

Chapter 10

Probability

01. 0607_m23_qp_22 Q: 17

An unbiased die is numbered 2, 3, 3, 4, 5, 6.
Wendy rolls the die three times.

Find the probability that Wendy rolls a prime number at least twice.



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..... [4]

02. 0607_s23_qp_22 Q: 8

Salma spins a biased spinner with sectors labelled 1, 2, 3, 4 and 5.
The table shows the relative frequencies of each of her scores.

Score	1	2	3	4	5
Relative frequency	0.1	0.05	0.3	0.35	p

(a) Find the value of p .

..... [2]

(b) Salma spins the spinner 4000 times.

Work out an estimate for the number of times she scores 3.

..... [1]

03. 0607_s23_qp_23 Q: 4

A bag contains 3 blue balls and 7 green balls.
One ball is chosen at random.

Find the probability the ball chosen is

(a) white

..... [1]

(b) not blue.

..... [1]

04. 0607_s23_qp_23 Q: 14

An archer shoots three arrows at a target.

The probability that she hits the target with each arrow is $\frac{7}{10}$.

Find the probability she hits the target exactly twice.



..... [3]
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05. 0607_s22_qp_21 Q: 7

Karen has 3 blue hats, 5 red hats and 2 white hats.
She also has 4 blue scarves, 3 red scarves and 1 white scarf.

- (a) Karen takes a hat at random and replaces it.

Find the probability that it is white.

..... [1]

- (b) Karen takes a hat and a scarf at random.

Find the probability that both the hat and the scarf are blue.

..... [2]

06. 0607_s22_qp_22 Q: 13

John goes to a shop that sells newspapers and magazines only.

- (a) Complete the table of probabilities of John buying something at the shop.

	Buys a newspaper	Does not buy a newspaper	Total
Buys a magazine			0.40
Does not buy a magazine	0.25		
Total	0.55		1.00

[2]

- (b) Find the probability that John buys a magazine but not a newspaper.

..... [1]

07. 0607_s22_qp_22 Q: 15

A bag has 5 black counters, 4 white counters and 1 red counter.
One counter is chosen at random and is replaced.
A second counter is then chosen at random.

Find the probability that the two counters chosen are different colours.

..... [4]

08. 0607_w22_qp_21 Q: 12

Bag A contains balls numbered 2, 4, 4, 4.
Bag B contains balls numbered 1, 1, 2, 3, 4, 4.
Bag C contains balls numbered 1, 2, 3, 4.

One of these three bags is chosen at random.
A ball is chosen at random from this bag.

Find the probability that the ball chosen is numbered 4.
Give your answer as a fraction.

..... [3]

09. 0607_w22_qp_22 Q: 5

A biased 5-sided spinner is spun 200 times.
The results are shown in the table.

Number	1	2	3	4	5
Frequency	24	48	63	38	27

(a) Find the relative frequency of the spinner landing on 2.

..... [1]

(b) The spinner is spun 1000 times.

Find the expected number of times that the spinner lands on 2.

..... [1]

10. 0607_w22_qp_23 Q: 5

An unbiased six-sided die is numbered 1, 2, 3, 4, 5, 6.
The die is rolled.

Find the probability that it shows

(a) 6,

..... [1]

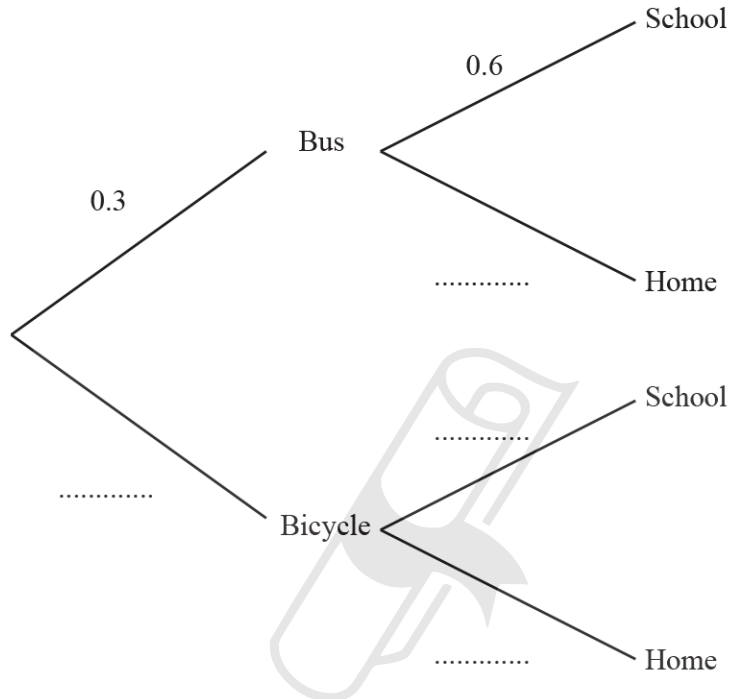
(b) a number greater than 6.

..... [1]

11. 0607_m21_qp_22 Q:7

Iraj travels to school either by bus or on a bicycle.
The probability that he goes by bus is 0.3 .
He can have lunch at home or at school.
The probability that he has lunch at school is 0.6 .

(a) Complete the tree diagram.



[2]

(b) Find the probability that Iraj travels on a bicycle to school and goes home for lunch.



..... [2]

12. 0607_s21_qp_21 Q: 12

A bag contains 12 discs.

7 discs are red and 5 discs are green.

A disc is picked at random and not replaced.

A second disc is then picked at random.

Find the probability that

(a) both discs are green,

..... [2]

(b) at least one disc is green.

..... [3]



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13. 0607_s21_qp_23 Q: 10

The faces of a die are numbered 1, 1, 2, 3, 3 and 4.
When it is rolled it is equally likely to show any face.
The die is rolled twice.

Find the probability that it shows an odd number both times.

..... [2]

14. 0607_w21_qp_21 Q: 7

Mia carries out a survey in a school to find out what students will do when they leave school.
These are her results.

	University	Job	Training	Travelling	Total
Frequency	112	43	27	18	200

(a) Find the relative frequency of university.

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(b) There are 1600 students in this school.

(i) Explain why the result in **part (a)** is a reasonable estimate of the probability that a student from this school will go to university.

..... [1]

(ii) Calculate an estimate for the number of students in this school who will go travelling.

..... [2]

15. 0607_w21_qp_23 Q: 5

There are 640 students in a school.
The table shows the favourite colour of each of the students.

Favourite colour	Blue	Green	Red	Yellow
Number of students	120	$2x$	280	x

(a) Find the value of x .

$x = \dots\dots\dots$ [2]

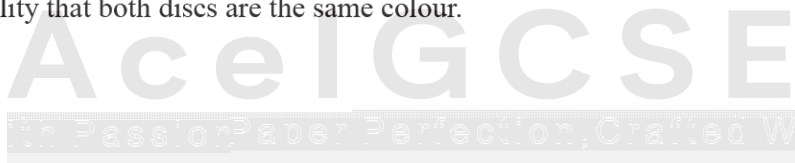
(b) Find the relative frequency of students whose favourite colour is red.
Give your answer as a fraction in its lowest terms.

$\dots\dots\dots$ [2]

16. 0607_w21_qp_23 Q: 13

A bag contains 12 discs.
There are 2 red discs, 4 blue discs, 5 green discs and 1 yellow disc.
A disc is chosen at random and not replaced.
A second disc is then chosen at random.

Find the probability that both discs are the same colour.



$\dots\dots\dots$ [3]

17. 0607_s20_qp_22 Q: 4

A bag contains red balls, blue balls and green balls only.

There are twice as many blue balls as green balls.

There are twice as many red balls as blue balls.

There are 16 blue balls in the bag.

Find the total number of balls in the bag.

..... [2]

18. 0607_s20_qp_23 Q: 6

A biased four-sided spinner is spun 150 times.

The number of times that the spinner lands on each number is shown in the table.

Number on spinner	1	2	3	4
Frequency	34	63	27	26

(a) Write down the relative frequency of the spinner landing on 2.

..... [1]

(b) Explain why it is reasonable to use your answer to **part (a)** as the probability of this spinner landing on 2.

..... [1]

(c) The spinner is spun 3000 times.

Find the expected number of times that the spinner lands on 2.

..... [2]

19. 0607_w20_qp_22 Q: 9

Pierre records the colour of each of 200 cars passing his home.
The table shows the results.

Colour	Silver	Black	Red	Green	Blue	Other
Frequency	23	68	35	20	32	22

(a) Write down the relative frequency of a silver car.

..... [1]

(b) Explain why it is reasonable to use the answer to **part (a)** as the probability that the next car which passes will be silver.

..... [1]

(c) Over the whole day 1200 vehicles pass Pierre's home.

Estimate the number of these cars that are silver.

..... [1]

20. 0607_s19_qp_23 Q: 9

A bag contains 2 blue balls, 3 red balls and 5 green balls only.

John takes a ball out of the bag at random.

He records the colour and puts the ball back in the bag.

Flavia takes a ball out of the bag at random and records the colour.

Find the probability that both balls are red.

..... [2]

21. 0607_w19_qp_21 Q: 4

At a railway station, the probability that any train departs on time is $\frac{7}{8}$.

The number of trains in one day is 72.

Work out the expected number of trains that depart on time.

..... [1]

22. 0607_w19_qp_22 Q: 15

An archer fires three arrows at a target.

The probability that the archer hits the target with each arrow is $\frac{3}{5}$.

Find the probability that the archer hits the target exactly twice.



..... [3]

23. 0607_w19_qp_23 Q: 8

200 students record the method they use most to travel to school.
The results are shown in the table.

Method of travel	Bus	Car	Walk	Cycle
Number of students	40	98	37	25

(a) Find, as a fraction, the relative frequency of a student travelling to school by bus.

..... [1]

(b) Give a reason why it is reasonable to use your answer to **part (a)** to estimate the probability that a student travels to school by bus.

..... [1]

(c) The school has 1800 students.

Estimate the number of students who travel to school by bus.

..... [1]

24. 0607_s18_qp_22 Q: 3

A bag contains 2 blue balls, 3 red balls and 5 green balls only.
One ball is chosen at random.

Find the probability that this ball is red.

..... [1]

25. 0607_s18_qp_22 Q: 16

A factory makes soft centre chocolates and hard centre chocolates only.
The probability that a chocolate chosen at random has a hard centre is 0.6 .
Three chocolates are chosen at random.

Find the probability they are all soft centre chocolates.

..... [3]

26. 0607_s18_qp_23 Q: 11

Jamil has a biased 6-sided die.
He rolls it 350 times.
The results are shown in the table.

Number on die	1	2	3	4	5	6
Frequency	20	50	72	68	56	84

(a) Find the relative frequency of getting a 2 with Jamil's die.

..... [1]

(b) Explain why your answer to **part (a)** is a good estimate of the probability of getting a 2.

..... [1]

(c) Estimate the number of times Jamil will get a 2 if he rolls the die 1400 times.

..... [1]

27. 0607_w18_qp_21 Q: 3

A bag contains 8 blue balls, 3 red balls and 4 green balls only.
One ball is chosen at random.

Find the probability that this ball is red.
Give your answer as a fraction in its simplest form.

..... [2]

28. 0607_w18_qp_21 Q: 16

A bag contains 4 red balls and 5 blue balls only.
Two balls are chosen at random without replacement.

Find the probability that the two balls chosen are different colours.



..... [3]

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29. 0607_s17_qp_21 Q: 14

A bag has 3 blue balls and 7 green balls only.
One ball is chosen at random and not replaced.
A second ball is then chosen at random.

Find the probability that both balls chosen are the same colour.
Give your answer in its simplest form.

..... [4]



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30. 0607_w17_qp_23 Q: 16

The probability that it rains today is 0.3 .

If it rains today, the probability that it will rain tomorrow is 0.4 .

If it does not rain today, the probability that it will rain tomorrow is 0.15 .

Find the probability that it will rain tomorrow.



..... [3]

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01. 0607_m23_ms_22 Q: 17

Question	Answer	Marks	Partial Marks
	$\frac{20}{27}$ or $\frac{160}{216}$ oe	4	M3 for $3 \times \frac{4}{6} \times \frac{4}{6} \times \frac{2}{6} + \frac{4}{6} \times \frac{4}{6} \times \frac{4}{6}$ oe or M2 for $\frac{4}{6} \times \frac{4}{6} \times \frac{2}{6}$ or $\frac{4}{6} \times \frac{4}{6} \times \frac{4}{6}$ or M1 for $\frac{4}{6}$

02. 0607_s23_ms_22 Q: 8

Question	Answer	Marks	Partial Marks
(a)	0.2 oe	2	M1 for $1 - (0.1 + 0.05 + 0.3 + 0.35)$ or B1 for 0.8 seen
(b)	1200	1	

03. 0607_s23_ms_23 Q: 4

Question	Answer	Marks	Partial Marks
(a)	0	1	
(b)	0.7 oe	1	

04. 0607_s23_ms_23 Q: 14

Question	Answer	Marks	Partial Marks
	$\frac{441}{1000}$	3	M2 for $3 \times \frac{7}{10} \times \frac{7}{10} \times \frac{3}{10}$ oe or M1 for $\frac{7}{10} \times \frac{7}{10} \times \frac{3}{10}$ oe

05. 0607_s22_ms_21 Q: 7

Question	Answer	Marks	Partial Marks
(a)	$\frac{2}{10}$ oe	1	
(b)	$\frac{12}{80}$ oe	2	M1 for $\frac{3}{10} \times \frac{4}{8}$ only

06. 0607_s22_ms_22 Q: 13

Question	Answer	Marks	Partial Marks																
(a)	<table border="1"> <thead> <tr> <th></th> <th>N</th> <th>not N</th> <th>Total</th> </tr> </thead> <tbody> <tr> <th>M</th> <td>0.3</td> <td>0.1</td> <td></td> </tr> <tr> <th>not M</th> <td></td> <td>0.35</td> <td>0.6</td> </tr> <tr> <th>Total</th> <td></td> <td>0.45</td> <td></td> </tr> </tbody> </table>		N	not N	Total	M	0.3	0.1		not M		0.35	0.6	Total		0.45		2	B1 for at least 2 correct
	N	not N	Total																
M	0.3	0.1																	
not M		0.35	0.6																
Total		0.45																	
(b)	0.1 or $\frac{1}{10}$	1	FT <i>their</i> table																

07. 0607_s22_ms_22 Q: 15

Question	Answer	Marks	Partial Marks
	$\frac{29}{50}$ or $\frac{58}{100}$ or 0.58 oe	4	<p>M3 for $\frac{5}{10} \times \frac{5}{10} + \frac{4}{10} \times \frac{6}{10} + \frac{1}{10} \times \frac{9}{10}$ oe or M2 for any 2 correct or M1 for $\frac{5}{10} \times \frac{5}{10}$ or $\frac{4}{10} \times \frac{6}{10}$ or $\frac{1}{10} \times \frac{9}{10}$ OR M3 for $2 \times \left(\frac{5}{10} \times \frac{4}{10} + \frac{5}{10} \times \frac{1}{10} + \frac{1}{10} \times \frac{4}{10} \right)$ oe or M2 for any 2 correct or M1 for $\frac{5}{10} \times \frac{4}{10}$ or $\frac{5}{10} \times \frac{1}{10}$ or $\frac{1}{10} \times \frac{4}{10}$ OR M3 for $1 - \frac{5}{10} \times \frac{5}{10} - \frac{4}{10} \times \frac{4}{10} - \frac{1}{10} \times \frac{1}{10}$ or M2 for $\frac{5}{10} \times \frac{5}{10}$ and $\frac{4}{10} \times \frac{4}{10}$ and $\frac{1}{10} \times \frac{1}{10}$ or M1 for $\frac{5}{10} \times \frac{5}{10}$ or $\frac{4}{10} \times \frac{4}{10}$ or $\frac{1}{10} \times \frac{1}{10}$</p>

08. 0607_w22_ms_21 Q: 12

Question	Answer	Marks	Partial Marks
	$\frac{16}{36}$ oe	3	<p>M2 for $\frac{1}{3} \times \frac{3}{4} + \frac{1}{3} \times \frac{2}{6} + \frac{1}{3} \times \frac{1}{4}$ or M1 for $\frac{1}{3} \times \frac{2}{4}$ or $\frac{1}{3} \times \frac{2}{6}$ or $\frac{1}{3} \times \frac{1}{4}$</p>

09. 0607_w22_ms_22 Q: 5

Question	Answer	Marks	Partial Marks
(a)	$\frac{48}{200}$ oe	1	
(b)	240	1	

10. 0607_w22_ms_23 Q: 5

Question	Answer	Marks	Partial Marks
(a)	$\frac{1}{6}$	1	
(b)	0	1	

11. 0607_m21_ms_22 Q: 7

Question	Answer	Marks	Partial Marks
(a)	Fully correct tree diagram $\begin{array}{cc} & 0.4 \\ 0.7 & 0.6 \\ & 0.4 \end{array}$	2	B1 for either 0.7 or 0.4 in a correct position
(b)	0.28 oe	2	FT <i>their</i> tree diagram M1 for <i>their</i> (0.7) \times <i>their</i> (0.4)

12. 0607_s21_ms_21 Q: 12

Question	Answer	Marks	Partial Marks
(a)	$\frac{5}{33}$ or $\frac{20}{132}$ oe	2	M1 for $\frac{5}{12} \times \frac{4}{11}$
(b)	$\frac{15}{22}$ or $\frac{90}{132}$ oe	3	M2 for $1 - \frac{7}{12} \times \frac{6}{11}$ oe or M1 for $\frac{7}{12} \times \frac{6}{11}$ oe OR M2 for <i>their</i> (a) $+ 2 \times \frac{5}{12} \times \frac{7}{11}$ oe or $\frac{5}{12} + \frac{7}{12} \times \frac{5}{11}$ or M1 for $\frac{5}{12} \times \frac{7}{11}$ oe

13. 0607_s21_ms_23 Q: 10

Question	Answer	Marks	Partial Marks
	$\frac{4}{9}$ or $\frac{16}{36}$ oe	2	M1 for $\frac{4}{6} \times \frac{4}{6}$ oe

14. 0607_w21_ms_21 Q: 7

Question	Answer	Marks	Partial Marks
(a)	$\frac{112}{200}$ oe	1	
(b)(i)	Large sample	1	
(b)(ii)	144	2	M1 for $\frac{18}{200} \times 1600$ oe

15. 0607_w21_ms_23 Q: 5

Question	Answer	Marks	Partial Marks
(a)	80	2	M1 for $(640 - 120 - 280) \div (2 + 1)$
(b)	$\frac{7}{16}$ cao	2	M1 for $\frac{280}{640}$ oe

16. 0607_w21_ms_23 Q: 13

Question	Answer	Marks	Partial Marks
	$\frac{34}{132}$ or $\frac{17}{66}$	3	M2 for $\frac{2}{12} \times \frac{1}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{5}{12} \times \frac{4}{11}$ or M1 for $\frac{2}{12} \times \frac{1}{11}$ or $\frac{4}{12} \times \frac{3}{11}$ or $\frac{5}{12} \times \frac{4}{11}$

17. 0607_s20_ms_22 Q: 4

Question	Answer	Marks	Partial Marks
	56	2	M1 for 32 or 8 seen

18. 0607_s20_ms_23 Q: 6

Question	Answer	Marks	Partial Marks
(a)	$\frac{63}{150}$ oe	1	
(b)	Large sample oe	1	
(c)	1260	2	M1 for <i>their</i> $\frac{63}{150} \times 3000$ oe

19. 0607_w20_ms_22 Q: 9

Question	Answer	Marks	Partial Marks
(a)	$\frac{23}{200}$ or 0.115	1	
(b)	Large sample oe	1	
(c)	138	1	

20. 0607_s19_ms_23 Q: 9

Question	Answer	Marks	Partial Marks
	0.09 oe	2	M1 for 0.3×0.3 oe

21. 0607_w19_ms_21 Q: 4

Question	Answer	Marks	Partial Marks
	63	1	

22. 0607_w19_ms_22 Q: 15

Question	Answer	Marks	Partial Marks
	$\frac{54}{125}$ oe	3	M2 for $3 \times \left(\frac{3}{5}\right)^2 \times \frac{2}{5}$ oe or M1 for $\left(\frac{3}{5}\right)^2 \times \frac{2}{5}$

23. 0607_w19_ms_23 Q: 8

Question	Answer	Marks	Partial Marks
(a)	$\frac{40}{200}$ oe	1	
(b)	Large sample oe	1	
(c)	360	1	FT for <i>their</i> (a) $\times 1800$

24. 0607_s18_ms_22 Q: 3

Question	Answer	Marks	Partial Marks
	0.3 oe	1	

25. 0607_s18_ms_22 Q: 16

Question	Answer	Marks	Partial Marks
	[0].064	3	M2 for 0.4^3 or M1 for 0.4 soi If 0 scored SC1 for answer 0.216

26. 0607_s18_ms_23 Q: 11

Question	Answer	Marks	Partial Marks
(a)	$\frac{50}{350}$ oe	1	
(b)	Large sample oe	1	
(c)	200	1	

27. 0607_w18_ms_21 Q: 3

Question	Answer	Marks	Partial Marks
	$\frac{1}{5}$	2	M1 for $\frac{3}{15}$

28. 0607_w18_ms_21 Q: 16

Question	Answer	Marks	Partial Marks
	$\frac{40}{72}$ oe $\left(\frac{5}{9}\right)$	3	M2 for $\frac{4}{9} \times \frac{5}{8} \times 2$ oe or M1 for $\frac{4}{9} \times \frac{5}{8}$ oe

29. 0607_s17_ms_21 Q: 14

Question	Answer	Marks	Part Marks
	$\frac{8}{15}$ final answer	4	B3 for $\frac{48}{90}$ oe or M2 for $\frac{3}{10} \times \frac{2}{9} + \frac{7}{10} \times \frac{6}{9}$ or M1 for $\frac{3}{10} \times \frac{2}{9}$ or $\frac{7}{10} \times \frac{6}{9}$

30. 0607_w17_ms_23 Q: 16

Question	Answer	Marks	Partial Marks
	0.225 oe	3	M2 for $0.3 \times 0.4 + 0.7 \times 0.15$ oe or M1 for 0.3×0.4 or 0.7×0.15



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