Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Combined probability (tree or table)

Time allowed: 1 hour 20 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Question 1 (Paper 1): no calculator.
Questions 2-6 (Paper 2): calculator allowed.
Questions 7-10 (Paper 4): calculator allowed.

Total marks

/ 64

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 64 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

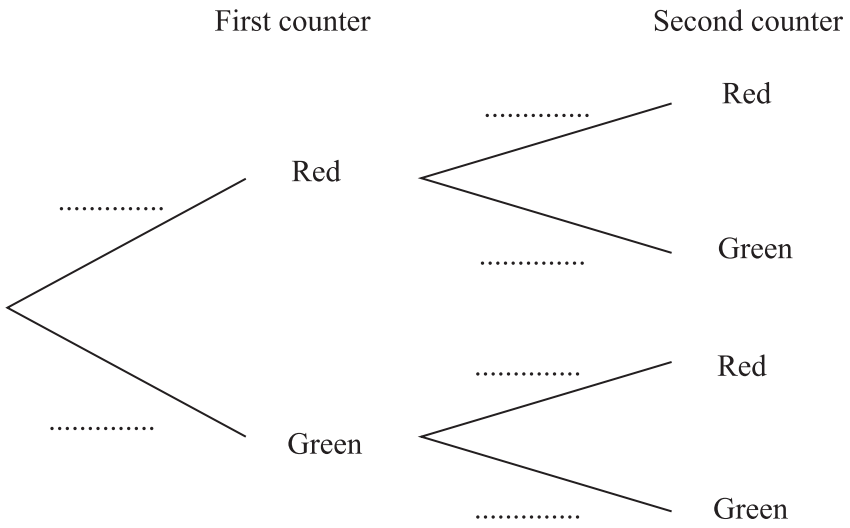
- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 A box contains 10 counters.
The counters are either red or green.
The ratio red counters : green counters = 1 : 4.

Shareen picks a counter at random, notes its colour and puts it back in the box.
She then picks a second counter at random.



(a) Complete the tree diagram.

[3]

(b) Find the probability that both counters are green.

..... [2]

(a) Tree diagrams, tables and Venn diagrams (b) Tree diagrams, tables and Venn diagrams Click for more variations

1(a)	Correct tree diagram	**3**	**B1** for $\frac{1}{5}$ oe **and** $\frac{4}{5}$ seen oe **M1** for either $\frac{1}{5}$ **or** $\frac{4}{5}$ in the correct place in the **first** branch If 0 scored, **SC1** for their two probabilities adding to 1 in the **first** branch
1(b)	$\frac{16}{25}$ oe	**2**	**FT** *their* **(a)** probabilities provided 0 < each of *their* $\frac{4}{5}$ < 1 **M1** for *their* $\frac{4}{5}$ × *their* $\frac{4}{5}$

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2 The probability that the school bus is late is $\frac{9}{10}$.

If the school bus is late, the probability that Seb travels on the bus is $\frac{15}{16}$.

If the school bus is on time, the probability that Seb travels on the bus is $\frac{3}{4}$.

Find the probability that Seb travels on the bus.

..... [3]

Tree diagrams, tables and Venn diagrams Click for more variations

2	$\frac{147}{160}$ oe	**3**	**M2** for $\frac{1}{10}\times\frac{3}{4}+\frac{9}{10}\times\frac{15}{16}$ or **M1** for $\frac{1}{10}\times\frac{3}{4}$ or $\frac{9}{10}\times\frac{15}{16}$

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3 Bag A and bag B each contain red sweets and yellow sweets.
Anna picks a sweet at random from bag A.
Ben picks a sweet at random from bag B.
The probability that Anna picks a red sweet is $\frac{2}{5}$.
The probability Anna and Ben both pick a yellow sweet is $\frac{1}{10}$.

Find the probability that Anna and Ben both pick a red sweet.

..... [3]

Tree diagrams, tables and Venn diagrams Click for more variations

3	$\frac{1}{3}$ oe	**3**	**M1** for $\left(1-\frac{2}{5}\right)\times p=\frac{1}{10}$ oe **M1** for $\frac{2}{5}\times(1-\textit{their } p)$ where $0<\textit{their } p<1$

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4 Mahir picks one number at random from the numbers 5, 10 and 15.
He then picks one number at random from the numbers 4, 5 and 6.
He adds the two numbers.

The sample space diagram shows some of the possible outcomes.

		First number		
	+	5	10	15
Second number	4		14	19
	5		15	20
	6		16	21

(a) Complete the sample space diagram. [1]

(b) Given that the total of the two numbers is odd, find the probability that one of the numbers added is 15.

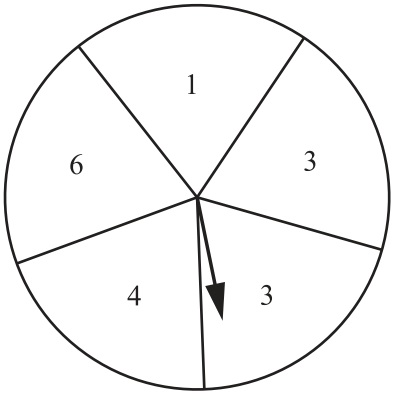
..... [2]

(a) Tree diagrams, tables and Venn diagrams (b) Conditional probability Click for more variations

4(a)	9 10 11	**1**	
4(b)	$\frac{2}{5}$ oe	**2**	**FT** for $\frac{their\,2}{their\,5}$ **B1FT** for $\frac{their\,2}{k}$ where $their\,2 \leqslant k \leqslant 9$ or for $\frac{c}{their\,5}$ where $0 < c \leqslant their\,5$

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5 The diagram shows a fair spinner.



Anna spins it twice and adds the scores.

(a) Complete the table for the total scores.

		Score on first spin				
		1	3	3	4	6
Score on second spin	1	2	4	4	5	7
	3	4	6	6	7	9
	3	4	6	6	7	9
	4					
	6					

[1]

(b) Write down the most likely total score.

..... [1]

(c) Find the probability that Anna scores

(i) a total less than 6,

..... [2]

(ii) a total of 3.

..... [1]

(a) Tree diagrams, tables and Venn diagrams (b) Basic probability (c)(i) Tree diagrams, tables and Venn diagrams (c)(ii) Basic probability Click for more variations

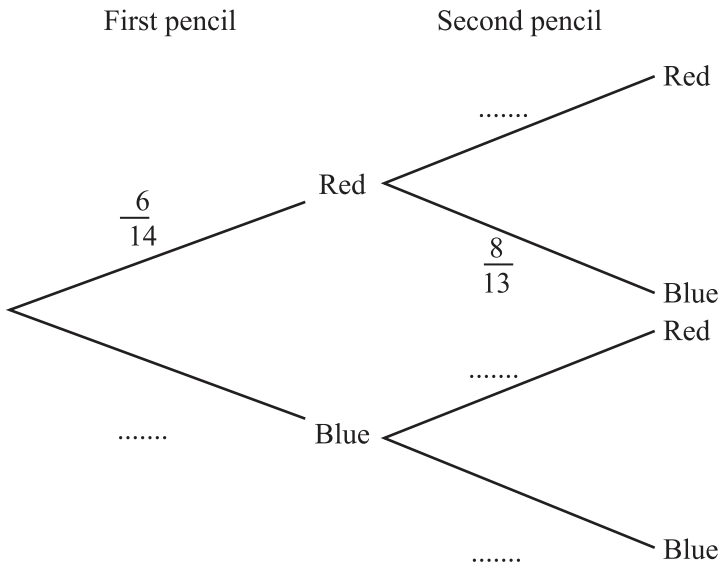
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5(a)	<table><tr><td>5</td><td>7</td><td>7</td><td>8</td><td>10</td></tr><tr><td>7</td><td>9</td><td>9</td><td>10</td><td>12</td></tr></table>	**1**	
5(b)	7	**1**	
5(c)(i)	$\frac{7}{25}$ or 0.28 or 28%	**2FT**	**FT** $\frac{their\ 7}{25}$ **B1** for $\frac{k}{25}$ If zero scored, then **SC1** for $\frac{2}{5}$ or $\frac{6}{15}$ if no values in the bottom two rows of the table.
5(c)(ii)	0	**1FT**	**FT** $\frac{their\ 0}{25}$

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6 A box contains 6 red pencils and 8 blue pencils.
A pencil is chosen at random and not replaced.
A second pencil is then chosen at random.

(a) Complete the tree diagram.



[2]

(b) Calculate the probability that

(i) both pencils are red,

Answer(b)(i) ..... [2]

(ii) at least one of the pencils is red.

Answer(*b*)(ii) ..... [3]

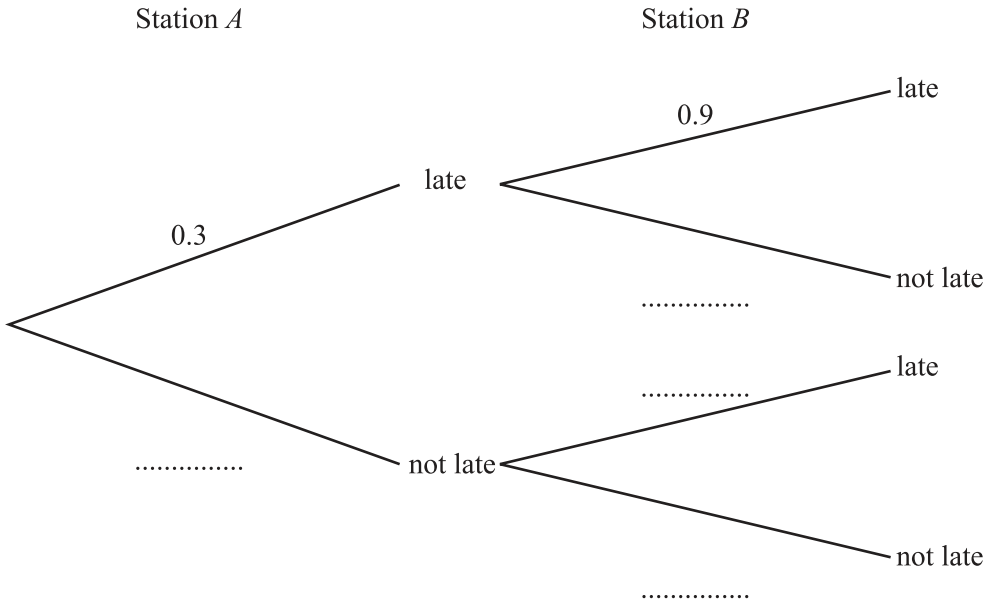
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(a) Tree diagrams, tables and Venn diagrams
(b)(i) Tree diagrams, tables and Venn diagrams
(b)(ii) Tree diagrams, tables and Venn diagrams
Click for more variations

6 (a)	$\frac{8}{14}$ and $\frac{5}{13}$	**1**	
	$\frac{6}{13}$ and $\frac{7}{13}$	**1**	
(b) (i)	$\frac{30}{182}$ oe	**2**	**M1FT** for $\frac{6}{14} \times$ *their* $\frac{5}{13}$
(ii)	$\frac{126}{182}$ oe	**3**	**M2FT** for $1 - \frac{8}{14} \times \frac{7}{13}$ or $\frac{6}{14} \times \frac{5}{13} + \frac{6}{14} \times \frac{8}{13} + \frac{8}{14} \times \frac{6}{13}$ or $\frac{6}{14} + \frac{8}{14} \times \frac{6}{13}$ oe or **M1FT** for sum of any two of $\frac{6}{14} \times \frac{5}{13}$ or $\frac{6}{14} \times \frac{8}{13}$ or $\frac{8}{14} \times \frac{6}{13}$

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7 A train stops at station A and then at station B.
If the train is late at station A, the probability that it is late at station B is 0.9 .
If the train is not late at station A, the probability that it is late at station B is 0.2 .
The probability that the train is late at station A is 0.3 .

(a) Complete the tree diagram.



[2]

(b) **(i)** Find the probability that the train is late at one or both of the stations.

..... [3]

(ii) This train makes 250 journeys.

Find the number of journeys that the train is expected to be late at one or both of the stations.

..... [1]

(c) The train continues to station C.
The probability that it is late at all 3 stations is 0.27 .

Describe briefly what this probability shows.

.....

..... [1]

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(a) Tree diagrams, tables and Venn diagrams (b)(i) Tree diagrams, tables and Venn diagrams
(b)(ii) Relative frequency and expected outcomes (c) Basic probability Click for more variations

7	**(a)**	0.7, 0.1 oe correctly placed 0.2, 0.8 oe correctly placed	**1** **1**	
	(b) (i)	0.44 nfww oe	**3**	**M2** for $1-$ *their* $0.7\times$ *their* 0.8 or for $0.3 +$ *their* $0.7 \times$ *their* 0.2 oe or **M1** for *their* $0.7 \times$ *their* 0.8 or for two of 0.3×0.9, $0.3 \times$ *their* 0.1, *their* $0.7 \times$ *their* 0.2
	(ii)	110	**1FT**	**FT** $250 \times$ *their* **(b)(i)**
	(c)	If late at first two stations then certain to be late at station C oe	**1**	Indication of certain event (allow 1 or 100% probability or sure) at third station if late at first two stations

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8 A box contains 20 packets of potato chips.

6 packets contain barbecue flavoured chips.
10 packets contain salt flavoured chips.
4 packets contain chicken flavoured chips.

(a) Maria takes two packets at random **without replacement**.

(i) Show that the probability that she takes two packets of salt flavoured chips is $\frac{9}{38}$.

[2]

(ii) Find the probability that she takes two packets of different flavoured chips.

..... [4]

(b) Maria takes three packets at random, **without replacement**, from the 20 packets.

Find the probability that she takes **at least two** packets of chicken flavoured chips.

..... [3]

(a)(i) Tree diagrams, tables and Venn diagrams (a)(ii) Tree diagrams, tables and Venn diagrams

(b) Conditional probability Click for more variations

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8(a)(i)	$\frac{10}{20} \times \frac{9}{19}$ oe	**M2**	**B1** for $\frac{9}{19}$ oe seen
8(a)(ii)	$\frac{62}{95}$ oe	**4**	**M3** for $\frac{6}{20} \times \frac{14}{19} + \frac{10}{20} \times \frac{10}{19} + \frac{4}{20} \times \frac{16}{19}$ oe or $1 - \frac{6}{20} \times \frac{5}{19} - \frac{10}{20} \times \frac{9}{19} - \frac{4}{20} \times \frac{3}{19}$ oe or **M2** for the sum of two products of different flavours isw or **M1** for one correct product of different flavours isw
8(b)	$\frac{5}{57}$ oe	**3**	**M2** for $N \times \left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18}\right) + \frac{4}{20} \times \frac{3}{19} \times \frac{2}{18}$ oe or for $3\left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18}\right)$ oe or $1 - \{N \times \left(\frac{4}{20} \times \frac{16}{19} \times \frac{15}{18}\right) + \frac{16}{20} \times \frac{15}{19} \times \frac{14}{18}\}$ oe or **M1** for $\frac{4}{20} \times \frac{3}{19} \times \frac{k}{18}$ oe seen

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9 **(a)** Sarah spins a fair four-sided spinner numbered 0, 1, 1 and 3.

(i) What number is the spinner most likely to land on?

..... [1]

(ii) Sarah spins the spinner twice.

Find the probability that it lands on the number 1 both times.

..... [2]

(iii) Sarah spins the spinner until it lands on the number 3.

The probability that this happens on the nth spin is $\frac{729}{16384}$.

Find the value of n.

$n =$ ..... [2]

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(b) Scott takes an examination.
The examination is in two parts, a theory test and a practical test.
Both parts must be passed to pass the examination.

The probability that Scott passes the theory test is 0.9 .
The probability that Scott passes the practical test is 0.8 .

Find the probability that

(i) Scott passes the examination,

..... [2]

(ii) Scott passes the theory test or the practical test but not both.

..... [3]

(a)(i) Basic probability | (a)(ii) Tree diagrams, tables and Venn diagrams | (a)(iii) First success on the nth attempt | (b)(i) Tree diagrams, tables and Venn diagrams | (b)(ii) Tree diagrams, tables and Venn diagrams | Click for more variations

9(a)(i)	1	**1**	
9(a)(ii)	$\frac{1}{4}$ oe **nfww**	**2**	**M1** for $\frac{2}{4}\times\frac{2}{4}$ oe
9(a)(iii)	7	**2**	**M1** for trials with $\left(\frac{3}{4}\right)^k\times\frac{1}{4}$ soi
9(b)(i)	0.72 oe	**2**	**M1** for 0.9×0.8
9(b)(ii)	0.26 oe	**3**	**M2** for $0.9\times0.2+0.1\times0.8$ or $1-$ *their* **(b)(i)** -0.1×0.2 or **M1** for 0.9×0.2 or 0.1×0.8 or $1-$ *their* **(b)(i)** or $1-0.1\times0.2$

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10 Kenwyn plays a board game.
Two cubes (dice) each have faces numbered 1, 2, 3, 4, 5 and 6.
In the game, a **throw** is rolling the **two** fair 6-sided dice and then adding the numbers on their top faces.
This total is the number of spaces to move on the board.
For example, if the numbers are 4 and 3, he moves 7 spaces.

(a) Giving each of your answers as a fraction in its simplest form, find the probability that he moves

(i) two spaces with his next throw,

Answer(a)(i) ..... [2]

(ii) ten spaces with his next throw.

Answer(a)(ii) ..... [3]

(b) What is the most likely number of spaces that Kenwyn will move with his next throw?
Explain your answer.

Answer(b) ..... because .....

..... [2]

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(c)

95	96	97	98	99 Go back 3 spaces	100 WIN

To win the game he must move **exactly** to the 100th space.
Kenwyn is on the 97th space.
If his next throw takes him to 99, he has to move back to 96.
If his next throw takes him over 100, he stays on 97.

Find the probability that he reaches 100 in either of his next two throws.

Answer(c) ..... [5]

(a)(i) Tree diagrams, tables and Venn diagrams (a)(ii) Tree diagrams, tables and Venn diagrams
(b) Basic probability (c) Tree diagrams, tables and Venn diagrams Click for more variations

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10 (a) (i)	$\frac{1}{36}$ **final answer**	**2**	**M1** for $\frac{1}{6}\times\frac{1}{6}$
(ii)	$\frac{1}{12}$ **final answer**	**3**	**M2** for $3\left(\frac{1}{6}\times\frac{1}{6}\right)$ oe or **M1** for identifying 3 correct pairs (4, 6), (6, 4) and (5, 5)
(b)	7	**1**	
	Refers to most combinations oe	**1**	**Dependent** on previous mark
(c)	$\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$	**5**	**M4** for $\frac{2}{36}+\left(\left[1-\frac{3}{36}\right]\times\frac{2}{36}\right)+\left(\frac{1}{36}\times\frac{3}{36}\right)$ oe or **M3** for 2 correct probabilities shown <u>added</u> from those above or **M1** for $\left(1-\frac{3}{36}\right)\times\frac{2}{36}$ seen oe And **M1** for $\frac{1}{36}\times\frac{3}{36}$ seen oe or $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}$ oe alone or added to a probability not of the form $\frac{n}{36}$

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