

【 附件 2 】

114 學年度小學數學雙語教案設計競賽

壹、 設計理念

This unit, themed “Pie Charts and Probability,” guides students in learning how to read off and construct pie charts while exploring the concept of event likelihood. The exercises are designed around familiar real-life experiences—such as pop music, mobile gaming, and blind box collectibles—making the learning content more relatable and engaging, and helping students find both enjoyment and meaning in their study of mathematics.

貳、教學分析

一、 Analysis of Teaching Materials

➤ Math

Before	Now	Future
<u>First Semester of Grade 4</u> 1. Understand simple statistical charts in daily life and learn to read off them. 2. Understand and read off bar charts. 3. Organize real-life data and construct bar charts. 4. Understand and read off line graphs. 5. Read off various modified forms of bar and line graphs found in everyday life.	1. Organize real-life data, construct pie charts with percentages, and read off them. 2. Organize real-life data, construct pie chart, and read off them. 3. Identify appropriate situations for using different types of statistical charts 4. Experience and explore the likelihood of events occurring.	<u>Grade 7</u> 1. Understand and read off frequency histograms. 2. Create frequency histograms based on frequency tables. 3. Understand and read off frequency polygons (line graphs). 4. Create frequency polygons based on frequency tables.
<u>First semester of Grade 5</u> Understand central angles and sectors.		<u>Grade 9</u> 1. Understand the concept of probability. 2. Use tree diagrams to list all possible outcomes of an
<u>Second semester of Grade 5</u> 1. Solve problems involving ratios and		

percentages. 2. Solve practical problems related to percentage applications.		event and determine the probability of a specific event occurring.
<u>First semester of Grade 6</u> 1. Read off line graphs. 2. Organize sequential data from daily life and construct line graphs.		

➤ English

Prior knowledge	
Vocabulary	zero to two hundred, color
Classroom instruction	It's time for class. Take out your textbook/pen. Please go back to your seat. Are there any volunteers ? You have (number) minutes to do this. Raise your hand. / Put your hands down.
Now	
Target sentence	1. What type of chart is it? It's a ____ chart. 2. How many degrees is it? It's _(數字)_ degrees. 3. It's fair. /It's unfair. 4. It's quite likely. 5. It's very likely. 6. It's very unlikely. 7. A is more likely than B.
Target Vocabulary	<u>Chart</u> : pie chart, bar chart, line chart <u>Number</u> : percent, degrees, protractor

二、Analysis of Students

The target learners of this lesson plan are sixth-grade students in a regular class at the third learning stage of elementary school, with a total of 24 students. During their free time, students often engage in discussions about pop music and mobile games, showing lively and energetic personalities.

In terms of mathematics learning, students already possess relevant prior knowledge. In Grades 4 and 5, they learned how to read off and draw bar charts and line graphs, and understood the concepts of central angles, sectors, and percentages. Overall, they actively participate in class, express ideas verbally, respond enthusiastically, and demonstrate good teamwork and presentation skills.

In English learning, students have taken one integrated English class per week since Grade 1, and two English classes per week since Grade 3. Most students can understand and read common classroom vocabulary and sentence patterns, and can respond using simple English. A small number of students mainly comprehend basic classroom instructions and have weaker oral English abilities. The students have previously taken bilingual physical education classes, and this unit marks their first experience with a bilingual mathematics lesson.

三、Analysis of Teaching Methods

1. *Lecture Method:*

At the end of each lesson, the teacher uses direct instruction to summarize key concepts, focusing on the meaning of pie charts, the steps for drawing pie charts, and the appropriate use and purpose of various types of charts. This helps students clarify and consolidate the core concepts of the unit.

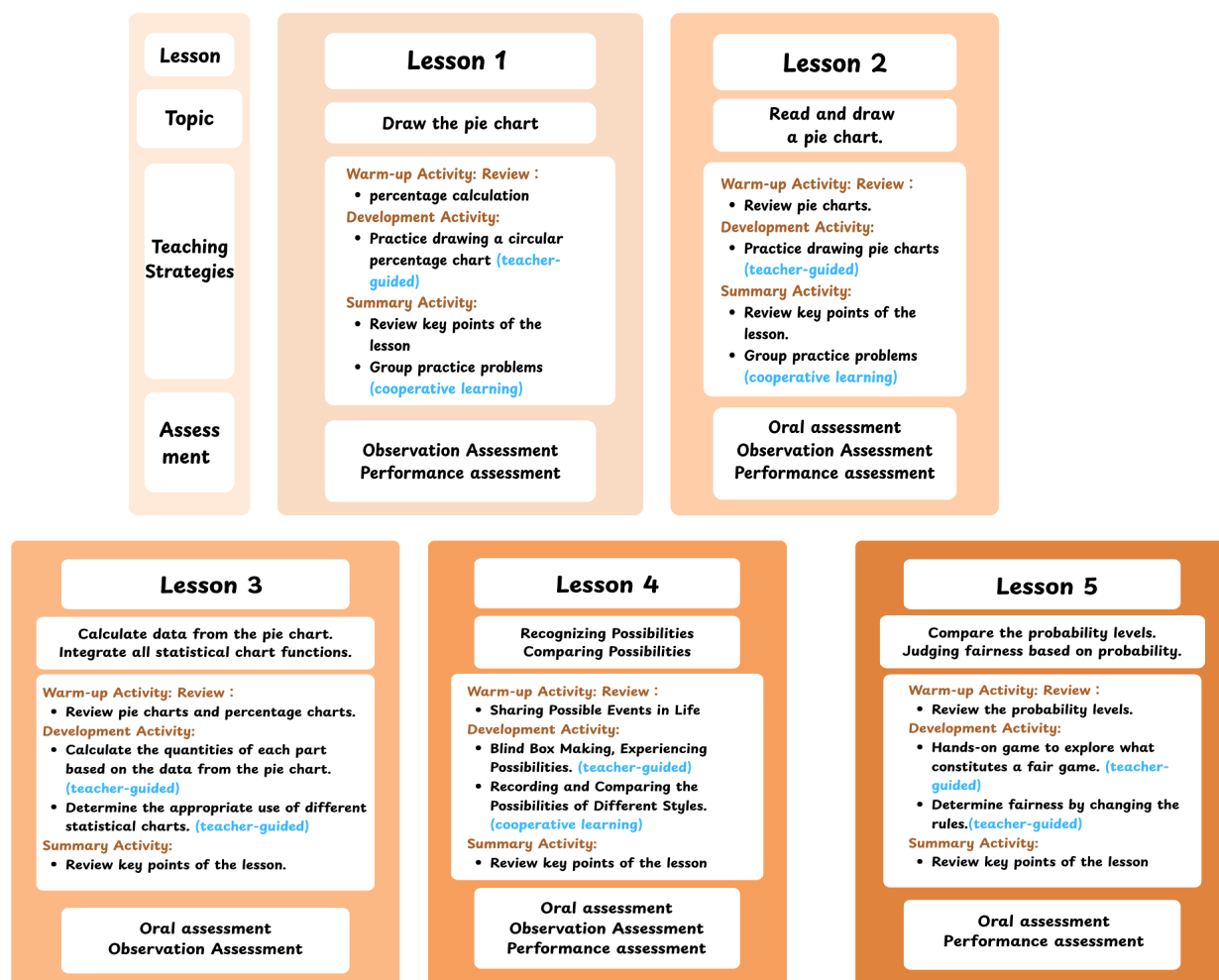
2. *Questioning Method:*

During the lessons, the teacher guides students' thinking through carefully designed questions such as "How is percentage calculated?" and "If there are no percentage marks on a pie chart, how can it be drawn?" Through step-by-step questioning, students gradually build a knowledge scaffold to achieve the learning objectives.

3. *Cooperative Learning Method:*

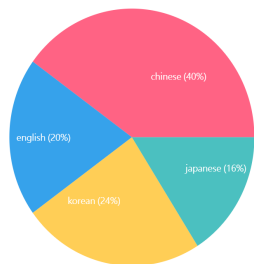
In the first two lessons, the "shared learning" approach of cooperative learning is applied. In the first lesson, students work in groups to draw pie charts based on given data. In the second lesson, they collaborate through task division to complete a Google Form challenge and worksheet, developing teamwork and problem-solving skills.

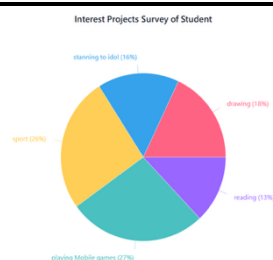
四、課程概念架構圖



參、教學活動設計

單元名稱	圓形圖	適用年級	Six grades
課程名稱	圓形圖 Circle Power!	教學時間	200 minutes (Five lessons)
教材版本	康軒六下數學課本 (第十二冊)		
教學準備	textbook, iPad, protractor, dices, ten-dollar coins		
能力指標/學習表現	分年細目/學習內容		單元教學目標
d-III-1 Read off from pie charts, draw line graphs and pie charts, and make simple inferences using these graphical displays of data.	D-6-1 Pie chart: Read off, explain and construct pie charts in real-life context, including pie charts that are already divided into 100 sections and provided to students in learning activities. D-6-2 Problem solving: Likelihood. Answer questions related to possibility by referring to statistical data. Preliminary experiences of probability, including the concept of quite likely, very unlikely, A is		1. Organize real-life data, create pie charts with percentages, and read off them. 2. Organize real-life data, construct pie charts, and read off them.

d-III-2 Solve simple problems related to plausibility based either on data or numerical values from graphs.	more likely than B.	3. Identify appropriate situations for using different types of statistical charts 4. Experience and explore the likelihood of events occurring.		
單元教學目標	教學內容	時間	評量方式	備註
1-1 Organize data from daily life, construct pie charts, and read off the information.	Warm Up Pop Music Survey Teacher asks：「Do you remember what charts we have learned before? 」 Students may respond: 「We learned bar chart and line chart. 」 Teacher continues: 「Right ! But we won't use these two charts. Today we will learn a new kind of chart – pie chart. (paste a pie chart) 。 」 Teacher says the task：「Before we draw a chart, we need to collect some data. Let's make a class survey! Think about what kind of music you like best — Chinese, English, Korean, or Japanese ? If you like, raise your hand. Everyone has one time. 」 Note: The statistics were generated on-site using information tools. Music Preference Survey of 六年甲班  (point to the pie chart) Teacher asks： Q1：How many students like Korean songs? ? What the percentage is ? Students may respond：「There are 6 people. It is 24% 。 」 Q2：What is the most popular type of music? What the percentage is ? Students may respond: 「Chinese song. It is 40% 。 」	10'	Observation	



Q3 : How do we get these percentages? ?

Students may respond: $10 \div 25 = 0.4 = 40\%$

Summary: 「 So, this new chart is called a *pie chart*. It shows parts of a whole — we can see the percentage of each group clearly. 」

Development activities

— Practice Drawing a Pie Chart

Task1 : Convert Numbers to Percentages

Interest Projects	drawing	stanning to idol	sport	playing Mobile games	reading	sum
Number of people	54	48	78	81	39	300

Teacher says : 「 Now, please change each number into a percentage. You have five minutes to do this. 」

Task2 : Draw the Pie Chart

Teacher asks : 「 How many marks are in a percentage pie chart? 」

Students may respond : 「 100 marks. 」

Teacher says : 「 So, one mark equals one percent. 」

Teacher says : 「 Right! We start from the 12 o'clock position. Draw each section based on its percentage, and don't forget to write the title and labels. 」

★ Important Concept: How to draw a pie chart ?

1. starting from the 12 o'clock position.
2. Each area shows part of the data.
3. Write the title, category name, and percentage.

(point to the pie chart)

Teacher asks : 「 Who can tell me the difference between the biggest and smallest part? 」

Students may respond : 「 The biggest is mobile games, the smallest is reading. They differ by 14%. 」

Summary: 「 Excellent! You can read and draw a pie chart now. Let's review before we finish. 」

Wrap up

20'

Performance

10'

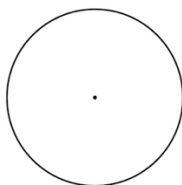
屏東國小六年級學生手遊遊玩人數統計表

Name	Minecraft	Arena of Valor	Roblox	Eggy Party	合計
Number	30	12	36	42	120
Percentage	25	10	30	35	100%

T : 「 I collected the number of sixth graders in our school who play mobile games, and I found the four most popular ones. Now, if the circle doesn't divide a circle into 100 sections, how can we draw a pie chart?

You've got five minutes — go ahead and try it. 」

(point to the circle)



(一) Teacher asks :

1. Each part of a pie chart is a sector, right? So how do we find the angle of each sector?"
(points to the central angle) Are there any volunteers?

➤ Teacher Explanation :

【 Method 1 】

A circle has 360 degrees. Minecraft takes up 25% of the 100%. Therefore, $360^\circ \times \frac{25}{100} = 90^\circ$. So the central angle of the sector representing Minecraft is 90 degrees.

【 Method 2 】

A circle has 360 degrees. Minecraft accounts for 30 out of 120 people. Therefore, $360^\circ \times \frac{30}{120} = 90^\circ$. So the angle of the sector representing Minecraft is 90 degrees.

➤ Summary : So, from the numbers and percentages in the table, we can figure out the central angle for each game in the pie chart.

2. After we find the angle, how can we draw 90

observation

Oral

	degrees on the circle? (Are there any volunteers?) ➤ Teacher Explanation : ① Take out your protractor. Put the center of the protractor right on the center of the circle. ② At the 12 o'clock position, make a mark right above the 0° line. ③ Draw a line from your mark to the center of the circle. Then look for the 90° mark on your protractor and make another mark there. ④ Draw a line from the 90° mark to the center of the circle. ⑤ Finally, write the category and its percentage inside the 90° section, such as "Minecraft 25%". Also include the title: "Statistics of Mobile Game Players among Sixth Graders at Pingtung Elementary School." (二) Ask the students to figure out the rest of the central angles and finish the chart. ➤ Teacher Explanation : 「 Let's check if our pie charts are correct! A circle has 360 degrees, so all your angles should add up to 360 degrees. 」 (Use method 1) <u>Arena of Valor</u>: Arena of Valor takes up 10% of the 100%. Therefore, $360^\circ \times \frac{10}{100} = 36^\circ$, so the central angle of the sector representing Arena of Valor is 36°. <u>Roblox</u> : Roblox takes up 30% of the 100%. Therefore, $360^\circ \times \frac{30}{100} = 108^\circ$, so the central angle of the sector representing Roblox is 108 degrees. <u>Eggy Party</u>: Eggy Party takes up 35% of the 100%. Therefore, $360^\circ \times \frac{35}{100} = 126^\circ$, so the central angle of the sector representing Eggy Party is 126 degrees. ➤ Summary : 「 All the game sections add up to 360 degrees($90^\circ + 36^\circ + 108^\circ + 126^\circ = 360^\circ$). Just remember to write each category and its percentage. 」	15'	Performance	
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二、Activity 2 : Cracking the Google Forms Myster

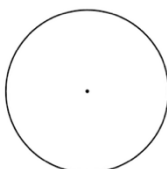
<https://forms.gle/zgHqg5yEg6XtrnDa9>



組別: _____ 座號: _____

《吉伊卡哇》娃娃角色販賣情況統計表

角色	吉伊卡哇	小八貓	兔兔烏羅希	小蝶	合計
數量 (個)	96	28	72	42	240
百分比	40	10	30	35	100%



➤ Teacher Explanation :

1. Each group, please take one tablet and your worksheet. Work together to finish the online form and complete your group worksheet.
2. When you get the central angle, don't forget to draw it on your worksheet too.
3. When you answer a question correctly, a letter will pop up. Make sure to write it down.
4. Finally, finish your worksheet and type the English word. Then you've completed the challenge!

Wrap up

Review of Today's Main Points

1. When there's no pie chart drawn and the circle isn't divided into 100 sections, you first need to calculate the central angle for each category.
2. Use a protractor to draw the corresponding central angles, and write down the category, percentage, and title.
3. Finally, after calculating the central angles for each category, you can add them all together, and they will equal 360 degrees.

-----End of this lesson-----

3-1 Based on the information in the pie chart, find the quantities of each part.

Warm up

It's time for class!

(一) Review old concepts: circle percentage charts, pie charts

Teacher asks : 「 Do you still remember the two

5'

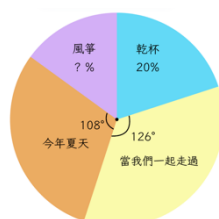
oral

5'

3-2 Based on the information in the pie chart, find the quantities of each part. 3-3 Organize bar charts, line charts, and pie charts together, and distinguish when to use each type of statistical chart.	different kinds of pie charts? 」 Which one is the percentage pie chart? Which one is the pie chart with angles? <i>(The student points to the picture.)</i> S1：圓形百分圖會有刻度，可以看到某一個項目佔的百分率。 S2：圓形圖沒有刻度，要從題目找線索，算出圓心角角度，最後繪製完整的圓型圖。 ➤ Summary : A circle chart has 100 equal parts. The whole circle is 100%. Each piece shows how much of the whole it is, written as a percent. In a pie chart, the circle is not cut into 100 parts. We need to first find the angle for each group. Then use a protractor to draw the angle for each group, and write the type, the percent, and the title. Development activities (一) Exercise 1 : 六年一班畢業旅行各項支出支出表 <table><thead><tr><th>項目</th><th>價錢(元)</th></tr></thead><tbody><tr><td>住宿</td><td></td></tr><tr><td>交通</td><td></td></tr><tr><td>門票</td><td></td></tr><tr><td>餐飲</td><td></td></tr><tr><td>其他</td><td></td></tr></tbody></table> Below is a pie chart showing the spending for Class 6-1's graduation trip. Each student paid 5400 dollars. Fill in the cost of each item on the right side. You have five minutes to do this. (Are there any volunteers ?) ➤ Teacher Explanation : Multiply the money by the percentage to get the right amount. Accommodation : 5400 x 40%= $5400 \times \frac{40}{100} = 2160$ (dollars) (二) Exercise 2 :	項目	價錢(元)	住宿		交通		門票		餐飲		其他		10' 10'	Observation Oral
項目	價錢(元)														
住宿															
交通															
門票															
餐飲															
其他															

There are 120 sixth-grade students at Pingtung Elementary School. The pie chart below shows each student's favorite graduation song. Some parts use percentages, and some use angles. What is the percentage of students who like “風箏” the most? Are there any volunteers ?

(Invite two students to come to the front and share)



S1 (圓心角換算百分率) :

當我們一起走過 : $360^\circ \times ?\% = 126^\circ$

$$?\% = \frac{126}{360} = 0.35 = 35\%$$

今年夏天 : $360^\circ \times ?\% = 108^\circ$

$$?\% = \frac{108}{360} = 0.3 = 30\%$$

風箏 : $100\% - (20\% + 35\% + 30\%) = 15\%$

S2 (百分率換算圓心角) :

乾杯 : $360^\circ \times 20\% = 72^\circ$

風箏 : $360^\circ - (72^\circ + 126^\circ + 108^\circ) = 54^\circ$

$360^\circ \times ?\% = 54^\circ$

$$?\% = \frac{54}{360} = 0.15 = 15\%$$

➤ Summary : When you see both percentages and angles, you can change angles to percentages or change percentages to angles. Both ways are OK.

(三) Exercise 3 :

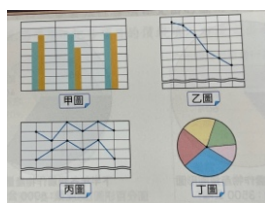
羽彤 made four kinds of charts to show information about her school. But the titles were blown away by the wind. Please work in groups to match each chart with the correct title.

Oral

13' Observation

Oral

You have five minutes to do this.



(What type of chart is it?)

➤ Students may respond:

Chart 甲：有 3 組長條，每組有 2 條，跟 C 的描述一樣，他有低、中、高三個年級，其中還有分男生與女生。

Chart 乙：他的折線越來越往下，就像是 B 的描述學校每年的人數越來越少。

Chart 丙：它有 2 條折線，每條折線有 6 個資訊，所以像 D 一樣，有最高溫、最低溫兩個資訊以及上半年等於 6 個月。

Chart 丁：每一個扇形代表整個資料中的一個部分，所以像 A 一樣，在家長中有分不同的職業，但他們都是在說一樣的事情。

➤ Summary :

A **line chart** is good for data that changes over time. For different categories, a **bar chart** is good for seeing which amount is bigger or smaller. A **pie chart** helps us see the size of each part compared to the whole.

Wrap up

Review of Today's Main Points

1. In a pie chart, when you see both percentages and angles, you can change angles to percentages or change percentages to angles. Both ways are OK.
2. A **line chart** is good for data that changes over time. For different categories, a **bar chart** is good for seeing which amount is bigger or smaller. A **pie chart** helps us see the size of each part compared to the whole.

-----End of this lesson-----

4-1 Understand the concept of probability.

Warm Up

Sharing Lucky Moments

Teacher says:

2'

4-2 Use everyday situations to experience the probability of events occurring. 4-3 Observe data in statistical charts and compare the probabilities of two events.	「It's time for class! Today, we are going to talk about luck and possibility! Have you ever won a prize or something lucky happened to you? 」 S1：老師我們家之前中過發票，最高中過兩千塊。 S2：我之前在班上抽獎品抽到大獎，是一隻超大娃娃，只有我拿到而已。 S3：老師我只有拿過安慰獎，不然就是銘謝惠顧。 S4：我也是，我都沒中過大獎，發票也沒有中過。 S5,6,7...：我也是，我也都沒中過大獎。 ➤ Teacher concludes: 「 So, we can see that winning a big prize is <i>not easy</i>! Some people have a higher chance, and some have a lower chance. This is what we call <i>probability</i>. 」 Development activities Task1：Experiencing Probability through Life Teacher asks: 「In our life, some things are must happening and some are not sure. Can you give me some examples? 」 Students may respond: 太陽一定從東邊升起，西邊落下；明天不一定會是好天氣。 <i>(Students are free to make associations; as long as they are correct, they will be affirmed.)</i> Teacher responds: Good! So we can use <i>quite likely</i>, <i>more likely</i>, and <i>very unlikely</i> to describe these situations. Task2：Blind Box Experiment Teacher explains: 「This is called Labubu, a POP MART blind box. It has six normal colors (red, orange, yellow, green, blue, purple) and one secret color (black). 」 <i>(As shown in the picture below)</i> 			
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	to put the slip back each time. 3. Record how many times you get each color. Then draw a <i>bar chart</i>. After drawing, teacher asks: 「 Which color has the highest bar? Which has the lowest? 」 「 What can we say about their possibilities? You can use the words we just learned, or use "a is more likely than b". 」 Students may respond: 「 Color A is more likely than color B. 因為 a 顏色再圖表出現的次數更多。 」 「 Black is very unlikely. 」 「 Color A is more likely. 」 ➤ Summary : 「 1. The taller the bar, the higher the possibility. Charts help us see which result is more likely. 2. Look at our chart again. We can say—Normal and color A are <i>very likely</i> to be picked. Rare and black are <i>very unlikely</i> to be picked. 3. But remember, it's <i>not impossible</i>! This is what we call <i>uncertainty</i>—something may be <i>more likely</i> or <i>less likely</i>, but still <i>possible</i>! 」 Speaking Practice: T: 「 Which one is more likely? 」 S: 「 Color A is more likely! 」 T: 「 Which one is quite unlikely? 」 S: 「 Black is quite unlikely! 」 T: 「 Is it impossible to get black? 」 S: 「 No, it's possible but very unlikely! 」 Wrap up <u>Review of Today's Main Points</u> Teacher says: 「 Let's review what we learned today! 1. Even when a result is very unlikely, it can still happen. For example, someone wins a lottery.			
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	2. Charts help us compare which result is more likely or less likely. We can see that A is more likely than B, or not. Class Sharing / Homework Teacher says : 「 I want you to share two stories with your classmates. 1. Something that was very likely but didn't happen. 2. Something that was very unlikely but really happened. 」 -----End of this lesson-----			
5-1 Observe data in statistical charts and compare the probabilities of two events. 5-2 Determine the fairness of a game based on probability relationships.	Warm up It's time for class. Teacher asks : The teacher went to the Pacific Department Store on the weekend to draw a Demon Slayer lottery. There are 100 tickets in total. <i>(The teacher points to the picture.)</i> Prize A (炭治郎模型) : 2 tickets Prize B (禰豆子抱枕) : 43 tickets Prize C (角色貼紙) : 55 tickets 1. Which prize is more likely: Prize A or Prize C? Prize C is very likely. ; Prize A is very unlikely. 2. Which prize is more likely: Prize B or Prize C? Prize C is more likely than prize B. <i>Try to say: "quite likely," " very unlikely," and "A is more likely than B.</i> Development activities 1. Exercise 1 : Everyone wants games to be fair when we play. What is "unfair"? What is "fair"? <i>(Point to the picture of the scale.)</i> 2. Each pair gets 10 dollars. 3. The rule is: if it shows "heads," the person who threw the coin wins. If it shows "tails," the other person wins. <i>(Show the coin.)</i> 4. During the activity, both sides should record how many times they win and lose. (ー) Do you think the coin-toss game is fair or	10' Oral 10' Performance		

	unfair? ➤ Summary : The coin has only two sides. It can be heads or tails. If we toss it many times, the chances of heads and tails will be about the same. (二) Exercise 3 : 豆豆 and 尼尼 play a dice game. They thought of two game rules. Let's try! 1. Work in pairs. Take out the dice from Appendix 10 and record who wins and who loses. 2. First round! One player is A, and the other is B. If the dice shows an odd number, A wins. If the dice shows an even number, B wins. 3. Second round! If the dice shows a number less than 3, A wins. If it shows any other number, B wins. 4. Are these two different game rules fair? Why or why not? ➤ Teacher asks : 1. In the two games, who wins more often? Why? S : 第一輪：兩人贏的次數差不多；第二輪：B 比較常贏。 2. A die has six faces. Does each number have the same chance? Which numbers make A win? Which make B win? How many chances does each have? A wins: 1, 2 → 2 chances B wins: 3, 4, 5, 6 → 4 chances ➤ Summary : If two people have the same chance to win, the game is fair. If one person has more chances to win, that person is quite likely to win, and the game is not fair. <u>Wrap up</u> <u>Review of Today's Main Points</u> 1. We can use "quite likely," "very unlikely," and "A is more likely than B" to show different chances. 2. Is it fair or unfair? If both sides have the same chance, it's fair. If one side has more chances to win, it's unfair. -----End of this unit-----	15'	Performance Observation	Oral
	1. We can use "quite likely," "very unlikely," and "A is more likely than B" to show different chances. 2. Is it fair or unfair? If both sides have the same chance, it's fair. If one side has more chances to win, it's unfair. -----End of this unit-----	5'		

肆、教學評量

單元教學目標	評量方式	備註
1-1 Organize data from daily life, construct pie charts, and read off the information.	Observation 、 Performance	
2-1 Recognize pie charts and read off the information. 2-2 Based on the data, construct pie charts.	Oral 、 Observation 、 Performance	
3-1 Based on the information in the pie chart, find the quantities of each part. 3-2 Based on the information in the pie chart, find the quantities of each part. 3-3 Organize bar charts, line charts, and pie charts together, and distinguish when to use each type of statistical chart.	Observation 、 Performance	
4-1 Understand the concept of probability. 4-2 Use everyday situations to experience the probability of events occurring. 4-3 Observe data in statistical charts and compare the probabilities of two events.	Oral 、 Observation 、 Performance	
5-1 Observe data in statistical charts and compare the probabilities of two events. 5-2 Determine the fairness of a game based on probability relationships.	Oral 、 Performance	