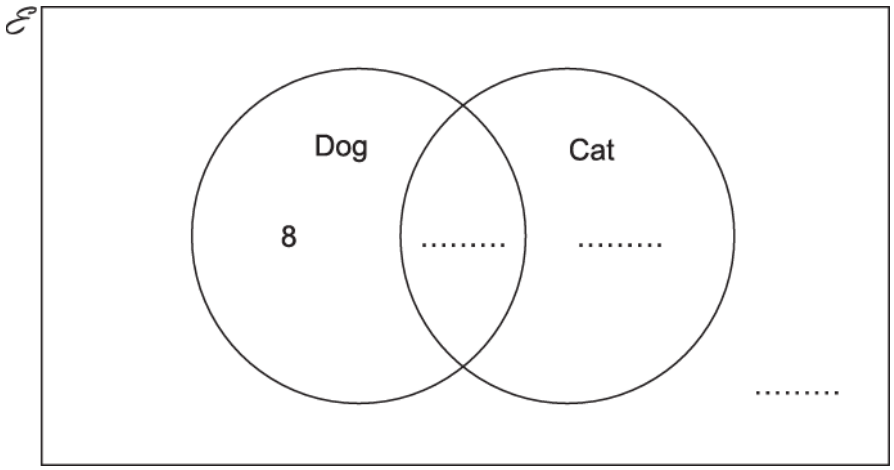
1. Here is a Venn diagram.



30 students are asked if they have a dog or cat.

- 21 have a dog.
- 16 have a cat.
- 8 have a dog, but not a cat.

Complete the Venn diagram.

[3]

2. Louise travels to work and home again by train.
The probability that her train to work is late is 0.7.
The probability that her train home is late is 0.4.

What is the probability that **at least** one of her trains is late?

_____ **[4]**

3(a). A tin contains four different types of sweet.

A sweet is taken from the tin at random.

The table below shows some of the probabilities of taking each type of sweet.

Sweet	Toffee	Fudge	Jelly	Mint
Probability	0.4	0.2		0.3

Complete the table.

[2]

(b). What is the probability that a toffee or a mint is taken from the tin?

(b) _____ [2]

4. Three friends, Ann (A), Bob (B) and Carol (C), go on holiday together.

They book a row of three seats on the plane.
When they arrive at the plane they sit in a random order.

(i) List all the different orders they could sit on the three seats.
The first one has been done for you.

Seat 1	Seat 2	Seat 3
A	B	C

[2]

(ii) What is the probability that Ann and Carol sit next to each other?

(ii) _____ [1]

(iii) What is the probability that Bob sits in seat 1 with Ann next to him?

(iii) _____ [1]

5. In a game, Ted can win, draw or lose.
The probability that he wins is 0.38.
The probability that he draws is 0.47.

Work out the probability that Ted loses.

_____

[2]

6. A dentist has this information about her patients.

Number of fillings	0	1 or 2	3 or 4	More than 4
Probability	0.25	0.17		0.4

(i) Complete the table.

[2]

(ii) One of the patients is chosen at random.
What is the probability that this person has 2 fillings or fewer?

(ii) _____

[2]

(iii) The dentist has 1500 patients altogether.
How many of these patients have 1 or 2 fillings?

(iii) _____

[2]

7(a). Otis flips two coins.

He records heads (H) or tails (T) for each of the two coins.

Complete the table to show the possible results when the two coins are flipped.

Coin 1	Coin 2

[2]

(b). What is the probability that the two coins

(i) both show heads,

(i) _____ [1]

(ii) show one head and one tail?

(ii) _____ [1]

8(a). Annabel has two fair spinners.

One spinner is numbered 1, 3, 5, 7 and the other is numbered 2, 4, 6, 8.

Both spinners are spun and the scores are added together.

Complete the table to show all possible totals.

	2	4	6	8
1	3	5	7	
3	5			
5				
7				

[2]

(b). Choose a word from this list to complete each sentence.

impossible	*unlikely*	*evens*	*likely*	*certain*

It is _____ that the total will be an odd number.

It is _____ that the total will be 7 or less.

[2]

(c). Work out the probability that the total will be 9.

Give your answer as a fraction in its simplest form.

_____ [2]

(d). Work out the probability that the total will be a multiple of 5.

_____ [1]

9. An athletics competition is held between four schools.

The table shows the probability of each school winning the competition.

School	1	2	3	4
Probability	0.15	0.37	x	$2x$

Work out the probability, x, of School 3 winning the athletics competition.

_____ **[3]**

10. Charlie (C), Max (M) and Sophie (S) are travelling by plane to St Petersburg.
Their seats are in a row of 3.

Complete the table to show where they could sit.
The first one has been done for you.

Seat 1	Seat 2	Seat 3
C	M	S

[2]

11(a) A fair ordinary dice is rolled and then a fair spinner is spun.

. The spinner is split into 2 equal sections, blue (b) and yellow (y).

List all the possible outcomes of rolling the dice and spinning the spinner.

The first one has been done for you.

You may not need to use all the rows.

Dice	Spinner
1	b

[2]

(b).

(i) What is the probability of getting an even number and blue?
Give your answer in its simplest form.

(i) _____ [2]

(ii) Which of these is more likely?

- Getting a number less than 6 and yellow

or

- Getting an odd number and blue.

Explain how you decide.

_____

_____ [2]

12(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]**

13. Ellie (E) is going to a football match with three friends, Alec (A), Karen (K) and Bev (B).

They sit next to each other in a row of four seats.
Ellie has to sit in seat 1 or seat 4.

Complete the table to show all twelve possible orders in which they could sit.
One has been done for you.

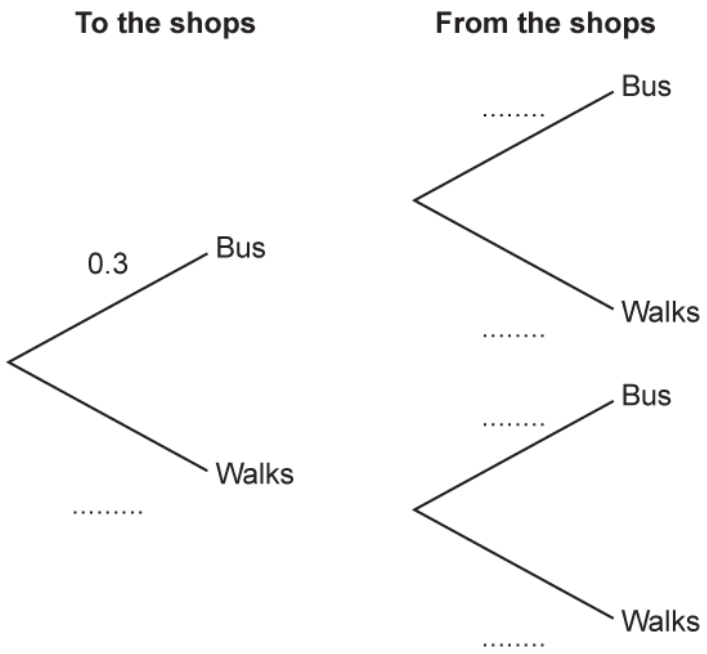
Seat 1	Seat 2	Seat 3	Seat 4
E	A	K	B

[2]

14(a) Kirsty either travels by bus or walks when she visits the shops.

. The probability that she catches the bus **to** the shops is 0.3.

The probability that she catches the bus **from** the shops is 0.8.



Complete the tree diagram.

[2]

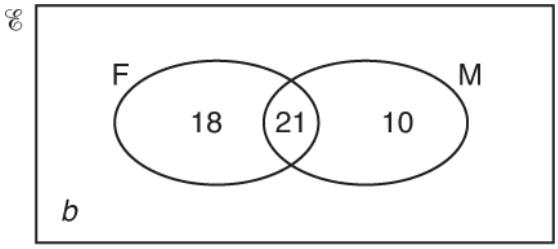
(b). Show that the probability that Kirsty walks at least one way is 0.76.

[2]

15.

The Venn diagram shows the number of students who passed their examination in French (F) and those who passed their examination in Mathematics (M).

The number of students who did not pass either examination is b.



(i) Find the value of b if the total number of students is 55.

b = _____ [1]

One of the 55 students is selected at random.

What is the probability that this student

(ii) passed both French and Mathematics,

(ii) _____ [1]

(iii) passed exactly one of these two subjects?

(iii) _____ [1]

16. Students at a school must choose one subject from Option 1 and one from Option 2.
The school offers two languages, French and Spanish.

The subjects are given in this table.

Option 1	Option 2
French	Spanish
Art	Geography
Music	History
Economics	

Work out the percentage of all the subject combinations which have exactly one language.

_____ % **[4]**

17. Bill owns four cars. Each car is a different colour.

Each day, he drives to work in one of his cars.

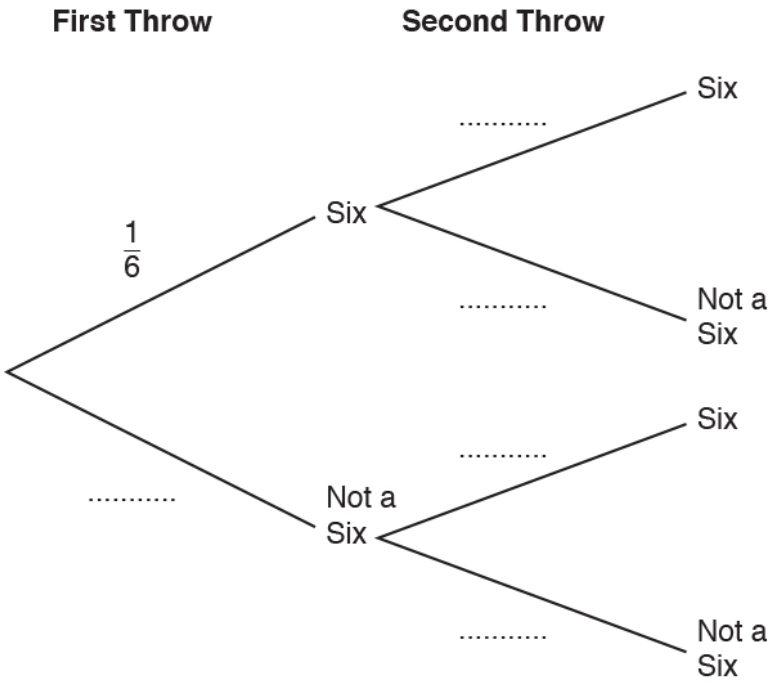
The table shows the probability that Bill chooses a car of a particular colour.

Car	red	blue	yellow	white
Probability	0.4	0.17	0.05	

Work out the probability that Bill chooses the white car.

---------- [2]

18. Noah starts to draw a tree diagram showing the outcomes of throwing a six when a fair dice is thrown twice.

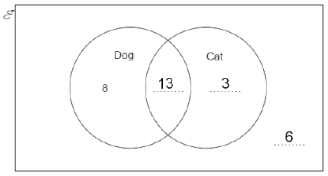


(i) Complete the tree diagram. [1]

(ii) What is the probability of throwing two sixes?

(ii) ---------- [2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1				3	**B1** for 13 in 'intersection' **B1** for (16 – *their* '13') in 'Cat' **B1** for sum of 8 + *their* three numbers = 30	
			Total	3		
2			0.82 **oe**	4	**M3** for 0.7 × 0.4 + 0.7 × 0.6 + 0.3 × 0.4 or 1 – 0.18 Or **M2** for two correct products Or **M1** for one correct product or 0.3 and 0.6 seen (may be on a tree diagram or equivalent)	
			Total	4		
3	a		0.1	2	**M1** for 0.4 + 0.2 + 0.3 **soi** or 1 – *their* '0.9'	
	b		0.7	2	**M1** for 0.4 and 0.3 identified	
			Total	4		
4		i	ACB, BAC, BCA, CAB, CBA	2	**B1** for at least three more ways of seating listed	
		ii	$\frac{2}{3}$ **oe**	1	**FT** on answer to part **(i)**	
		iii	$\frac{1}{6}$ **oe**	1	**FT** on answer to part **(i)**	
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
5			[0].15 or $\frac{15}{100}$ oe	2	M1 for 1 – 0.38 – 0.47 oe	Do not accept just 15 Examiner's Comments A high access question with a good majority of correct answers. Very few showed calculation of 1 – 0.85 even when the correct answer was given. Most candidates scored 2 or 0 but those who gained the method mark usually failed to add 0.38 and 0.47 correctly. There were a few students who used percentages then did not use the percentage sign.
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
6		i	0.18 oe	2	**M1** for 1– (0.4 + 0.17 + 0.25) soi by answer 0.54	In (i), (ii) : ignore qualifying words : ignore any conversion attempts : –1 once for poor notation e.g. $\frac{0.42}{1}$ ratio etc Examiner's Comments The majority of candidates knew the probabilities had to add to 1 and could find the missing value.
		ii	0.42 oe	2	**M1** for 0.25 + 0.17 oe	Examiner's Comments There were many correct answers. A small number of candidates had an answer of 0.17, failing to include 0 in their total for less than 2.
		iii	255	2	**M1** for 0.17 × 1500 oe	Ignore rounding after correct answer Examiner's Comments There were many correct answers in (iii). Most candidates successfully used their calculator to solve the problem. A few used a non-calculator method which often led to errors.
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
7	a		HH HT TH TT	2	**B1** for 3 correct (ignore repeats)	
	b	i	$\frac{1}{4}$ oe isw	1FT	FT *their* list dep on at least **B1**	Not from $\frac{2}{8}$
		ii	$\frac{2}{4}$ oe isw	1FT	FT *their* list dep on at least **B1** **Examiner's Comments** Many candidates did very well with this question and were able to systematically record the 4 outcomes before giving correct answers as fractions or decimals. A few gave repeats in their table but were able to then follow through from their table to the probabilities. Some candidates gave probabilities as ratios or used the words 'likely', 'evens', etc which did not score. A few candidates gave percentages and these were usually candidates who scored high marks and so were often correct.	Not from $\frac{4}{8}$
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
8	a		- - - 9 - 7 9 11 7 9 11 13 9 11 13 15	2	**B1** for 6 correct entries **Examiner's Comments** Almost always answered correctly with a few candidates slipping with one or two entries. A very small number had little idea how to complete the table.	
	b		Certain Unlikely	1 1	**Examiner's Comments** The majority were successful in choosing the correct probability words, the only common error was to choose likely rather than unlikely for the second word.	
	c		$\frac{1}{4}$	2	**B1** for $\frac{4}{n}$ or $\frac{n}{16}$ **Examiner's Comments** A large number were correct and some earned one mark as they had either the numerator or denominator correct, a few had just failed to cancel to a fraction in its simplest form.	
	d		$\frac{3}{16}$ or 0.1875 or 18.75%	1	**Examiner's Comments** Candidates found this part hard with many thinking there were only 2 numbers that were a multiple of 5, presumably the two fives and had not included the 15.	
			Total	7		

Question			Answer/Indicative content	Marks	Part marks and guidance	
9			0.16 oe	3	**M2** for (1 – 0.15 – 0.37) ÷ 3 oe soi Or **M1** for 1 – 0.15 – 0.37 soi by 0.48 **Examiner's Comments** Many candidates scored full marks on this last question. Some candidates scored one mark for calculating 0.48 and frequently they either gave that as the answer or divided by 2. Of those who scored no marks it was not uncommon to see candidates dividing 0.52 by 3.	**M2** implied by an answer figs 16
			Total	**3**		
10			CSM, MSC, MCS, SCM, SMC only	2	**M1** 3 additional correct **Examiner's Comments** Very well answered. Occasionally the given combination was repeated. It was usually systematically done with pairs of combinations where seat 1 is static and the other 2 are reversed etc. Candidates who did not list systematically were more likely to repeat one of the outcomes. In a few cases all the combinations were not given, but generally enough of them to score M1. Very few candidates scored zero.	
			Total	**2**		

Question			Answer/Indicative content	Marks	Part marks and guidance	
11	a		11 correct combinations listed	2	M1 for 8 correct ignoring repeats or extras Examiner's Comments This was generally well answered, a large number of candidates used systematic listing. A small number of candidates gave only 6 listings.	
	b	i	$\frac{1}{4}$, 0.25, 25%	2	M1 for $\frac{3}{12}$ oe Examiner's Comments In part (i) many scored credit for $\frac{3}{12}$, but then had not written this in its simplest form.	
		ii	Less than 6 and yellow with $\frac{5}{12}$ oe and $\frac{3}{12}$ oe	2	M1 for $\frac{5}{12}$ oe or $\frac{3}{12}$ oe Examiner's Comments Part (ii) was less well answered, some candidates just choosing the correct statement without giving any reasons.	Not with incorrect statement, e.g. $\frac{5}{12}$ cannot be with odd and blue For 2 marks, can accept both 5 (chances) and 3 (chances) as a statement. Statement may be ringed or ticked If ratio throughout can score 1 mark in **(ii)**
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
12	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	
13			11 correct rows no repeats	2	**B1** for 6 or more additional correct rows, condone repeats **Examiner's Comments** Most candidates scored a minimum of 1 mark. A significant number did not read the question correctly and showed no regard for the position of “E”. Those candidates scoring both marks tended to list systematically, this method does need to be reinforced to candidates. The candidates who did not list systematically often repeated at least one line, (often the given one).	accept 1, 2, 3 and 4 used if intention is clear for **B1**
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
14	a		0.7 0.8 , 0.2, 0.8, 0.2	1 1	**Examiner's Comments** In part (a) many scored 1 mark for 0.7, but failed to score the mark for 0.8 and 0.2 correctly placed on the second set of branches. Some placed them in the wrong order, while others used 0.3 and 0.7 again. In (b) only a small number were able to show why the probability was 0.76. It was very rare for 1 – 0.24 to be used; most correct answers involved the addition of 0.06, 0.56 and 0.14.	
	b		0.76 with a complete correct method	2	**M1** for one correct product from *their* probabilities e.g 1 – 0.24 = 0.76 or 0.06 + 0.56 + 0.14 = 0.76 Marks may be awarded for work on the diagram	
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
15		i	6	1		
		ii	$\frac{21}{55}$ oe	1	Condone correct probability and unlikely for 1 mark Accept [0].3818 to [0].382 or 38.18% to 38.2% but not ratio or in words **Examiner's Comment** In this part, some candidates lost marks because they used words from the list rather than fractions and others used a ratio, which is not an acceptable form of probability.	
		iii	$\frac{28}{55}$ oe	1	Condone correct probability and likely for 1 mark Accept [0].509 to [0].51 or 50.9% to 51 % but not ratio or in words	
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance		
16			42 or 41.66 ... or 41.7 isw	4	Accept 41. 6 but do not accept 41.6 **B2** for 12 correct options shown or **B1** for options shown with at most 2 errors or omissions or repeats OR **B1** for [4 × 3 =] 12 [combinations] **B1** for FG, FH, AS, ES only AND **M1** for $\frac{\textit{their } 5}{\textit{their } 12}$ [× 100] shown AND **B1** for *their* stated fractional probability, with denominator less than 25, correctly converted to percentage	<table><tr><td>F</td><td>S</td><td>M</td><td>S</td></tr><tr><td>F</td><td>G</td><td>M</td><td>G</td></tr><tr><td>F</td><td>H</td><td>M</td><td>H</td></tr><tr><td>A</td><td>S</td><td>E</td><td>S</td></tr><tr><td>A</td><td>G</td><td>E</td><td>G</td></tr><tr><td>A</td><td>H</td><td>E</td><td>H</td></tr></table> Choices with only 1 language Implied only by [0].416[6..] or [0].417 *Their* (5 and 12) must come from list or 3 × 4 and *their* 12 ≠ *their* 5 Exact or correctly rounded to nearest integer or 1dp **Alternative method** **B3** for	

Question	Answer/Indicative content	Marks	Part marks and guidance
			$\frac{1}{4} + \frac{2}{12}$ or **B2** for $\frac{1}{4}$ oe **and** $\frac{2}{12}$ oe or **B1** for $\frac{2}{12}$ oe **Examiner's Comment** This question was best answered using systematic listing. Some very good and well organised lists were seen, but candidates were too often not systematic and started with, for example, French linked to Geography and then History, then moved to the second column to link Spanish with Art, then Music and Economics; in this way they sometimes repeated or missed combinations. Some candidates listed only the combinations with one language and realised that there were 3 × 4 = 12 combinations. Common errors were to combine subjects in one column such as French and Art or to attempt to combine $\frac{1}{4}$ and

Question			Answer/Indicative content	Marks	Part marks and guidance	
					$\frac{1}{3}$ in some way. Another frequently seen wrong method was to find 5 combinations, but think there were a total of 7 combinations, from 4 + 3. A significant number of candidates made errors in changing a fraction to a percentage, including rounding errors, such as 41.6%.	
			Total	4		
17			0.38 oe	2	M1 for 1 – (0.4 + 0.05 + 0.17) | If answer line blank check $\frac{0.38}{1}$ table scores M1 Examiner's Comments Many candidates gained full marks on this question. Failure to secure full marks usually came from arithmetic errors in an otherwise correct method. Other candidates added the values but then did not subtract their total from 1.	
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance		
18		i	Correct probabilities filled	1	First $\frac{5}{6}$, Throw Second Throw $\frac{1}{6}, \frac{5}{6}, \frac{1}{6}, \frac{5}{6}$	Accept equivalent fractions	
		ii	$\frac{1}{36}$ oe	2	M1 $\frac{1}{6} \times their \frac{1}{6}$ for	FT *their* tree diagram	
			Total	3			