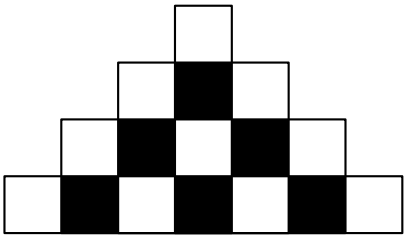
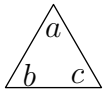
**Easy**

1. A "stair-step" figure is made of alternating black and white squares in each row. Rows 1 through 4 are shown. All rows begin and end with a white square. The number of black squares in the 37th row is

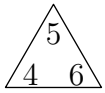


(A) 34 (B) 35 (C) 36 (D) 37 (E) 38

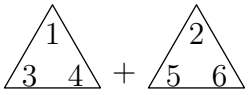
2. Suppose that




means $a + b - c$. For example,



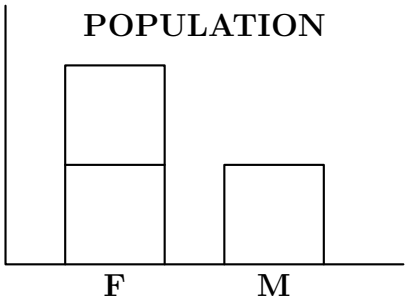

is $5 + 4 - 6 = 3$. Then the sum




is

(A) $-2$ (B) $-1$ (C) 0 (D) 1 (E) 2

3. The population of a small town is 480. The graph indicates the number of females and males in the town, but the vertical scale-values are omitted. How many males live in the town?




(A) 120 (B) 160 (C) 200 (D) 240 (E) 360

4. If A and B are nonzero digits, then the number of digits (not necessarily different) in the sum of the three whole numbers is

$$\begin{array}{cccc} 9 & 8 & 7 & 6 \\ & A & 3 & 2 \\ & & B & 1 \\ \hline \end{array}$$

(A) 4 (B) 5 (C) 6 (D) 9 (E) depends on the values of A and B

5. What is the smallest result that can be obtained from the following process?

Choose three different numbers from the set $\{3, 5, 7, 11, 13, 17\}$. Add two of these numbers. Multiply their sum by the third number. (A) 15 (B) 30 (C) 36 (D) 50 (E) 56

6. Brent has goldfish that quadruple (become four times as many) every month, and Gretel has goldfish that double every month. If Brent has 4 goldfish at the same time that Gretel has 128 goldfish, then in how many months from that time will they have the same number of goldfish?

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

7. Jose, Thuy, and Kareem each start with the number 10. Jose subtracts 1 from the number 10, doubles his answer, and then adds 2. Thuy doubles the number 10, subtracts 1 from her answer, and then adds 2. Kareem subtracts 1 from the number 10, adds 2 to his number, and then doubles the result. Who gets the largest final answer?

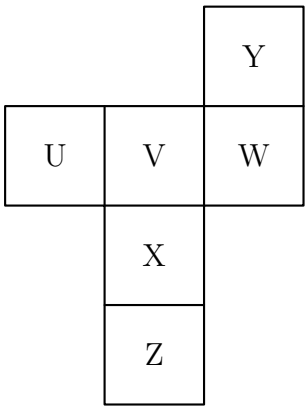
(A) Jose (B) Thuy (C) Kareem (D) Jose and Thuy (E) Thuy and Kareem

8. The 64 whole numbers from 1 through 64 are written, one per square, on a checkerboard (an 8 by 8 array of 64 squares). The first 8 numbers are written in order across the first row, the next 8 across the second row, and so on. After all 64 numbers are written, the sum of the numbers in the four corners will be

(A) 130 (B) 131 (C) 132 (D) 133 (E) 134

**Medium**

1. A piece of paper containing six joined squares labeled as shown in the diagram is folded along the edges of the squares to form a cube. The label of the face opposite the face labeled X is



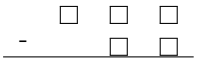

(A) Z (B) U (C) V (D) W (E) Y

2. In the fall of 1996, a total of 800 students participated in an annual school clean-up day. The organizers of the event expect that in each of the years 1997, 1998, and 1999, participation will increase by 50 percent over the previous year. The number of participants the organizers will expect in the fall of 1999 is

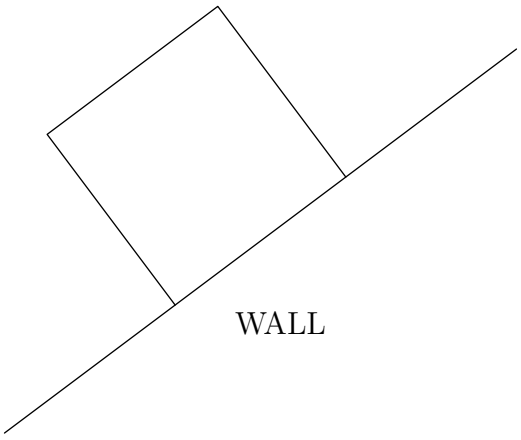
(A) 1200 (B) 1500 (C) 2000 (D) 2400 (E) 2700

3. When placing each of the digits $2, 4, 5, 6, 9$ in exactly one of the boxes of this subtraction problem, what is the smallest difference that is possible?

(A) 58 (B) 123 (C) 149 (D) 171 (E) 176




4. A rectangular grazing area is to be fenced off on three sides using part of a 100 meter rock wall as the fourth side. Fence posts are to be placed every 12 meters along the fence including the two posts where the fence meets the rock wall. What is the fewest number of posts required to fence an area 36 m by 60 m?




(A) 11 (B) 12 (C) 13 (D) 14 (E) 16

5. At the beginning of a trip, the mileage odometer read 56, 200 miles. The driver filled the gas tank with 6 gallons of gasoline. During the trip, the driver filled his tank again with 12 gallons of gasoline when the odometer read 56, 560. At the end of the trip, the driver filled his tank again with 20 gallons of gasoline. The odometer read 57, 060. To the nearest tenth, what was the car's average miles-per-gallon for the entire trip?

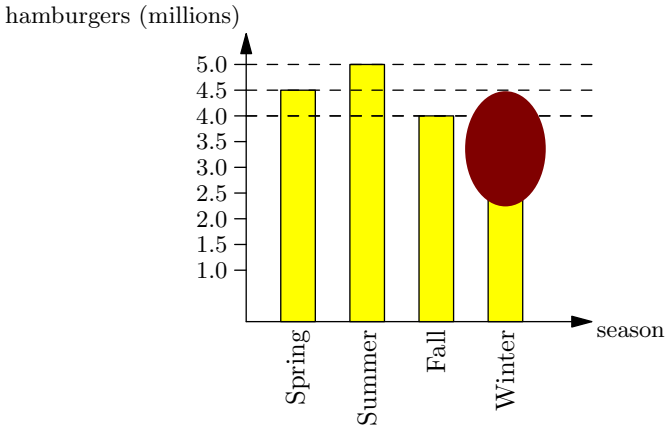
(A) 22.5 (B) 22.6 (C) 24.0 (D) 26.9 (E) 27.5

6. The table below displays the grade distribution of the 30 students in a mathematics class on the last two tests. For example, exactly one student received a 'D' on Test 1 and a 'C' on Test 2 (see circled entry). What percent of the students received the same grade on both tests?

| Test 1 \ Test 2 | A | B | C | D | F |
|---|---|---|---|---|---|
| A | 2 | 2 | 1 | 0 | 0 |
| B | 1 | 4 | 3 | 0 | 0 |
| C | 1 | 3 | 5 | 2 | 0 |
| D | 0 | 0 | (1) | 1 | 1 |
| F | 0 | 0 | 2 | 1 | 0 |

(A) 12% (B) 25% (C) $33\frac{1}{3}\%$ (D) 40% (E) 50%

7. A bar graph shows the number of hamburgers sold by a fast food chain each season. However, the bar indicating the number sold during the winter is covered by a smudge. If exactly 25% of the chain's hamburgers are sold in the fall, how many million hamburgers are sold in the winter?




(A) 2.5 (B) 3 (C) 3.5 (D) 4 (E) 4.5

**Hard**

1. Three members of the Euclid Middle School girls' softball team had the following conversation.

Ashley: I just realized that our uniform numbers are all 2-digit primes.

Bethany: And the sum of your two uniform numbers is the date of my birthday earlier this month.

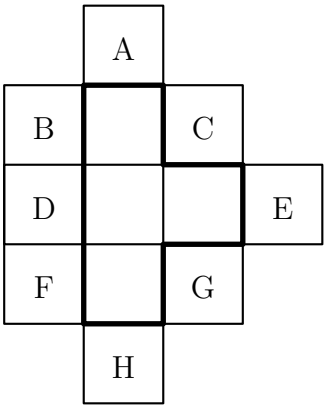
Caitlin: That's funny. The sum of your two uniform numbers is the date of my birthday later this month.

Ashley: And the sum of your two uniform numbers is today's date.

What number does Caitlin wear?

**(A)** 11 **(B)** 13 **(C)** 17 **(D)** 19 **(E)** 23

2. Suppose one of the eight lettered identical squares is included with the four squares in the T-shaped figure outlined. How many of the resulting figures can be folded into a topless cubical box?

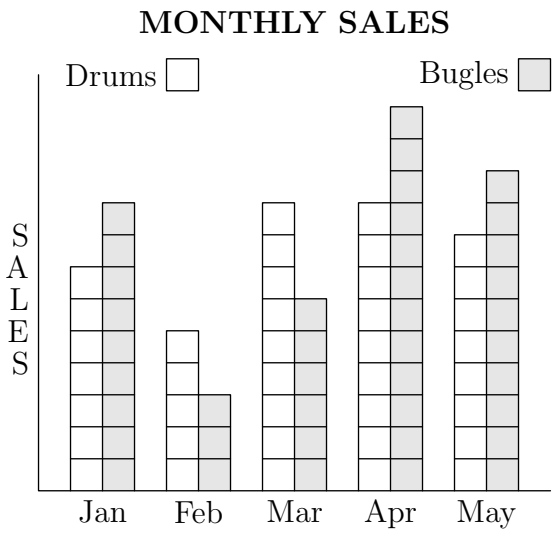



(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

3. King Middle School has 1200 students. Each student takes 5 classes a day. Each teacher teaches 4 classes. Each class has 30 students and 1 teacher. How many teachers are there at King Middle School?

(A) 30 (B) 32 (C) 40 (D) 45 (E) 50

4. Northside's Drum and Bugle Corps raised money for a trip. The drummers and bugle players kept separate sales records. According to the double bar graph, in what month did one group's sales exceed the other's by the greatest percent?

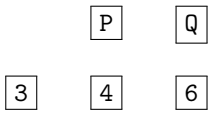



(A) Jan (B) Feb (C) Mar (D) Apr (E) May

5. 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

6. Five cards are lying on a table as shown.



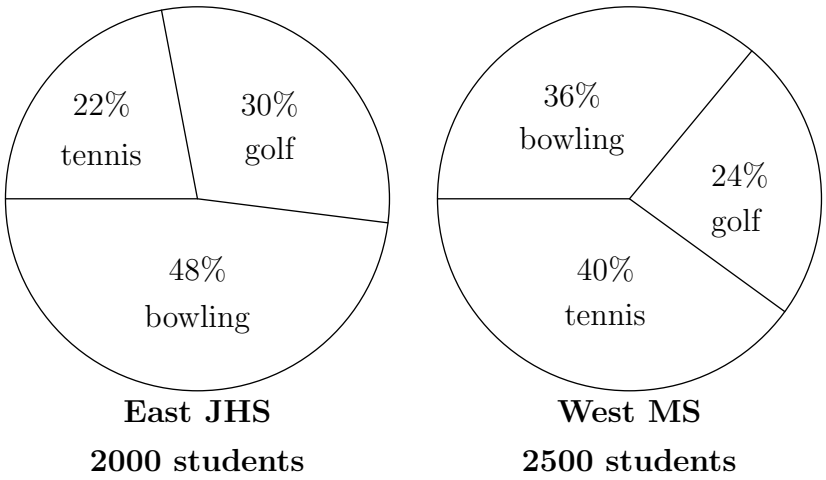

Each card has a letter on one side and a whole number on the other side. Jane said, "If a vowel is on one side of any card, then an even number is on the other side." Mary showed Jane was wrong by turning over one card. Which card did Mary turn over?

(A) 3 (B) 4 (C) 6 (D) P (E) Q

7. Pat Peano has plenty of 0's, 1's, 3's, 4's, 5's, 6's, 7's, 8's and 9's, but he has only twenty-two 2's. How far can he number the pages of his scrapbook with these digits?

(A) 22 (B) 99 (C) 112 (D) 119 (E) 199

8. The pie charts below indicate the percent of students who prefer golf, bowling, or tennis at East Junior High School and West Middle School. The total number of students at East is 2000 and at West, 2500. In the two schools combined, the percent of students who prefer tennis is




(A) 30% (B) 31% (C) 32% (D) 33% (E) 34%

9. Ana's monthly salary was 2000 dollars in May. In June she received a 20 percent raise. In July she received a 20 percent pay cut. After the two changes in June and July, Ana's monthly salary was

(A) 1920 dollars (B) 1980 dollars (C) 2000 dollars (D) 2020 dollars (E) 2040 dollars