SMILE WORKCARDS

Probability Pack Three

Contents

smile

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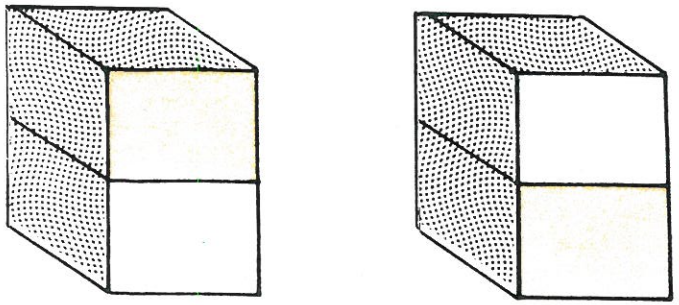
You will need: Centi-cubes

Forty Towers

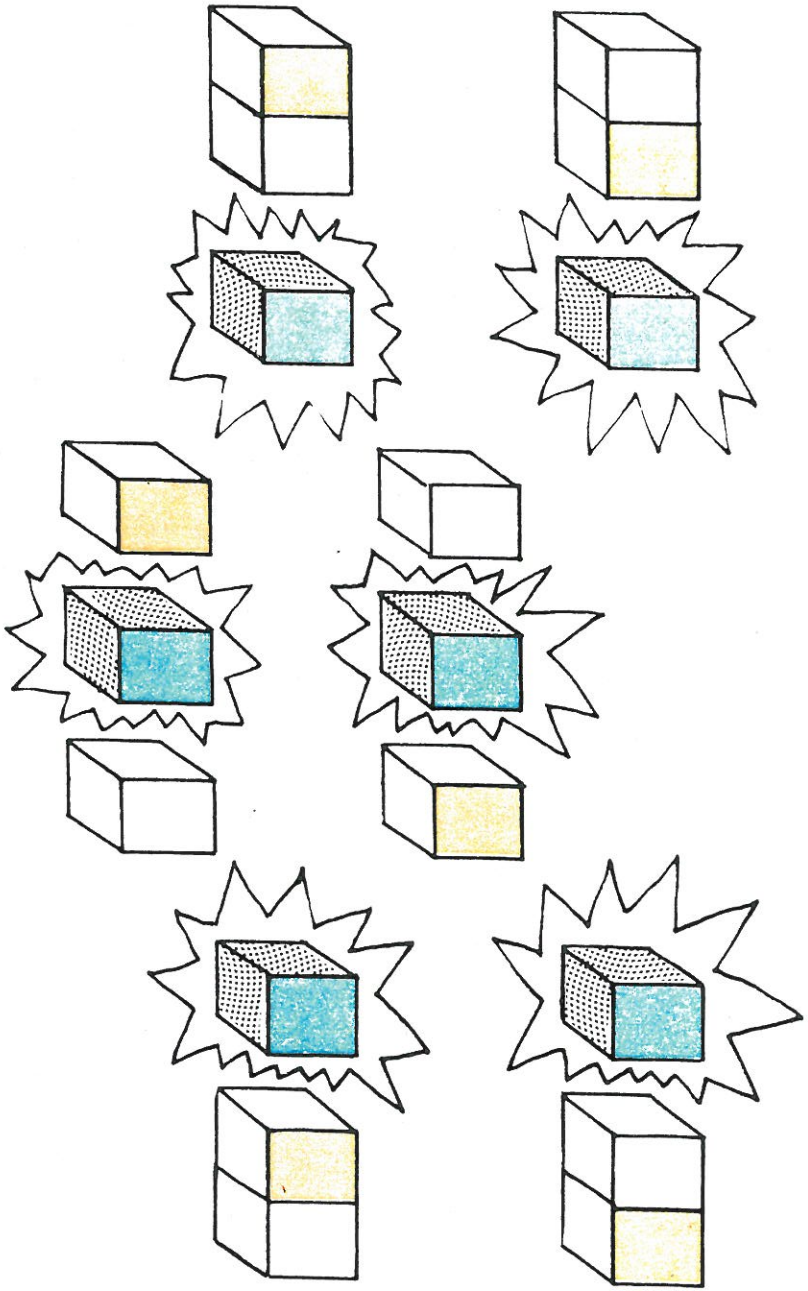
Make both these 2 - towers using yellow and red centi-cubes.



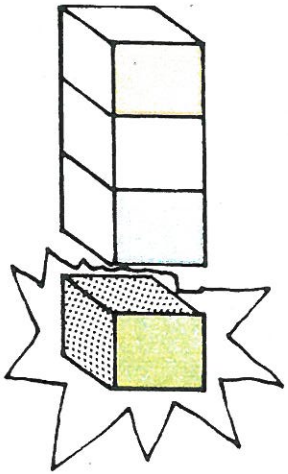
Use these 2 - towers and some blue centi-cubes to make as many different 3 - towers as you can.

ilea

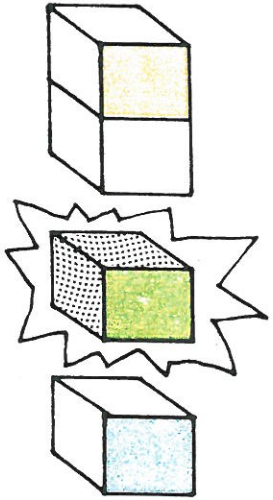
Did you get all these?



How many 4 - towers can you make, which have green at the bottom?



How many 4 - towers are there with green second from the bottom?



How many 4 - towers are there altogether?

Copy and complete this table in your own book.

Number of Colours	Number of different towers	
1	1	1
2	2	2 x 1
3	6	3 x 2 x 1
4		
10		
40		
n		

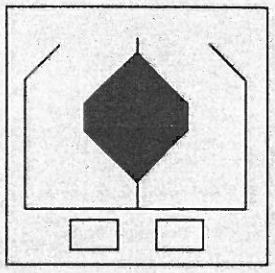
Pinball Experiments

You will need MicroSMILE program *Pinball* and worksheet **2207a**.

Experiment 1

Select [1] level

Drop [40] balls



Record your results on the worksheet.
Empty the balls.

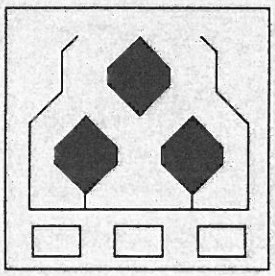
Repeat 4 times.

Predict how many balls will fall into each of the boxes when you drop **100**.
Test your prediction.

Experiment 2

Select [2] levels

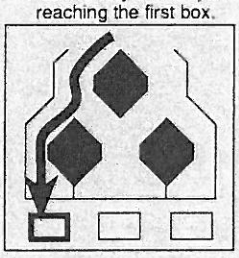
Drop [40] balls



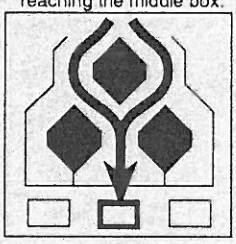
Record your results on the worksheet.
Empty the balls.

Repeat 4 times.

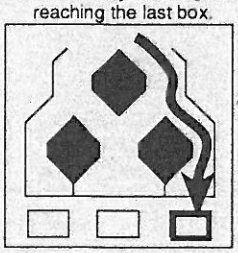
There is only *one* way of reaching the first box.



There are *two* ways of reaching the middle box.



There is only *one* way of reaching the last box.

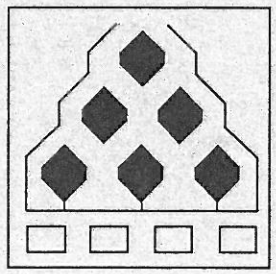


Predict how many balls will fall into each of the boxes when you drop **100**.
Test your prediction.

Experiment 3

Select [3] levels

Drop [40] balls



Record your results on the worksheet.
Empty the balls.

Repeat 4 times.

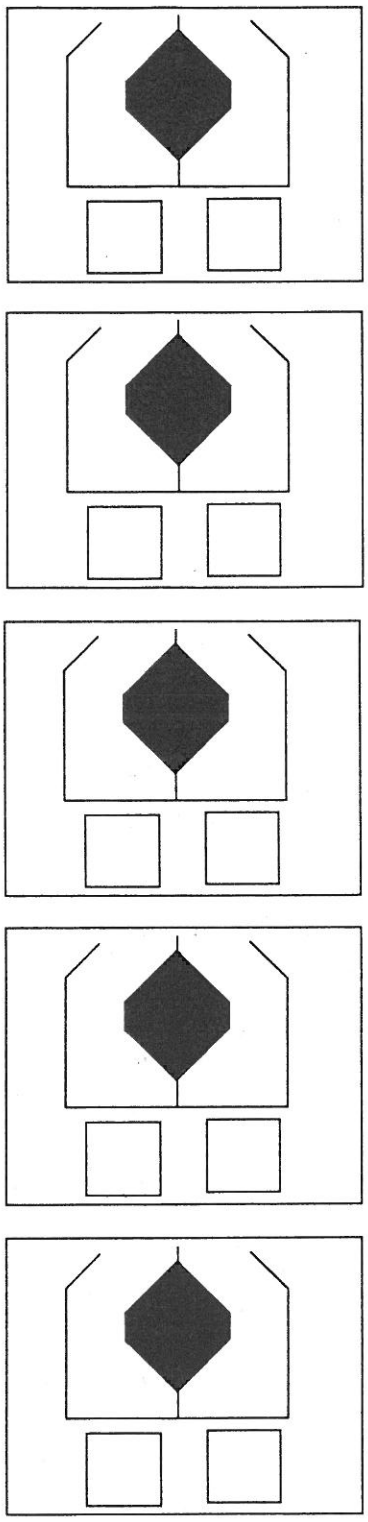
Look at how many ways there are to get to each box.
Predict how many balls will fall into each of the boxes when you drop **200**.
Test your prediction.

Were your test results close to your predictions?

Continue to experiment with *Pinball*, making predictions and testing.

Experiment 1

Dropping **40** balls



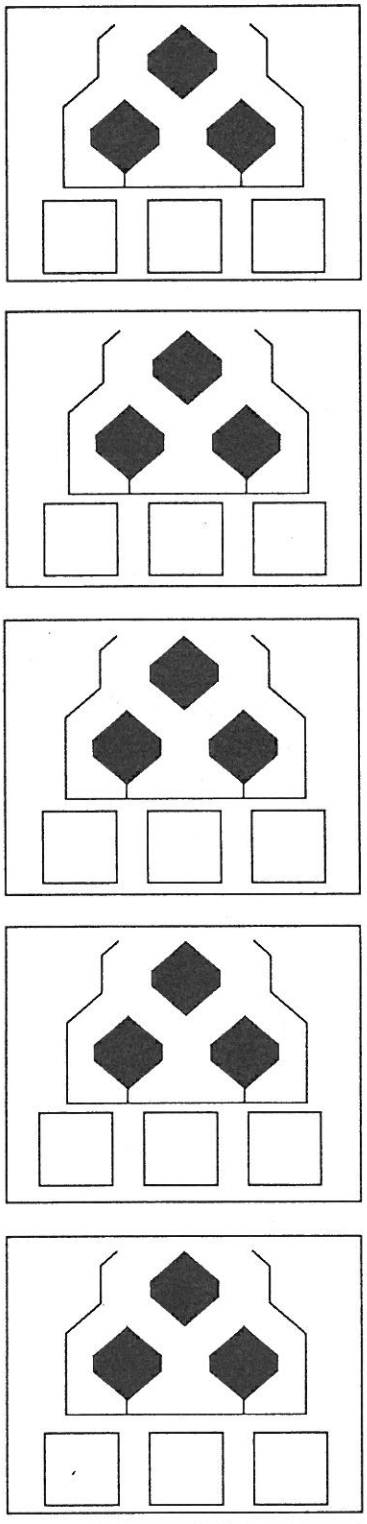
Dropping **100** balls

Predict

Test

Experiment 2

Dropping **40** balls



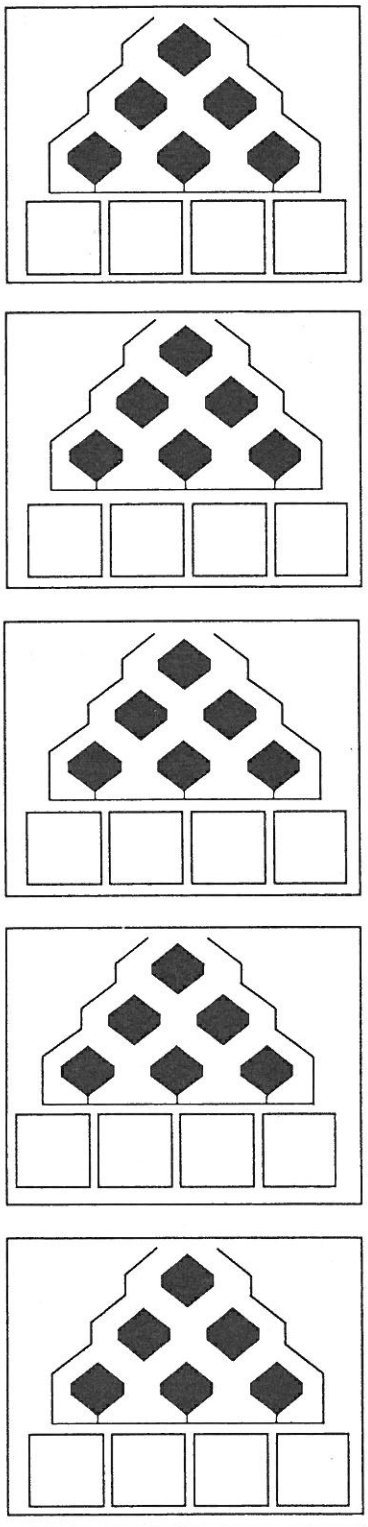
Dropping **100** balls

Predict

Test

Experiment 3

Dropping **40** balls



Dropping **200** balls

Predict

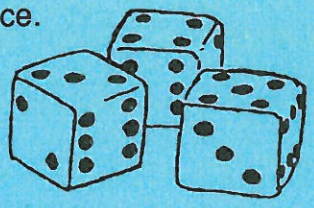
Test

Smile **2100**

Putting it to the Test

An activity for a small group.

You will need 3 dice.



Here are four statements.

1. If you throw two dice, you are likely to see a **6** on one of them.

2. It is easier to throw a **6** with three dice than a **6** with two dice.

3. It is easier to get a total of **8** or more with two dice than to get a total of **11** or more with three dice.

4. If you throw one dice, it is more difficult to throw a **6** than any other number.

- Discuss each statement.
  Predict whether they are true or false or is it difficult to say?
- Test each statement out *at least 20 times.*
- Record your results.
- Discuss your results.
  Do you still agree your original predictions?
  Why?

Probability

A full pack of cards consists of 4 suits

♥ hearts ♣ clubs ♠ spades ♦ diamonds

Each suit contains 13 cards: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen and King.

Picking a card from a full pack of playing cards

There are **52** cards in a full pack of playing cards.

13 of the cards are hearts, **39** are not hearts.

The probability of picking a heart is 13 out of 52 or $\frac{13}{52}$ $(=\frac{1}{4})$

The probability of not picking a heart is 39 out of 52 or $\frac{39}{52}$ $(=\frac{3}{4})$

$\frac{13}{52} + \frac{39}{52} = \frac{52}{52} = 1$ You can either pick a heart or not pick a heart, the two events are mutually exclusive.

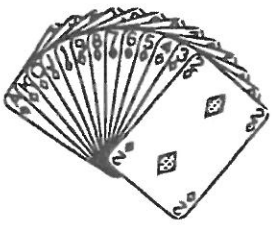
The total probability of **all** mutually exclusive outcomes is 1.

If you know the probability of an event occurring you can find the probability of the event not occurring by subtracting from 1.

The probability of picking an ace is $\frac{4}{52}$

The probability of not picking an ace is $1 - \frac{4}{52} = \frac{48}{52}$ $(=\frac{12}{13})$

A card is picked from a full pack of playing cards.



What is the probability of:

1. a) getting the ace of spades?
   b) not getting the ace of spades?

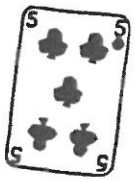
   Check that your probabilities for questions a) and b) total 1.

2. a) getting a king?
   b) not getting a king?

3. getting a diamond?
4. not getting a diamond?

Picking a card from a pack of playing cards with *one* card missing

A pack of cards has the five of clubs missing.



There are **51** cards in this pack.

12 of the cards are clubs, **39** are not clubs.

The probability of picking a club is 12 out of 51 or $\frac{12}{51}$.

The probability of not picking a club is $1 - \frac{12}{51} = \frac{39}{51}$.

$\frac{12}{51} + \frac{39}{51} = \frac{51}{51} = 1$ You can either pick a club or not pick a club, the two events are mutually exclusive.

The total probability of **all** mutually exclusive outcomes is **1**.

A card is picked from a pack of playing cards, which has the seven of hearts missing.

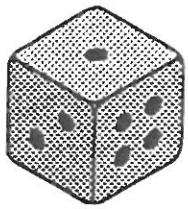
What is the probability of:

5. a) getting a spade?
b) not getting a spade?

6. a) getting a heart?
b) not getting a heart?

7. a) getting a 7?
b) not getting a 7?

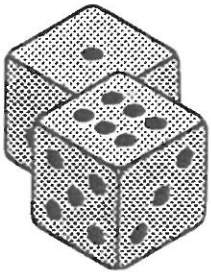
Check that your probabilities for a) and b) total 1 each time.



A dice is rolled

What is the probability of:

8. getting a number greater than 4?
9. getting a number less than 1?
10. getting a 7?
11. not getting a 6?
12. getting a number less than 3?



Two dice are rolled

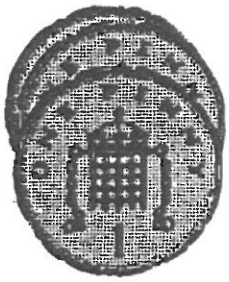
Copy and complete the table of all the possible total scores.

Dice 1

Dice 2	1	2	3	4	5	6
1	2	3	4			
2	3	4				
3	4					
4						
5						
6						

What is the probability of:

13. getting a total score of 10?
14. not getting a total score of 10?



Three coins are tossed

One possible outcome is Heads, Heads, Tails (HHT).
List all the possible outcomes.

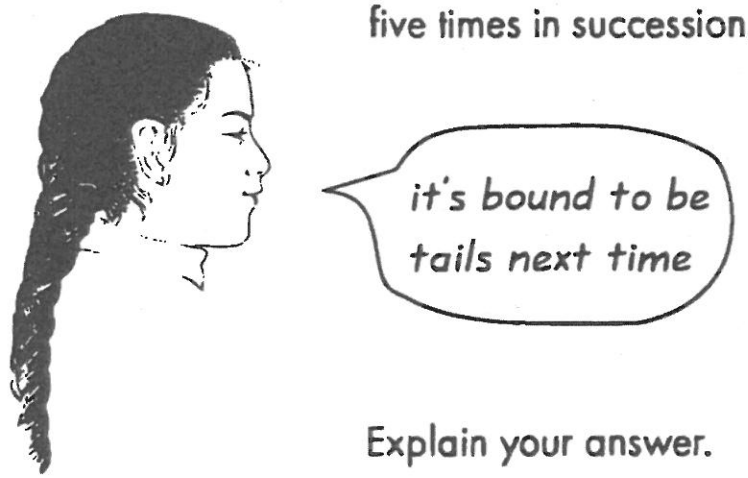
What is the probability of:

15. getting *exactly* two heads?
16. getting *at least* two heads?

17. What is the smallest probability of an event?
What is the largest probability of an event?
[Look at your answers for questions 9) and 10).]

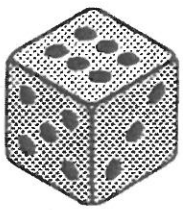
18. If the probability that a person chosen at random is left-handed is $\frac{1}{20}$, what is the probability of being right-handed?

19. A coin is being tossed and heads have come up five times in succession.



Is she correct?

Explain your answer.



20. A dice is rolled 600 times.
About how many times would you expect a number greater than 2 to turn up?

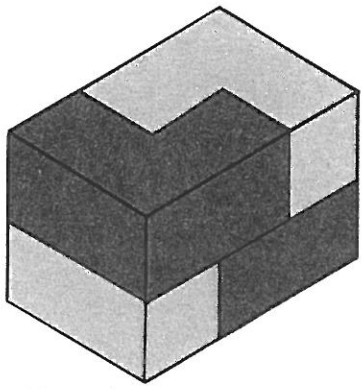
PROBABILITY KITTY

Permutating Tricubes

You will need a set of DIME Tricubes.

Four tricubes make

a **3** x **2** x **2** cuboid.



Using two colours, how many different ways can you make a **3** x **2** x **2** cuboid?

How can you be sure you have found all the different ways?

Explain the system you are using.

Use three colours. . .

Find the fakes!

Six students were asked to toss a coin 50 times each and record the results. Some of them couldn't be bothered tossing a coin, and simply invented their results. They all filled in their tables row by row.

Here are the six sets of results
(T = tail, H = head)

Artie

H	T	T	T	T	H	H	T	H	H
T	T	H	T	T	T	T	H	H	H
T	T	H	H	T	T	T	H	T	T
T	T	H	T	H	H	H	T	H	H
H	H	H	H	T	H	H	H	H	H

Sue

T	T	H	T	T	T	T	H	H	H
T	T	H	T	H	T	H	T	T	T
T	H	T	H	H	T	H	H	H	H
T	H	H	H	T	H	H	H	T	T
T	H	H	T	H	T	H	T	H	H

Maria

H	T	T	H	H	T	T	H	T	H
T	H	T	H	T	H	T	T	H	T
H	T	H	H	T	H	T	T	H	H
T	H	T	H	T	H	T	H	T	H
T	H	H	T	H	T	H	T	H	H

Simon

T	H	H	H	H	H	H	H	T	H
H	T	T	T	T	H	H	T	H	T
T	H	T	T	T	T	T	H	T	H
T	T	T	H	T	H	T	T	T	T
H	T	H	H	H	T	T	T	T	T

Debbie

T	T	H	H	T	H	T	T	T	T
H	H	T	T	H	H	H	T	T	H
H	H	H	H	T	H	H	H	T	T
H	T	H	H	T	H	H	T	T	H
H	T	H	H	T	H	H	H	H	H

Bob

H	T	T	H	T	H	T	T	H	T
H	H	T	T	H	T	H	H	T	H
T	T	H	H	T	H	T	T	H	T
T	H	T	H	H	T	H	T	H	T
H	T	H	T	T	H	T	H	T	T

Which sets of results were faked?
Justify your conclusions.

PROBABILITY KITTY 2

KITTY HAD TWO FRIENDS WHO SHE LIKED EQUALLY WELL ..... SARAH AND IRENE

EVERY SUNDAY SHE WOULD VISIT ONE OR THE OTHER. SHE WOULD LET LUCK DECIDE WHICH.....

EACH FRIEND LIVED THE SAME DISTANCE IN OPPOSITE DIRECTIONS FROM KITTY'S STATION

THE INTERVAL FOR TRAINS GOING IN BOTH DIRECTIONS WAS TEN MINUTES

KITTY WOULD LEAVE HER HOUSE AT A RANDOM TIME EACH SUNDAY.....

..... AND SHE WOULD GET ON WHICHEVER TRAIN CAME FIRST

YET.....

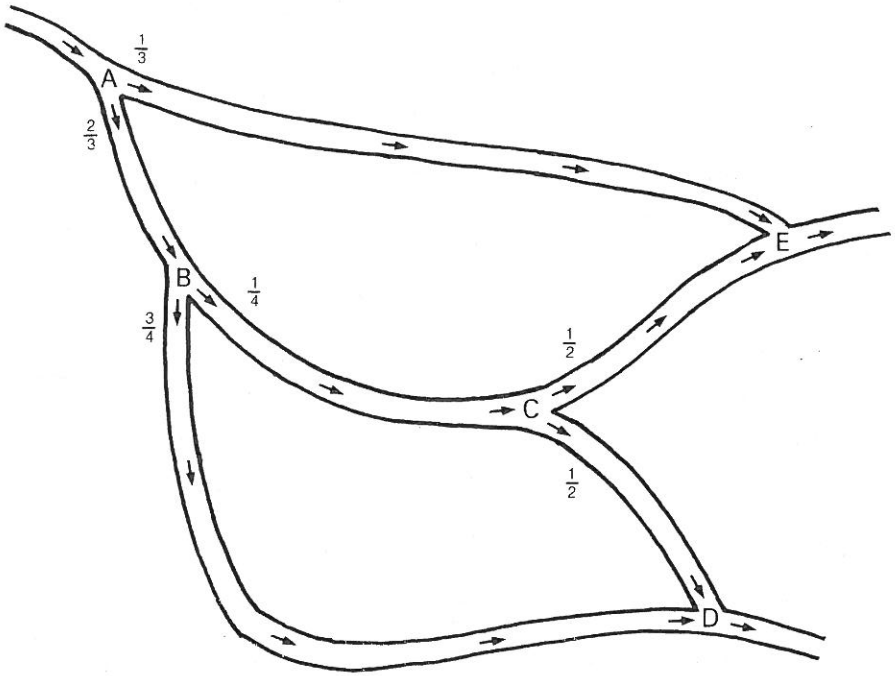
NINE TIMES OUT OF TEN KITTY WOULD VISIT IRENE. CAN YOU SAY WHY?

HI KITTY!

HELLO AGAIN!

WHY DOESN'T KITTY VISIT ME VERY OFTEN?

Combined probability

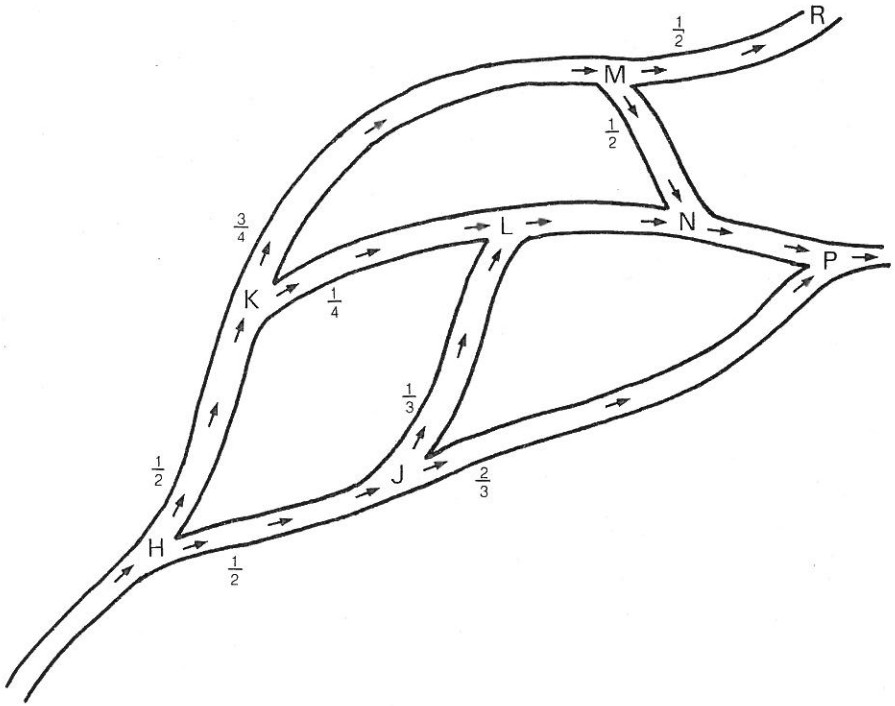


This is a network of roads. Cars travel in the direction of the arrows. At each junction, the traffic is expected to divide as shown. During the evening rush hour, 2400 cars pass through the network.

1. How many cars would you expect to take the left fork at C?

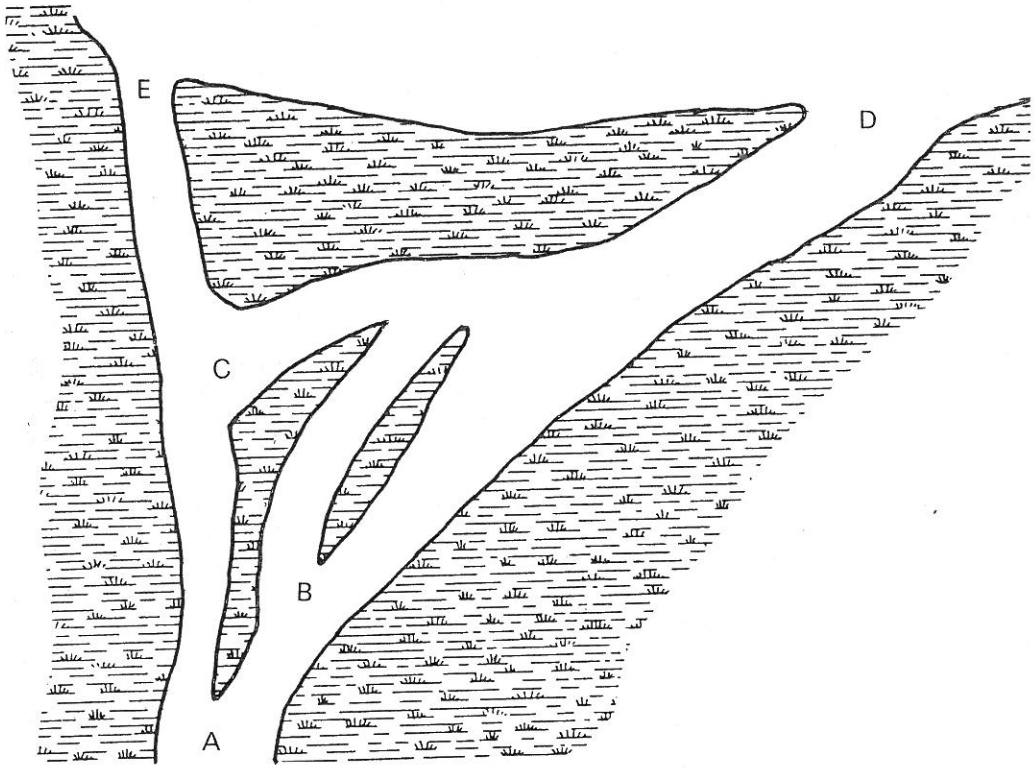
How many cars would you expect to pass through E?

What is the probability that a car will pass through D?



2. What is the probability that a car will pass through L?

   What is the probability that a car will pass through P or R?



This is a river delta. At A, $\frac{1}{5}$ of the river water goes off to the left. $\frac{1}{4}$ of the water arriving at B goes down the left channel whereas at C, the water divides evenly.

3. What is the probability that a leaf floating down the river enters the sea at D?

Probably Probable?

Sunita used the **Pinball** program from **MicroSMILE 11 More.**

Each time she set the probability boxes, she recorded the outcome.

For **A**, **B** and **C** find the numbers you would need to put into the probability boxes to achieve similar results.

A. What probability do you think Sunita chose to give these outcomes?

outcome 1	66	26	8	0	0
outcome 2	65	32	3	0	0
outcome 3	71	26	3	0	0

B. What do you think the probability was this time?

outcome 1	0	1	15	58	109	67
outcome 2	0	3	13	49	99	86
outcome 3	0	3	12	48	111	76

C. What do you think the probability was this time?

outcome 1	0	5	23	38	34
outcome 2	2	7	21	43	27
outcome 3	1	8	31	40	20