Calculating Probability
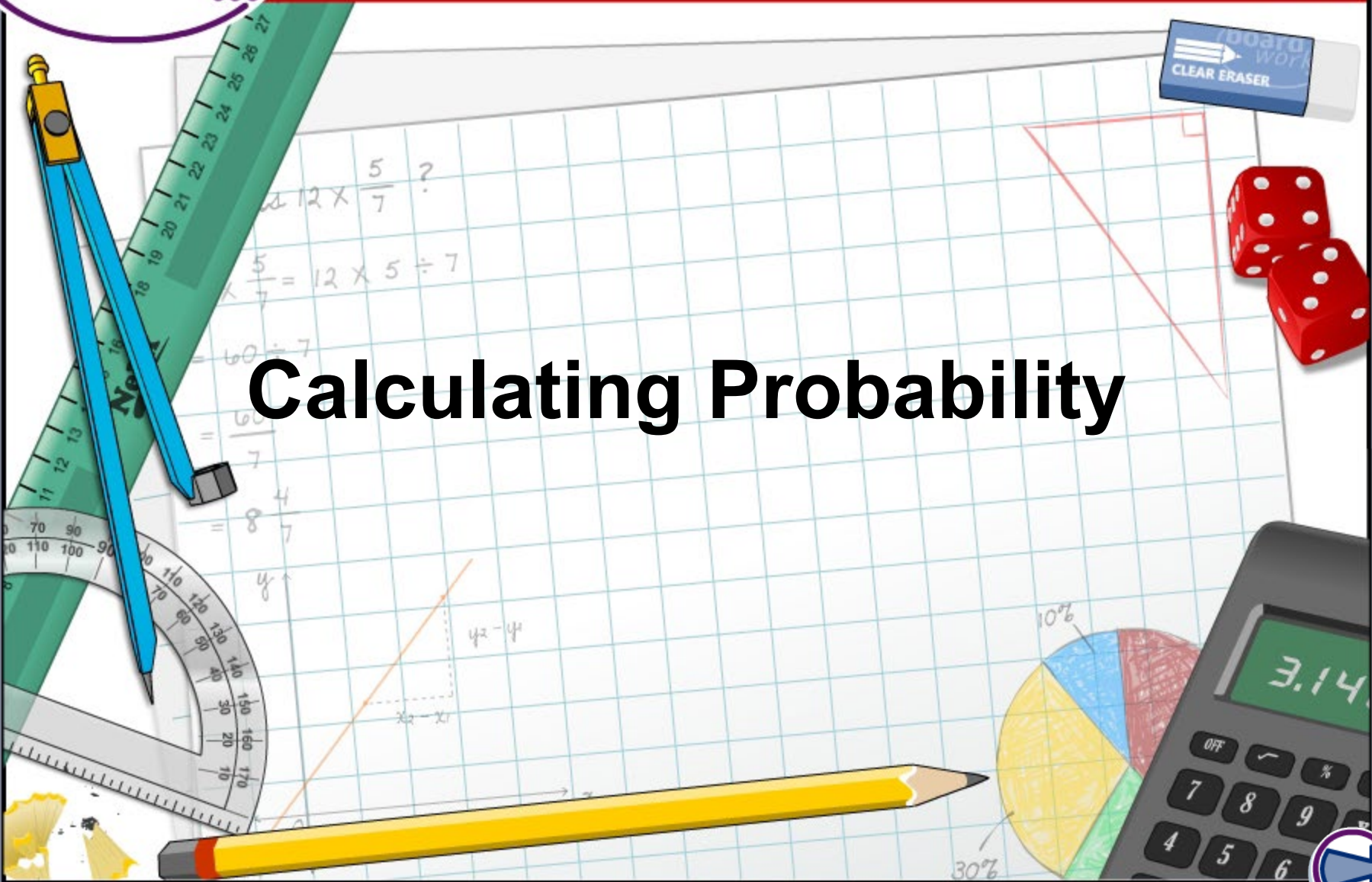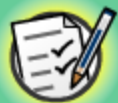
Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

MODELING

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) **Make sense of problems and persevere in solving them.**

2) **Reason abstractly and quantitatively.**

3) **Construct viable arguments and critique the reasoning of others.**

4) **Model with mathematics.**

5) **Use appropriate tools strategically.**

6) **Attend to precision.**

7) **Look for and make use of structure.**

8) **Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Probability is a measurement of the **chance** or **likelihood** of an event happening.

Words that we might use to describe probabilities include:

unlikely

50–50 chance

likely

small chance

possible

certain

very likely

impossible

probable

equal chance

the sun rising in the east

likely

being st...   ...kely

How likely is each statement?

next ye...   ...ssible

Press **start** to begin.

waking u...   ...ain

start

flipping tails on a coin

equal chance

How would you order these events according to their probabilities?

the next baby born being a boy

meeting Abe Lincoln

a card from a deck being a number card

rolling a six on a die

a square having four right angles

| impossible | unlikely | even chance | likely | certain |

100% chance of a candy bar

likely

0.25 chan...

likely

$\frac{1}{24}$ chan...

...ely

0.5 chan...
bar...

...ain

$\frac{11}{12}$ ch...
chocolate candy bar

even chance

How likely is it to draw each type of candy from the bag?

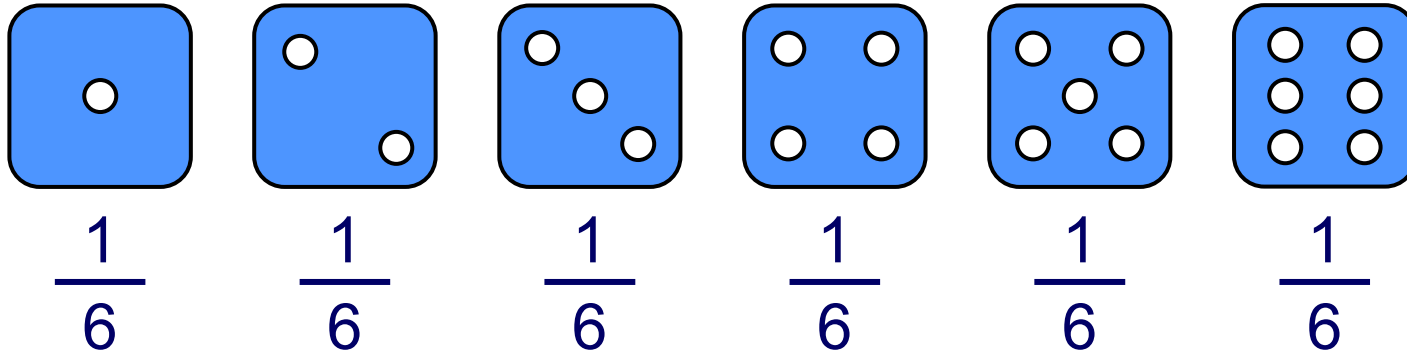Press **start** to begin.

start

0

$\frac{1}{2}$, 0.5, 50%

1

Click on each die to roll it. Do you think the next die roll is likely to be higher or lower? Why?

How might we calculate exactly how likely a die is to land on a certain number?

When we roll a die, how many possible outcomes are there?

$$\frac{1}{6} \qquad \frac{1}{6} \qquad \frac{1}{6} \qquad \frac{1}{6} \qquad \frac{1}{6} \qquad \frac{1}{6}$$

There are 6 different numbers we could roll.

Since each number on the die is equally likely, the chances of getting one of these six (for example a three) is 1 in 6, or $\frac{1}{6}$.
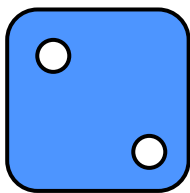
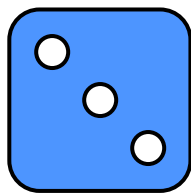**How could you find the probability of rolling an even number?**
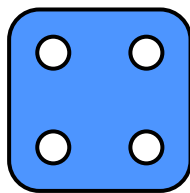
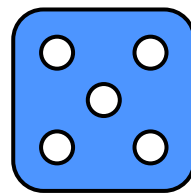How many possible outcomes are there?
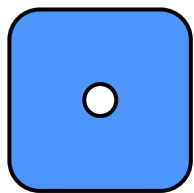
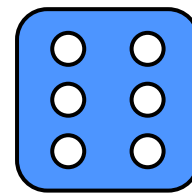$\dfrac{1}{6}$ $\dfrac{1}{6}$ $\dfrac{1}{6}$ $\dfrac{1}{6}$ $\dfrac{1}{6}$ $\dfrac{1}{6}$

There are **6** numbers we could roll.

How many of the numbers are even? **3**

3 of the 6 outcomes are even, so the probability of rolling an even number would be $\dfrac{3}{6}$, or $\dfrac{1}{2}$.

Is there a formula you could use to find the probability of a particular outcome?

If the outcomes of an event are equally likely, then we can find the probability using the formula:
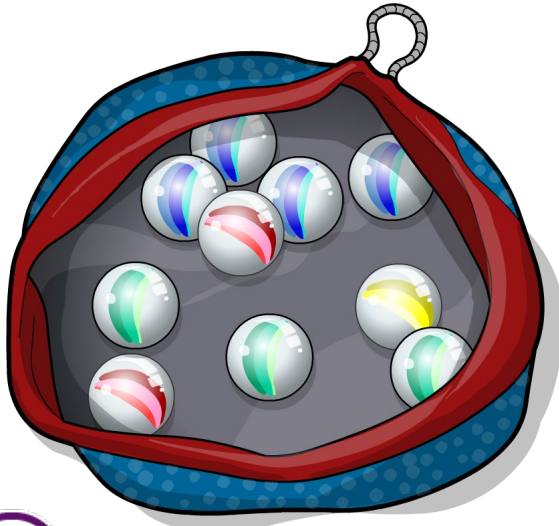
$$\text{Probability of an event} = \frac{\text{Number of successful outcomes}}{\text{Total number of possible outcomes}}$$

Try playing the dice game again now that you know how to calculate probability.
Has your score improved?

A bag contains 1 yellow, 3 green, 4 blue and 2 red marbles. What is the probability of pulling a green marble from the bag without looking?

$$\text{Probability of an event} = \frac{\text{Number of successful outcomes}}{\text{Total number of possible outcomes}}$$

Number of successful outcomes =
Number of green marbles = **3**

Number of possible outcomes =
Number of marbles = 1 + 3 + 4 + 2 = **10**

P(green) = $\frac{3}{10}$ or **0.3** or **30%**

This spinner has eight equal sections. What is the probability of the spinner landing on

a) red
b) blue
c) green

What is the probability of this spinner landing on yellow?

Mutually exclusive outcomes

Outcomes are **mutually exclusive** if they cannot happen at the same time.

For example, when you toss a single coin, either it will land on heads or on tails. There are two mutually exclusive outcomes.

Outcome A: Heads

Outcome B: Tails

When you roll a die, either it will land on an odd number or on an even number. There are two mutually exclusive outcomes.

Outcome A: An odd number
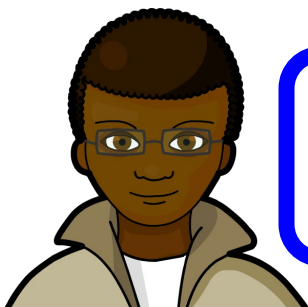
Outcome B: An even number

A student is chosen at random from the class. Which of the following pairs of outcomes are mutually exclusive?

> Outcome A: the student has brown eyes.
>
> Outcome B: the student has blue eyes.

These outcomes are mutually exclusive because a student can either have brown eyes, blue eyes or another color of eyes.

> Outcome C: the student has black hair.
>
> Outcome D: the student wears glasses.

These outcomes are not mutually exclusive because a student could have both black hair and wear glasses.

Independent

Dependent

Which of these outcomes are dependent and which are independent?

Press **start** to begin

start

rolling double sixes

Madison is playing a card game with some of her friends.
To win the next point, she needs to turn over a sun or a moon.
What is the probability of drawing one of these cards?