Date: _____

Probability problem solving 1

Sit down with a pen and paper.

Calculator allowed

Understanding probability

You will now take part in **7 bets.**

You are going to start with **7 counters.**

Draw this table.

All 7 events were carried out for real.

Question	+/- Counters	Total (7)
1		
2		
3		
4		
5		
6		
7		

The aim is to get as many counters as possible by making smart choices.

1 counter to play

One coin flip ← Event

If you guess it right you win 2 counters.

You have to pay to take the bet. If you lose the bet you lose this counter.

Heads (1 counter)

What's my chances?

Tails (1 counter)

Here are your options along with your bet to play. Click to make a decision.

Unsure? Click here to see what your chances are.

Not playing

1 counter to play   One coin flip

If you guess it right you win 2 counters.

Heads (1 counter)

What's my chances?

Tails (1 counter)

Not playing

This is gambling.

Gambling: Sacrificing a quantity (money) for a chance to win more.
Take risky action in the hope of a desired result.

Outcome: A possible result.

Desired outcome: The result you want to happen.

Flipping a coin has two outcomes, **heads or tails.**

If you want to work out the probability use this formula.

$$Probability = \frac{Desired\ outcome}{Total\ number\ of\ outcomes}$$

You want one of the outcomes to happen.

$$Probability\ of\ winning\ a\ coin\ flip = \frac{1}{2}$$

There are two outcomes.

$$\frac{1}{2} = 0.5 = 50\% = Even$$

Update your table

Outcome

1 counter to play

One coin flip

If you guess it right you win 2 counters.

Heads (1 counter)

Question	+/- Counters	Total (7)
1	+1	8

Tails (1 counter)

Question	+/- Counters	Total (7)
1	-1	6

Not playing

Question	+/- Counters	Total (7)
1	0	7

1 counter to play

One roll of a dice

If it is a six you win 5 counters.

Take the bet

What's my chances?

Not playing

This is gambling.

The **betting industry** is a **big business** making money from it's players.

The industry is based on mathematics and specifically **probability**.

They will not offer a bet that will lose them money in the long term so it is important to know the mathematics.

What are my chances?

1 counter to play	One roll of a dice

If it is a six you win 5 counters.

1 If you roll the dice **6 times**, how many 6's will you expect to get?

2 If you roll the dice **600 times**, how many 6's would you expect to get?

Let's say you take this bet **6 times** and **win once**.

3 How much have you paid to play?

4 How many counters did you get from wins?

This is what we expect to happen.

5 How much have you lost altogether?

1 counter to play

One roll of a dice

If it is a six you win 5 counters.

1 If you roll the dice **6 times**, how many 6's will you expect to get? **1**

2 If you roll the dice **600 times**, how many 6's would you expect to get?

100

Let's say you take this bet **6 times** and **win once**.

3 How much have you paid to play? **6 counters**

4 How much have you won? **5 counters**

5 How much have you lost? **1 counter**

If you scaled this up to 600 rolls you should expect to lose 100 counters. **Over time you will always be losing counters. It is certain.**

1 counter to play

One roll of a dice

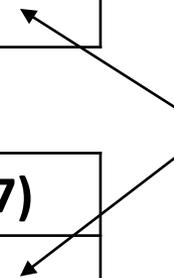**If it is a six you win 5 counters.**

<u>Outcome</u>

Take the bet

Question	+/- Counters	Total (7)
2	-1	

Update

Not playing

Question	+/- Counters	Total (7)
2	0	

1 counter to play

One roll of a dice

If it is a one you win 7 counters.

Take the bet

What's my chances?

Not playing

1 counter to play   **One roll of a dice**

If it is a one you win 7 counters.

1   If you roll the dice **12 times**, how many 1's will you expect to get?

2   If you roll the dice **240 times**, how many 6's would you expect to get?

Let's say you take this bet **36 times** and **win 6**.

3   How much have you paid to play?

4   How many counters did you get from wins?   This is what we expect to happen.

5   How much have you won altogether?

1 counter to play

One roll of a dice

If it is a one you win 7 counters.

$$\frac{1}{6} \, of \, 12 = \frac{1}{6} \times 12$$

1 If you roll the dice **12 times**, how many 1's will you expect to get? **2**

2 If you roll the dice **240 times**, how many 6's would you expect to get?

Let's say you take this bet **36 times** and **win 6**.

$$\frac{1}{6} \times 240 = 40$$

3 How much have you paid to play? **36 counters**

This type of bet would not be profitable for a betting company unless it is used to make you spend money on more profitable bets.

4 How many counters did you get from wins?

42 counters

5 How much have you won altogether?

6 counter

1 counter to play

One roll of a dice

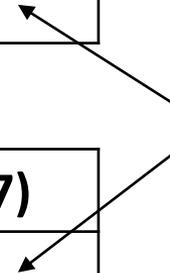**If it is a one you win 7 counters.**

Outcome

Take the bet

Question	+/- Counters	Total (7)
3	-1	

Update

Not playing

| Question	+/- Counters	Total (7)
3	0	

The next four problems will be next lesson.

Keep hold of your table.

Now test your understanding.

1 What is the probability of rolling a 3 on a dice?

2 If you roll a 6, what is the probability your next roll is also a 6?

3 What is the probability you will go to the moon? **Answer in words**.

4 What is the probability the spinner lands on a red?

5 What is the probability the spinner will land on a prime number?

6 What is the probability of it landing on a 9?

7 *"It is likely to land on a blue."* Is this true?

8 What is the probability it will land on either a purple or an even number?

9 If I spin it twice is it likely that at least one will be red?
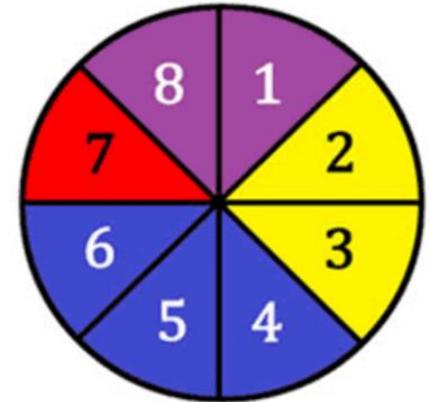
1 What is the probability of rolling a 3 on a dice? $\frac{1}{6}$

2 If you roll a 6, what is the probability your next roll is also a 6? $\frac{1}{6}$

3 What is the probability you will go to the moon? **Answer in words**.

Very unlikely

4 What is the probability the spinner lands on a red? $\frac{1}{8}$

5 What is the probability the spinner will land on a prime number? $\frac{4}{8}$

6 What is the probability of it landing on a 9? **0**

7 *"It is likely to land on a blue."* It is more likely to land on one of the other colours. Blue appears the most but not more than 50% of the spinner.

8 What is the probability it will land on either a purple or an even number? $\frac{4}{8}$

9 If I spin it twice is it likely that at least one will be red? **No. Only** $\approx$ **23%**
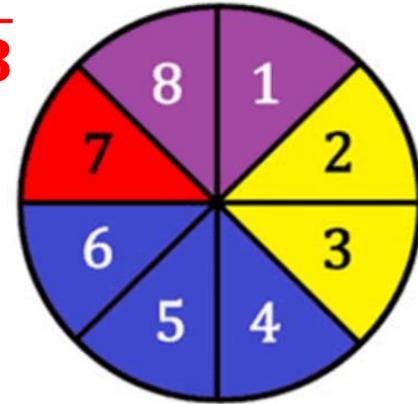
Well done for completing the lesson.

Reflections