Y7 UNIT 21 *Probability of One Event* Lesson Plan 1

Introduction to Probability

Activity ***Notes***

1A

Background

T: I'm really looking forward to the weekend, building snowmen and having snowball fights with my neighbours.

Ps: ?

T: Haven't you heard the weather forecast? We're going to have snowstorms, and the temperature will be $-10\,^\circ\text{C}$.

Introduction to topic; T teasing Ps and then leading into discussion.

T: So you think that's impossible at this time of year in Britain?

Ps: Yes!

Ps protest that it's impossible.

T: I would never say that *anything* is impossible where our weather is concerned! But I would say that it's 'unlikely' or even 'almost impossible' that it will snow heavily here at this time of year.

1B

Examples of probabilities

T: You can see (puts **OS 21.1.2** sheet on OHP) four words on this OS. Read them aloud - do you understand them? What does 'certain' mean? We'll have a look at them now.

Whole class activity.

OS 21.1.1

After putting OS 21.1.2 on OHP, T reads out the sentences from OS 21.1.1 and asks (volunteer) Ps to come out and write the sentences under the appropriate word. Discussion, agreement. Praising.

T: What can we say will be 'certain' to happen? Let's take the example of rolling a dice. What can we be certain of?

P: We can be certain that we'll obtain a 1, 2, 3, 4, 5 or 6.

T lets Ps answer in chorus.

T: What about when we toss a coin?

Ps: It will land 'Heads' or 'Tails'.

T: Are you sure?

Ps: Yes!

T: Certain?

Ps: Yes!

T: OK. Now let's look at some other probabilities.

8 mins

2

Deciding on probabilities

PB 21.1, Q1

Individual work.

After some minutes, T and Ps discuss answers, and try to reach agreement!

(a) *Certain*

(b) *Depends on day of the week, and whether P usually travels to school by bus.*

(c) *Depends on the team and who they are playing.*

(d) *Depends on day of week, weather, time of year and P's general punctuality.*

14 mins

3A

Introducing 0 - 1 for probabilities

T: We can use a measure to express the probability of an event. We use 'zero' for events which are impossible, '1' for events which are certain and probabilities between 0 and 1 for all other events.

(continued)

Y7 **UNIT 21** ***Probability of One Event*** Lesson Plan 1 *Introduction to Probability*

Activity ***Notes***

3A *(continued)*

These can be expressed as fractions, decimals or percentages.We'll look more closely at this soon.

T: Can you say what number describes the probability of getting a head when tossing a coin? $\left(\frac{1}{2} = 0.5 = 50\%\right)$

Praising.

3B

Introducing the probability line

OS 21.2

OS 21.2.2 appears on OHP and T introduces the probability line. Then T reads out the events from OS 21.2.1 and waits for Ps to volunteer. After discussing and agreeing how likely or unlikely the particular event is, T asks a P to mark its probability on the line. This continues for all the events.

Agreement, correction. Praising.

22 mins

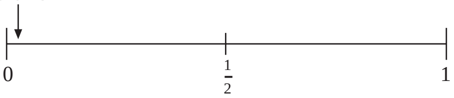
4

Practice using probability line

PB 21.1, Q3

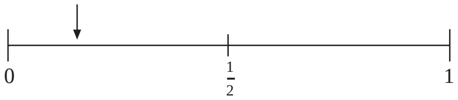
Solutions

(a)



(b) *Depends on the student; it could be 0 for a student who does not have a packed lunch, or close to 0 for a student who brings a packed lunch regularly, but it could be much higher for a student who brings a packed lunch only occasionally.*

(c)



(d) *Depends on the location of the school and the time of year.*

(e) *1 – (answer to (d)).*

Individual work, monitored, helped.

Checking at BB: T draws a probability line on BB and calls out Ps to mark their answers on it.

Discussion, agreement.

Praising.

28 mins

5

'Fair', 'unbiased' and other definitions

T: What is meant by 'fair' or 'unbiased'; for example, the 'unbiased' dice in part (c) of the previous question? We talked about 'fair' coins in Unit 11 ... can you remember?

T and Ps recall the discussion in Unit 11 about fair/unfair supplies, then T leads Ps to the concepts of 'possible outcomes', 'equally likely' and the probability of an event.

T: When any dice, playing cards or coins are used for a fair bet, it's very important that all possible outcomes are equally likely. Can you see why? Let's look at a dice.

P: The possible outcomes are 1, 2, 3, 4, 5 or 6. 'Fair dice' means that any of the outcomes is equally likely.

T: How does that apply to a coin?

P: The possible outcomes are 'Heads' and 'Tails'. 'Fair coin' means that we are equally likely to get either outcome when tossing the coin.

T encourages a slower P to answer.

T: What about rolling a dice? What event has a probability of '1' ?
(This is a certain event, the probability of getting 1, 2, 3, 4, 5 or 6)

Agreement. Praising.

(continued)

Y7 **UNIT 21** ***Probability of One Event*** Lesson Plan 1 *Introduction to Probability*

Activity ***Notes***

5
(continued)

T: What fraction of the possible outcomes is 'the probability of getting a number that is larger than 3' ?

(This means numbers 4, 5, 6, and these are $\frac{3}{6}$ *(or half) of the outcomes)*

T: If we throw an unbiased dice once, what is the probability of getting a number larger than 3 ? $(\frac{1}{2} = 50\%)$

T: What fraction of the possible outcomes is throwing a six? $(\frac{1}{6})$

T: What is the probability of this happening? $(\frac{1}{6})$

T: Well done!

T: So how do you think we can calculate the probability of an event with outcomes that are equally likely?

T (writes on BB):

$$\boxed{\text{Probability of an event} = \frac{\text{number of successful outcomes}}{\text{total number of outcomes}}}$$

Praising wherever possible.

T helps Ps find the definition. After agreement, T writes it on BB, Ps in Ex.Bs. A short discussion (explanation) follows about why the probability line is from 0 to 1.

37 mins

6A **Whole class practice with probabilities**
OS 21.3 (B)

Whole class activity.
Task appears on OHP. T asks, volunteer Ps explain the problem, use the 'rule' and give the answer.

6B **Individual practice with probabilities**
OS 21.3 (A)

Individual work.
When checking, discussion should take place, with counting of the number of successful outcomes, Agreement, feedback, self-correction. Praising.

45 mins

Set homework
PB 21.1, Q2
PB 21.1, Q8
PB 21.2, Q1

Y7 UNIT 21 *Probability of One Event* Lesson Plan 2

Calculating Probabilities and Complementary Events

Activity

Notes

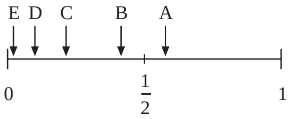
1

Checking homework

PB 21.1, Q2 (a) E (b) A (c) B (d) D

PB 21.1, Q8 Depends on P, but should show a decreasing likelihood from A through to E, for example:

e.g.



PB 21.2, Q1 (a) $\frac{1}{2}$ (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{2}{3}$ (e) $\frac{1}{3}$ (f) $\frac{1}{2}$

When checking, Ps explain how they have counted the number of successful outcomes and used the rule for each question. Praising.

4 mins

2

Further work with probabilities

PB 21.2, Q2

$$p\,(\text{red}) = \frac{6}{20} = \frac{3}{10} = 0.3 = 30\%$$

$$p\,(\text{blue}) = \frac{14}{20} = \frac{7}{10} = 0.7 = 70\%$$

T: What do you notice?

(0.3 + 0.7 = 1 or 30% + 70% = 100%*)*

T: Why is this?

(Because we are certain to take a sweet that is either blue or red)

Whole class activity.

When discussing the problem, Ps must realise that, although there are two possible types of outcome, the possibility of taking a red/blue sweet is not $\frac{1}{2}$. The rule they have learnt applies only in the case 'of an event with outcomes that are equally likely'.

When writing solutions on BB, T asks Ps to give the results in as many forms as they can.

Agreement. Praising.

T can now lead on from this to the concept of complementary events.

Praising.

12 mins

3A

Questions involving probabilities

PB 21.2, Q4 (a) and PB 21.2, Q5 (a)

P_1: In PB 21.2, Q4 (a) there are four possible outcomes, all equally likely: 1, 2, 3, 4.

Only one of these is successful, so:

$$p\,(\text{pointing to } 1) = \frac{1}{4}$$

P_2: In PB 21.2, Q5 (a) the possible outcomes, all equally likely, are 1, 2, 2, 3, 3, 4, 4, 5, so

$$p\,(\text{pointing to } 1) = \frac{1}{8}$$

Whole class activity.

T asks Ps to consider what they have just discussed and find and count all the outcomes that are equally likely. Then two volunteer Ps draw up the solution on BB (care needed to ensure orderly spoken mathematics).

3B

Further practice

PB 21.2, Q4 (c)

PB 21.2, Q5 (b), (c), (e)

P_1: ... $\rightarrow p\,(\text{multiple of } 3) = \frac{1}{4}$

P_2: ... $\rightarrow p\,(5) = \frac{1}{8}$

T encourages Ps to draw up the problems on BB as in previous examples.

(continued)

Y7	**UNIT 21** ***Probability of One Event*** Lesson Plan 2	*Calculating Probabilities and Complementary Events*
Activity		***Notes***
3B *(continued)*	P_3: ... → $p\,(4) = \frac{2}{8} = \frac{1}{4}$ p_4: ... → p (less than 4) $= \frac{5}{8}$	
3C	**PB 21.2, Q4 (b)** *(* $\frac{1}{2}$ *)* **PB 21.2, Q5 (d)** *(* $\frac{4}{8} = \frac{1}{2}$ *)*	Individual work, monitored, helped. Checking at BB. Agreement, feedback, self-correction. Praising.
	22 mins	
4	**Applying probabilities** **Activity 21.1 with additional questions (f) - (i)**	
4A	**Whole class activity** **Questions:** (a) 20 *(* $\frac{1}{20}$ *)* (d) multiple of 3 *(* $\frac{6}{20} = \frac{3}{10}$ *)* (e) prime number *(* $\frac{8}{20} = \frac{4}{10}$ *)*	Whole class activity. Each pair of Ps has a copy of Activity 21.1. T lets Ps interpret the problems and find solutions to parts (a), (d) and (e) at BB. Agreement. Praising.
4B	**Working in pairs** **Questions:** (b) an even number *(* $\frac{1}{2}$ *)* (f) an odd number *(* $\frac{1}{2}$ *)* (c) 18, 19 or 20 *(* $\frac{3}{20}$ *)* (g) less than 18 *(* $\frac{17}{20}$ *)* (h) more than 12 *(* $\frac{8}{20}$ *)* (i) less than 12 *(* $\frac{11}{20}$ *)* P_1 (writes on BB): $p(\text{b}) + p(\text{f}) = \frac{10}{20} + \frac{10}{20} = \frac{20}{20} = 1$ P_2 (writes on BB): $p(\text{c}) + p(\text{g}) = \frac{3}{20} + \frac{17}{20} = \frac{20}{20} = 1$ P_3 (writes on BB): $p(\text{h}) + p(\text{i}) = \frac{8}{20} + \frac{11}{20} = \frac{19}{20} \neq 1$	Now Ps work in pairs (by seating). Discussion at the checking stage will lead to the explanation of complementary events. The pairs of tasks (b) - (f) and (c) - (g) (using only positive whole numbers) are examples of complementary events; tasks (h) and (i) show how the problem can be misinterpreted. After clarifying the concept (and stating that the sum of their probabilities is equal to 1), Ps have to draw up the complementary event of the event (h) → 'not more than 12' or → 'equal to 12 or less'. Agreement. Praising.
	30 mins	

Y7	**UNIT 21** ***Probability of One Event*** Lesson Plan 2	*Calculating Probabilities and Complementary Events*
Activity		***Notes***
5	**Whole class practice - complementary events** **OS 21.6** *36 mins*	Whole class activity. Task appears on OHP. Each question can be interpreted, solved and explained by a different volunteer P. Agreement. Praising.
6	**Individual work - complementary events** **(A)** **PB 21.4, Q1** **(B)** **PB 21.4, Q3** **(C)** **PB 21.4, Q7** ***Solutions*** ***(A)*** $p(\mathrm{A}') = 1 - p(\mathrm{A}) = 1 - \frac{3}{5} = \frac{2}{5}$ *(B)* *It's true that there are only a few ambidextrous ('two-handed') children, but as there are some, we can't answer the question. However, we cam say that the probability that a child is* not *left-handed is* $\frac{19}{20}$. ***(C)*** $p(\text{in set A}) = \frac{4}{12} = \frac{1}{3}$ $p(\text{not in set A}) = 1 - \frac{1}{3} = \frac{2}{3}$ *45 mins*	Individual work, monitored, helped. Detailed checking at BB, repeating the concept of complementary events. Problem (B) provides a good opportunity for reinforcing the concept. Agreement, feedback, self-correction. Praising.
	Set homework **PB 21.2, Q8** **PB 21.4, Q2** **PB 21.4, Q10**	Ps are asked to each bring a dice with them to the next lesson.

Y7

UNIT 21 *Probability of One Event*

Lesson Plan 3

Relative Frequency

Activity		***Notes***
1	**Checking homework** **PB 21.2, Q8** **(a)** $\frac{1}{3}$ **(b)** $\frac{1}{2}$ **(c)** $\frac{1}{6}$ **(d)** $\frac{1}{2}$ **(e)** $\frac{5}{6}$ **PB 21.4, Q2** $\frac{7}{8}$ **PB 21.4, Q10** **(a)** $\frac{33}{100}$ **(b)** $\frac{67}{100}$ *6 mins*	When checking the first question, T makes Ps state how they interpreted the probability of an event and what is meant by equally likely and successful outcomes. Before checking the second and third questions, Ps state the concept of complementary events.
2	**Mental work with complementary numbers** T: I've decided that I don't like zeros. Choosing a whole number at random from 1 to 100, what is the probability that I will avoid zeros, that is, I will get a number that contains no zeros? *Solution* *It's easier to find the probability of the complementary event:* $p\ (\text{the number contains zero}) = \frac{10}{100} = \frac{1}{10} = 0.1$ *so the answer is 0.9 or 90%.* *10 mins*	Mental work to see if most/some/stronger Ps can apply their knowledge about complementary events. If not, T leads them to the solution.
3 *(continued)*	**Whole class activity** T: I'm pleased with that answer. The probability $\frac{1}{10}$ means that I will get a zero only once for every 10 numbers I choose. Do you think it works like that? Let's see what happens in a practical example. **OS 21.4**	Whole class activity. Task appears on OHP. After discussing the probability of getting Heads, T and Ps agree that it doesn't mean that they will get 50 Heads from 100 tosses. T explains the idea of 'relative frequency' to Ps. Then T takes a coin and asks Ps to come to the front and toss the coin, one P per toss, 20 times, fill in the next row in the table at OHP (count the relative frequency at BB) and pass the coin on to the next P. (Passing on the coin first and then counting relative frequency saves time.) T helps Ps. In the meantime, each P copies the table into Ex.B and fills it in. After the 400th toss, each P receives a copy of OS 21.5 on which to show the results. If the process is taking too long, T can interrupt it after 300th toss.

Y7 UNIT 21 *Probability of One Event* Lesson Plan 3 *Relative Frequency*

Activity

Notes

3
(continued)

After examining the changes in the relative frequency with the increasing number of trials, Ps can compare it with the probability and state conclusions.

30 mins

4

Uses of relative frequency

T: So far we have met two kinds of events. We know that, if we toss a fair coin, the probability of getting a Head is $\frac{1}{2}$.

But how do we decide that, for example, the probability of it snowing on Christmas Day is $\frac{1}{8}$? A dice is no help here, so how do you think the probability can be estimated?

T leads Ps to discover the usefulness of relative frequency, found from observation or experiments, for estimating the probability of events like this.

PB 21.3 Worked Example 1

Next Matthew's toast problem is presented. Discussion, answering, praising; warning - don't try this at home!

35 mins

5

Whole class activity - relative frequencies
PB 21.3, Q9

Whole class activity.

After estimating the probability of winning (30%), discussion follows about the reliability of the estimation, referring back to OS 21.4.

40 mins

6

Individual practice - relative frequencies
PB 21.3, Q3 (changed)

Tally Chart for the First 60 Rolls of the Dice

Number	*Tally*	*Frequency*
1		
2		
3		
4		
5		
6		

Individual work preceded by whole-class discussion.

T has asked Ps to each bring a dice with them, and now asks if they think their dice is unbiased.

T sketches a tally chart and a table for counting relative frequencies on BB and Ps copy them.

Then, using the tally chart, each P rolls the dice 60 times, counts the frequencies and fills in the first row of the other table, recording relative frequencies. T walks among Ps and helps slower ones.

After discussing the results of the first 60 rolls, T asks Ps to complete the table at home, using similar tally charts, for the remaining rolls.

(continued)

Activity

6
(continued)

Notes

Table for Counting Relative Frequency

Number	*Cumulative Frequency After 60 Rolls*	*Relative Frequency After 60 Rolls*
1		
2		
3		
4		
5		
6		

45 mins

Set homework

(1) Complete PB 21.3, Q3 (changed)

(2) PB 21.3, Q8

Y7 UNIT 21 *Probability of One Event* Lesson Plan 4

Estimating Number of Successes

Activity | *Notes*

1

Checking homework (see Activity 3 for part (2) of homework)

(1) PB 21.3 (changed)

4 mins

Discussing the exercise. T and Ps agree that many trials are needed to estimate the probability, because the relative frequencies can change considerably as the number of trials increases. After a large number of trials, they usually approximate to a concrete value ($\approx$ probability).

Then T asks Ps if they found that their dice was fair.

2

Whole class activity

PB 21.3 Worked Example 3

T: Let's look at the example of Rachel testing a coin for fairness. She has done a number of trials. What do her results show?

14 mins

Whole class activity.

The results Rachel recorded appear on OHP. T asks question (a), draws a table on BB as shown in Solution on p 145 of PB Y7A, and asks Ps to come out and

- summarise the total frequencies,
- calculate the relative frequencies as asked
- fill in the table at each stage.

Then T puts a grid (for the relative frequency graph, prepared in advance) on OHP, and asks other volunteer Ps to plot the points.

After discussion Ps come to a common conclusion.

Discussion, agreement. Praising.

3

Checking homework

(2) PB 21.3, Q8

T: We now know that we can estimate a probability only if we have done a large number of trials or we have unbiased data.

Let's look at the second part of the homework. How much data did Tony have, and was it enough for him to make an estimate about probabilities?

T (after checking and discussing): What would you think if Tony's estimation was based on 500 observations? Would you be more confident then to give an estimation for the next 500 days?

Ps: Yes!

T: OK. Now the calculations using 500 observations.

(On about $\frac{1}{5}$ *of 500 days = 100 days, Tom will be unable to find an empty space in the car park)*

20 mins

Checking and discussion. T introduces Ps to the topic of this unit.

Y7 UNIT 21 *Probability of One Event* Lesson Plan 4

Estimating Number of Successes

Activity		***Notes***
4	**Further practice with probabilities** **OS 21.7** T (writes on BB): Since $\dfrac{\text{number of successful trials (events)}}{\text{total number of trials (events)}} = \text{relative frequency} \approx \text{probability}$ our estimation will be calculated by $\dfrac{\text{expected number of successful outcomes}}{\text{total number of trials (events) in the future}} = \text{probability}$ giving $\text{expected number} = \text{probability} \times \text{total number}$ P_1 (writes on BB): $p(\text{Heads}) = \dfrac{1}{2}$ $\text{Total number of events} = 500$ $\text{Expected number of Heads} = \dfrac{1}{2} \times 500 = 250$ *28 mins*	Whole class activity. After the previous activity, T and Ps discuss how to count (and why it is so) the expected numbers of successful outcomes. Then T puts OS 21.7 on OHP. A P is asked to read out question (a) and Ps agree on the probability of the event and the number of events; T asks a P to come to BB to write down what has been discussed and calculate the solution. Agreement. Praising. Ps write in Ex.Bs. Continue with question (B).
5	**Individual work with probabilities** **PB 21.5, Q1** *36 mins*	Individual work, monitored, helped. Detailed discussion at BB about finding the probability and using the rule as in the previous task. A different P answers each question. Agreement, feedback, self-correction. Praising.
6	**Probability - using complementary events** T: Let's look at a problem where the probability cannot be calculated, but has been estimated from experiments. The probability that a certain type of seed doesn't germinate is 20%. How many seeds would you expect to germinate if you planted 200 seeds? *Solution* $p(\text{A}) = 1 - p(\text{A}') = 80\%$ $80\% \text{ of } 200 = \dfrac{200}{100} \times 80 = 160$ So 160 seeds are expected to germinate. *40 mins*	Mental work, making use of complementary events, encountered in Lesson 3. Discussion, and then Ps calculate the answer mentally. Ps explain their answers, T agrees and praises.
7	**Further practice PB 21.5, Q5** *((a) 2 (b) 8 (c) 40)* *45 mins*	Individual work, monitored, helped. Checking: Ps dictate, T agrees and writes on BB. Feedback, self-correction. Praising.
	Set homework **PB 21.5, Q2** **PB 21.5, Q10**	

Y7 UNIT 21 *Probability of One Event* Lesson Plan 5

Mutually Exclusive Events

Activity | ***Notes***

1A

Checking homework

PB 21.5, Q2 **(a)** 40 **(b)** 80 **(c)** 80 **(d)** 120

e.g. for (c)

total number of possible outcomes $= 5$

total number of successful outcomes $= 2$ (numbers 1 and 2)

$$p(\text{less than } 3) = \frac{\text{total successful}}{\text{total possible}} = \frac{2}{5}$$

total number trials $= 200$

expected total number successful outcomes

$$= p(\text{total successful}) \times \text{total possible}$$

$$= \frac{2}{5} \times 200 = 80$$

It's important that Ps now recall and strengthen the topics they have learnt in this unit, so this homework must be checked and discussed thoroughly, and the formula for finding the probability of an event repeated.

1B

PB 21.5, Q10

(a) 2, assuming he goes to school 5 days a week.

(b) The answer is still correct because the expected number of times missed is a long term average; sometimes he might miss the bus 3 times, as here, and other times he might miss it once, twice or not at all, in a 4-week period.

Agreement, feedback, self-correction. Praising.

Verbal checking and discussion about the expected number of successful outcomes and what can happen in reality.

8 mins

2

Defining mutually exclusive events

T: You're going to be given three sets of questions. Your task is to answer the questions and then compare the results in each set.

> When you roll a fair dice, what is the probability of the following events?
>
> (a) A = getting a two
> B = getting a three
> C = getting a two or a three
>
> (b) A = getting a number more than 4
> B = getting a 4
> C = getting a number more than 3
>
> (c) A = getting a prime number
> B = getting an even number
> C = getting a prime or an even number

Solution

(a) $p(\text{A}) + p(\text{B}) = \frac{1}{6} + \frac{1}{6} = p(\text{C}) = \frac{2}{6}$

(b) $p(\text{A}) + p(\text{B}) = \frac{2}{6} + \frac{1}{6} = p(\text{C}) = \frac{3}{6}$

(c) $p(\text{A}) + p(\text{B}) = \frac{3}{6} + \frac{3}{6} \neq p(\text{C}) = \frac{5}{6}$

Task appears on OHP, or each P is given a copy.

Individual work, monitored, helped, with detailed discussion, leading to the definition of mutually exclusive events and the rule for the probabilities of these events.

For (a) it is obvious that C = A or B, while for (b) Ps have to calculate. In both (a) and (b) we can state that $p(\text{C}) = p(\text{A or B}) = p(\text{A}) + p(\text{B})$.

For (c), the definition of event C shows that C = A or B, but $p(\text{C}) = p(\text{A}) + p(\text{B})$ will not be true. Counting the successful outcomes, Ps can find out why this is so.

After discussing these, T introduces the concept of mutually exclusive events, and makes Ps state the rule *(two events are mutually exclusive if only one can take place at any given time)*.

Agreement. Praising.

20 mins

Y7 UNIT 21 *Probability of One Event* Lesson Plan 5

Mutually Exclusive Events

Activity		***Notes***
3	**Mutually exclusive events** **OS 21.8** P (writes on OS): $p(\text{Y}) = \frac{8}{18} = \frac{4}{9}$ $p(\text{G}) = \frac{4}{18} = \frac{2}{9}$ $p(\text{Y or G}) = \frac{4}{9} + \frac{2}{9} = \frac{6}{9} = \frac{2}{3}$ *25 mins*	Whole class activity. Task appears on OHP, with the rule for mutually exclusive events. Ps write it in their Ex.Bs. Then T asks a volunteer P to explain why 'taking a green ball' and 'taking a yellow ball' are mutually exclusive events; another volunteer P comes to OHP to explain and fill in OS. Another P can be asked to check the result that $\frac{1}{3}$ of the balls are red. Agreement. Praising.
4	**Individual work - probabilities as percentages** **PB 21.6, Q1** $p(\text{R}) = \frac{6}{20} = 30\%$ $p(\text{B}) = \frac{5}{20} = 25\%$ $p(\text{Y}) = \frac{9}{20} = 45\%$ $p(\text{R or B}) = 30\% + 25\% = 55\%$ $p(\text{R or Y}) = 30\% + 45\% = 75\%$ $p(\text{B or Y}) = 25\% + 45\% = 70\%$ e.g. $p(\text{R or B}) = 1 - p(\text{Y})$ *32 mins*	Individual work, monitored, helped. T asks Ps to work in percentages. Checking at BB: T asks 6 Ps to write (quickly) on BB the answers to questions (a) - (f), and then return to their seats. Now T asks the class if the answers on BB are correct. Discussion follows. (They can also note in discussion that, for example, 'R or B' and 'Y' are complementary events.) Feedback, self-correction. Praising.
5	**Whole class activity with probabilities** **PB 21.6, Q8** P_1: $p(\text{E}) = 1 - p(\text{T or L}) = \frac{1}{3}$ P_2: $p(\text{T or L}) = p(\text{T}) + p(\text{L})$ $\Rightarrow p(\text{T}) = p(\text{T or L}) - p(\text{L})$ $= \frac{2}{3} - \frac{1}{4} = \frac{8}{12} - \frac{3}{12} = \frac{5}{12}$ P_3: $p(\text{E or T}) = p(\text{E}) + p(\text{T})$ $= \frac{1}{3} + \frac{5}{12} = \frac{4}{12} + \frac{5}{12} = \frac{9}{12} = \frac{3}{4}$ P_4: $p(\text{E or T}) = 1 - p(\text{L}) = \frac{3}{4}$ *40 mins*	Whole class activity. T leads Ps to discover that there are three possible mutually exclusive outcomes: 'Early', 'On time' and 'Late', if we are waiting for a bus (and it comes!); this is why 'T or L' and 'E' are complementary events. After discussion, T asks three volunteer (probably stronger) Ps to explain and write on BB what has just been discussed. After P_3 has explained and written on BB,T asks if anyone can show another, quicker, method for answering (b). Agreement. Praising.

Y7	**UNIT 21** ***Probability of One Event*** Lesson Plan 5	*Mutually Exclusive Events*
Activity		***Notes***
6	**Misconceptions** **OS 21.10, Q1 - 3** T: We've said a lot about estimating the probabilities of events. When people are betting on something, they often make the wrong decision because of something they believe to be true that is not. We'll look at some of these misconceptions now.	Whole class activity. Each P has a copy of OS 21.10. T asks a P to read out a statement, gives Ps time for discussion and then they explain why the conclusion is incorrect, statement by statement. Agreement. Praising.
	45 mins	
	Set homework **OS 21.10, Q4 - 8** **PB 21.6, Q7**	

Y7 UNIT 21 *Probability of One Event* Lesson Plan 6

Practising, Summarising

Activity | ***Notes***

1A

Checking homework

OS 21.10, Q4 - 8

Discussion. It is most important to understand that, for gambling problems, the probability of an event (→ estimation) remains the same - each new event is independent of all previous events.

When answering Q6, T can ask Ps to suggest other similar examples.

For Q8, T might need to help Ps realise why this is a misconception.

1B

PB 21.6, Q7

P_1 (writes on BB):

W: Walking

C: Cycling

B: By bus

$$p(\text{W or C}) = p(\text{W}) + p(\text{C})$$

$$p(\text{W}) = p(\text{W or C}) - p(\text{C})$$

$$\Rightarrow p(\text{W}) = \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$$

P_2: $p(\text{B}) = 1 - p(\text{W or C})$

$$p(\text{B}) = 1 - \frac{3}{4} = \frac{1}{4}$$

P_3: $p(\text{C or B}) = p(\text{C}) + p(\text{B}) = \frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

or

P_4: $p(\text{C or B}) = 1 - p(\text{W}) = \frac{1}{2}$

Discussion - checking at BB: volunteer Ps are asked to come to BB to give solutions. While doing this they reinforce the concepts of complementary events and mutually exclusive events and the rules they have leant about them.

Agreement, Feedback, self-correction. Praising.

8 mins

2

Revision - mental work

T: Let's see what we've learnt in this unit.

M 21.2

Mental work. The Diagram Sheet for Mental Tests appears on OHP and T reads out the questions. Each question should be repeated so that slower Ps can fully understand what is being asked.

Ps volunteer and give full explanations with their answers, with class discussion where appropriate. This test covers almost everything from the unit.

Agreement, feedback, self-correction. Praising.

20 mins

Y7 UNIT 21 *Probability of One Event* Lesson Plan 6 *Practising, Summarising*

Activity | *Notes*

3 **Probabilities with playing cards**

3A **Activity 21.3, Q1, Q2 (a) and (b)**

Task appears on OHP and each P is given a copy.

Whole class activity - all Ps involved in discussion on these questions.

3B **Activity 21.3, Q2 (c) - (f)**

+ (g) .... no Aces?

+ Q3. How many spades would you expect to obtain if you took a card at random 60 times from a complete pack, replacing the card in the pack each time?

Solutions

1\. 52

2\. (a) $\frac{1}{52}$ (b) $\frac{13}{52} = \frac{1}{4}$ (c) $\frac{4}{52} = \frac{1}{13}$

(d) $\frac{2}{52} = \frac{1}{26}$ (e) $\frac{3}{52}$ (f) $\frac{12}{52} = \frac{3}{13}$

(g) $\frac{48}{52} = \frac{12}{13}$

3\. *15 spades*

Individual work, monitored, helped.

Detailed discussion.

After agreement, T writes each answer on BB (→ self-correction). Praising

30 mins

4 **A simple lottery game**

Activity 21.2

Table Showing Frequencies of Numbers Obtained in Simple Lottery

Number of Trials	*Tally Chart for (,)*	*Cumulative Frequency*	*Relative Frequency*
50			
100			
150			

Whole class activity with some individual work.

T explains the rules of this simple lottery as they apply to (a) (the successful outcome is when *both* digits are same as the winning pair of numbers).

Each P chooses a 'card' (a pair of numbers 1-6), and T sketches a table on BB and asks Ps to copy it into Ex.Bs (labelling the second column with their chosen card).

Then T throws the dice repeatedly and asks Ps to keep a tally of each successful outcome.

After the 50th and 100th throws, T waits for Ps to sum their tallies and fill in the rows of the table.

After the 150th throw, Ps again put results on the table; discussion follows as to what each P has observed and what they expect.

After listing all the possible outcomes, Ps find the probability of winning with their card. Then T makes Ps compare the theoretical result with the relative frequencies from the

(continued)

Y7 UNIT 21 *Probability of One Event* Lesson Plan 6 *Practising, Summarising*

Activity

4
(continued)

Notes

150 trials. T asks Ps to say whether their card is 'lucky' or 'unlucky' and then lists the cards on BB in order, starting with the 'luckiest'.

Now that Ps fully understand the game and the theoretical probabilities, they take part in another 10 rounds (trials) and can bet (no stakes) on cards.

Results (received with pleasure or disappointment!), discussion.

Encouragement. Praising.

Calculating probabilities

Q1 → (1, 2) (1, 3) (1, 4) (1, 5) (1, 6)
(2, 3) (2, 4) (2, 5) (2, 6) (3, 4)
(3, 5) (3, 6) (4, 5) (4, 6) (5, 6)

Q2 → $\frac{1}{15} \approx 0.066\ldots \approx 6.7\%$

or more
45 mins

Set homework
PB 21.1, Q5
PB 21.1, Q6
PB 21.1, Q8