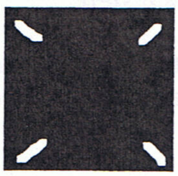
Commentary

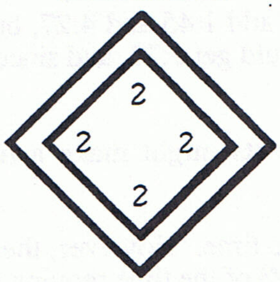
Jupiter, I

1. **(a.7; b. 8; c. 3; d. 24)** Students could practice making up their own Venn Diagrams about the class by picking characteristics such as eye color and hair color, or clothing combination. In this problem, the difficult part is (d) -- some students will try to use the numbers 7, 8, and 3 to get the total in the clubs.

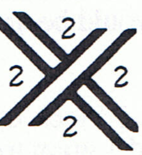
2. **(36)** Angles have been identified in the figures.



4 right angles in the big black square



8 right angles in each white squares (16 total)



8 right angles at the intersection of the white squares (16 total)

3. **(Monday)** Students might make a list --*S, M, T, W, T, F, S* -- and start counting with Friday, till they get to 24.

4. **(a. 149; b. 599; c. 30; d. 3x*n* - 1)** The first two parts ask the student to notice that each second number is obtained by multiplying the first number by 3, then subtracting 1. Part (c) asks them to reverse this thinking, and part (d) asks them to generalize the pattern to any number *n*. The answer for (d) might be written in a number of different, equivalent ways.

5. **(60 and 12)** Students may use "guess and check" by listing the pairs of addends whose sum is 72; their guessing should get more precise as they get closer to finding the correct pair. They might get a hint as to where to start by noticing that the difference being 48 means that one of the numbers is above 50.

6. **(d. $3.18)** The problem has students use their real-world number sense to get an answer.

7. **(75¢)** Three for 25¢ means that nine would cost 75¢; 10¢ each means that nine would cost 90¢.

Commentary

Jupiter, II

1. **(2 years)** One-half inch per month means 1 inch every 2 months. Students can therefore count month's "by twos" until they get to 12 inches. The count of 24 months is 2 years.

2. **($1.50)** Students at this grade level know intuitively that 50% is 1/2, and they can find 1/2 of dollar amounts, usually without any actual computation. 1/2 of $6 is $3, and 1/2 of $3 is $1.50.

3. **(104, 68, 50)** The unusual thing about this pattern is that it's much easier if you start at the right end, and work to the left. You can see that you are adding 9 each step.

4. **(45)** Students will likely use a calculator to solve this problem. A few might notice that the sum of the first n counting numbers is $n \times (n + 1) \div 2$. Therefore the problem becomes finding the first or smallest n such that $n \times (n + 1) \div 2 \geq 1000$.

5. **(6:12 pm)** This problem involves elapsed time. Students can add 1:45 and 4:27, but they must remember that they aren't in the decimal system. They should get 5:72, and since 72 minutes is 1 hour and 12 minutes, 5:72 can be rewritten as 6:12.

6. **(Maria: 10; Patsy: 8; Colleen; 9; Kenyada: 11)** Students might make a list, or they may make name cards and act the problem out.

7. **(20 spaces ahead)** Each color should come up about 1/3 of the time. However, the orange moves and the blue moves cancel each other out, leaving about 1/3 of the time moving ahead 2 spaces. 1/3 of 30 spins is 10 spins, and at 2 spaces each move, you would be ahead 20 spaces.

8. **(She was wrong. x = 33 grams)** Students can see intuitively that 1 block can be removed from both sides of the balance scale, leaving 3 sharpeners and 1 gram to balance 100 grams. Then the 3 sharpeners must weigh 99 grams, and then each would weigh 33 grams. x is used simply to introduce the idea of an unknown quantity as a variable.

Commentary

Jupiter, III

1. **(The diagonal from upper left to lower right should be ringed.)** Give students one star for having all the correct products in the chart, and another for the correctly-ringed diagonal.

2. **(12)** The ratio of 48 to 60 is the same as the ratio of 24 to 30, or 12 to 15, or 4 to 5. He would get the most bags possible by working with the 4 to 5 ratio, putting 9 items in each bag. This would give 12 bags, as 12 x 4 is 48 and 12 x 5 is 60.

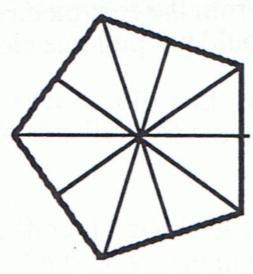
3. **(1:00)** The only difficult part of this problem comes if students try to compute 10:45 + 2:15, because they are not in the decimal system with time. The sum of 10:45 and 2:15 is 12:60, which is 1:00. Students with good number sense will likely "count on" from 10:45, using hours and then quarter hours.

4. **Green Black Yellow**
   Red Blue Orange
   Students can be encouraged to solve such logic problems by making a chart, and proceeding by process of elimination.

5. **($4)** Students should have an intuitive feel for this type of problem, rather than subtracting $11.15 from $15.00, and rounding the answer. They should know that $11.15 is close to $11, and $15 - $11 is $4.

6. **(a. 6; b. 63)** 64 play, then the 32 winners of those matches play, then the 16 winners of those matches play, then the 8 winners of those matches play, then the 4 winners of those matches play and finally the last two winners play. This is 6 rounds of golf, and the winner must play in all of those. Since there are 63 losers, and each had to play a match to lose, there are 63 matches altogether.

7. There are 5 such lines of symmetry, as shown below.



8. **(3,897)** There are several clues that make this *guess-check-revise* problem a little friendlier. Since the sum of the four digits is 27, the average size of the digits must be fairly large. However, the *thousands* digit has to be either a 1, 2, or 3, while the corresponding *tens* digit is a 3, 6, or 9. Pick the 3 to begin the search, using 9 for the *tens* digit, and make the last digit a 7 since that's the largest odd digit not already used. This gives a sum of 27, as required, if 8 is the *hundreds* digit.

Commentary

Jupiter, IV

1. **(a. 70; b. 2520)** The student can multiply 14 times 5 for (a), and 14 times 180 for (b).

2. **(65° F)** Students can add 15 to 72, then subtract 22.

3. **(24)** Students may want to make a list and establish a pattern in order to solve this problem. They might name the pots shown as A, B, C, and D, and then see how many lists they can make, such as ABCD, ABCD, ACBD, ACDB, ADBC, ADCB. Those six are all the orders possible if A is on the left. There would be 6 such with B starting on the left, and 6 with C and 6 with D also, for a total of 24.

4. **(423)** *Guess-check-revise* is one way to solve the problem. A starting hint is that since the sum of the digits is nine, their average value is 3 so they are all small numbers.

5. **(Saturday)** Students might use calendar, or list S, M, T, W, T, F, S, and start counting with 7 on Tuesday, and count to 25.

6. **(a. 3 million; b. 36 million; c. 2 1/2 billion)** The problem situation calls for estimated answers rather than exact numbers, which would be misleading in such a problem. Students should be allowed leeway in their estimates, as they can vary quite a bit. Hopefully students will use a calculator to find (a), and continue to use it in finding (b) and (c) by entering only the non-zero digits to fit into the 8-digit calculator.

7. **(a. 10; b. 9; c. 9)** Students may use cubes or blocks to construct models. Students with good spatial visualization can find the answers from the pictures.

8. **(car and donkeys)** Students can approach this in a number of ways. Since the car matches 3 elephants from the second picture, they can be "removed" from the last tug of war without affecting the situation. Thus we are left asking which would win, 1 elephant matched against 3 donkeys. From the first picture, we see that an elephant pulls as much as 2 1/2 donkeys, so 3 donkeys would put pull one elephant. Therefore a car and 3 donkeys would out pull 4 elephants.

Commentary

Jupiter, VI

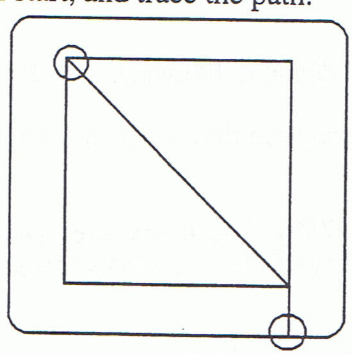
1. **(28 hours, 30 minutes)** Students will likely count from 7:15 one morning to 7:15 the next morning as 24 hours, and then count up by the hour to get to 11:15, finally counting a half hour to 11:45.

2. **(770 feet)** Students may draw the diagram and sub-divide it into two parts. Also, students can figure out the missing lengths. 150 ft.+ 200 ft. + 185 ft. + 25 ft. + 35 ft. + 175 ft. = 770 ft. It is interesting to note that the perimeter of this figure is the same as if the figure were a 185 by 200 foot rectangle.

3. **(a. $33.10; b. 45; c. 1/32)** The pattern for (a) is that each number increase by 20¢. For (b), each succeeding number decreases by half. Each next number in (c) is also half of the preceding number.

4. **(B)** Box A has a 3 out of 5 chance to win with red. Box B has a 2 out of 3 chance to win with red. If students change ratios so that they are based on the same second number, the result will be obvious. 3 out of 5 is the same as 6 out of 10 or 9 out of 15. 2 out of 3 is the same as 4 out of 6, 6 out of 9, 8 out of 12, and 10 out of 15. But then 10 out of 15 is a better chance than 9 out of ten. Students may run a probability experiment to verify this result.

5. **(See figure below.)** A network of paths such as the one below can be traced without lifting a pencil, if it has either 0 or two *odd vertices*. A vertex is *odd* if it has an odd number of paths going in or coming out. Furthermore, if you can trace the network, you have to start at one of the odd vertices, and you'll end up at the other. Therefore the two odd vertices circled below are the only places you can start, and trace the path.



6. **(7)** This can be solved by guess-check-revise, or by working backward.

7. **(a. 6; b. 3; c. 49)** Students with good number sense will notice that the fractions involved are either close to zero or close to 1, which means that each mixed number would either be rounded to the whole number showing, or up to the next whole number. In (a), 3 10/11 rounds to 4 and 2 1/101 rounds to 2, so the sum is close to 4 + 2 or 6. In (b), 5 2/47 rounds to 5, and 2 1/35 rounds to 2, so their difference is close to 5 - 2 or 3. In (c), 6 17/19 rounds to 7, and 7 3/290 rounds to 7, so their product is close to 7 x 7 or 49.

8. **(1/6)** Students might draw a diagram to show that 1/3 of 1/2 is 1/6

9. **(0)** The ten one-digit numbers include zero, which makes the overall product zero also.

Commentary

Jupiter, VII

1. **(marble bag)** The chance of drawing a blue marble is 1/3; the chance of drawing a weekend day is 2/7. We must compare these fractions to see which is larger. Finding a common denominator (21) allows us to compare the fractions by comparing the numerators. 1/3 is 7/21, and 2/7 is 6/21, and thus 1/3 is greater than 2/7. Another way to compare the fractions is to use a calculator and change both fractions into decimals, and compare the decimals.

2. **(2000 years)** Many students will think you must multiply 4 and 2000, but the problem doesn't call for any computation if you think carefully about the situation.

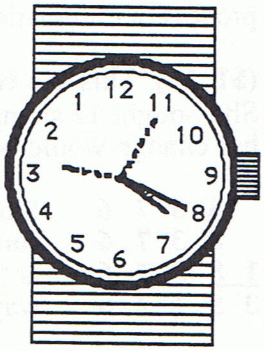
3. **(25)** Students can use grid paper to make the rectangles that have 20 as a perimeter. The one with the largest area can then be found by counting unit squares.

4. **(To get back fewer coins)** Many people use a method like that mentioned to avoid carrying extra coins around in their pockets.

5. **(Juan is 15, Derrick is 5, Tyrone is 10)** A suggested strategy is to use *guess-check-revise* by guessing the youngest person's age, and doubling and tripling that amount to get the other ages, adding to see if the sum is 30. If not, revise the youngest person's age appropriately.

6. **(2:38; 2:57; 3:20; 3:48)** Students will have to either count backwards to get each new time, or subtract. Subtraction involves subtracting across non-base ten numerals.

7. **(See watch to the right.)** The time shown is 2:55, and adding 4:45 to that gives a time of 7:40. Showing 7:40 will be a challenge for many students, on this watch.



8. **(1/10)** A quart is 2 pints, so 5 quarts is 10 pints. One pint is then 1/10 of 5 quarts.

9. **(a. answers will vary; b. answers will vary.)** Whatever a student writes in for (a), use a calculator to find 70% of that number by multiplication. Be lenient in checking accuracy -- give credit for being within one pound of the right answer for (b). Students will employ a variety of methods for finding 70% of their weight, if they don't use a calculator. Some, for example, might reason and take 7 out of every ten pounds they weigh, and then add on some extra for the pounds over a multiple of ten. Others might find 50% or 75% as those are intuitive numbers to work with (1/2 and 3/4) for many weights, and then adjust their answer because 70% isn't exactly 50% or 75%.

Commentary

Jupiter, VIII

1. **(65)** Students may use the *guess-check-revise* method. Some students might get the answer by putting the 36 and 94 on a number line, and deciding the point half-way between.

2. **6 , 4 or 4 , 6**
   2 , 10 or 10 , 2
   6 , 8 or 8, 6
   7 , 9 or 9, 7
   3 , 15 or 15, 3
   30, 1 or 1, 30

   Perhaps the easiest way to solve each of these problems is to focus on the numbers that would give the indicated product, and then see which of those pairs of numbers would give the indicated sum.

3. **(10)** Students may act out this problem, or they might draw a diagram with A, J, S, C, and T around a circle. They would then connect each letter with each other letter with a line, and count the lines.

4. **(B)** This is a two-step problem. Students will first have to find the sum of Karen's grades: 92 + 88 + 99 + 97 + 89 and get 465. Then they will divide 465 by 5 and come up with 93%, which is a B. Students can use a calculator for such situations.

5. **50,682 − 43,896 = 6,786**

   The problem involves deducing the two missing numbers, and one way is to work through the standard subtraction algorithm for the numbers.

6. **(36° C)** Students should realize that 12°C is too cold, and 120°F is too hot. Therefore by process of elimination, 36°C is the correct choice.

7. **($1. 16)** This is a two-step problem. Students first have to decide how much Rachel spent. She bought 12 stamps at 32 cents each. 12 x $0.32= $3.84. Next, the students compute what her change would be. $3.84 from $5.00 = $1.16.

8. **8376 + 8376 + 18376 = 35128**

   Students can start by looking for the T value. Three such numbers must sum to give an 8 in the ones place; 6 is a good choice. Then knowing 1 is "carried" to the next place, then can solve for N. Proceeding in this way solves the problem.

9. **(a. 70; b. answers will vary.)** Part (a) involves multiplying 10 and 7. For part (b), whatever number the student puts in the first blank, divide the number by 7 in a calculator to get the number in the second blank. The answers will most likely be 9 ÷ 7 = 1 2/7 ≈ 1.3 or 10÷ 7 = 1 3/7 ≈ 1.4 or 11 ÷ 7 = 1 4/7 ≈ 1.6. Be lenient in accepting reasonable answers for part (b), as some students will have the right idea but not know how to divide decimals or round their answers.

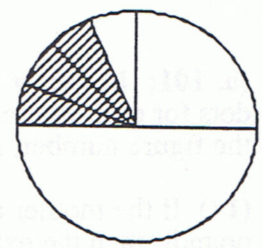
Commentary

Jupiter, IX

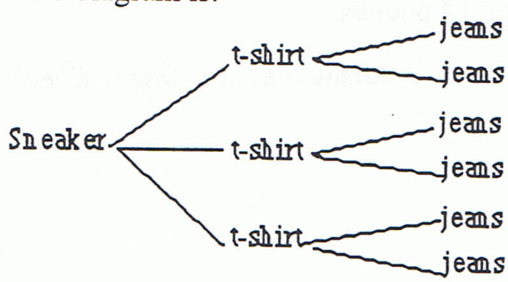
1. **(96)** Students can count the cubes in layers. There would be 16 on each of the 6 layers, or 16 x 6 total cubes.

2. **($5)** Students can compute 25% of $10, 15% of $10, and 10% of $10 and add to get $5 spent. Then $10 - $5 gives $5 left to spend. Another way is to add the 3 percents (25%, 15%, and 10%) to get 50% spent. Then 50% of $10 was not spent, and 50% of $10 is $5.

3. **(See diagram below. 3/16)** Students might show the circle cut in half, then one of the halves cut in half to get fourths, then one of those fourths cut into four pieces, and three of them shaded (see below). If so, it would take 16 of the smaller pieces to make the whole circle, so each is 1/16. Three shaded sixteenths would be 3/16.



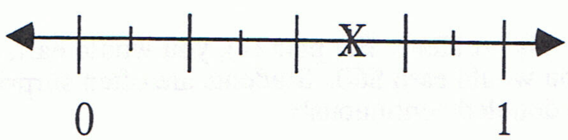
4. **(6)** One possible diagram is:



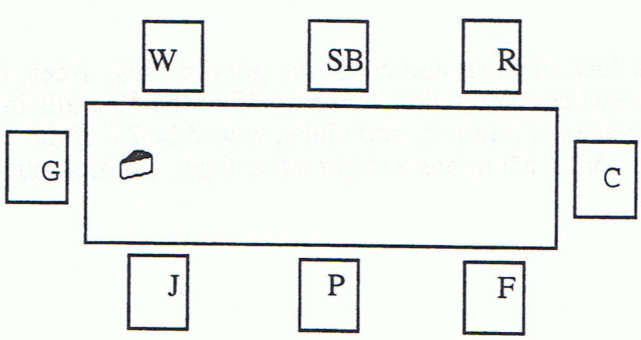
5. **(3*x* - $14.62 or 3 x *x* - $14.62 or *x* + *x* + *x* - $14.62 or any equivalent expression)**

6. **(143)** Students will add to find the answer.

7.



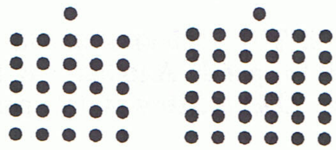
8.



Commentary

Jupiter, X

1. **(See figures below)** Note that each figure is a square with the same number of dots on each side as the figure number, plus an extra dot on top.



5 6

2. **(a. 101; b. 20; *n* x *n* + 1)** This problem encourages students to generalize the number of dots for each figure, rather than drawing them. Each figure is made from this number of dots: the figure number, squared, with 1 dot added on top.

3. **(14)** If the mother and one pup weighed 15 pounds, and the mother and two pups weighed 17 pounds, then the extra pup in the second weighing must be 2 pounds. Since all the pups are the same weight, 7 pups would weigh 14 pounds.

4. **(See below.)** There are other solutions. Students may use *Guess-Check -Revise.*

6	1	8
7	5	3
2	9	4

5. **(168)** Multiply 7 by 24.

6. **(b)** Students might use a calculator for this problem. For plan (a), you would earn \$55; for (b), you would earn \$102.30; for (c), you would earn \$60. Students are often surprised at how quickly an amount becomes, when doubled continuously.

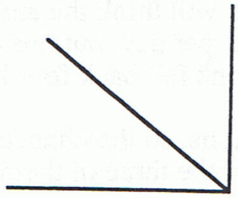
7. **(4)**

8. **(Mom)** Students might take out a deck of cards and count the possibilities. Aces, face cards, and hearts when counted so they aren't counted twice, make up 25 of the 52 cards in the deck. The other cards, 2 through 10 of spades, diamonds, and clubs, would be 27 of the 52 cards. Since 27/52 is a better chance than 25/52, Mom has a slight advantage. But not much.

Commentary

Jupiter, XI

1. **(The fold line should divide the corner in two equal parts as shown below.)**

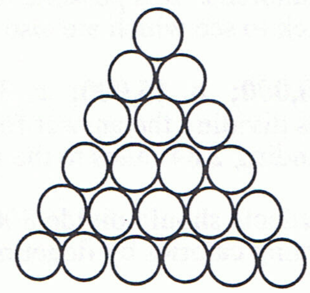


2. **(8)** The fractions are either close to 0 or close to 1. The mixed numbers can then be rounded to produce the following whole number computation: 4 + 3 – 2 + 6 – 3, which gives 8.

3. **(6)** Calling the three students A, B, and C, there are 6 ways: ABC, ACB, BAC, BCA, CAB, and CBA

4. **(10, 15)** The problem involves simply counting. The next two problems build on this one.

5. **(See the shape to the right.)**



6. **(55)** The number of circles makes the familiar pattern: 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, ... To get each succeeding term, you add one more than what you added in the previous term. To get from 1 to 3, you add 2 to 1. To get from 3 to the next number, you add 3. To get the next term, you add 4, then 5, then 6, and so on.

7. **(a. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47; b. 15 out of 49 or 15/49 or any equivalent; c. no)** The probability of picking a number that is not prime is 34/49.

8. **(a. < ; b. < ; c. =)**

9. **(From the left, the 1st, 3rd, and 5th figures should be circled.)** The first figure has two square faces at its ends. The third figure also has two square bases, although they are "tilted". The fifth figure has only one square face, the one on which it rests.

10. **(25)** The problem will become, in later years, an algebraic situation of the form $60 = 2x + 10$. In this case, the two tubes of glue must weigh 50 grams since 50 + 10 = 60. If two tubes of glue weigh 50, then each weighs 25.

Commentary

Jupiter, XII

1. **(16)** Students may need help recognizing that the snail is climbing and then falling. Students may draw pictures or use a number line. Some students will think the answer is 20 days because of the snail making progress at the rate of 1 foot per day, but this discounts the fact that once the snail reaches the top on the 16th day, it won't fall back four feet that night.

2. **(3/4, 75%)** The circle is divided equally into four regions, so the chance of landing on each of those regions is 1/4. The chance of landing on any of the three of them is then 3/4.

3. **($12.50)** Some students will find half of $25 as $12.50, and then subtract that amount from $25 and get $12.50 again. Others will simply say that if the item is on sale for 1/2 off, the price you pay is also 1/2 of the price showing.

4. **(81)** Students may want to use a calendar, or set up a chart, in order to solve this problem. There would be 20 days left in October, 30 in November, and 31 in December.

5. **(180)** Students may use the *guess-check-revise* approach. The 2nd clue says the number is in the hundreds. It is possible to then write down the multiples of 12 that are in the hundreds, and check to see which are also multiples of 9 in which the units digit is less than the tens digit.

6. **(a. 180,000; b. 15,000; c. 3)** Part (a) involves multiplying 10,000 and 18; part (b) involves dividing the answer for (a) by 12; part (c) involves dividing (b)'s answer by 5280, and rounding 2.84 miles to the nearest whole number, 3.

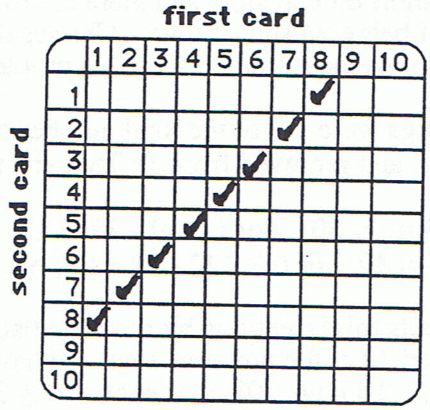
7. **(50)** Students should divide 800 by 16, which is the number of hours the person is awake and burning calories by fidgeting.

8. **($15)** $10 for 100 pretzels means his cost per pretzels is 10¢ each. If he sells them for 25¢ each, he makes a profit of 15¢ per pretzel. Therefore 100 pretzels would bring a profit of 100 x 15¢ or $15. Another solution: when you sell 100 giant pretzels for 25¢ each you make $25. If they cost you $10, your profit is $15.

Commentary

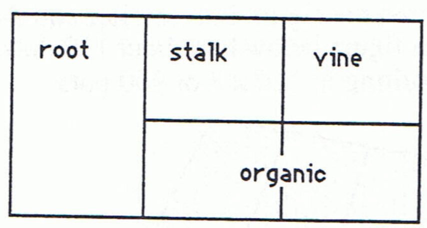
Jupiter, XIII

1. **(8 chances out of 100, 8/100, 8%, 8:100, or a reduced form of these answers, such as 4/50, 2/25, and so forth.)** Students can obtain such an answer by making a chart of the possibilities. The chart below shows the eight possibilities of success, out of the 100 possibilities for the two cards.



2. **(Joey)** Joey earned $1.50 x 20 = $30.00; Susan earned $5.00 x 5 = $25.00.

3. **(2/6 or 1/3)** A diagram such as that below will help the student find the answer. The organic portion is 2 pieces out of 6 that would make the whole garden, hence 2/6 or 1/3 is the answer.



4. **(35 ÷ 7 = 5)** The problem is a simple partitioning interpretation of division.

5. **(a. 5 feet by 4 feet; b. 15 kilograms)** Both problems involve number sense. Students can eliminate all the unreasonable answers simply because of what they know about the size and weight of a bicycle.

6. **(a. 9; b. 104; c. Lamps, Television, and Walkman)** Students can count the types of appliances directly from the chart for (a). For (b), the total number of light bulbs in the chart is 26, and each stands for 4 appliances from the key, so the total is 104. Lamps is most popular with 5 light bulbs, followed by Television and Walkman with 4 each.

7. **(189, 180, 117)** The pattern involves subtracting 9 each time you move one term to the right.

Commentary

Jupiter, XIV

1. **(Charles was correct.)** The window "edges out" on the right hand side about half a square unit, and there are six of those square units on that side of the window. Therefore the area is 24 square units, plus the six extra half-squares, or 27 square units altogether. The picture is a little short of taking up the sixth square unit on the right-hand end. Measurement shows that it's about 1/5 of a square unit short on that side, and there are four such squares on that end. Therefore its area is four 1/5's short of being 24 square units. Charles desire to be an architect means that he will probably be quite exact in his measurements, as this problem shows.

2. **(32)** The 8 pigs were 1/4 of the total number of animals, since that is the amount left when 1/2 and 1/4 are combined and removed from 1. Then the total number of animals is 4 x 8 or 32.

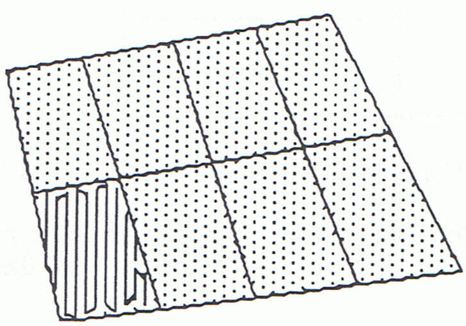
3. **(a. 15; b. 30; c. 50)** For (a),59 - 32 = 27; 27 ÷ 9 = 3; 5 x 3 = 15. For (b), 86 - 32 = 54; 54 ÷ 9 = 6; 6 x 5 = 30. For (c), 122 - 32 = 90; 90 ÷ 9 = 10; 10 x 5 = 50.

4. **(140)** Students might get this by working backwards. To end up with 60 after multiplying by 5, you must have had 12 at the previous step. To have 12 after dividing by 9, you must have had 108 in the previous step. To have 108 after subtracting 32, you must have had 140 to begin.

5. **($4.25)** The 17 quarters would be $4.25.

6. **(a. 3/12 or 1/4 or 0.25 or 25%; b. 9/12 or 0.75 or 75%)** In (a), there are 3 months being considered out of twelve, so the chance is 3/12 you will get one of those. In (b), the chances are 9/12 since 9 months are being considered, out of 12.

7. **(c. 1000)** Students can partition the figure into smaller equal-sized pieces, count those, and gain an estimate by multiplying. The figure below has about 120 dots in the section that has been counted, and there are 8 such sections, resulting in 120 x 8 or 960 pots.



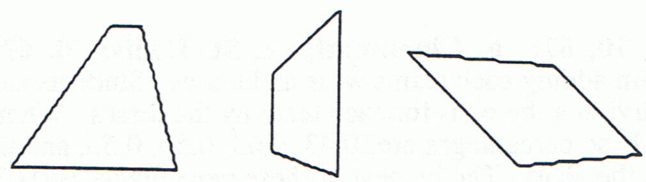
8. **(a. yes; b. yes; c. no; d. yes)** This problem will demonstrate that some students can translate a verbal situation into an equation, but others cannot.

Commentary

Jupiter, XV

1. **(a. 32; b. $160)** There are 10 faces on the side showing, giving 20 altogether on the two sides. There are 8 faces the make up the "steps," and 4 more on the end. The estimate of the cost can be made by rounding $4.99 to $5, and multiplying 32 x $5.

2. **(Any picture of a <u>trapezoid</u> is acceptable.)**

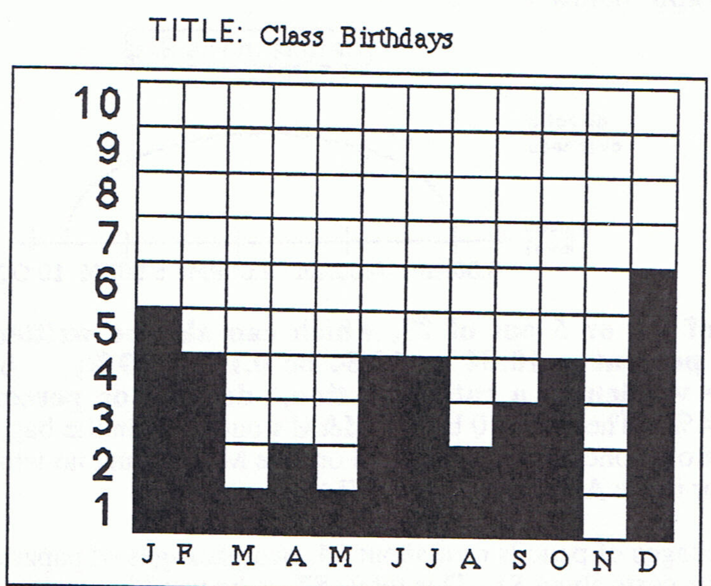


3. **(3)** One-half of a dozen is 6, and one-half of 6 is 3.

4. **(800)** Four out of five is the same ratio as eight out of ten, which is the same as 80 out of 100, which is the same as 800 out of 1000.

5. **(24; its factors are: 1,2,3,4,6,8,12,24)** Students will likely have to *guess-check-revise* to find the number with the most factors.

6. **(See the graph below.)** The title can be anything that makes good sense, such as "Class Birthdays." The labels on the bottom axis should represent the months of the year, probably with an initial.



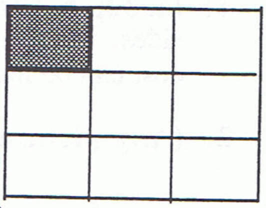
7. **(35)** Two hours is 120 minutes, and the 15-minute break means that 105 minutes are available for music. $105 \div 3 = 35$.

8. **(9)** The perimeter of the square is 36 miles. So the four sides add to 36, meaning that each side must be $36 \div 4 = 9$ miles in length.

Commentary

Jupiter, XVI

1. **(Any model with one shaded cell is correct.)** Students will likely think of dividing the rectangle into thirds either horizontally or vertically, and then one of those thirds into thirds going in the other direction.

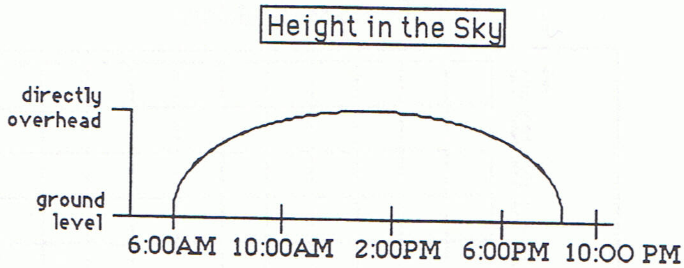


2. **(a. 71, 68, 69, 70, 67; b. Cincinnati; c. St. Louis; d. 69)** The total number of games comes from adding each teams wins and losses. Students can find the winning percentages by dividing the wins for each team by the losses. When rounded off to two decimal places, these percentages are: 0.43, 0.63; 0.55, 0.53, and 0.45 for the teams as listed, top to bottom, in the chart. The highest of these percentages is 0.63 and the lowest is 0.44, corresponding to Cincinnati and St. Louis, respectively. The average number of games played is (68 + 69 + 70 + 67 + 71) ÷ 5, or 69.

3. **(7)** There are 3 large squares, and 4 smaller ones in the center.

4. **($69.72)** The students first need to find how each item will cost on sale. They will probably divide the price of the dress by 2 to get the new price, $47.25. They will probably divide the price of the shoes by 4 to get $7.49, and subtract that from the regular price to get the sale price, $22.47. They then add these two sale prices. This is only one way a fourth grader might approach this problem.

5. **(See the graph below.)**

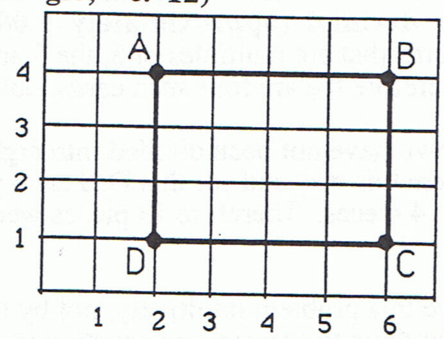


6. **(a. 10 out of 54, or 5 out of 27, which can also be written as a ratio, fraction, decimal or percent -- 10:54 or 10/54 or 0.19 or 19%; b. 13 out of 54, which can also be written as a ratio, fraction, decimal or percent -- 13:54 or 13/54 or 0.24 or 24%)** There are 10 brown M&M's out of 54 in the bag, which is a 10/54 chance of getting a brown one. There are 13 red or blue M&M's and no whites, so the chances of getting a color in the American flag is 13/54.

7. **($3)** Four packages of pencils cost about $4, two packages of paper cost about $2.00, and the eraser package costs about $1. This totals $7, so he would have $3 left out of $10.

Commentary
Jupiter, XVII

1. **(a. See below; b. rectangle; c. 12)**



2. **(150, 200)** Students can measure with a piece of paper and a pencil the distance from 100 to the second dot, and compare that to the distance from the second dot to 300. They will find the distance to be the same, which means the middle dot is half way between 100 and 300, or is 200. A similar strategy shows that the first open box holds 150.

3. **(61)** Students can divide: 671 ÷ 11 = 61

4. **(a. hexagon; b. 6; c. obtuse)**

5. **(24 or 25)** Students can round 57 minutes to 60 minutes, which is one hour. There are 24 hours in a day, therefore an estimate of 24 fatalities per day is reasonable. If a student calculates that since 57 is 3 minutes less than 1 hour, there would be 24 x 3 or 72 extra unaccounted for minutes, meaning another group of 57 minutes in 24 hours, then 25 is a reasonable estimate also..

6. **(precise calculation, estimate)** Either answer might be acceptable in each situation, except the directions say to use each term once. Therefore the student is forced to choose the most likely term for each spot.

7. **(1, 3, 10, 15)**

8. **(The number pattern increases by adding one greater number to the total each time. See alternate formula below.)** 1 + **2** = 3 (the next level); 3 + **3** = 6 (the next level); 6 + **4** = 10 (the next level); 10 + **5** = 15; and so on. Most students won't notice this, but they can find each new number without knowing the previous number. If there are n small rectangles, then the total number of rectangles formed is $(n)(n + 1) \div 2$.

9. **(28)** Following the lead from problem 8, the student can add 6 to 15 to get 21 rectangles with 6 small rectangles, then 7 + 21 to get the next total. Or, with 7 small rectangles, there are (7)(8) ÷ 2 total rectangles.

Commentary

Jupiter, XVIII

1. **(4 out of 52, 2 out of 26 or 1 out of 13, which could also be written as a fraction (4/52, e.g.), a decimal (approximately 0.08), or a percent (8%))** Out of each suit, there are two cards that are multiples of 5, the 5 and the 10. There are two red suits, diamonds and hearts. Therefore the are four such cards, out of 52 in the deck.

2. **(3/8)** The two pizzas shown have not been divided into eighths yet, as pizzas normally are. The student can divide them this way and see that Dad ate 6 pieces, Jenny ate 1 piece, Danny ate 2 pieces, and Mom ate 4 pieces. Therefore 13 pieces were eaten, leaving 3 pieces. Three pieces is 3/8 of a pizza.

3. **(15)** Students should solve this problem intuitively, not by trying to use the equation. The equation is there simply for them to associate an equation with a real-life situation. They can *guess-check-revise* to find the weight of an apple, or they can deduce the answer logically as they will be called on later to solve such equations. If three apples and 5 grams weigh 50 grams, then 3 apples by themselves must weigh 45 grams. Therefore each apple weighs 45 ÷ 3 or 15 grams.

4. **(26 students)** There is extra information in this problem -- 16 classes. The problem is solved by dividing 104 students by 4.

5. **(even)** Students might want to test this out, by opening a book to several different places and multiplying the numbers on the facing pages with a calculator.

6. **(a. $9.60; b. 2 hours and 40 minutes)** Students can first multiply each color string by 8, add those products to get 96 and multiply by 10 cents. Or, they might add all the colors together for one bracelet and get 12, and multiply that amount by 8, and then 10 cents. For the second question, students can multiply 20 minutes by 8 and get 160 minutes, and convert that to 2 hours and 40 minutes.

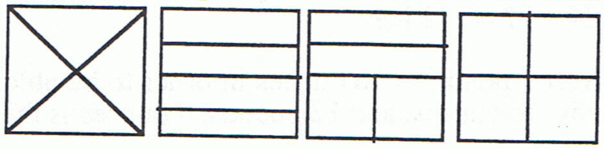
7. **(6 meters)** Students might estimate this amount visually -- the height of a door is about 2 meters, and the width is not quite 1 meter, so the distance around the outside would be about 1 + 2 + 1 + 2 or 6 meters. Some students might actually measure a door, and find approximately the same dimensions. Most interior doors in houses are about 5.5 meters around the outside, which is closer to 6 meters than any of the other answers.

8. **(11 hours 30 minutes)** The trip from Tallahassee takes the longest. Students will most likely "count up" from the departing time to the arrival time, getting 6 1/2 hours, 11 1/2 hours, 5 hours, and 8 hours, respectively. On the Tallahassee trip, some might get the time by realizing that a 12-hour trip would go from 7:30 AM to 7:30 PM, and this would be 1/2 hours shorter than that, giving 11 1/2 hours for the trip.

Commentary

Jupiter, XIX

1. **(Four possibilities are shown below.)** Students can show "fourths" in a number of ways. The square must be divided into 4 parts, and the parts must have the same area. However, the parts do not have to be the same shape.

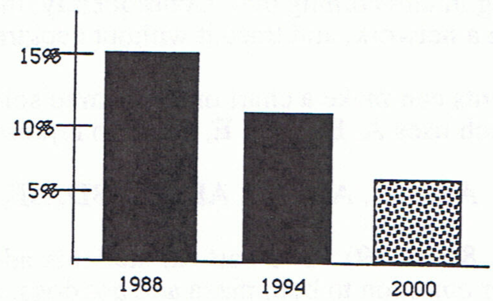


2. **(45)** Students might start by listing the numbers greater than 39 but less than 46: {40, 41, 42, 43, 44, and 45}. The only number of the list that you count when you count by threes and fives is 45. "It roared an odd number of times." is not necessary as a clue.

3. **(771)** Students might use a calculator to divide 3855 by 5, getting 771. Students might be challenged to find the approximate number of pushups per minute -- 13 -- and to then approximate the rate of his doing push ups (about 1 every 5 seconds).

4. **(square is 4 units; rectangle is 8 units)** Some students might misinterpret the problem and try to use all four figures to make the square, and then all four again to make the rectangle. They will find they can't make such a square.

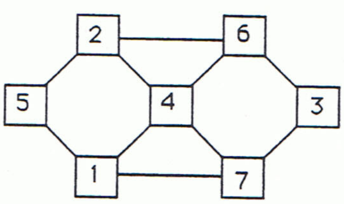
5. **(The graph should be approximately equivalent to the one shown.)** The change from 1988 to 1994 is from 15% to 11%. That same change from 1994 to 2000 would result in about 7% in 2000.



6. **(Figure B)** Students might find the drawing by tracing over figure A, and actually turning it three 90° turns, to match it up with one of the given drawings.

7. **(40 students)** This problem cab be solved by *working backward* and then adding. On Friday 12 students got the silly willies; therefore on Thursday, 10 students did; Wednesday, 8 did; Tuesday, 6 did; and Monday, 4 did. 12 + 10 + 8 + 6 + 4 = 40.

8. **(One solution is shown.)** Students might start by putting 4 in the center, and the two numbers that "surround" it, 3 and 5, on the ends.



Commentary
Jupiter, XX

1. **(112)** Students may make a chart according to the animal's number of legs. Dogs, cats, turtles, lizards and the pig have 4 legs each, so the total of 4-legged creatures is 4 x (5 + 4 + 2 + 2 + 1) or 4 x 14 = 56. The 12 birds contribute 24 legs and the 4 spiders have 8 legs each or 32 all together. Therefore there are 56 + 24 + 32 = 112 legs.

2. **(55 pounds, 8 oz)** Students need to convert 1 pound to 16 ounces in order to be able to subtract. The 68 pounds become 67 pounds, 16 ounces, and 12 pounds, 8 ounces is then subtracted.

3. **($6.25)** Students might multiply 12.5 x $0.50, or they might realize that every 2 pounds will cost $1, so 12 pounds will cost $6. They then realize that 1/2 pound will cost half of 50¢, or 25¢, and combine that with $6.

4. **(pages 88, 89)** Students may need to be reminded that pages in a book are consecutive. If they divide 177 by 2, they will get a hint that the answer must be 88 and 89.

5. **(4)** Drawing 1/2 dozen eggs, or 6 eggs, will lead to a solution. Then 1/3 of them, or 2 eggs, can be crossed out, leaving 4 eggs.

6. **(E and F should be circled.)** These two points are the only two with an odd number of paths going in and coming out. Consequently, these are the only two places where you can begin such a network, and trace it without backtracking.

7. **(15)** Students can make a chart or diagram to solve this problem, or a list such as the one below which uses A, B, C, D, E, and F to represent the six classrooms:

   AB, AC, AD, AE, AF, BC, BD, BE, BF, CD, CE, CF, DE, DF, EF

8. **(a. 57; b. 8; c. 29)** For part (a) students add 7, 13, 29, and 8. For (b), they look for the number common to both pizza and hot dogs, but is not common to tacos. For (c), the students locate the number common to all three rectangles.

Commentary

Jupiter, XXI

1. **(a. 6th and 12th; b. 1st, 5th, 7th, and 11th)** Students can draw the 12 steps, and the two animals jumping, as a concrete way to solve the problem. Or they might simply list the steps that each will land on and find the answer that way. Some might write the numbers from 1 to 12, and write "C" or "F" above each number is the cricket or flea lands on it.

2. **($230)** This will probably be a two step problem. Students will probably divide 92 by 2 and then multiply that quotient by 5.

3. **($230,000,000.00 or $230,000,000)** In this answer, look for the dollar sign and the correct number of zeros.

4. **(a. drier; b. 2.76; c. 67)** Part (a) simply involves comparing the 1995 bar with the "normal" bar. Part (b) involves subtracting 1.43 from 4.19; part (c) requires students to subtract 1928 from 1995.

5. **(118)** Students may draw a picture; there are 10 bricks (10 x 10 cm = 100 cm) and 9 sections of mortar (9 x 2 cm = 18 cm). The total is then 100 cm + 18 cm.

6. **(more than)** The total number of calories listed is 2217. Some students will be able to estimate accurately that the calories sum to more than 2000, without actually getting the total number of calories accurately.

7. **(6)** Out of the 36 ways the dice can land, these ways give a sum of 7: (1,6), (6,1), (2,5), (5,2), (3,4), (4,3).

8. **(b. 25 million)** Students can convert 25,000 miles into 132,000,000 feet using a calculator. If the average person is 5.5 feet tall, this number can be divided into 132,000,000 to get 24 million people necessary. An average height of 5 feet would result in a little more than 26 million people. Therefore the most reasonable answer is about 25 million.

Commentary

Jupiter, XXII

1. **(Tuesday)** Students can use a calendar or make a chart with "Su, M, T, W, Th, F, Sa" at the top, and begin numbering backward with 24 under Saturday.

2. **(8)** Students can solve this problem by drawing a diagram or by visualizing 24 colas. 1/2 of 24 is 12, and 1/3 of 12 is 4. Therefore Chris gave away 4 sodas of the 12, leaving 8.

3. **(65)** Students will probably solve this by first finding the total weight of the 12 girls: 12 x 55 = 660 pounds. Then they will compute 1050 - 660 = 390 pounds, the weight of the 6 boys. Computing 390 ÷ 6 = 65 pounds per boy.

4. **(91, 92, 93)** Students may use the *guess-check-revise* method. Some students might know that the numbers they seek are about 1/3 of the total, and approximate the numbers by dividing 276 by 3. This gives 92, which is the middle number.

5. **(48)** Students may want to draw a picture to help solve this problem. Spiders have 8 legs, which would be 4 pairs of shoes per spider.

6. **(29 hours and 45 minutes)** Most students will realize that from 8:45 AM to 8:45 AM the next day, is 24 hours. They will then "add on" 5 additional hours to get to 9:45, 10:45, 11:45, 12:45, and 1:45, and then 45 minutes to get to 2:30 PM.

7. **(27)** There would be 12 wheels on the 3 cars, 8 on the 4 bicycles, 6 on the 2 tricycles, and 1 on the unicycle.

8. **($1.84)** Students will probably add $6.98 and $9.99 to get $16.97, then add the tax of $1.19 to get $18.16. They will subtract this amount from $20.

9. **(a. C; b. D; c. G)** Hopefully students will notice that the multiples of 7 are in column A, and use this fact to get "close to" the numbers 100, 500, and 1,000. Ninety-eight (14 x 7) is the closest multiple of 7 less than 100, so 98 would be in column A, forcing 100 to be in column C. Likewise, 497 or 71 x 7 is in column A, giving that 500 is in column D. Finally, 994 or 142 x 7 is in A, indicating that 1000 is in column G.

Commentary

Jupiter, XXIII

1. **(3rd from the left is circled.)** Students with good spatial visualization can find the right card by imagining the turns. Others might draw the figure on a card or sheet of paper, and make the turns.

2. **(296 pounds)** 310 - 14 = 296.

3. **(6)** One way to begin the problem is to write down the room numbers 12, 14, and 16, and *guess-check-revise*. If there are 2 friends in each room, then there will always be four friends in the other two rooms.

4. **(7 kids, 4 boys and 3 girls)** Sam and Suzie are included in the number of brothers or sisters. One way to begin is to write list "B" and "G" for boys and girls, and *guess-check-revise*. The number under B must be more than 1 since Sam has at least one brother, making 2 boys at least. So try 2 for B, which means Sam has 1 sister, giving Suzie 0 sisters. But this contradicts what is given, so revise the guess under B to 3. This gives Sam 2 brothers and 2 sisters, and Suzie 1 sister. But then Suzie has 3 brothers, which is not twice as many as her 1 sister. Revise the guess under B to 4, giving Sam 3 brothers and 3 sisters, and Suzie 2 sisters and 4 brothers. This meets the conditions of the problem.

5. **($8.78)** He spent a total of $47.87 plus $3.35 in tax. This totals $51.22. Subtract $51.22 from $60.00.

6. **(a. 6; b.**

Age Group	**% Participation ;**
7-11	**40%**
12-17	**37%**
18-24	**10%**
25-34	**9%**
35-up	**4%**

c. The older you get, the less likely you are to be in roller hockey.)

7. **(74)** Students can use the second clue and the last clue to list the numbers from 71 to 79. The first clue eliminates the odd numbers, leaving 72, 74, 76, and 78. But 72 and 76 are both divisible by 4, and 78 is divisible by 3. Hence by process of elimination, 74 is the answer.

8. **(8)** Students should try to find the weight of a book without manipulating the variable x in the equation. They can reason that the 4 books alone must contribute 32 ounces to the weight on the left, since those books plus 5 ounces weigh 37 ounces. Then if 4 books weigh 32 ounces, each book must be 8 ounces.

Commentary

Jupiter, XXIV

1. **($2.25)** Four weeks at a daily rate would be $0.35 x 5 x 4 = $7.00. A 4-week subscription is $4.75. $7.00- $4.75 is $2.25.

2. **(>)** 1/2 + 3/4 is 5/4 or 1 1/4. 2/3 + 1/2 is 4/6 + 3/6 or 7/6, or 1 1/6. 1 1/4 is greater than 1 1/6 since 1/4 is greater than 1/6. Some students will get the answer by focusing on 3/4 and 2/3 -- since 1/2 is part of each side, it can be ignored. 3/4 > 2/3, so 1/2 + 3/4 must be greater than 1/2 + 2/3.

3. **(130,000)** 354 x 365 = 129,210. When rounded to the nearest ten thousand, the answer is 130,000.

4. **(18)** Students need to drawn figures and look for rectangles of different sizes.

If,  = 1 unit, then

# of 1 unit rectangles = 6
# of 2 unit rectangles = 7
# of 3 unit rectangles = 2
# of 4 unit rectangles = 2
# of 6 unit rectangles = 1
18 total

5. **(1 week 3 days 17 hours 50 minutes)** This problem involves "borrowing" in a non-base ten system. The time "4 weeks, 3 days, 13 hours, 21 minutes" can be rewritten as "3 weeks, 9 days, 36 hours, 81 minutes" so that the lower number can be subtracted.

6. **(18 and 17)** Students can find the answer by making a list of pairs of numbers that sum to 35, and comparing the products of those pairs. They will notice that the closer the numbers in the pairs become to each other, the higher the product.

7. **(P)** The pattern is not a numerical pattern, which will confuse some students. *M V E M J S U N P* represents the first letter of each of the planets in our solar system, in order of their position from the sun -- Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Many adults memorized a saying such as "My very educated mother just served us nine pickles" to remember this sequence.

8. **(15, 21, 28, 36)** Students may make a drawing of the next four triangular numbers, and count the dots. They will notice that each new figure in the pattern adds a row on the bottom, with one more dot in it than the previous figure.

9. **(a. about 25%; b. AB^-; c. O^-)** For part (a), students can turn the graph and readily see that A^+ is about 1/4 or 25%. The most rare type is the one with the smallest area -- careful observation, or perhaps tracing the regions of each and comparing the tracing, shows that AB^- is slightly smaller than AB^+. For (c), AB^+ is smaller than 0^-, so the chances of 0^- are greater.

Commentary

Jupiter, XXV

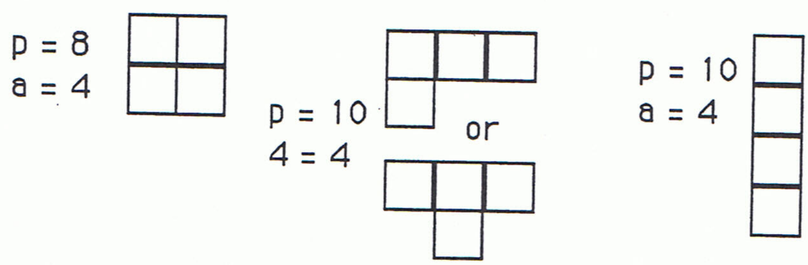
1. **(59,049)** Students may make a list to find a pattern. The pattern is increasing each clap by multiplying the previous distance by 3. This is also 3^{10}, which can be computed quickly on a calculator with a repeating function by this process:

   [3] [x] [3] [=] [=] [=] [=] [=] [=] [=] [=] [=]

claps - km	claps - km
1 - 3	6 - 729
2 - 9	7 - 2,187
3 - 27	8 - 6,561
4 - 81	9 - 19,683
5 - 243	10 - 59,049

2. **(4)** Pages 47 and 48 are back-to-back, but 20, 21, and 104 are all individual pages.

3. **(There are 3 basic ways to arrange the tiles, as below.)** Students can draw the three basic configurations and count to find the perimeter -- the area is always 4, since 4 tiles are used. One basic configuration is a square, another is 3 tiles together and another one on the side somewhere, and the third is 4 tiles in a row. Students will likely have other arrangements of these three basic shapes.



4. **(6)** Students can use the first initials and make a list: TJC, TCJ, CJT, CTJ, JCT, JTC

5. **(11 cherries)** Students may draw pictures or use letters. From the right-hand scale, we know that a piece of cake and 5 cherries can be substituted for an apple because they weigh the same. Therefore a piece of cake and 5 cherries can replace the apple in the right-hand pan of the left-hand scale. Therefore 2 pieces of cake balance 1 piece of cake and 6 cherries. One piece of cake is removed from both sides of this scale, leaving 1 piece of cake balancing 6 cherries. This means that 6 cherries can replace the piece of cake on the right-hand pan of the right-hand scale, leaving 1 apple to balance 6 + 5 or 11 cherries. There are other ways to reach this same conclusion. Such problems are important foundations for later work with algebra.

6. **(2, 4, 6, 8, 12, 14, 16, and 18 in left area; 10 and 20 in intersection; 5, 15, 25, 30, 35, 40, 45, and 50 in right area.)** A Venn diagram is a way to show visually the intersection of two sets. The intersection contains elements common to both sets.

7. **(7 and 12)** Students may use trial and error with addends or factor pairs. Some may begin the problem by listing the numbers that add to 19, and checking to see if their product is 84.

8. **($1.80)** 1/6 of 18 is 3 quarters or $0.75; 1/3 of 18 is 6 dimes or $0.60 and 1/2 of 18 is 9 nickels or $0.45. Students might want to draw 18 coins, and physically circle 1/3, 1/6, and 1/2 of the set.