R R R
G Ϭ Ϭ
ω ω ω
B B B

**LUCKY DIP
25¢ A CHANCE
3 balls the same color
WIN $5**

RGWB
16 16 16 16

RGWB
4 4 4 4

RGWB

Ann is in charge of a **Lucky Dip** to raise money for charities.

Each barrel contains an equal number of red, green, white and black balls.

The balls are buried in sawdust so that you cannot see them before you pick one out.

To play the game, you give Ann your 25¢, then you pick one ball from each barrel.

You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once.

$$\frac{1}{16}$$

$$16 \times 4 = 64 \qquad \frac{4}{64} = \frac{1}{16}$$

2. Do you think that the **Lucky Dip** will raise money for the local charities?

No

Show your calculations.

$$0.25 \times 16 = 4$$

16 turns = $4 gained.
$5 prize.
$ -1 lost.

CCR 2

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations.

Change one

<u>75¢ a chance</u>

75¢ a chance; get 3 balls the same color; win $.5. Calculations

$16.4 = 64$ $\frac{4}{64} = \frac{1}{16}$, $0.75 \times 16 = \$12$. In 16 turns, it will raise $12

but one person will win causing a decrease in $5 Basically in 64 turns

the game will raise $11. Using ratios, you raise $0.171875 every time
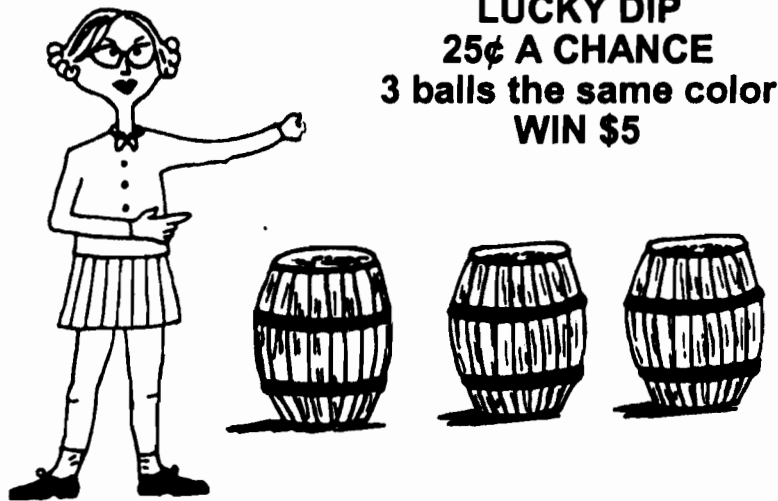
some one takes a turn.

Change two

<u>more panels</u>

Have an extra panel. 75¢ a chance. Get 4 balls, win $5 Calculations

All same color = $4 \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$. If 64 turns it will raise

$48, but one person will be winning causing a decrease of $5

so $48 - $5 = $43. So they could drop the price down to persuade

more people to play. so at 25¢ it would be $16 - $5 = $11 win.

CCR 2

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You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once.

$\frac{1}{64}$

$$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$$

2. Do you think that the **Lucky Dip** will raise money for the local charities?

yes

Show your calculations.

$64 \times .25 = ^\$16$

$16 - 5 = 11$

CCR 2

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations.

Change one

$38 more

put 2 more colors in the bins

$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$ $216 \times .25 = 54$ $54-5 = 49$ $49-11 = 38$

Change two

$48 more

add another bin so you need 4 balls of the same color

$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{256}$ $256 \times .25 = 64$ $64-5 = 59$ $59-11 = 48$

CCR 2

LUCKY DIP
25¢ A CHANCE
3 balls the same color
WIN $5

$$\frac{4}{4} \times \frac{1}{4} = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

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You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once. $\frac{1}{16}$

2. Do you think that the **Lucky Dip** will raise money for the local charities?   NO

Show your calculations.

You play 16x & pay 25¢ each time
16×25¢ = $4 by probability you win once
out of 16x and you win $5 thus you
loose $1

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations.

Change one

+1 one barrel, $\frac{1}{64}$ chance of winning

Increase the number of barrels,
If Ann increases the number of barrels by 1
probability of winning decreases and she will
earn more money becase for the peson to win they have

$\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{1}$

$\frac{1}{4} \cdot \frac{1}{4} = \frac{1}{4} = \frac{1}{16} \times \frac{1}{4} = \frac{1}{64}$

to spend $16.
earn $11

Change two

more colors

Increase the number of colors
probabity changes to $\frac{1}{5}$ for each barrel
probability you win decrease $\frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5} = \frac{1}{25}$
25·25¢ = $6·25 so earn $1·25

CCR 2

Charity Fair

LUCKY DIP
25¢ A CHANCE
3 balls the same color
WIN $5

Ann is in charge of a **Lucky Dip** to raise money for charities.

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You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once. $\frac{1}{16}$

rrr rrg rrw rrb rgg rww rbb rgr rgw rgb rwr rwg rwb rbr rbg rbw
... ...

$16 \cdot 4 = 64$ $\frac{4}{64}$ or $\frac{1}{16}$

2. Do you think that the **Lucky Dip** will raise money for the local charities?   *No*

Show your calculations.

Since $0.25 \cdot 20 = 5$

And $20 \cdot \frac{1}{16} =$ more than 1

So before she can get $5
the $5 is already gone because
Someone already win it due to the
fact that 20 times has more than 100% chance

CCR 2

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations.

Change one

Lower winning price to $3

Since before save up to $5, player has more than 100% and before $4 player has exactly 100%. So $3 is a good price yet not 100% win chance for the player to have before spending $3.

Change two

Increase cost for a chance

If she increase cost for one chance, the player will pay her $5 before the player's chance of winning raise to 100%.
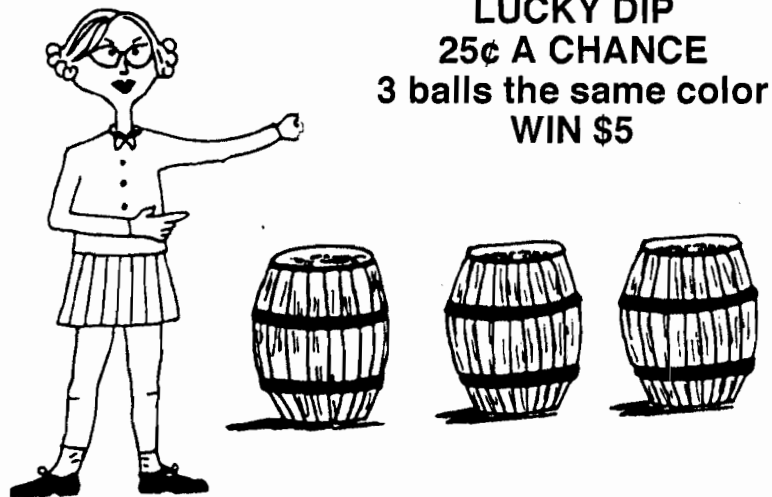
CCR 2

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To play the game, you give Ann your 25¢, then you pick one ball from each barrel.

You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once.

$$1 \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$$

$$\frac{1}{16}$$

1st barrel   2nd barrel   3rd barrel

2. Do you think that the **Lucky Dip** will raise money for the local charities?

No

Show your calculations.

Prize ratio $= \frac{\$5}{\$0.25} = 20$

Chance of winning $= \frac{1}{16}$

$20 \cdot \frac{1}{16} = 1.25 > 1$

Ann loses money

CCR 2

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations. $N = \#$ of people playing

Change one

$\frac{11}{16}N$

Increase the amount of money to play to $1. Now the price ratio is 5; chance of winning is $\frac{1}{16}$; Multiply them to get $\frac{5}{16}$ which is less than 1. Therefore, Ann will make more money. If n people come to play, n is large, Ann's income will be $1 \cdot n$. Price money $= \frac{1}{16} \cdot n \cdot 5 = \frac{5}{16}n$. Money to charity $= 1n - \frac{5}{16}n = \frac{11}{16}n$.

Change two $N = \#$ of people playing

$\frac{11}{64}N$

Decrease the chance of winning to $\frac{1}{64}$ by making the player pick two balls of the same color out of the last barrel instead of one ball (all balls must be same color). Ann's income: $0.25 \cdot N$
Players' income: $\frac{1}{64} \cdot N \cdot 5$ $0.25N - \frac{5}{64}N = \frac{11}{64}N$. Money to charity.

$\frac{11}{64}N$

CCR 2