Title:	Probability Paint
Grade(s):	4, 5
Subject(s):	Mathematics
Author:	ICAC Team
Overview:	The teacher will review probability and use **Microsoft Paint** to demonstrate probability situations. Next, students will use **Paint** to construct their own probability illustrations, share them with the class, and identify the probability of various events that are represented by the illustration.

Content Standards:	MA (4)	16. Determine outcomes of simple events as likely, unlikely, certain, equally likely, or impossible.
	MA (5)	15. Use common fractions to represent the probability of events that are neither certain nor impossible.
	TC (3-5)	2. Use various technology applications, including word processing and multimedia software.
	TC (3-5)	5. Practice safe use of technology systems and applications.
	TC (3-5)	9. Use technology tools to organize, interpret, and display data.
	TC (3-5)	10. Use digital environments to collaborate and communicate.

Local/National Standards:	
Primary Learning Objectives:	The student will use **Microsoft Paint** software to create illustrations representing the probability of simple events (in terms of *likely*, *unlikely*, *equally likely*, *impossible, and certain*).
Additional Learning Objectives:	
Approximate Duration of Lesson:	45 minutes
Materials and Equipment:	
Technology Resources Needed:	Desktop or laptop, **Microsoft Paint**, Promethean Board or projector
Background/ Preparation:	Students should know how to simplify fractions ($^4/_8 = ½$).
Procedures/ Activities:	Step 1 <u>Review/Lesson on Probability</u> Remind students that *probability* is the chance that you will get a particular result. (List the vocabulary terms on the board or overheard as you discuss them).

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Examples:
a. If you flip a coin, what is the probability that it will land heads up? *1 out of 2, or 1/2.* (You may also express this as a percentage if you are teaching percents, e.g. ½ = 50%).

b. What is the probability that you will roll a 2 on a number cube? *1 out of 6, or 1/6.*

c. What is the probability that you will roll an even number on a number cube? *3/6, or 1/2*

Flipping a coin and rolling a number cube are examples of experiments resulting in *outcomes.* Each possible outcome is known as an *event.* For example, when flipping a coin, one possible *event* is that it lands heads; another possible *event* is that it lands tails.

Each event has a certain probability of occurring. The event may be *likely, unlikely, equally likely, certain, or impossible* (Write these terms on the board).

Provide some examples for each term:
a. If I flip a coin 20 times, what is the probability that I will get 10 heads? (*likely* because the expected probability is ½ heads and ½ tails; 10 is half of 20).

b. What is the probability that I will get only one head? (*unlikely*).

c. If I flip a coin once, what is the probability that I will get a head compared to the probability that I will get a tail? (*equally likely*).

d. What is the probability that I will get a head or a tail? (*certain*).

e. If I flip a coin twice, what is the probability that I will get 3 heads? (*impossible*).

Step 2   **Microsoft Paint** Example:

Demonstrate to students how to use **Microsoft Paint** as you create the illustration below (Use Promethean Board

or projector to display your computer screen to class). Describe each step to the students as you perform it. Start the **Microsoft Paint** activity on your computer by clicking on the paint icon OR, click on *Start*, then *All Programs*, then *Accessories,* the *Paint.*
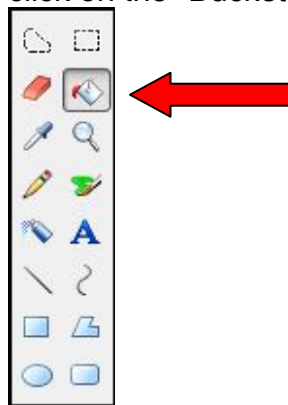

Click on the Shapes tab to reveal a variety of shapes:

Click on the eclipse shape, move mouse to blank screen, click and drag mouse to create a shape:
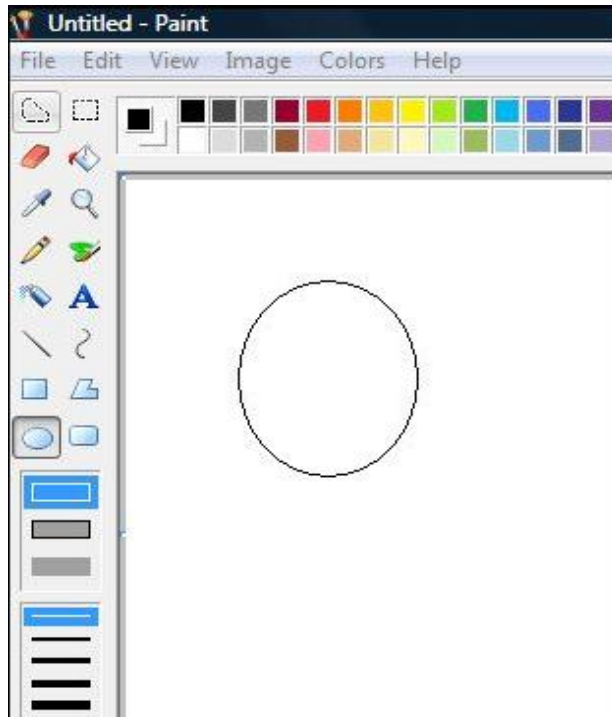
Color the shape blue. To select a color for the shape, first click on the "Bucket" icon:
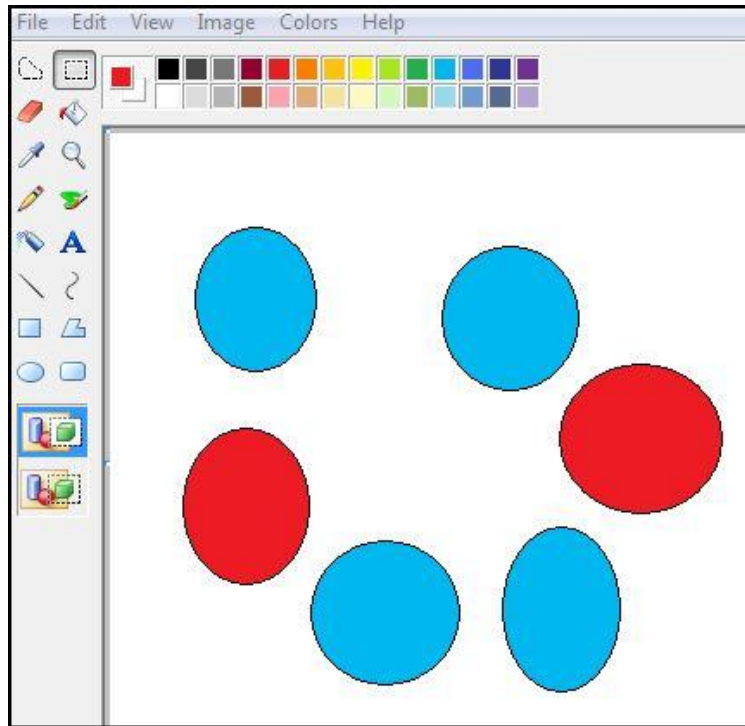

Choose a color by clicking on a color box:

Click on the shape to color the shape (*You are "pouring the bucket of paint" onto the shape.)*

Now make four blue circles (Click, drag, then release the mouse button to make a circle, then follow the above directions to color them blue).
Change the color and add two red circles to your picture.

Show your illustration to the class and ask them to tell you the probability of picking a red circle by chance. (For example, if the circles were placed in a bag and you draw one out without looking.) *Answer: 2/6 or 1/3.*

Would the probability of picking a red circle by chance be likely, unlikely, certain, or impossible? *Unlikely, because the chances are twice as great that you would pick a blue circle.*

Create a second example containing 3 red circles, 2 blue squares, and 3 green squares.

Ask: What is the probability of picking a square? *5/8* How would we describe that event? *Likely.*

What is the probability of picking a blue square? *2/8 or 1/4* How would we describe that event? *Unlikely.*

Step 3   Have students open **Microsoft Paint** and click on the Shapes tab. Ask the students to use the shapes to construct diagrams illustrating each of the relative probabilities that you have written on the board (**likely, unlikely, equally likely, certain,** or **impossible**).

Students may save each illustration so that they can start with a fresh page for every event. After a drawing is complete, simply click the "File" tab, and scroll down to "Save As," name the document, and click on "Save."
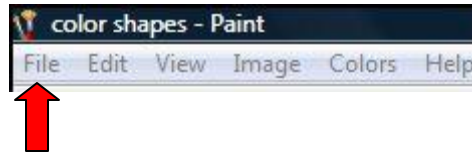
To create a new page click on the "File" tab, scroll down and click "New".

Step 4   For each type of event, ask a student to show and explain his or her illustration. Ask the class whether they agree or disagree that the probability is correct.

Attachments: None

Assessment Strategies:
On a worksheet or quiz have students calculate the probabilities of the following events:
1. What is the probability of drawing a red M&M from a bag that contains 4 chocolate, 3 red, 3 yellow, and 2 blue M&Ms? *Answer: 3/12 = ¼ or 0.25=25%*
2. What is the probability of drawing an Ace (of any of the four suits) from a deck of 52 cards? *Answer: 4/52 = 1/13*
3. Construct a diagram (on paper or using **Microsoft Paint**) to illustrate a probability of 2/5 for picking a circle out of a bag of 10 plastic shapes including circles, squares, and triangles. (Diagram could show 4 circles, 3 squares, and 3 triangles. Other combinations are possible).

Extension: Have students give the probability of being born on a Wednesday (1/7)…or being born in November (1/12).

Extend the lesson by teaching students how to calculate the probability of 2 independent events. For example, if you flip 2 coins at once, what is the probability that they *both* will land heads?

The probability of independent events (one does not influence the other) is the product of the probabilities of each event. The probability of getting a heads on each coin is ½, so the probability of getting 2 heads is ½ x ½ = ¼.

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What is the probability of tossing 3 coins and all of them landing tails? *Answer: ½ x ½ x ½ = 1/8*

See this website for more explanation and sample problems:
http://www.mathgoodies.com/lessons/vol6/independent_events.html

Remediation: Make the lesson more concrete by printing several computer screens showing diagrams used in this lesson (simply press the

"Snipping Tool" under Accessories, in Programs to take a screenshot that will be saved to pictures. To store on a USB drive, just drag and drop the screenshot into your USB. Or draw your own on paper.

Cut out the figures (red circles, green squares, etc.) and place them in a bag or small box. Have the students predict the probability of picking a particular shape or color (the number of figures of that shape or color divided by the total number of figures in the bag).

Have them test their prediction by randomly drawing (without looking) one figure from the bag. Return the figure to the bag and shake to mix up the figures. Repeat at least 20 times, keeping track of how many times the chosen figure is drawn. Lead students to see that the actual number drawn is very close to the predicted probability and that the actual percentage comes closer to the predicted percentage when the sample size is larger (more trials).

Probability is always the chance that you will get a particular result and is expressed as a fraction (or decimal) whose numerator is the number of occurrences of the event (e.g., red circles) and denominator is the total number of possible events (e.g., total number of figures in the bag).

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