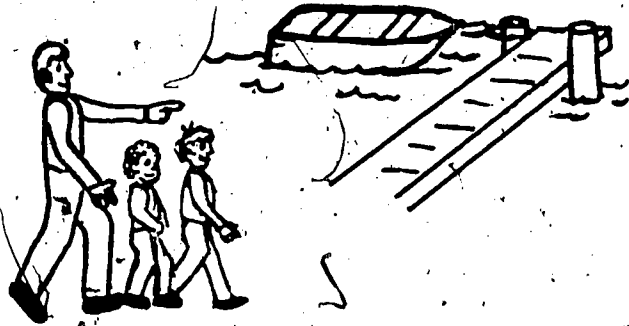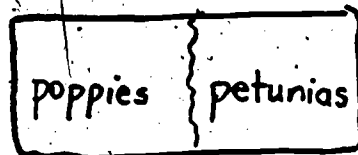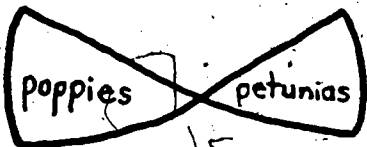17.RD6

A father and his two sons wish to cross
a river in a boat, but the boat will
only carry 200 pounds at a time. If the
father weighs 200 pounds and his sons
weigh 100 pounds each, how can they cross
the river in the boat?

18.RD6.

1. Mrs. Plough planted poppies and petunias in a
   plot so they shared a boundary. Which of these
   is Mrs. Plough's plot? (A point is not a boundary.)


2. Mr. Gardner wanted to plant gardenias, geraniums,
   and gladiolas. Show how he could plant the flowers
   so the gardenias are next to the geraniums, but
   the geraniums are not next to the gladiolas.

3. Show how Mr. Gardner could plant the flowers so
   each type is next to each of the other two types.

The 2 boys cross together. One stays and the other returns. Then the father crosses alone and the boy returns. Finally both boys cross together.

One team drew a diagram to picture the answer:

① BBF ⌇ ⌇   ② F ⌇ ⌇ BB   ③ FB ⌇ ⌇ B

④ B ⌇ ⌇ FB   ⑤ BB ⌇ ⌇ F   ⑥ ⌇ ⌇ BBF
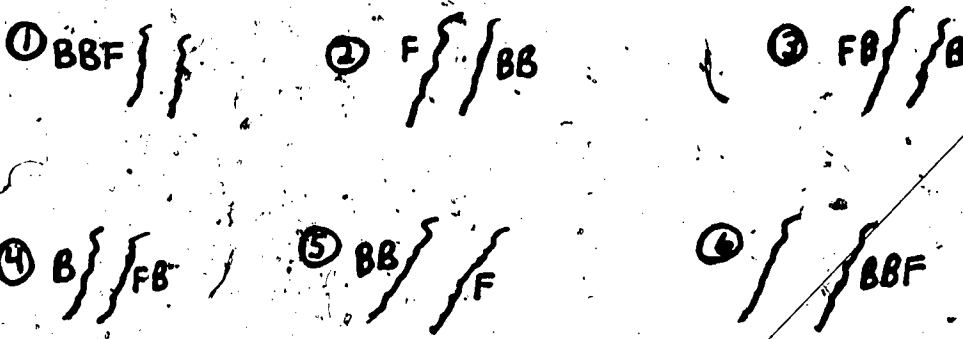
Another team took slips of paper marked (boy) (boy) (father).
They moved the slips across an imaginery river until
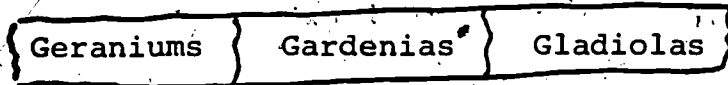they understood how to solve the problem.

1. | Poppies | Petunias |
   |---|---|

2. | Geraniums | Gardenias | Gladiolas |
   |---|---|---|

3. | Geraniums | |
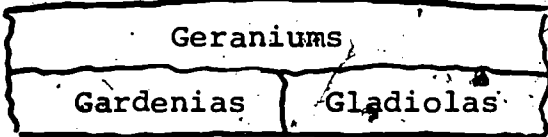 |---|---|
   | Gardenias | Gladiolas |

One team solved the problem by drawing pictures of the
flower gardens. Then they read the problem again and
decided if the picture was a correct answer.

19 RD6

Two candles of equal length are lit at the same time. One candle takes 6 hours and the other 3 hours to burn out. After how much time will the slower burning candle be exactly twice as long as the faster burning one?

20RM6

SRRIIIIINNNGGGGG
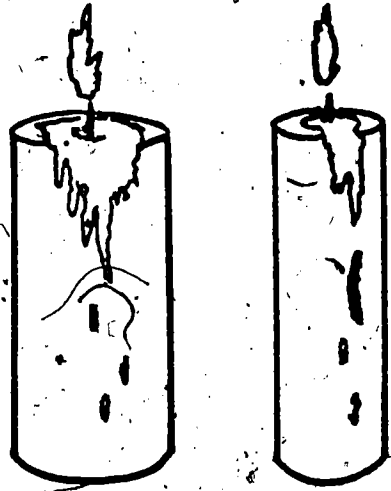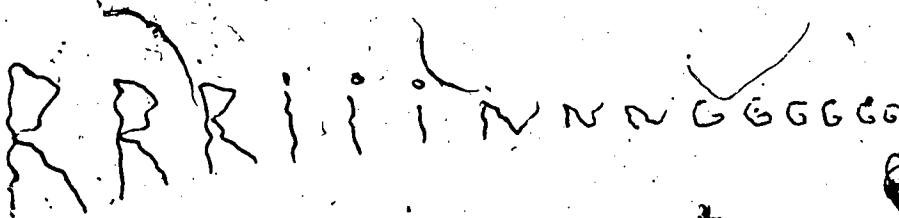
1. Find out how many times the phone rings in 10 seconds.
2. Estimate how long a ring is.
3. Estimate how long the pause is in between each ring.

19RD6
T   2 Hours.

One team drew pictures of the two candles to show how much
would be left after one hour, after two hours, after three
hours.
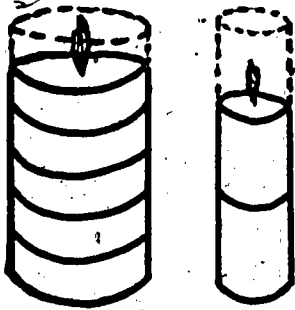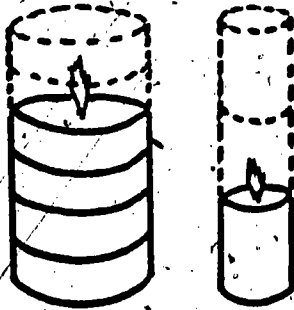
After One Hour   After Two Hours   After Three Hours
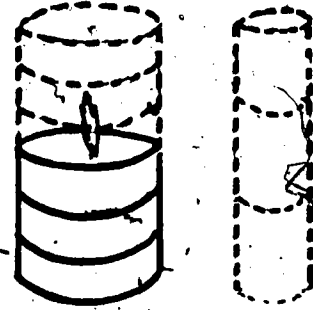
They saw that after two hours 4/6 of the big candle was left and
1/3 of the little candle was left.   4/6 is twice as big as 1/3.

20RM6
T

1. 3 or 4 times

2. A ring is about one second long

3. The pause is about two seconds long.

One team listened to a phone ringing and collected their data.

1. CCHHHH
2. HHHH / cc
3. CHHHH / C
4. CHHH / CH
5. CCHHH / H
6. HHH / CCH
7. CHHH / CH
8. CHH / CHH
9. CCHH / HH
10. HH / CCHH
11. CHH / CHH
12. CH / CHHH
13. CCH / HHH
14. H / CCHHH
15. CH / CHHH
16. C / CHHHH
17. CC / HHHH

10 gallons.

To check their guess one team got a faucet to drip 18 times
in 10 seconds. They put a measuring cup under it and found
the cup was filled in 10 minutes. Then they made this table.

Time	10 min.	1 hr.	1 hr.	24 hrs.	24 hr.	24 hrs.
Water	1 cup	6 cups	3 pts.	72 pts.	36 qts.	9 gal.

Another team checked their guess by getting a faucet to
drip 18 times in 10 seconds. Then they let the faucet drip
into a container for 30 minutes. The container had one
quart of water in it after 30 minutes. Then they made
this table.

Time	30 min.	1 hr.	2 hrs.	2 hrs.	24 hrs.
Water	1 qt.	2 qts.	4 qts.	1 gal.	12 gal.

21 RD6

Four hikers came to a wide river. The only way they could cross the river was in a small boat owned by two children. The boat would hold both children or one hiker. It would not hold a hiker and a child and it would not hold two hikers. How did the hikers cross the river using only the boat?

22 RM6

If a water faucet drips 18 drips in 10 seconds, how much water will be lost in 24 hours? Which of these guesses would you choose?

1 gallon   10 gallons
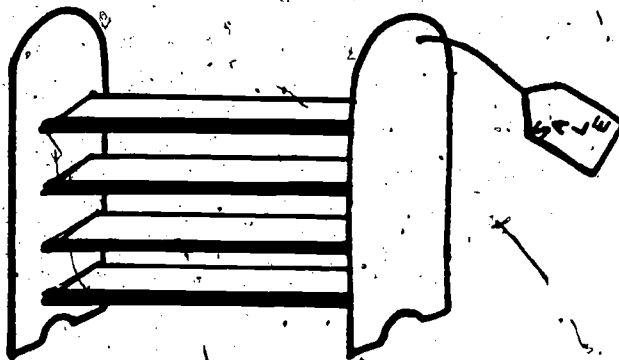
100 gallons   1000 gallons

23RC6

Your dad plants corn in rows that are 30 inches apart. How many rows can he plant in a field that is 375 feet wide?

24RD6

A furniture dealer bought a bookcase for $35.00 and sold it for $40.00. Then he repurchased it for $30.00. He then sold it again for $35.00. How much profit did he make -- $5.00, $10.00, $15.00?

23RC6

T   150 or 151 rows

One team made this table.

Feet	2½	5	25	100	300	75	375
Rows	1	2	10	40	120	30	150

There could be 150 or 151 rows.

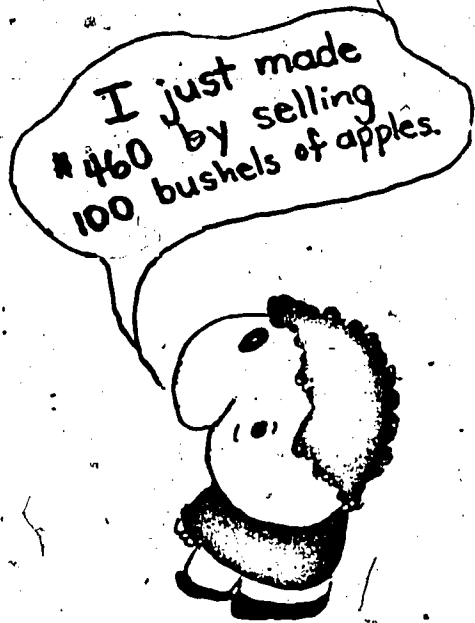If the rows start at the very edge of the field there are 151 rows. Otherwise there are 150 rows.

24RD6

T $10.00

He made $5.00 on the first sale and $5.00 on the second sale.

25RV6

Number 1 Apples
$5.00 a bushel

Number 2 Apples
$4.00 a bushel

I just made
$460 by selling
100 bushels of apples.
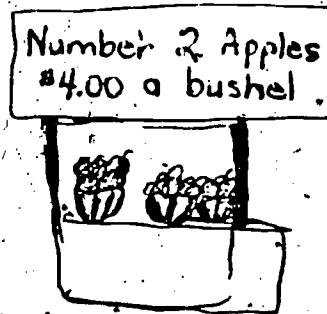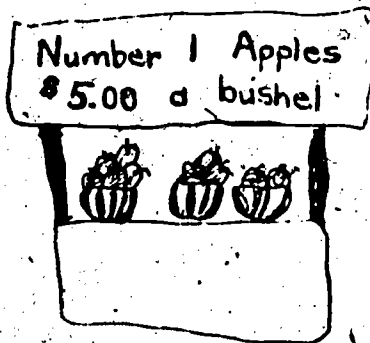
How many bushels of number 1 and number 2 apples did he sell?

26 RM6

The small jar holds 6 ounces.

Peanut Butter — Jar A

Peanut Butter — Jar B
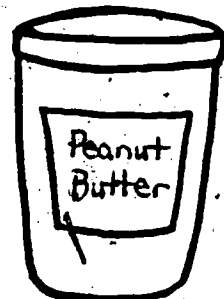
Peanut Butter — Jar C

Estimate how many ounces each of the other two jars hold.

60 bu. of #1 apples (and 40 bu. of #2 apples)

One team made guesses and put them in a table until they found one that worked.

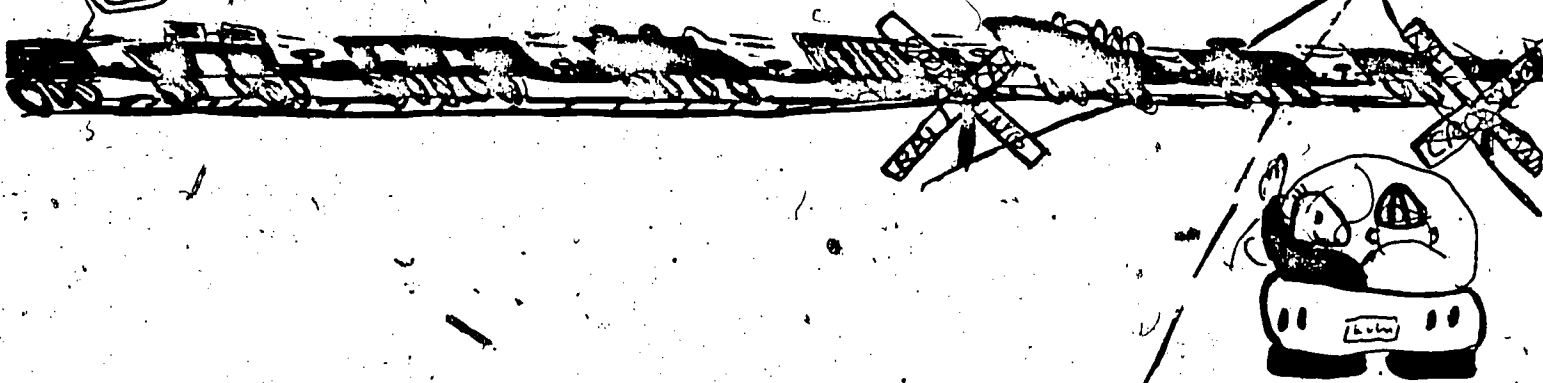| #1	#2	value
10	90	$410
30	70	430
50	50	450
60	40	460

26RM6
T

Jar B   12 Ounces

Jar C   20 Ounces

You are counting railroad cars. 14 railroad cars go by in 1 minute. Railroad cars are about 70 feet long. Estimate the speed of the moving train in miles per hour.

26C6

Your classroom is a big box.

1. Make an estimate for the dimensions of your classroom.

    Length (ℓ) _____ meters
    Width (w) _____ meters
    Height (h) _____ meters

2. Use your estimates to estimate the total surface area of your room.

    Surface Area = $2\ell \times w + 2w \times h + 2\ell \times h$
    Surface Area. _____ square meters.

3. Estimate the volume of your classroom.

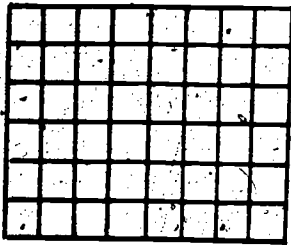   Volume = $\ell \times w \times h$
    Volume _____

1GM6
T
About 12 miles per hour.

One team multiplied 14 times 70. They estimated the train
was moving about 1000 feet a minute or 60,000 feet in 1 hour
(60 minutes). They estimated that 60,000 feet per hour was
about 12 miles per hour.

2GC6
T

The students' estimates of surface area and volume are
dependent on their estimates of the classroom dimensions.

1. One team found that two of their steps were about
   1 meter. They stepped off the length and width and
   then estimated the height.

2. To determine the surface area and volume, one team
   used the formulas. Another team used drawings.
   They estimated the surface area by counting squares.
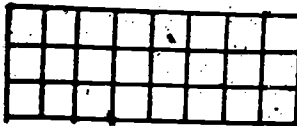
2 long walls   2 short walls

floor and ceiling

3GD6

Make a sequence with nine dots like the ones above
on your paper. Cross all the dots with 4 straight
lines without lifting your pencil.

4GM6

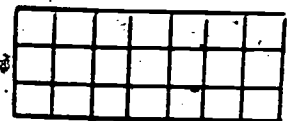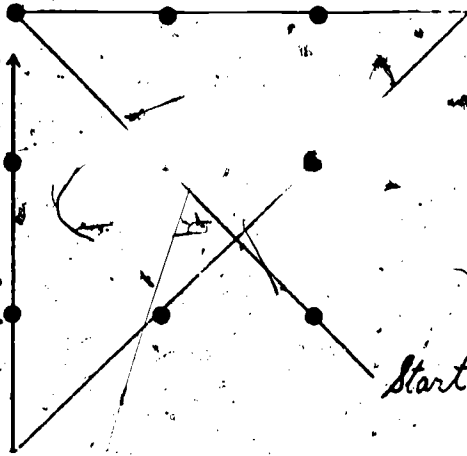|				
...del 229½ Sunnyside	232-1150	...jes Lotte 209 W 5	234-7969	Hegel
...ughton Estella Mrs 331 Sumner	234-4806	Hayes Luverne 420½ E 4	235-7283	Hegenb.
Haughton Sylvester 2605 Idaho	232-2084	Hayes M A 616 Wallgate Av	234-7817	Heggebo r
Haughton William Jr 331 Sumner	234-4806	Hayes Mary 520 Adams	291-6336	Heggebo L
Haugsdal Bruce 1864 Independence Av	233-4219	Hayes Ophelia 235 Jackson	232-1676	Heggebo M
Haupt Ernest G 1228 Maynrd	232-8201	Hayes P J Jr 1012 Grant	232-9122	Heggebo Rob.
Hauptly Rober...l est 425 Washington	232-6561	Hayes Paul Mrs 246 Western	233-1125	Heggebo T M
Res 142 B..ryington Dr	291-7168	Hayes Rearl Rev 1203 Beech	232-2345	Heiberger
Haurum Rick 910 A..borough	233-0417	Hayes R 112 Western Av	234-1964	Heiberger
Haurum Vernon L 2023 Downing	234-4531	Hayes Ray J 515 F 3	233-5012	Heichel M
H..- ...-hall	234-0010	Hayes P..	233-4720	Heichel P.
	234-2934	H	232-8135	Heich
	232-970.			

Find a telephone book.

1. How many phone numbers are on a page?

2. How many phone numbers are in your book?

3. If there are 1,000,000 phone numbers in a
   Chicago phone book, how many pages would it
   take to list them?

3GD6
T

There are other ways to do it.

4GM6
T

1. The students will randomly select a page from the
   phone book and count the numbers on that page. For a
   9" x 11" phone book, a good estimate is 275 to 300
   numbers per page.

2. The students multiplied the number of phones per
   page by the number of pages in the book.

3. 3,333 pages (This answer will depend on the data
   collected in the previous problems.)

5GC6
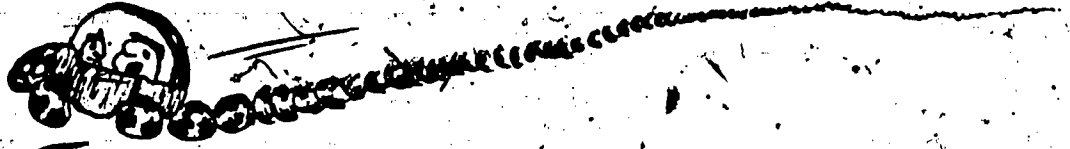
One turn of a car wheel moves the car ahead
about 6 feet. A tire manufacturer guarantees a
tire for 40,000 miles. Estimate how many turns
of the tire are guaranteed by the manufacturer.

6GV6

Lou weighed 5 kilograms more than Len. If Len
weighed twice as much as he does now, then he
would weigh 20 kilograms more than Lou. How much
does each person weigh?

5GC6
T   36,000,000 turns of the tire is a good estimate.

One team divided 5280 (feet in a mile) by 6 and estimated
a car wheel would make 900 turns in one mile. They thought
the manufacturer guaranteed 900 x 40,000 or about 36,000,000
turns of the tire.

6GV6
T

Lou 15 kg   Len 10 kg

One team made this table to record their guess.

Lou	x2	Len	Difference
6	12	6 - 5 = 1	12 - 1 = 11
10	20	10 - 5 = 5	20 - 5 = 15
20	40	20 - 5 = 15	40 - 15 = 25
15	30	15 - 5 = 10	30 - 10 = 20

111

7GM6

About how long is a lima bean? Use your estimate to answer these questions.

1. How many lima beans would make a line across your desk if your desk is 60 centimeters across?

2. How many lima beans would it take end to end to go across your classroom if the classroom is about 10 meters wide?

3. How long a line could you make with 10,000 beans end to end?

4. If there are about 1,200 beans in a pound, how many pounds of beans would you need to go 1 mile (about 1600 meters)?

86C6

PERFECT SQUARES
1
4
9
16

4 is a perfect square because 2 x 2 = 4

25 is a perfect square because 5 x 5 = 25

81 is a perfect square because 9 x 9 = 81

What number can you add to both 100 and 164 to get two perfect squares?

112

7GM6
   T

1. 60 beans
   Most teams estimated a lima bean to be one centimeter long.

2. 1000 beans

3. 10,000 cm or 100 m

4. One team estimated that 1,200 beans would go 1,200 centimeters or 12 meters. In 1 mile (1600 meters) they estimated they would need about 133 pounds.

Something Else to Try:

   About six miles.

8GC6
   T
                         125

One team made guesses that would make 100 plus the guess a perfect square and then checked it for 164.

100 + 21 = 121(11 x 11)   164 + 21 = 185

100 + 44 = 144(12 x 12)   164 + 44 = 208

100 + 69 = 169(13 x 13)   164 + 69 = 233

100 + 96 = 196(14 x 14)   164 + 96 = 260

100 + 125 = 225(15 x 15)   164 + 125 = 289(17 x 17)

113

96D6

Assume that a person can carry 4 days'
supply of food and water for a trip
across a desert which takes 6 days to
cross. One person cannot make the trip
alone because the food and water would
be used after 4 days. How many persons
would have to start out in order for
one person to get across and for the
others to get back to the starting point?

106V6

Mary gave a puzzle to Ed to solve. She said, "I
spent 66¢ and bought 3 gizzies and 2 fizzies. If
I had bought 2 gizzies and 3 fizzies I would have
needed two cents less. How much does a gizzy cost?"
Ed solved the problem in two days. Can you solve it?

9GD6
T
3 Persons Must Start.

One team organized its thinking in this table. The persons
are called A, B, and C. The numbers show the amount of food
supply. The arrows show the direction they're going.

	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
	Begin	End	Begin	End	Begin	End	Begin	End	Begin	End	Begin	End
A	4→	3	4→	3	4→	3	3→	2	2→	1	1→	0
B	4→	3	4→	3	2←	1	1←	0 Home				
C	4→	3	1←	0 Home								

10GV6
T

14 cents for a gizzy (and 12¢ for a fizzy)

115

116M6
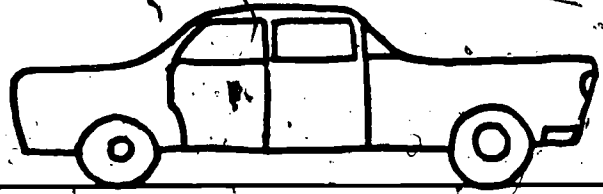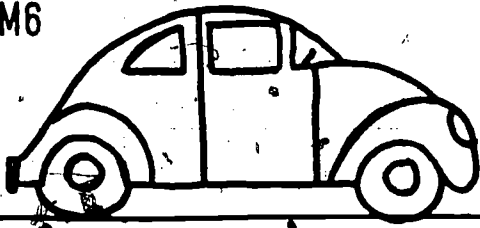
A small car is about 15 feet long and a large car
is about 18 feet long. Use this information to
estimate an answer to these.

1. How many large cars can be parked bumper to
   bumper in 300 feet? (About one block).

2. How many small cars can be parked bumper to
   bumper in 300 feet?

3. A line on the toll way was bumper to bumper
   for 3 miles. About how many cars were on that
   section of the tollway?.

126C6

Railroad ties are 18 inches apart. If the railroad
track from New York to San Francisco is 3000 miles,
how many ties would it take?

116

11GM6
T

1. 16 cars is a good estimate
2. 20 cars
3. Between 880 and 1056

One team used their estimates in parts 1 and 2 to estimate that 18 cars could be lined-up bumper to bumper in 300 feet.

Using 15000 feet to be about 3 miles, they thought:

$$300 \text{ feet} = 18 \text{ cars}$$
$$15000 \text{ feet} = 900 \text{ cars}$$

Something Else to Try

The team estimated that 1 small and 1 large car parked bumper to bumper would make a line 33 feet long. They built a table:

Cars	2	100	100,000,000
Length (feet)	33	1650	1,650,000,000

12GC6
T   10,560,000 Ties

This assumes it is 18 inches from the center of one

tie to the center of the next tie.

117

13GD6

Three explorers and three cannibals
had to cross a river in a small boat.
The boat would carry only two persons
at a time. Knowning the habits of the
cannibals, the explorers knew that
if there were ever more cannibals than
explorers on one side of the river,
they would get eaten. Only one of
the explorers and one of the cannibals
could row. How did they manage to get
across the river?
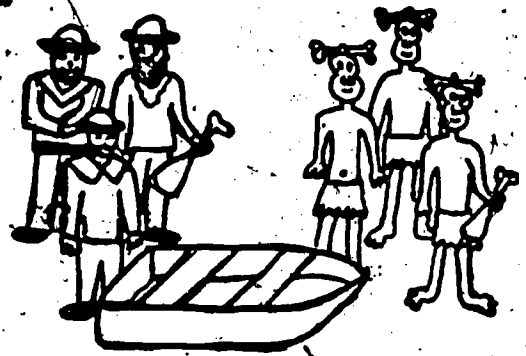
14GV6

Chris found that 5 norks and
5 plorbs weigh 100 grams. Terrie
found that 6 norks and 2 plorbs
weigh 100 grams. What do 10 norks
and 10 plorbs weigh? How can Chris
and Terrie find the weight of one
nork?
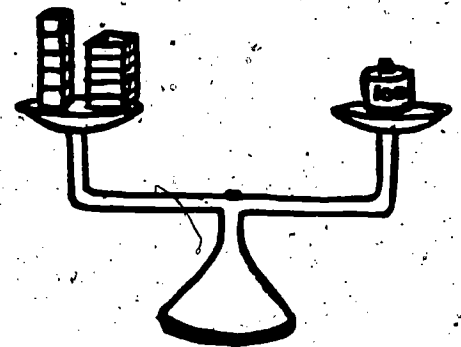
The circled letters indicate the rowers.

1. Ⓒcc
   ⒺEE

2.   C
   ⒺEE   ©C

3.   c©
   EEE   c

4. ⒺEE   c©©

5. ⒺEE
   ©   cc

6. E
   ©   ⒺE
      cc

7. ⒺE
   ©c   E
         C

8. E   ⒺE
   C   ©C

9. ⒺE
   cc   E©

10. CC   ©
         ⒺEE

11. ©cc   EEE

12. C   ©c
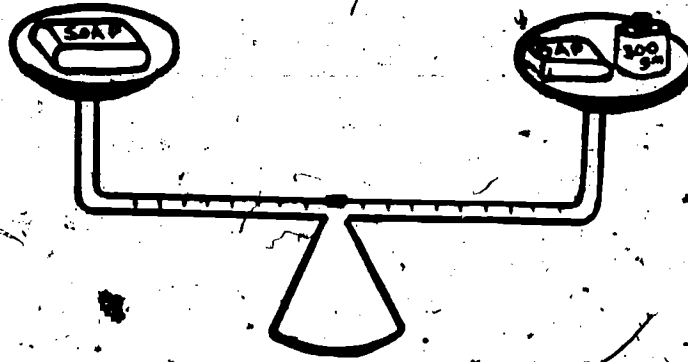   EEE

13. ©c   C
         EEE

14. ©cc
    ⒺEE

10 norks + 10 plorbs weigh 200 grams.
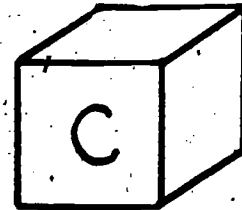30 norks + 10 plorbs weigh 500 grams.

20 norks must weigh 300 grams.
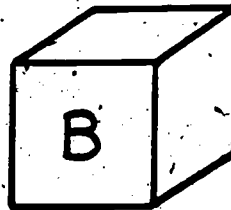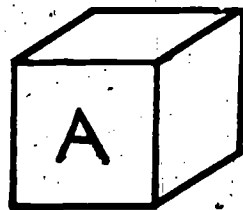
Each nork weighs 15 grams.

119

15GC6

If you place 1 bar of soap on a pan of a scales and 3/4 of a bar of soap and a 300 gram weight on the other, the pans balance. How much does the bar of soap weigh?

16GV6

Use this information to determine how many beans are in these boxes. The sum of the number of beans in A and B is 385. The difference between the number of beans in B and C is 65. The sum of the number of beans in A and C is 320. The difference between the number of beans in A and C is 70.

1200 grams.

One team thought this way:

"300 grams must be equal to 1/4 of the bar of soap.

Therefore, 4 times 300 should be the weight of the soap,

4 x 300 = 1200."

A has 195.   B has 190.   C has 125.

One team organized their guesses in a table. They
first guessed A had 100 beans.

A	B	C	
100	285	220	But 100 − 220 ≠ 70. So they
200	185	120	guessed A had 200. But 200 − 120 ≠ 70
190	195	130	So they guessed A had 190. But 190 − 125 ≠ 70.
195	190	125	So they guessed A had 195. 195 − 125 = 70

Another team looked for two numbers that added to 320
and differed by 70. These numbers (195 and 125) were
the number of beans in A and C. Then they found that
B has 190 beans.

17 6C6

A restaurant, famous for its rolls, doesn't charge
'for them if the diner eats a reasonable number.
There is a charge, however, for each roll eaten above
the magic number. A husband and wife who loved the
crispy rolls, together consumed 13 and were charged
60 cents. Had one person eaten them, the charge
would have been $1.60.
How many rolls can a person eat without being charged?

18GD6
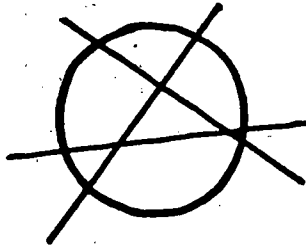
You can cut a pie into 7 pieces with only three
straight cuts. What is the largest number of
pieces you can make with 5 cuts?

5 free rolls each

One team organized its thinking this way.
First they guessed each person got 6 free rolls.
Two persons would get 12 free rolls and have to pay for only
1 roll. That roll cost 60¢. If one person ate 13 rolls
(6 free), 7 would have to be paid for. Then would cost
$4.20, not $1.60.

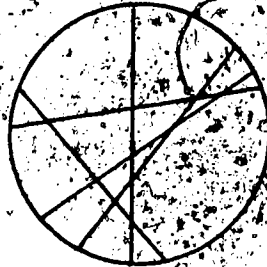Next the team guessed each person got 4 free rolls and then
tested their guess.

	Number of free rolls each person	Number to pay for	cost of rolls
(2 people)	6 *guess*	1	60¢ *check*
(1 person)	6 *guess*	7	(7 x .60 = $4.20)
(2 people)	4 *guess*	5	12¢ *check*
(1 person)	4 *guess*	9	(9 x .12 = $1.08)
(2 people)	.5 *guess*	3	20¢ *check*
(1 person)	5 *guess*	8	(8 x .20 = 1.60)

16 pieces.

One team drew
a picture and
counted the
pieces.

Another team made a list and looked for a pattern.

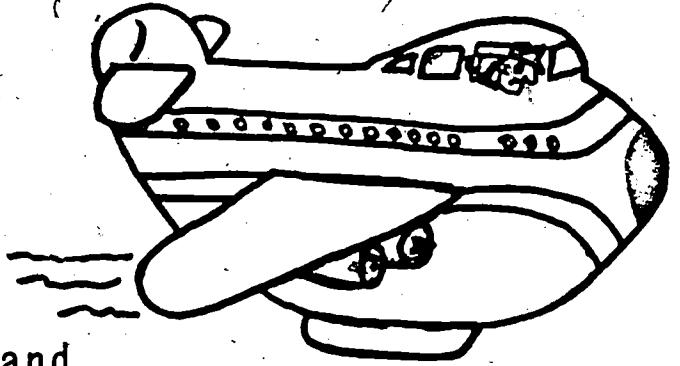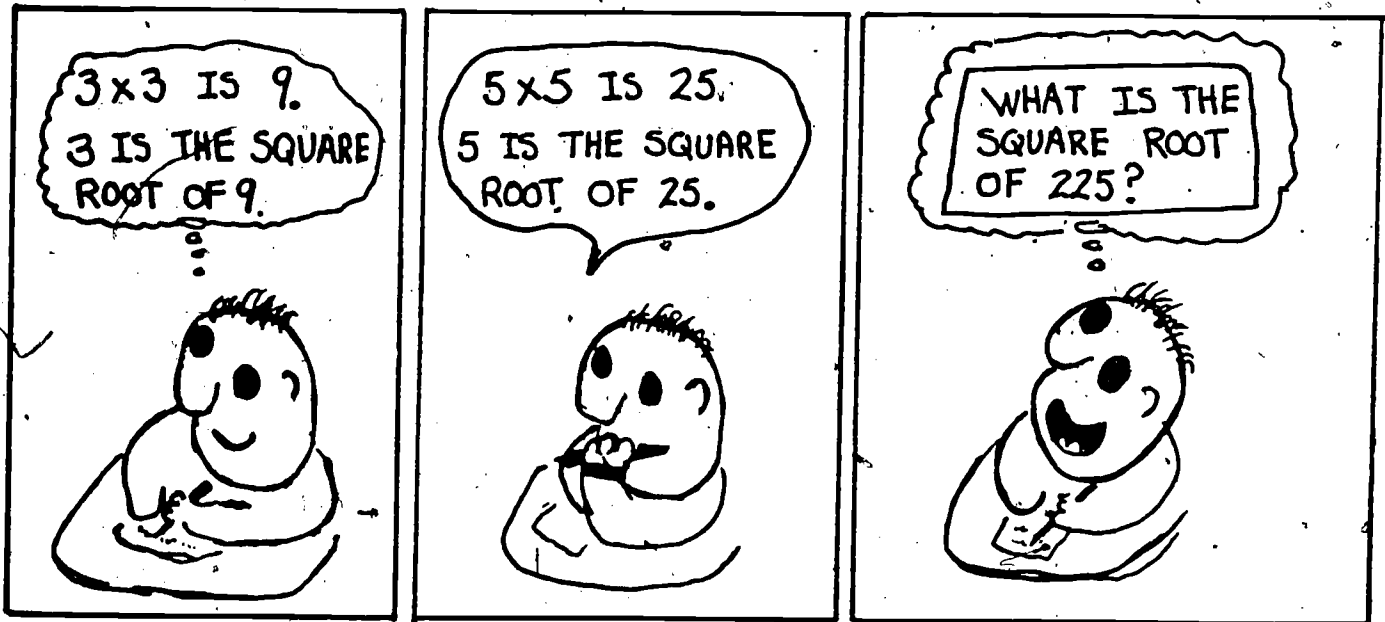| Number of cuts	Number of pieces
0	1
1	2 (1 more added)
2	4 (2 more added)
3	7 (3 more added)
4	11 (4 more added)
5	16 (5 more added)

19GM6

How high is an airplane?

1. You are a passenger on an airplane. The pilot says you are flying at 32,000 feet. Estimate how many miles high you are flying?

2. You look out the window and estimate that it takes you about 5 seconds to fly from one road to the next, which you know is about a mile. How many miles per hour is the plane traveling?

3. The plane took off at an angle of 30 degrees. How far at that angle will the plane fly before it reaches its cruising elevation of 32,000 feet?
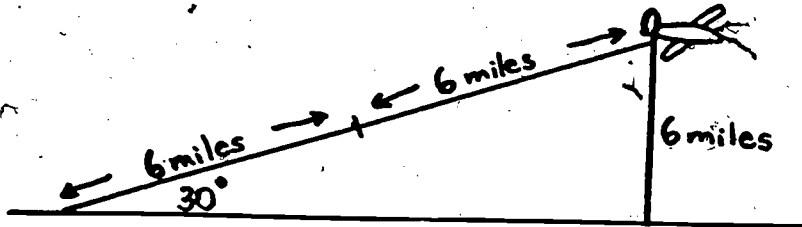
20GC6

3×3 IS 9. 3 IS THE SQUARE ROOT OF 9.

5×5 IS 25. 5 IS THE SQUARE ROOT OF 25.

WHAT IS THE SQUARE ROOT OF 225?

1. 6 miles high is a good estimate.
2. 720 miles per hour is a good estimate. One team
   thought this way: 1 mile in 5 seconds is 12 miles in
   1 minute. 12 miles in 1 minute is 720 miles in 1 hour.
3. One team made this drawing:

They used their drawing to estimate that the plane would
travel 12 miles.

15 is the square root of 225

One team multiplied to find the square root of 225. They

made a list like this:

                    10 x 10 = 100
                    11 x 11 = 121
                    12 x 12 = 144
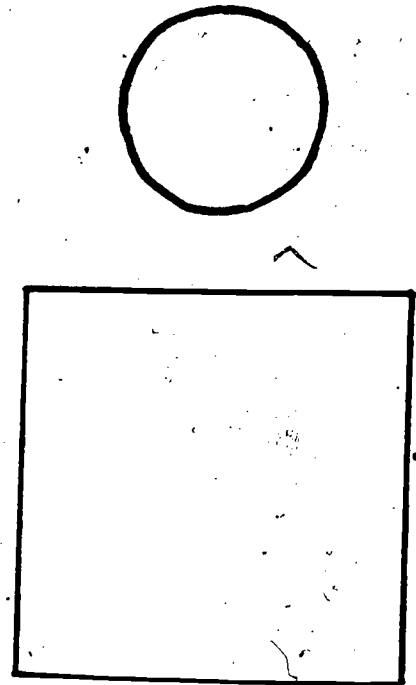   13 x 13 = 169
                    14 x 14 = 196
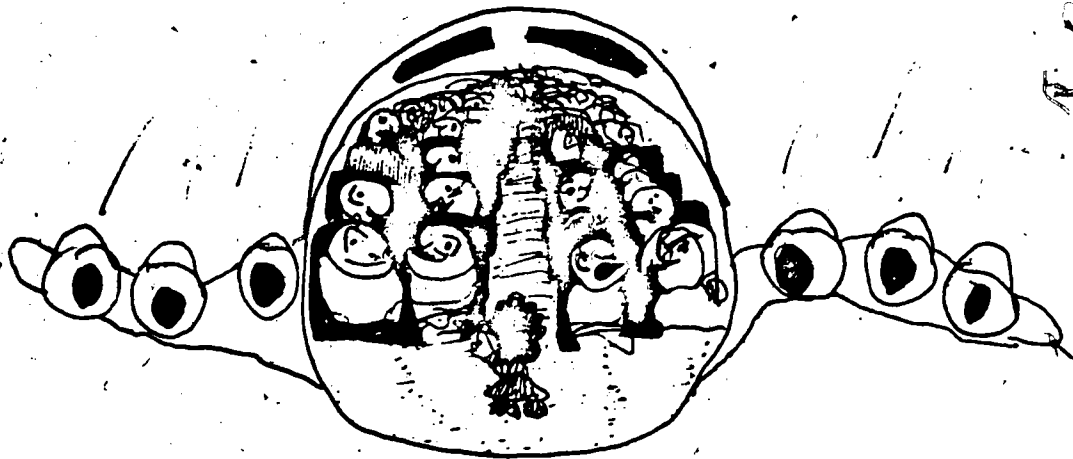   15 x 15 = 225

21GD6

What is the fewest number of
circles you can draw that have
a 1 inch diameter that will
completely cover a square that
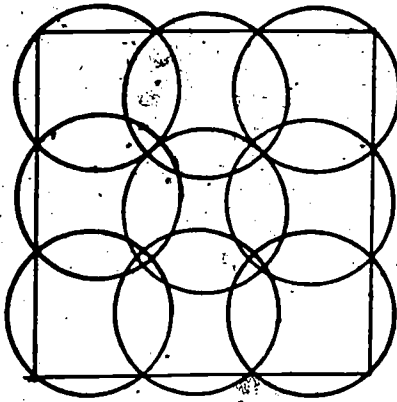is 2 inches on a side?

226V6

The flight attendant counted 70 passenger tickets.
She noted that there were 2 empty seats for every
9 passengers and said there must be two people on
the plane without tickets. How many passengers
will the plane hold?

Nine.

The plane will hold 88 passengers

One team realized there were 72 passengers on the plane.
They built a table to find the number of empty seats.

Empty Seats	2	16
Passengers	9	72

They decided the airplane could hold 16 + 72 or 88 passengers.

23GM6

A bicycle travels about 7 feet forward for each turn
of the wheel.

1. About how many times does it turn in a mile?
The mileage on the odometer on your bike shows 583
miles.

2. About how many times did the wheel turn during
the 583 miles?

24GM6

If you stacked 19 billion
hamburgers, how high would
the stack be?

1. A wheel turns 750 to 755 times in a mile.
2. About 440,000 times.

One team thought this way:

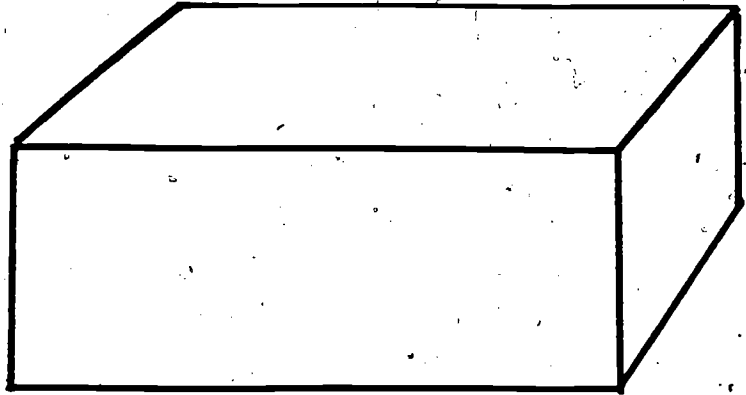| Turn of Wheel	Feet Forward
1	7
10	70
100	700
700 ⟶ (750)	4900 ⟶ (5250)
800	5600

Another team divided 5,280 feet by 7 feet and computed to

solve the problem.

24GM6
  T

19,000,000,000 hamburgers ⟶ 19,000,000,000 inches
⟶ 1,583,333,333 feet
⟶ 299,813 miles

One team found the height of the stack in inches, then
feet (by dividing by 12), then miles (by dividing by 5280).
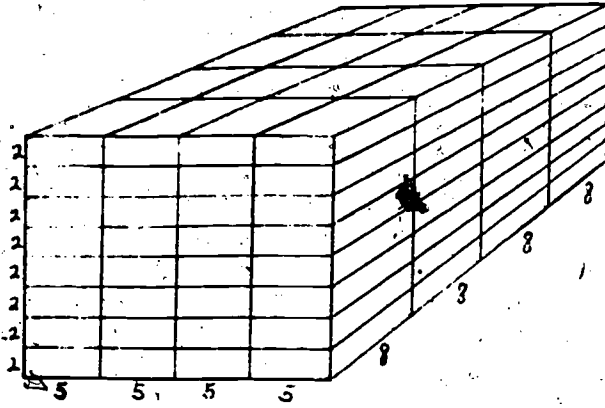
256D6

How many boxes 5 cm by 8 cm by 2 cm can you put in
a box that is 20 cm by 32 cm by 16 cm?

25GD6
T   128 boxes

One team drew a picture and saw they could stack 4 boxes

across, 4 boxes back, and 8 boxes high.

4 x 4 x 8 = 128 boxes

131