NEW CENTURY MATHS 11 MATHEMATICS STANDARD (PATHWAY 2)

FULLY WORKED SOLUTIONS

Chapter 4

SkillCheck

Question	1

а	$\frac{7}{25}$	С	$\frac{1}{4}$
b	$\frac{1}{11}$	d	$\frac{2}{3}$
Ques	tion 2		
а	$\frac{27}{40}$	с	$1 - \frac{1}{8} = \frac{7}{8}$
b	$\frac{3}{25}$	d	$1 - \frac{4}{9} = \frac{5}{9}$
Ques	tion 3		
а	$17 \div 20 = 0.85$	С	$25 \div 40 = 0.625$
b	$9 \div 36 = 0.25$	d	$4 \div 15 = 0.2\dot{6}$
Ques	tion 4		
а	$\frac{10}{25} \times 100\% = 40\%$	с	$\frac{4}{52} \times 100\% = 7\frac{9}{13}\%$
b	$\frac{45}{72} \times 100\% = 62.5\%$	d	$\frac{16}{48} \times 100\% = 33\frac{1}{3}\%$
Ques	tion 5		
а	52	d	26
b	6	е	4
С	12	f	5

a
$$\frac{4}{20} = \frac{1}{5}$$

b $\frac{6}{20} \times 100\% = 30\%$
c $\frac{12}{20} = \frac{3}{5}$

d
$$\frac{2+6}{20} = \frac{8}{20} = \frac{40}{100} = 40\%$$

Question 7



b	Total = 4 + 16 + 11 + 1 = 32
	$\therefore \frac{4}{32} = \frac{1}{8}$
С	0%
d	$\frac{28}{32} \times 100\% = 87.5\%$
е	1

- **a** Teacher to check.
- **b** AC
- c VU
- d AC
- e VU

- **f** Teacher to check.
- g VU
- **h** Teacher to check.
- i U
- j L

Exercise 4.01 Probability of simple events

Question 1

а	{Mon, Tues, Wed, Thurs, Fri, Sat, Sun}; 7	d	{boy, girl}; 2
b	{M, A, T, H, E, I, C, S}; 8	е	{pass, fail}; 2
С	{G, PG, M, MA, R}; 5		
Ques	tion 2		
а	21	d	7
b	12	е	4
С	10 000		
Ques	tion 3		
а	26	d	2
b	4	е	12
С	20	f	1

Question 4

a England wins, Brazil wins, dra	ιw
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b No

Question 5

Each event (fine, rain) is not equally likely.

Question 6

Total = 6 + 3 = 9

a
$$\frac{6}{9} = \frac{2}{3}$$

b $\frac{3}{9} = \frac{1}{3}$
c $\frac{0}{9} = 0$
d $\frac{9}{9} = 1$

Total = 15 cards

a
$$P(2,4,6,8,10,12,14) = \frac{7}{15}$$

b $P(1,3,5,7,9,11,13,15) = \frac{8}{15}$
c $\frac{1}{15}$
d $P(1,10,11,12,13,14,15) = \frac{7}{15}$

Question 8

Total = 10 letters

a
$$\frac{2}{10} = \frac{1}{5}$$

b $\frac{3}{10}$
c $\frac{2}{10} = \frac{1}{5}$
d $\frac{5}{10} = \frac{1}{2}$

Question 9

 $\frac{1}{3}$

Question 10

Total = 24 coins

a $\frac{8}{24} \times 100\% = 33\frac{1}{3}\%$ **b** $\frac{1}{24} \times 100\% = 4\frac{1}{6}\%$ **c** $\frac{6}{24} \times 100\% = 25\%$

c
$$\frac{19}{24} \times 100\% = 79\frac{1}{6}\%$$

$$\frac{4}{6} \times 100\% = 66\frac{2}{3}\%.$$
$$\therefore D$$

Total = 6 equal parts

a

$$\frac{2}{6} = \frac{1}{3}$$
 c
 $\frac{3}{6} = \frac{1}{2}$

 b
 $\frac{1}{6}$
 d
 $\frac{5}{6}$

 Question 13
 e
 $\frac{2}{52} = \frac{1}{26}$

 b
 $\frac{6}{52} = \frac{3}{26}$
 f
 $\frac{1}{52}$

 c
 $\frac{4}{52} = \frac{1}{13}$
 g
 $\frac{2}{52} = \frac{1}{26}$

 d
 $\frac{36}{52} = \frac{9}{13}$
 h
 $\frac{13}{52} = \frac{1}{4}$

Question 14

 $\frac{8}{1200} = \frac{1}{150}$

Question 15

 $\frac{2}{12} = \frac{1}{6} = 0.1\dot{6}$

Question 16

Each of the 16 teams is not equally likely to win the competition, the levels of ability/success are different.

a
$$P(9 \text{ to } 20) = \frac{12}{20} \times 100\%$$

 $= 60\%$
b $P(1,4,9,16) = \frac{4}{20} \times 100\%$
 $= 20\%$
c $P(3,6,9,12,15,18) = \frac{6}{20} \times 100\%$
 $= 30\%$

Total = 7 a $\frac{2}{7}$ d b $\frac{4}{7}$ e c $\frac{1}{7}$ f

 $\frac{5}{7}$

 $\frac{5}{7}$

0

Exercise 4.02 Tables and tree diagrams

Ques	tion 1											
а	D					d	D				g	В
b	G					е	А				h	F
С	Е					f	В				i	С
Ques	tion 2											
а	i	2					ii	6				
b	i	{H1,	, H2,	Н3,	H4, H	5, H6, T	1, T2,	T3, T4, T	Г5, Т6} v	where H	= head,	T = tail
	ii			Co	oin							
				н	т							
			1	H1	Т1							
			2	H2	Т2							
		Die	3	H3	Т3							
		П	4	H4	Т4							
			5	H5	Т5							
			6	H6	Т6							
	iii		Co	oin	Die	Outcom	es					
					1	H1 H2						
			/ ¹	н	4 5	H3 H4 H5						
		<			6	H6 T1						
			Ϊ,	г	23	T2 T3						
					$\begin{pmatrix} 4\\5\\6 \end{pmatrix}$	T4 T5 T6						
С	12											
d	i	<i>P</i> (H	2,H	4,H6	$(5) = \frac{3}{12}$	$=\frac{1}{4}$						
	ii	P(T	1,T2	$) = \frac{2}{12}$	$\frac{2}{2} = \frac{1}{6}$							
	iii	P(H	2, H	3, H4	,H5,H	$(6) = \frac{5}{12}$						

а	1st digit	2nd digit	Outcomes	b	12	
	4	5 7 8 4	45 47 48 54	С	i	$\frac{3}{12}$ × 100% = 25%
		7 8 4 5	57 58 74 75		ii	$\frac{6}{12}$ × 100% = 50%
	8 <	4 5 7	84 85 87		iii	$\frac{6}{12}$ × 100% = 50%
					iv	$\frac{3}{12}$ × 100% = 25%

Question 4

а	i	{HHH, HHT, HT	H, HTT, TI	НН, ТНТ,	TTH, TTT}
	ii	1st toss	2nd toss	3rd toss	Outcomes
		H	H T H T	H H H H H H H H T H T H T	HHH HHT HTH HTT THH THT TTH TTH

b 8

c i $\frac{3}{8} = 0.375$ iii $\frac{1}{8} = 0.125$ ii $\frac{4}{8} = 0.5$ iv $\frac{4}{8} = 0.5$

а	2	С	16
b	4	d	102

		۰.	
- 5			

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

- **b** 36
- c i $\frac{3}{36} = \frac{1}{12}$ ii $\frac{5}{36}$ iii $\frac{3}{36} = \frac{1}{12}$

v
$$\frac{18}{36} = \frac{1}{2}$$

vi $\frac{8}{36} = \frac{2}{9}$

d i
$$\frac{1}{36} \times 100\% = 2\frac{7}{9}\%$$

e i 7

Question 7

С

1st course а С Y R W 2nd 2nd 8 course 8 CB RB WB YB CPRP WP ΥP CS RS WS YS b 12

i
$$\frac{6}{12} = \frac{1}{2}$$

ii $\frac{6}{12} = \frac{1}{2}$
ii $\frac{2}{12} = \frac{1}{6}$
iv $\frac{1}{12}$

ii
$$\frac{6}{36} \times 100\% = 16\frac{2}{3}\%$$

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а				Ch	airper	son		
			н	R	Α	к	Т	
		н	-	RH	AH	KH	TH	H = Harry
	ary	R	HR	-	AR	KR	TR	R = Rita
	cret	\mathbf{A}	HA	RA	-	KA	TA	A = Alison
	Se	К	ΗK	RK	AK	-	TK	K = Kirstie
		т	HT	RT	AT	\mathbf{KT}	-	T = Thuc
h i			1	0.04				
			$\frac{1}{20}$	0.0.)			

iii
$$\frac{4}{20} = 0.2$$

iv $\frac{2}{20} = 0.1$

Question 9

ii $\frac{8}{20} = 0.4$



b

А



а	Sat	Sun S	Outcomes	d	i	$\frac{1}{9}$
		C R S C R	SC SR CS CC CR		ii	$\frac{3}{9} = \frac{1}{3}$
	R	S C R	RS RC RR		iii	$\frac{8}{9}$
b	Sat and Sunday				iv	$\frac{5}{9}$
	∴ A				v	$\frac{2}{9}$
С	9					-

- **a** getting a head
- **b** selecting a diamonds, clubs or spades card
- **c** passing a driving test
- **d** having 3 or fewer children
- **e** selecting a white sock
- **f** the weather today not being rainy
- **g** not winning the race
- **h** a traffic light showing red or amber

Question 2

а	$1 - P(6) = 1 - \frac{1}{6}$	С	$1 - P(\text{multiple of } 3) = 1 - \frac{2}{6}$
	$=\frac{5}{6}$		$=\frac{4}{6}$
b	$1 - P(\text{less than } 3) = 1 - \frac{2}{6}$		$=\frac{1}{3}$
	$=\frac{4}{6}$		
	$=\frac{2}{3}$		
Ques	stion 3		

{HH, HT, TH, TT}

a
$$\frac{1}{4}$$

b $1-P(\text{two tails}) = 1 - \frac{1}{4}$
 $= \frac{3}{4}$
c $\frac{2}{4} = \frac{1}{2}$
d $1-P(\text{one tail}) = 1 - \frac{1}{2}$
 $= \frac{1}{2}$
e $\frac{1}{4}$
f $1-P(\text{no tails}) = 1 - \frac{1}{4}$
 $= \frac{3}{4}$

{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

a
$$\frac{3}{8}$$

b
$$1-P(\text{two tails}) = 1 - \frac{3}{8}$$

 $= \frac{5}{8}$
c $\frac{3}{8}$

d
$$1 - P(\text{one tail}) = 1 - \frac{3}{8}$$

 $= \frac{5}{8}$
e $\frac{1}{8}$
f $1 - P(\text{no tails}) = 1 - \frac{1}{8}$
 $= \frac{7}{8}$

Question 5

a
$$P(10,11,...,20) = \frac{11}{20}$$

= 0.55
b $1 - P(\text{divisible by } 3) = 1 - P(3,6,9,12,15,18)$
 $= 1 - \frac{6}{20}$
 $= \frac{4}{20}$
= 0.7

c
$$P(1, 2, ..., 9) = \frac{9}{20}$$

= 0.45

d
$$1-P(\text{contains 7}) = 1-P(7,17)$$

= $1-\frac{2}{20}$
= $\frac{18}{20}$
= 0.9
e $1-P(\text{divisible by 5}) = 1-P(5,10,15,20)$

$$=1-\frac{1}{20}$$
$$=\frac{16}{20}$$
$$=0.8$$

f 1 - P(factor of 20) = 1 - P(1, 2, 4, 5, 10, 20)= $1 - \frac{6}{20}$ = $\frac{14}{20}$

Question 6

$$1 - P(\text{win prize}) = 1 - \frac{8}{1000}$$
$$= \frac{992}{1000}$$
$$= \frac{124}{125}$$

: A

a
$$1-P(P) = 1 - \frac{1}{11}$$

 $= \frac{10}{11}$
b $1-P(B) = 1 - \frac{2}{11}$
 $= \frac{9}{11}$
c $1-P(vowel) = 1 - \frac{4}{11}$
 $= \frac{7}{11}$
d $1-P(A,B) = 1 - \frac{3}{11}$
 $= \frac{8}{11}$

Question 8

 $1 - P(\text{Sat}, \text{Sun}) = 1 - \frac{2}{7}$ $= \frac{5}{7}$

Question 9

Total = 9

a
$$1-P(\text{green}) = 1 - \frac{4}{9}$$

 $= \frac{5}{9}$
b $\frac{3}{9} = \frac{1}{3}$
c $1-P(\text{white}) = 1 - \frac{2}{9}$
 $= \frac{7}{9}$
d $1-P(\text{yellow}) = 1 - \frac{1}{3}$
 $= \frac{2}{3}$
e $1-P(\text{red}) = 1 - 0$
 $= 1$
f $1-P(\text{green, yellow}) = 1 - \frac{7}{9}$
 $= \frac{2}{9}$

Question 10

Total possibilities = 36

 $P(2,12) = \frac{2}{36}$ ∴ P(not losing) = 1 - P(2,12) = 1 - \frac{2}{36} = \frac{17}{18}

∴ B

1 - P(rain) = 1 - 0.23= 0.77 = 77%

Question 12

a
$$1-P(10) = 1 - \frac{4}{52}$$

 $= \frac{12}{13}$
b $1-P(\text{picture card}) = 1 - \frac{12}{52}$
 $= \frac{10}{13}$
c $1-P(\text{club}) = 1 - \frac{1}{4}$
 $= \frac{3}{4}$
d $1-P(\text{blue})$
e $1-P(\text{resc})$
f $1-P(\text{blue})$

d
$$1 - P(\text{black}) = 1 - \frac{1}{2}$$

 $= \frac{1}{2}$
 $1 - P(\text{red ace}) = 1 - \frac{2}{52}$
 $= \frac{25}{26}$
 $1 - P(\text{black } 7, 8, 9, 10) = 1 - \frac{8}{52}$
 $= \frac{11}{13}$

Question 13

Total = 164 seconds

a
$$\frac{63}{164} = 0.38414...$$

 ≈ 0.384
b $1 - P(\text{red}) = 1 - 0.384$
 $= 0.616$
c $1 - P(\text{amber}) = 1 - \frac{2}{164}$
 $= \frac{81}{82}$
 $= 0.9878...$
 ≈ 0.988
d $1 - P(\text{green}) = 1 - \frac{99}{164}$
 $= 0.3963...$
 $= 0.396$
e $1 - P(\text{red}, \text{amber}) = 1 - \frac{65}{164}$
 $= \frac{99}{164}$
 $= 0.6036...$
 ≈ 0.604
f $1 - P(\text{red}, \text{green}, \text{amber}) = 1 - \frac{164}{164}$

$$1 - P(\text{born 3rd June}) = 1 - \frac{1}{365}$$

= $\frac{364}{365}$

Question 15

$$1 - P(\text{end } 0,9) = 1 - \frac{2}{10}$$

= $\frac{8}{10}$

 $\therefore \frac{8}{10} \times 100\% = 80\%$

Question 16

a draw

Question 17

$$1 - P(win) = 1 - \frac{13}{20}$$

 $= \frac{7}{20}$

Question 18

Total = 9 parts

a
$$1 - P(\text{win holiday}) = 1 - \frac{1}{9}$$

 $= \frac{8}{9}$
b $1 - P(\text{cash or computer}) = 1 - \frac{3}{9}$
 $= \frac{2}{3}$

b

100 - 42 - 51 = 7%

- **a** 2+15+70+56+6+1=150
- **b i** $\frac{56}{150} = \frac{28}{75}$

ii
$$P(51, 52, > 52) = \frac{63}{150}$$

 $= \frac{21}{50}$

iii
$$P(48, 49) = \frac{17}{150}$$

Question 2

a no **b** yes, biased towards 6 **c** $\frac{22}{80} \times 100\% = 27.5\%$ **d** $27.5 \approx 28$

Question 3

a 1

b Total = 40

i
$$\frac{14}{40} = 0.35$$

ii $\frac{5}{40} = 0.125$
iii $1 - P(\text{no children}) = 1 - 0.125$
= 0.875
iv $P(2,3,4,5) = \frac{25}{40}$
 $P(2,3,4,5) = \frac{25}{40}$

С

$$\frac{3}{40} \times 150 = 11.25$$
$$\approx 11$$

 $\frac{12}{28} \times 100\% = 42\frac{6}{7}\%$

= 0.625

a No

b i
$$\frac{10}{30} = \frac{1}{3}$$
 ii $1 - \frac{7}{30} = \frac{23}{30}$

Question 6

a $\frac{11855248}{23401892} \times 100\% = 50.659...\%$ $\approx 50.66\%$

b female, as greater than 50%

c Percentage of population that are male = 100% - 50.66%

= 49.34%

Predicted number of males = $49.34\% \times 25\ 000\ 000$

= 12 335 000

Questions 7–11

Teacher to check.

{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT} а i b There are 3 outcomes in the sample space that have exactly two heads. There are a total of 8 outcomes in the sample space. P(two heads) = $\frac{3}{8}$ $3 \div 8 \times 100 = 37 \frac{1}{2} \%$ ii There are 4 outcomes in the sample space that have exactly one or three heads. P(one or three heads) = $\frac{4}{9} = \frac{1}{2}$ $1 \div 2 \times 100 = 50\%$ $88 \times P(\text{two heads}) = 88 \times \frac{3}{8}$ i С = 33 $88 \times P$ (one or three heads) = $88 \times \frac{1}{2}$ ii $\frac{30}{88} \times 100 = 34.09\% \approx 34.09\%$ i d $\frac{35+12}{88} \times 100 = \frac{47}{88} \times 100 = 53.409\% \approx 53.41\%$ ii They are close. е $200 \times P(\text{two heads}) = 200 \times \frac{3}{8} = 75$ f i $200 \times P(\text{one or three heads}) = 200 \times \frac{1}{2} = 100$ ii $\frac{80}{200} \times 100 = 40\%$ i g $\frac{72+25}{200} \times 100 = \frac{97}{200} \times 100 = 48.5\%$ ii h Yes, they do.

a i Teacher to check.

ii
$$P(1) = \frac{1}{6} = 0.1\dot{6} \approx 0.167$$

iii Teacher to check.

iv
$$P(\text{even}) = \frac{3}{6} = 0.5$$

b
$$150 \times P(1) = 150 \times \frac{1}{6} = 25$$

Question 3

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

b

а

i There are a total of 36 outcomes. There are three times when the numbers sum to 4. $P(4) = \frac{3}{36} = \frac{1}{12} = 0.08\dot{3} \approx 0.0833$

ii There are two times when the numbers sum to 2 or 12.

$$P(2 \text{ or } 12) = \frac{2}{36} = \frac{1}{18} = 0.0\dot{5} \approx 0.0556$$

iii There are 6 + 2 = 8 times when the numbers sum to 7 or 11. $P(7 \text{ or } 11) = \frac{8}{36} = \frac{2}{9} = 0.\dot{2} \approx 0.2222$

d i
$$120 \times P(4) = 120 \times \frac{1}{12} = 10$$

ii
$$120 \times P(2 \text{ or } 12) = 120 \times \frac{1}{18} = \frac{20}{3} = 6.6 \approx 7$$

iii
$$120 \times P(7 \text{ or } 11) = 120 \times \frac{2}{9} = \frac{80}{3} = 26.\dot{6} \approx 27$$

There are 52 cards in a standard deck of cards.

a i There are 12 picture cards in a standard deck. $P(\text{Picture card}) = \frac{12}{52} = \frac{3}{13} \approx 0.231$ **ii** $\frac{20}{78} \approx 0.256$ **b** $78 \times P(\text{Picture card}) = 78 \times \frac{3}{13} = 18$ $\therefore A$

a Number of possible outcomes when a die is tossed = 6 Number of possible outcomes when a coin is tossed = 2 Total number of possible outcomes when a die and coin are tossed together = $6 \times 2 = 12$ {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}

b i
$$P(T3) = \frac{1}{12} \approx 0.083$$

ii
$$\frac{5}{48} \approx 0.104$$

iii
$$P(\text{Head and even number}) = \frac{3}{12} = \frac{1}{4} = 0.25$$

iv
$$\frac{5+2+5}{48} = \frac{12}{48} = 0.25$$

v
$$P(\text{Tail and not } 4) = \frac{5}{12} = 0.41\dot{6} \approx 0.417$$

vi
$$\frac{3+6+5+4+3}{48} = \frac{21}{48} = \frac{7}{16} = 0.4375 \approx 0.438$$

c i
$$48 \times P(T3) = 48 \times \frac{1}{12} = 4$$

ii
$$48 \times P(\text{Head and even number}) = 48 \times \frac{1}{4} = 12$$

iii
$$48 \times P(\text{Tail and not } 4) = 48 \times \frac{5}{12} = 20$$

Each outcome has an equal chance.

Question 7

a i $\frac{23}{50} \times 100 = 46\%$

ii
$$\frac{55}{140} \times 100 \approx 39.3\%$$

iii
$$\frac{84}{200} \times 100 = 42\%$$

iv
$$\frac{226}{540} \times 100 \approx 41.9\%$$

b Yes, the coin seems to be coming up heads around 42% of the time instead of 50%.

For the first lolly: $P(\text{red}) = \frac{5}{8}$, $P(\text{green}) = \frac{3}{8}$ If the first lolly is red, then for the second lolly: $P(\text{red}) = \frac{4}{7}$, $P(\text{green}) = \frac{3}{7}$ If the first lolly is green, then for the second lolly: $P(\text{red}) = \frac{5}{7}$, $P(\text{green}) = \frac{2}{7}$ P(one of each colour) = P(RG) + P(GR) $= \frac{5}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{5}{7}$ $= \frac{30}{56}$ $= \frac{15}{28}$

 $\therefore C$

Question 2

For the first prize: $P(\text{win}) = \frac{2}{50}$, $P(\text{lose}) = \frac{48}{50}$

If Nikolai wins first prize, then for the second prize: $P(win) = \frac{1}{49}$, $P(lose) = \frac{48}{49}$ If Nikolai loses the first prize, then for the second prize: $P(win) = \frac{2}{49}$, $P(lose) = \frac{47}{49}$

a
$$P(\text{wins first prize}) = \frac{2}{50} = \frac{1}{25}$$

b $P(\text{wins both}) = P(WW)$
 $= \frac{2}{50} \times \frac{1}{49}$
 $= \frac{1}{1225}$
c $P(\text{wins no prize}) = P(LL)$

c
$$P(\text{wins no prize}) = P(\text{LL})$$

$$= \frac{48}{50} \times \frac{47}{49}$$
$$= \frac{1128}{1225}$$

d P(wins at least one prize) = 1 - P(wins no prizes)

$$=1 - \frac{1128}{1225}$$
$$= \frac{97}{1225}$$





G

For the first battery: $P(\text{flat}) = \frac{2}{10}$, $P(\text{not flat}) = \frac{8}{10}$ If the first battery is flat, then for the second battery: $P(\text{flat}) = \frac{1}{9}$, $P(\text{not flat}) = \frac{8}{9}$ If the first battery is not flat, then for the second battery: $P(\text{flat}) = \frac{2}{9}$, $P(\text{not flat}) = \frac{7}{9}$



Question 4

For the chairperson: $P(M) = \frac{3}{7}$, $P(W) = \frac{4}{7}$

If the chairperson is a man, then for the secretary: $P(M) = \frac{2}{6}$, $P(W) = \frac{4}{6}$ If the chairperson is a woman, then for the secretary: $P(M) = \frac{3}{6}$, $P(W) = \frac{3}{6}$





b i
$$P(\text{exactly one rainy day}) = P(R\overline{RR}) + P(\overline{RRR}) + P(\overline{RRR})$$

 $= 0.2 \times 0.8 \times 0.8 + 0.8 \times 0.2 \times 0.8 + 0.8 \times 0.8 \times 0.2$
 $= 0.384$
 $= 0.384 \times 100\%$
 $= 38.4\%$

ii
$$P(\text{no rainy days}) = P(\overline{RRR})$$

= $0.8 \times 0.8 \times 0.8$
= 0.512
= $0.512 \times 100\%$
= 51.2%
iii $P(\text{at least one rainy day}) = 1 - P(\text{no rainy day})$

$$P(\text{at least one rainy day}) = 1 - P(\text{no rainy days})$$
$$= 1 - 0.512$$
$$= 0.488$$
$$= 0.488 \times 100\%$$
$$= 48.8\%$$

Question 6

The probability of not rolling a 6 on any one roll is $\frac{5}{6}$.

$$\therefore P(\text{not rolling a } 6) = \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6}$$
$$= \frac{125}{216}$$

On any toss: P(H) = 0.37, P(T) = 0.63

a
$$P(TTT) = 0.63 \times 0.63 \times 0.63$$

= 0.250

$$P(2 \text{ tails}) = P(\text{HTT}) + P(\text{THT}) + P(\text{TTH})$$

= 0.37 × 0.63 × 0.63 + 0.63 × 0.37 × 0.63 + 0.63 × 0.63 × 0.37
= 0.441

Question 8

For the first card: $P(E) = \frac{2}{5}, P(O) = \frac{3}{5}$

If the first card is even then for the second card:

If the first card is odd then for the second card:



1st toss 2nd toss 3rd toss Outcomes

H <

Η <

H

Η

Т

Η

Т

HHH

HHT

HTH

HTT

THH THT TTH

TTT







b
$$P(\text{double fault}) = P(\text{NN})$$

= 0.22 × 0.06
= 0.0132

c
$$P(\text{one serve goes in}) = P(I) + P(NI)$$

= 0.78 + 0.22 × 0.94
= 0.9868

For the first student: $P(10) = \frac{8}{18}$, $P(11) = \frac{6}{18}$, $P(12) = \frac{4}{18}$ If the first student selected is from Year 10, then for the second student: $P(10) = \frac{7}{17}, P(11) = \frac{6}{17}, P(12) = \frac{4}{17}$ If the first student selected is from Year 11, then for the second student: $P(10) = \frac{8}{17}, P(11) = \frac{5}{17}, P(12) = \frac{4}{17}$ If the first student selected is from Year 12, then for the second student: $P(10) = \frac{8}{17}, P(11) = \frac{6}{17}, P(12) = \frac{3}{17}$ $P(10,10) = \frac{8}{18} \times \frac{7}{17}$ а **´1**0 $=\frac{28}{153}$ P(10,11) + P(11,10)b $=\frac{8}{18}\times\frac{6}{17}+\frac{6}{18}\times\frac{8}{17}$ $=\frac{16}{51}$ 12 С P(at least one from Year 12)student =1-P(none from Year 12)



P(at least one from Year 12)= 1 - P(none from Year 12) = 1 - [P(10, 10) + P(10, 11) + P(11, 10) + P(11, 11)] = 1 - $\left(\frac{28}{153} + \frac{16}{51} + \frac{6}{18} \times \frac{5}{17}\right)$ = 1 - $\frac{91}{153}$ = $\frac{62}{153}$

 $P(\text{each from a different level}) = 1 - P(\text{both from the same level}) = 1 - [P(10, 10) + P(11, 11) + P(12, 12)] = 1 - (\frac{28}{153} + \frac{6}{18} \times \frac{5}{17} + \frac{4}{18} \times \frac{3}{17}) = 1 - \frac{49}{153} = \frac{104}{153}$

d

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$$P(\text{born in March}) = \frac{1}{12}$$
$$P(\text{MMM}) = \frac{1}{12} \times \frac{1}{12} \times \frac{1}{12} \times 100\%$$
$$= 0.0579\%$$

The correct answer is A.

a
$$P(VN) = 0.08 \times 0.10$$

 $= 0.008$
 $= 0.008 \times 100\%$
 $= 0.8\%$
b $P(VD) = 0.08 \times 0.90$
 $= 0.072$
 $= 0.072 \times 100\%$
 $= 7.2\%$
c $P(ND) = 0.92 \times 0.10$
 $= 0.092$
 $= 0.092 \times 100\%$
 $= 9.2\%$

Sample HSC problem

	¢	٠	
5		-	
	c	1	

		1st die						
	-	1	2	3	4	5	6	
	1	0	1	2	3	4	5	
p.	2	1	0	1	2	3	4	
p pu	3	2	1	0	1	2	3	
21	4	3	2	1	0	1	2	
	5	4	3	2	1	0	1	
	6	5	4	3	2	1	0	

b There are ten 1s \therefore 1

c i
$$\frac{8}{36} = \frac{2}{9}$$

ii $\frac{18}{36} = \frac{1}{2}$

iii
$$1 - P(5) = 1 - \frac{2}{36}$$

 $= \frac{17}{18}$

a $\frac{1}{26}$

b
$$P(a,e,i,o,u,y) = \frac{6}{26}$$

 $= \frac{3}{13}$
c $1 - P(w,x,y,z) = 1 - \frac{4}{26}$
 $= \frac{11}{13}$

Question 2

a 25%

b
$$P(\text{black}) = 1 - \frac{1}{3} - \frac{1}{4} - \frac{1}{4}$$

 $= \frac{1}{6}$
 $\therefore \frac{1}{6} \times 100\% = 16\frac{2}{3}\% \text{ (or } 16.6\%)$

c
$$\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$$

 $\therefore \frac{7}{12} \times 100\% = 58\frac{1}{3}\% \text{ (or } 58.3\%)$

d P(not red) = 1 - P(red)

$$=1-\frac{1}{3}$$

= $\frac{2}{3}$
∴ $\frac{2}{3}$ ×100% = 66 $\frac{2}{3}$ % (or 66.6%)

Question 3

Being married and being single are not equally likely outcomes.



Question 5

a
$$P(11, 22, 33, 44, 55, 66) = \frac{6}{36}$$

 $= \frac{1}{6}$

b
$$P(26, 62, 35, 53, 44) = \frac{5}{36}$$

Question 6

1 - P(miss) = 100% - 68%= 32%

$$1 - P(\text{win}) = 1 - \frac{54}{240}$$
$$= \frac{31}{40}$$
$$= 0.775$$
$$\therefore \text{ D}$$

Question 8

Total = 140 **a** $\frac{30}{140} = \frac{3}{14}$ **b** $\frac{49}{140} = \frac{7}{20}$ **c** $1 - P(\text{bicycle}) = 1 - \frac{18}{140}$ 61

$$=\frac{1}{70}$$

Question 9

a $\frac{77}{80} \times 100\% = 96.25\%$ **b** $\frac{3}{80} \times 5000 = 187.5$

 ≈ 188

Question 10

- **a** Teacher to check.
- **b** Teacher to check.

c
$$\frac{1}{6}$$

$$\mathbf{d} \qquad \frac{1}{6} \times 48 = 8$$

Question 11

В



a
$$\frac{5}{80} \times \frac{4}{79} \times \frac{3}{78} = 0.000122, 0.012\%$$

b 1 - Pr(No prizes) =
$$1 - \frac{75}{80} \times \frac{74}{79} \times \frac{73}{78}$$

= 0.178
 $\approx 18\%$

c Pr(1 win) = Pr(WLL) + Pr(LWL) + Pr(LLW)
=
$$\frac{5}{80} \times \frac{75}{79} \times \frac{74}{78} + \frac{75}{80} \times \frac{5}{79} \times \frac{74}{78} + \frac{5}{80} \times \frac{74}{79} \times \frac{5}{78}$$

= $3 \times \left(\frac{5}{80} \times \frac{75}{79} \times \frac{74}{78}\right)$
= 0.16888
≈ 17%