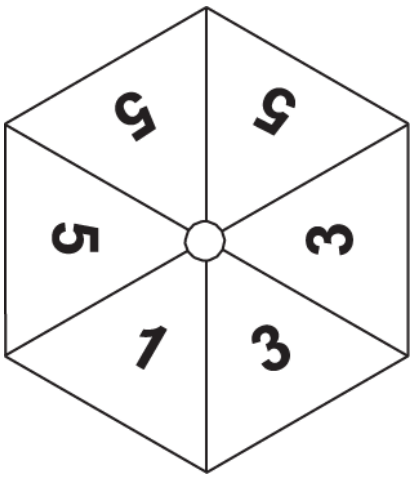
1(a). An unbiased spinner is shown below.



Write a number to make each sentence true.

(i) It is **evens** that the spinner will land on number _____.

[1]

(ii) There is a probability of $\frac{1}{6}$ that the spinner will land on number _____.

[1]

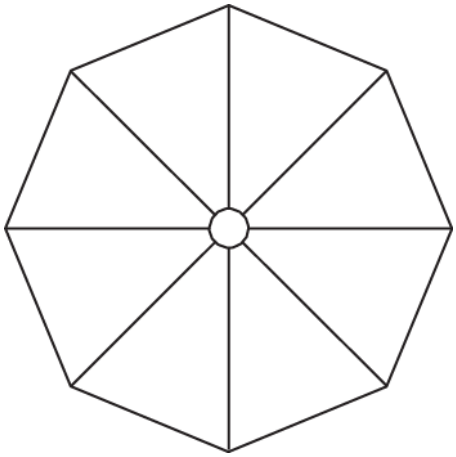
(iii) It is **impossible** that the spinner will land on number _____.

[1]

(b). The spinner below has the following properties.

- There are eight equal sections, each showing one number.
- There are three different numbers on the spinner.
- The probability of the spinner landing on an even number is greater than the probability of it landing on an odd number.
- It is more likely that the spinner will land on a 6 than either of the other numbers.

Complete the spinner to show one possible arrangement of numbers.



[3]

2(a). Abi, Ben and Carl each drop a number of identical drawing pins, and count how many land with the pin upwards.
The table shows some of their results.

	Number of pins dropped	Number landing 'pin up'
Abi	10	4
Ben	30	9
Carl	100	35

Abi says

As a drawing pin *can* only land with its pin up or with its pin down, the probability of a drawing pin landing 'pin up' is $\frac{1}{2}$.

Criticise her statement.

---

[1]

(b). Carl's results give the best estimate of the probability of a drawing pin landing 'pin up'.
Explain why.

---

[1]

(c). Two pins are dropped.

Estimate the probability that both pins land 'pin up'.

(c) _____ **[2]**

3. A bag contains only pink counters and orange counters.
There are 7 pink counters and 2 orange counters.

Mia takes a counter from the bag without looking.

(i) What is the probability that the counter is pink?

_____

[1]

(ii) What is the probability that the counter is green?

_____

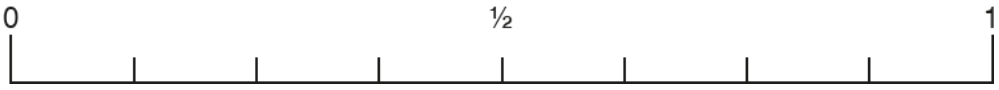
[1]

4(a). A fruit bowl contains 48 pieces of fruit.

3 Apples	6 Bananas	5 Plums	4 Oranges	30 Peaches

A piece of fruit is taken from the bowl at random.

Use arrows to mark the following on the probability line below.



The probability that it is a banana.

Label this arrow **B**.

[1]

(b). The probability that it is a peach.

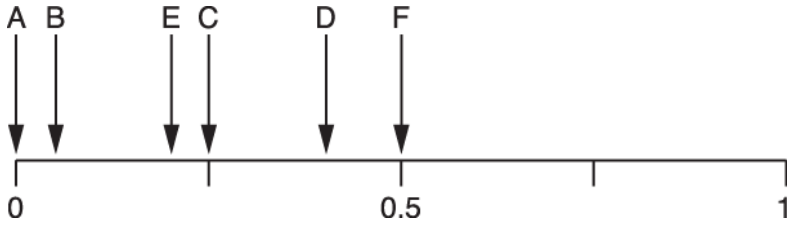
Label this arrow **P**.

[1]

5(a). Sarah has 80 sweets in a bowl.

- 16 are red
- 40 are green
- 20 are blue
- 4 are orange

Sarah chooses a sweet at random from the bowl.



Which arrow shows the probability that the sweet is

(i) green,

(i) Arrow _____

[1]

(ii) red,

(ii) Arrow _____

[1]

(iii) orange.

(iii) Arrow _____

[1]

(b). The next day, 20 of the sweets have been eaten and there are now 60 sweets left in the bowl. Sarah now picks a sweet at random.

- It is impossible to choose an orange sweet.
- It is equally likely to be a red sweet or a blue sweet.

Work out a possible number of sweets of each colour in the bowl.

Red _____ , Green _____

Blue _____ , Orange _____

[3]

6(a). A four-sided spinner is numbered 1 to 4.

The spinner is spun many times and, each time, the number it lands on is recorded.

The table shows the results.

Number	1	2	3	4
Frequency	132	117	128	123

Explain why it is reasonable to use this information to work out an estimate of the probability of getting a 4 with this spinner.

---

[1]

(b). Use the values in the table to work out an estimate of the probability of getting a 4 with this spinner.

---

[2]

(c). Is the spinner fair or biased?

Explain clearly how you decide.

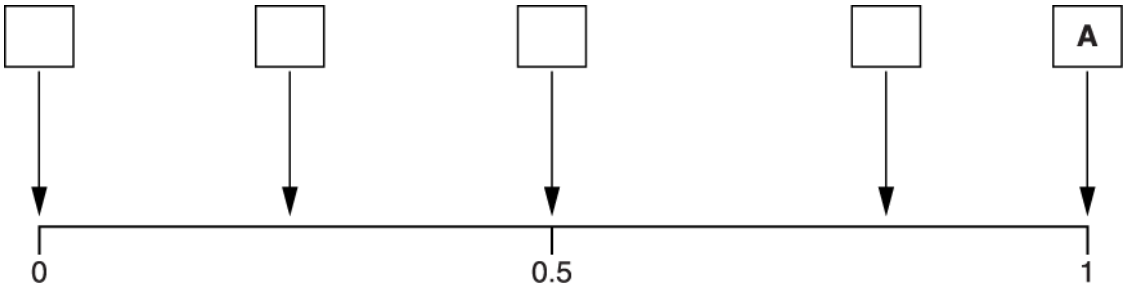
---

[2]

7. Twenty cards, numbered 1 to 20, are placed in a bag.
A card is chosen at random from the bag.

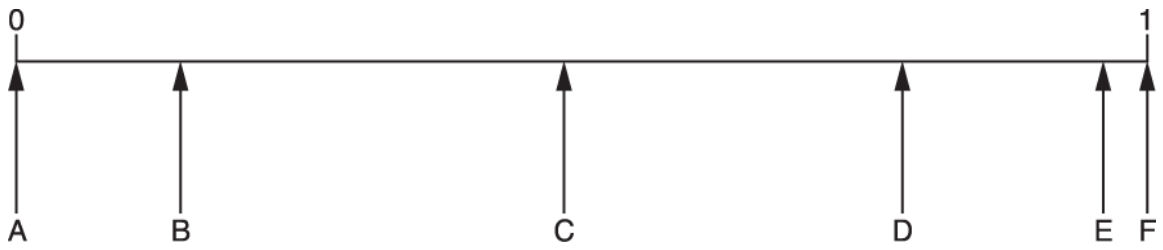
Write the letter in the box above an arrow on the probability line for each of these events.
Event **A** has been done for you.

A A positive number is chosen.
B An odd number is chosen.
C A negative number is chosen.
D A multiple of 4 is chosen.
E A number less than 17 is chosen.



[4]

8(a). The probability line shows the probabilities of 6 events.



Choose the correct arrow that matches each of these events.

Flipping a fair coin and getting a tail.

_____ [1]

(b). Rolling a fair normal 6-sided dice and getting a 5.

_____ [1]

(c). Rolling a fair normal 6-sided dice and getting a multiple of 9.

_____ [1]

(d). It will be sunny on at least one day in March.

_____ [1]

9(a). Giovanni has a bag containing 20 sweets.
5 are red, 4 are blue, 10 are green and 1 is orange.

He chooses a sweet at random from the bag.

Choose from the words below to complete each sentence.

likely	impossible	certain	evens	unlikely

It is _____ that he chooses a red sweet.

It is _____ that he chooses a sweet that is **not yellow**.

It is _____ that he chooses a blue sweet or a green sweet.

It is _____ that he chooses a green sweet.

[4]

(b). Sophia has a bag of 18 sweets with the same four colours of sweets as Giovanni.

She chooses one sweet at random from her bag.

- It is evens that she chooses a red sweet
- It is more likely that she chooses a green sweet than a blue sweet
- It is equally likely she chooses a blue sweet as choosing an orange sweet

Write down one possible combination for the numbers of different colours of sweets that Sophia has in her bag.

Sophia has _____ red sweets, _____ orange sweets,

_____ blue sweets and _____ green sweets **[3]**

10(a) Tom takes a counter, at random, from a bag of counters.

.

He records the colour of the counter and replaces it into the bag.

He does this 2000 times.

The table below shows his results.

Colour of counter	Red	Blue	Yellow
Number of times	653	509	838

Can Tom be certain that there are only red, blue and yellow counters in the bag?

Give a reason to support your answer.

_____ because _____

_____ [1]

(b). Tom is now told that there are only red, blue and yellow counters in the bag.

(i) Complete the relative frequency table below.

Give each of your answers as a decimal.

Colour of counter	Red	Blue	Yellow
Relative frequency			

[2]

(ii) Explain why these relative frequencies are reasonable estimates of the probabilities of randomly choosing the different colours of counters from the bag.

---

[1]

(iii) Tom chooses another counter from the bag at random.

Work out an estimate of the probability that it is either red or blue.

(iii) _____ [2]

(iv) There are 24 counters altogether in the bag.

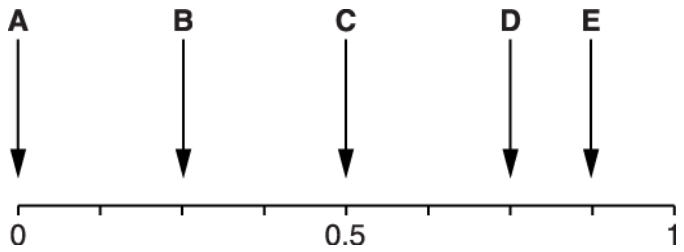
Work out an estimate of the number of yellow counters.

(iv) _____ [2]

11. Baby Gabriel has 8 bibs in his drawer:

- 2 blue
- 1 black and white
- 4 green
- 1 yellow.

His mum takes a bib from the drawer without looking.



Which arrow shows the probability that the bib she takes is

(i) green,

(i) _____ [1]

(ii) blue,

(ii) _____ [1]

(iii) not yellow?

(iii) _____ [1]

12(a) Ewan has 12 yoghurts in his fridge.

.

This table shows the number of yoghurts of each flavour in his fridge.

Flavour	Number of yoghurts
Chocolate	6
Strawberry	3
Lemon	2
Vanilla	1

Ewan takes a yoghurt, at random, from the fridge.

What is the probability that the flavour is

(i) vanilla,

(i) _____ [1]

(ii) banana?

(ii) _____ [1]

(b). Complete these sentences.

The probability that the flavour is _____ is $\frac{1}{2}$.

The probability that the flavour is _____ is $\frac{1}{4}$.

[2]

13. Rick asked a random sample of 160 students from his school what they did for lunch.
The table shows the results of Rick's survey.

School lunch	Packed lunch	Go to shops	No lunch
43	61	38	18

Work out the relative frequency of eating school lunch.

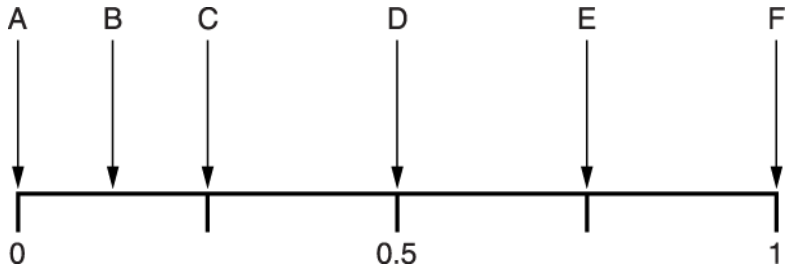
_____ [1]

14(a) A sandwich shop has these 40 sandwiches for sale one morning.

.

- 10 tuna
- 20 ham
- 7 chicken
- 3 cheese

A sandwich is chosen at random from these sandwiches.



Which arrow shows the probability that the sandwich is

(i) tuna,

(i) Arrow _____ **[1]**

(ii) beef,

(ii) Arrow _____ **[1]**

(iii) ham?

(iii) Arrow _____ **[1]**

(b). By the afternoon, 30 of the sandwiches have been sold.
Here are some facts about the 10 sandwiches left.

- There are three types of sandwich left.
- If one sandwich is chosen at random, it is evens that it will be tuna.
- If one sandwich is chosen at random, it is less likely to be chicken than cheese.

Work out one possible combination of the types and numbers of the 10 sandwiches left.

[3]

15(a) At Willingboro Academy, pupils are either right-handed or left-handed,but not both.

. The probability that a pupil chosen at random from Willingboro Academy is left-handed is 0.1.

(i) Write down the probability that a pupil chosen at random from the Academy is right-handed.

(i) _____ [1]

(ii) The Academy has 780 pupils altogether.

How many of these pupils are **left-handed**?

(ii) _____ [2]

(b). At St Michael's School, the probability that a pupil chosen at random is left-handed is $\frac{1}{12}$.

There are 912 pupils at St Michael's School.

Which of St Michael's School and Willingboro Academy has the greater number of left-handed pupils, and by how many?

_____ has _____ more left-handed pupils. **[3]**

16(a) A random sample of students in a school is asked about their lunch arrangements.

. The table shows their responses.

	School dinner	Sandwiches	Home	Local shop
Frequency	82	58	36	24

(i) Complete the table of relative frequencies for these data.
Give each answer as a decimal.

	School dinner	Sandwiches	Home	Local shop
Relative frequency				

[3]

(ii) Explain why it is reasonable to use the relative frequencies as estimates of probability.

---

[1]

(b). Use the data to work out an estimate of the probability that a student, chosen at random, either goes home or goes to the local shop for lunch.

---

[2]

(c). There are 3200 students in the school altogether.

How many of these would you expect to have a school dinner?

---

[2]

17(a) Gill has five boxes that contain only red and yellow counters.

.

box A	8 red, 4 yellow
box B	9 red, 6 yellow
box C	5 red, 2 yellow
box D	5 red, 7 yellow
box E	14 red, 6 yellow

She takes a counter from a box without looking.

If she takes a counter from box A, what is the probability that it is red?

_____ [1]

(b). If the probability that she takes a red counter is $\frac{5}{7}$, which box did she take it from?

box _____ [1]

(c). If the probability that she takes a red counter is 0.7, which box did she take it from?

box _____ [1]

(d). If the probability that she takes a red counter is 60%, which box did she take it from?

box _____ [1]

18(a) Jayden makes a 5-sided spinner, numbered from 1 to 5.

. He records the number of times he scores a 3 from different numbers of spins.

Number of spins	10	50	200
Number of times 3 scored	4	18	76
Relative frequency			

Complete the table to show the relative frequencies of scoring 3.

[2]

(b). Which of the relative frequencies gives the best estimate of the probability of scoring 3?

Give a reason for your answer.

_____ because _____

_____ **[1]**

(c). Estimate the number of times Jayden would expect to score a 3 if he spins the spinner 500 times.

_____ [1]

(d). Is Jayden's spinner fair?

Give a reason for your answer.

_____ because _____

_____ **[1]**

19(a). Wanda asked a random sample of 120 students from a college what they were planning to do when they left college.

The table shows the results of Wanda's survey.

University	Apprenticeship	Job
74	16	30

One of these students is selected at random.

What is the probability that the student is planning to go to university?

_____ [1]

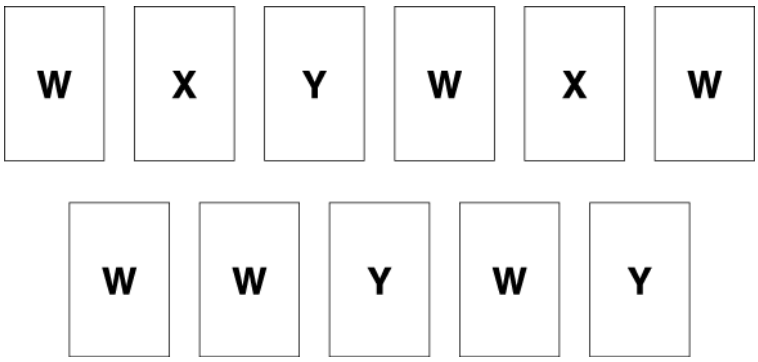
(b). There are 2400 students at the college.

Estimate the number of these students who plan to get a job.

_____ [2]

20(a) Emilea has some cards with letters on them.

.



Emilea takes a card without looking.

What is the probability the card has a W on it?

_____ [1]

(b). What is the probability the card has either an X or a Y on it?

_____ [1]

(c). What is the probability the card has a Z on it?

_____ [1]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1	a	i	5	1		
		ii	1	1		
		iii	Any number apart from 1, 3 or 5	1		
	b		Three different numbers only 6 appears most More even numbers than odd	3	**B1** for each of the three properties	
			Total	**6**		
2	a		Outcomes not equally likely **oe**	1		
	b		Larger number of trials	1		
	c		0.09 – 0.16	2	**M1** for $\left(\frac{48}{150}\right)^2$ or 0.35^2 or any reasonable estimate (**FT** *their* **(b)**)	
			Total	**4**		
3		i	$\frac{7}{9}$ or [0].77[7…] or [0].78 or 77.[7…]% or 78%	1	Accept $\frac{7}{9}$ with '[very] likely' on the answer line $\frac{7}{9}$ with 7 in (out of) 9 on the answer line	ISW Do not accept a ratio Examiner's Comments This was very well done with the majority giving fractional answers. Fewer incorrect forms were seen and in (i) if 'likely' was stated it was often accompanied with the correct fraction.

Question			Answer/Indicative content	Marks	Part marks and guidance	
		ii		1	Do not accept 'impossible' or 'none' alone. Accept 0 with eg 'no chance' on the answer line 0 with 0 in (out of) 9 on the answer line	Do not accept a ratio Condone $\frac{0}{9}$ Examiner's Comments In (ii) $\frac{0}{9}$ was very commonly stated. As with part (i) fractions were sometimes accompanied with 'impossible'.
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
4	a		Arrow at $\frac{1}{8}$ labelled B	1		Tolerance ± 2mm by eye If no arrow accept B in correct position
	b		Arrow at $\frac{5}{8}$ labelled P	1		Tolerance ± 2mm by eye If no arrow accept P in correct position Examiner's Comments Only a relatively small number answered this question successfully with a large proportion placing their arrows in wrong positions. There was no real pattern to the incorrect answers as the placements often seemed to be quite random, but placing P at the three quarter mark was quite common. A significant number simply indicated the positions with letters only for which a mark could be awarded or an unlabelled arrow which was ambiguous and could not score. Successful students often labelled the divisions on the scale with 6, 12, 18, etc. which helped them to locate the correct position.
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
5	a					Examiner's Comments This question on simple probability and reasoning was very well answered. Almost all candidates were able to interpret the probability line in.
		i	F	1		
		ii	E	1		
		iii	B	1		
	b		No orange and total = 60 and red = blue where $10 \leq$ red ≤ 16	3	**B1** for number of red = number of blue where $10 \leq$ red ≤ 16 And **B1** for no orange	e.g. 3 for Red 16 Blue 16 Green 28 2 for Green 26 Blue 10 Red 10 1 for Green 30, Orange 2, Red 12, Blue 12 Examiner's Comments This required some interpretation and reasoning and was very well attempted by many. Most were able to give the number of orange sweets as zero to earn partial credit. A common error was to give the number of red and blue sweets as equal but with impossible values such as 25 for each when there were only 20 blue and 16 red sweets at the start before 20 of them were eaten.
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
6	a		Large number of trials oe	1		Examiner's Comments Many candidates realised that the large number of trials made this a reliable estimate. Others wrote about it being a fair spinner which made the estimate reliable. Some discussed how the data could be used to find the probability.
	b		$\frac{123}{500}$ isw or 0.246 or 24.6%	2	**B1** for 500 seen Or **M1** for $\frac{123}{their 500}$	Examiner's Comments There were many correct answers given as a fraction, a decimal or a percentage. Some candidates failed to total the frequencies correctly. A number divided the wrong way around. Others ignored the table and went for $\frac{1}{4}$ or equivalent as their answer.
	c		-Fair and frequencies approx. same oe -All approx. ¼ of 500 (125)	1 1indep	Or -Fair and all probabilities approx. same oe -All approx. 0.25 oe	See appendix 2 Exemplar responses Fair, results are close (1, 0) Fair, it lands an even amount of times (0, 0) Fair, the numbers are close together (1, 0) Biased as the frequencies are not all the same (0, 0) Fair, an equal amount of numbers on the spinner (0, 0) Fair, all the numbers are in the 100's and the biggest gap is 15 (1, 0) Biased, as you should get 125 for each number (0, 1) Fair, all the numbers are close to 125 which is what you expect (1, 1)

Question			Answer/Indicative content	Marks	Part marks and guidance	
						Fair, as there are no drastic anomalies in the frequencies (1, 0) Fair, all the probabilities are approximately 0.25 (1, 1) Fair, all frequencies are in a range of 9 (1, 0) Fair, each result was similar (1, 0) Fair, lands on each of them a lot of times (0, 0) Examiner's Comments Most candidates thought that the spinner was fair since the frequencies were close. Others thought that it was biased since they were not all exactly 125, $\frac{1}{4}$ of the total number of spins. A number thought that it was fair because the probability of getting a 4 was approximately 0.25 but made no reference to the other numbers.
			Total	5		
7			Order on line C D B E	4	B1 for each correct box Examiner's Comments This was well done, most scored all 4 marks, a few made errors with the probabilities of an odd number chosen and a number less than 17 chosen.	
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
8	a		C	1	Examiner's Comments There were mixed responses in interpreting the probability line. This was answered well.	
	b		B	1	Examiner's Comments There were mixed responses in interpreting the probability line. This was answered well.	
	c		A	1	Examiner's Comments A common error was B.	
	d		E	1	Examiner's Comments A common error was F.	
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
9	a		Unlikely Certain Likely Evens	4	**B1** for each correct **Examiner's Comments** The question involved interpreting the vocabulary of probability and candidates scored reasonably well on the question. This was well answered.	
	b		[Red] 9 or 9 [Orange] 2 1 [Blue] 2 1 [Green] 5 7	3	**B1** for Red = 9 **and B1** for more green than blue or for orange = blue **Examiner's Comments** This was challenging and required a more strategic approach, many were successful in addressing the three conditions and almost all were able to address at least one of the conditions to gain partial credit.	
			Total	7		

Question			Answer/Indicative content	Marks	Part marks and guidance	
10	a		e.g. - No, there could be another colour - No, he has not seen all the counters - No, he may have picked the same counter / colour multiple times	1	Examiner's Comments Some very sensible arguments were put forward to justify their decision. A common error was to assume that there were 2000 counters in the bag.	Condone e.g. - Yes, large number of (or 2000) trials - Yes, would have picked another colour by now - Yes, 2000 trials and only got red, blue and yellow Example Responses No – there could be different colours at the bottom of the bag (1) No – he could have picked up the same counter multiple times (1) No – there could be a chance of other colours (1) No – there may be one or two of another colour (1) No – every time he picks a counter he puts it back in – he could be choosing the same one over and over (1) No – although he does this 2000 times, he may have picked up one more than once (1) No – he replaces each counter so he has not seen all of the counters (BOD1) No – he is picking at random (0) No – he put the counters back in the bag (0) No – because it's down to chance (0) No – you can't see in the bag (0)

Question			Answer/Indicative content	Marks	Part marks and guidance	
						No – we don't know how many counters are in the bag – there could be 10000 (0) Yes – he did not get any others in a test of 2000 counters (1) Yes – he would not have done it 2000 times without realising there was more than 3 colours (1) Yes – he performed the test 2000 times so the data would be correct (1) Yes – he has counted up all the colours and they add to 2000 (0) Yes – the number of times he did it add up to 2000 (0)
	b	i	0.3265 0.2545 0.419 rot to at least 2dp	2	**B1** for one of these values rot to 1 dp or better oe **Examiner's Comments** There were some correct answers for the probabilities but errors occurred when rounding. Common incorrect approaches were to divide the frequency by 10, 100 or 1000. Some divided 2000 by each frequency and did not reflect on the appropriateness of the answers. There were many omissions throughout this question.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
		ii	e.g. - Large number of trials oe	1	Examiner's Comments Common errors were to say that the probabilities added to 1 or to explain what the relative frequency meant.	Ignore other comments Condone: - Done it enough times oe - Done it 2000 times oe
		iii	0.581[0] or 0.58 oe	2	**M1** for *their* (0.3265 + 0.2545) or for 1 – *their* (0.419) Examiner's Comments There were many correct answers but just as many omissions. The final part had a few good answers following a correct method. Once again there were many omissions and a few answers that appeared to be guesswork.	
		iv	10	2	**M1** for 24 × *their* (0.419) soi	For M1, if no working, check back — condone rounding up or down
			Total	8		
11		i	C	1		
		ii	B	1		
		iii	E	1	Examiner's Comments This was often well answered, although a small number gave answers such as ‘unlikely’.	
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
12	a	i	1/12 or 0.08(3…) or 8.3(3…)%	1	Examiner's Comments Most students understand that the probability in questions of this type needed to be given as a fraction. Only a small number gave answers as words such as unlikely, ratios or 1 in 12 etc, which were not acceptable.	Ratio on the answer line scores 0 Accept unlikely or 1 in (out of) 12 on the answer line with the correct answer
		ii		1	Only accept impossible or none **with** a correct answer on the answer line Examiner's Comments Most students understand that the probability in questions of this type needed to be given as a fraction. Again a very small number gave an answer of impossible without the numerical value 0, which was not acceptable. Many candidates gave an answer of 0/12 which, although inelegant, is condoned.	Ratio on the answer line scores 0 Condone 0/n or 0 in (out of) n (n a positive integer)
	b		… flavour is **chocolate** is ½ … flavour is **strawberry** is 1/4	2	**B1** for one correct Examiner's Comments There were many fully correct responses, demonstrating a clear understanding of how the equivalence of fractions ties in with probability.	
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
13			$\frac{43}{160}$ or 0.268[…] or 0.269 or 0.27	1	Award mark if $\frac{43}{160}$ seen **Examiner's Comments** Few candidates understood the concept of relative frequency. Answers were often greater rather than smaller than 1.	Condone 26.8[…]% or 26.9% or 27%, must have % symbol or correct fraction seen
			Total	1		

Question			Answer/Indicative content	Marks	Part marks and guidance	
14	a	i	C	1		Throughout this part accept indication on probability line e.g. flavour written next to correct letter, ignore any probabilities given
		ii	A	1		
		iii	D	1	**Examiner's Comments** Very well answered and the majority of candidates were able to select the correct letters from the probability scale that represented the given event.	
	b		5 tuna **and** cheese and one other flavour totalling 5 where the number of cheese is 3, 2 or 1 and is greater than the number of chicken	3	**B1** for 5 tuna **B1** for number of cheese is greater than the number of chicken and the cheese is either 3, 2 or 1 **Examiner's Comments** Involved some simple problem solving; a good number were successful in giving one of the correct solutions. Most others were able to identify that there were 5 tuna sandwiches left from the condition that choosing a tuna sandwich was even, many were unable to give more cheese sandwiches left than chicken. A few gave an answer such as 4 cheese, where there were more cheese sandwiches left than there were at the start of the day.	Condone e.g. Tuna 5/10, Cheese 3/10, chicken 2/10 for 3 marks or B marks eg For **2** marks 5 tuna 3 cheese 1 chicken eg For **1** mark 3 tuna 3 cheese 4 ham
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
15	a	i	0.9 oe	1		
		ii	78	2	**M1** for 780 × 0. 1 oe **Examiner's Comments** This was very well answered with most giving correct answers to both parts (i) and (ii). A few gave answers such as 0.99 to part (i) and 390 to part (ii)	
	b		Willingboro Academy by 2	3FT	FT difference between *their* (a)(ii) and 76 with a correct choice of school **M2** for the difference between *their* (a)(ii) and $912 \times \frac{1}{12}$ oe and chooses the correct school or **M1** for $912 \times \frac{1}{12}$ oe **Examiner's Comments** This was well attempted. The most common error was to approximate the decimal version of the fraction $\frac{1}{12}$ to 0.8 or 0.83 which resulted in a rounding error in the calculation. A few did not know how to find $\frac{1}{12}$ of 912.	If 1/12 pa to give e.g. 75.7 then M2 maximum Accept 0.083[..] for 1/12 for method
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
16	a	i	0.41 0.29 0.18 0.12	3	**B1** for 200 soi **M1** for use of $\frac{\text{frequency}}{\textit{their}\ \text{total}}$ **Examiner's Comments** In part (i), a minority gave correct decimal relative frequencies. Many gave answers such as 0.82, 0.58 etc, considering the total to be 100 and not 200 and 8.2, 5.8, 3.6 etc were also common answers. The term relative frequency was not understood by many.	At least once
		ii	Large sample size	1	**Examiner's Comments** Part (ii) was poorly answered with the majority giving answers such as 'because they add up to 1' or 'it is easy to convert to percentages'. Only a few described the large sample size as the significant factor.	
	b		0.3[0] oe	2	*–1 for poor notation* **M1** for *their*(0.18) + *their*(0.12) or (36 + 24) / (82 + 58 + 36 + 24) oe **Examiner's Comments** Some knew that the addition of the final two answers in their table was needed here while others who did not have the correct values started again to reach the correct value, having done the incorrect division in part (a)(i).	e.g. 0.3/1, 3 in 10 etc

Question			Answer/Indicative content	Marks	Part marks and guidance	
	c		1312	2	**M1** for *their*(0.41) × 3200 or for 82 ÷(82 + 58 + 36 + 24) × 3200 oe **Examiner's Comments** A minority had the correct answer; of these many used the original data tocalculate the expected value rather than the value from their table. A few were able to gain partial credit for using a value from their table and multiplying it by 3200.	Ignore rounding after correct answer
			Total	8		

Question			Answer/Indicative content	Marks	Part marks and guidance	
17	a		2/3 or 4/6 or 8/12 or 0.66(…) or 0.67 or 66% or 67%	1	isw Examiner's Comments Many candidates gave the correct answer. A common error was to give an answer of 8/4, a few gave a ratio as an answer which is not appropriate for a probability. A small number did not realise that a numerical answer was required and gave an answer of likely.	Accept a correct fraction with 'likely' on the answer line
	b		C	1	Examiner's Comments A majority of candidates realised that box C with 5 red and 2 yellow would have a probability of 5/7 of taking a red counter. A common error was to choose box D which had 5 red and 7 yellows, with candidates clearly not thinking this through.	Accept lower case in all parts Accept 5 red 2 yellow
	c		E	1	Examiner's Comments Generally only a few candidates found the correct box in this part.	Accept 14 red, 6 yellow
	d		B	1	Examiner's Comments Generally only a few candidates found the correct box in this part.	Accept 9 red, 6 yellow
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
18	a		0.4 0.36 0.38 **oe**	2	**B1** for 1 correct Or answers figs 4, 36 **and** 38 **Examiner's Comments** Relative frequency was not understood by most candidates. Nearly all gave an answer of a number greater than one, from either adding, multiplying or dividing the number of spins by the number of 3s.	Accept $\frac{4}{10}$, $\frac{18}{50}$, $\frac{76}{200}$ etc

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b		0.38, more trials [give a better estimate]	1	Examiner's Comments Most candidates did not appreciate that the most number of spins would give the best estimate.	Response 0.38, used more spins (**1**) [implies more trials] 200, if you do more spins then you will get more accurate results (**1**) 0.38, he span it 200 times so more reliable (**1**) 124, it samples a larger number (**1**) [bod, 124 identifies correct column] 0.38 because it's the highest number (**0**) [not clear that highest number of spins] 98 out of 200, it shows that Jayden has also scored other numbers out of the 200 spins (**0**) [irrelevant] 0.38, it's between 0.4 and 0.36 so is more reliable (**0**) [irrelevant] Accept any implication of 200 spins column for 0.38 Award 0 if any incorrect statement
	c		180 to 200	1	FT 500 × *their* relative frequency from (b) Examiner's Comments Although candidates rarely scored in part (a), some candidates were able to use the values in the table to come up with a sensible estimate within the acceptable range.	allow ±10 from calculated value Accept a range if end values are within given range FT only if relative frequency < 1 Condone eg 190/500 as answer

Question			Answer/Indicative content	Marks	Part marks and guidance	
	d		No, would expect probability of 0.2 if fair Or No, would expect 100 3s if fair	1	Examiner's Comments Many candidates thought that the spinner was fair. For those who correctly thought that the spinner was biased, explanations were either incorrect or incomplete. For instance many candidates thought it was not fair because there were different numbers of odd and even numbers on the spinner.	Response No, for 10 it should be 2, for 50 it should be 10 and for 200 it should be 40 (**1**) [compares expected outcomes] No, you shouldn't expect 180, you should expect 100 if it was fair (**1**) [compares expected outcomes] No, if it was fair he would score 3 every 5 times, but he scores it much more frequently than every 5 times (**1**) [implies expected outcomes] No, more 3s were scored than other numbers, it was not equal (**1**) [borderline but implies unequal probabilities] No the relative frequency of 3 is higher than it should be if it was fair (**1**) [borderline as doesn't state 0.2] No, out of the 5 sides 3 comes up nearly half the times (**1**) [just acceptable, implies unequal] No, he scores 3 roughly a quarter of the time and there are 5 numbers so it's likely the 3 section is bigger than the others (**0**) [but if it said more than quarter we would accept] No, it has a better chance of landing on 3 than on any other number (**0**) [this may not be true, would be acceptable if also said not

Question			Answer/Indicative content	Marks	Part marks and guidance	
						equal] No, the numbers are not close together (**0**) Should compare probabilities or expected outcomes If 'Yes' award 0
			Total	5		
19	a		$\frac{74}{120}$ oe	1	accept 0.616[…] or 0.617 or 61.6[…][%] or 61.7% or better **Examiner's Comments** The majority of candidates found the probability correctly in part (a). A few did not realise that a number was required and gave an answer such as 'likely'. A very small number gave a ratio, which is incorrect, as a solution.	do not accept ratio as answer **isw** for incorrect cancelling or 74 in 120 or 74 out of 120 etc after correct fraction seen Condone 'likely' after correct fraction seen
	b		600 final answer	2	**M1** for $\frac{30}{120} \times 2400$ **oe** or for 600 seen with 2400 **Examiner's Comments** Some estimated the number of students successfully using an elegant method. Others tried to build up 30 to 120 to 600 to 2400, by adding on multiples of 120, but several made arithmetical errors in this approach.	e.g $\frac{600}{2400}$ or 600 out of 2400
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
20	a		$\frac{6}{11}$	1	**Examiner's Comments** Candidates who gave a numerical probability throughout the question usually gained all 3 marks. Some candidates still give probability in an incorrect form and some used words.	Penalise incorrect form once
	b		$\frac{5}{11}$	1	**FT** 1 – *their* (a) **Examiner's Comments** Some gave two separate probabilities rather than combining them.	
	c			1	**Examiner's Comments** Impossible was a common answer.	Accept $\frac{0}{11}$ or words zero, nil or nought only
			Total	3		