, 16, 256, and $256^2 \approx 60{,}000$. Thus 500 is exceeded on the fourth depression of the $\boxed{x^2}$ key.

1996 Q20

20. Suppose there is a special key on a calculator that replaces the number x currently displayed with the number given by the formula $1/(1-x)$. For example, if the calculator is displaying 2 and the special key is pressed, then the calculator will display -1 since $1/(1-2) = -1$. Now suppose that the calculator is displaying 5. After the special key is pressed 100 times in a row, the calculator will display

(A) -0.25 **(B)** 0 **(C)** 0.8 **(D)** 1.25 **(E)** 5

20. **(A)** After the special key is pressed once, the calculator display reads -0.25 since $1/(1-5) = 1/(-4) = -0.25$. If the key is pressed again, the calculator display reads 0.8 since $1/(1-(-0.25)) = 1/(1.25) = 0.8$. If the key is pressed a third time, the calculator display reads 5, since $1/(1-0.8) = 1/(0.2) = 5$. Thus pressing the special key three times returns to the original calculator display. The calculator display will continue to cycle through the three answers -0.25, 0.8, and 5. Since 100 is 1 more than a multiple of 3, the calculator display will be -0.25.

2001 Q20

20. Kaleana shows her test score to Quay, Marty and Shana, but the others keep theirs hidden. Quay thinks, "At least two of us have the same score." Marty thinks, "I didn't get the lowest score." Shana thinks, "I didn't get the highest score." List the scores from lowest to highest for Marty (M), Quay (Q) and Shana (S).

(A) S,Q,M (B) Q,M,S (C) Q,S,M (D) M,S,Q (E) S,M,Q

20. (A) Quay indicates that she has the same score as Kaleana. Marty's statement indicates that her score is higher than Kaleana's, and Shana's statement indicates that her score is lower than Kaleana's. The sequence S,Q,M is the correct one.