Chapter 8

Probability

01. 0580_m24_qp_22 Q: 12

Farid spins a three-sided spinner with sides labelled A, B and C.
The probability that the spinner lands on C is 0.35 .
Farid spins the spinner 40 times.

Calculate the number of times he expects the spinner to land on C.

..... [1]

---

02. 0580_m24_qp_22 Q: 25

A bag contains 2 green buttons, 5 red buttons and 6 blue buttons.
Two buttons are taken at random from the bag without replacement.

Calculate the probability that the two buttons are different colours.

..... [4]

---

03. 0580_s24_qp_21 Q: 2

Geetha has a box of toys.
She picks a toy at random from the box.
The probability that she picks a wooden toy is 0.6 .

(a) Work out the probability that she does not pick a wooden toy.

..... [1]

(b) The box contains three types of toys, wooden, plastic or metal.

Type of toy	Wooden	Plastic	Metal
Number of toys		14	14
Probability	0.6		

Complete the table.

[2]

04. 0580_s24_qp_21 Q: 22

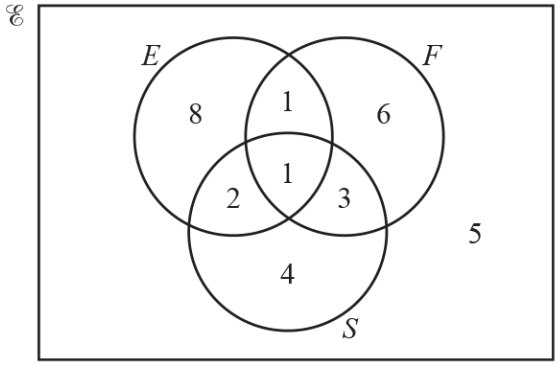
Bag A and bag B each contain red counters and blue counters only.
Stephan picks a counter at random from bag A and Jen picks a counter at random from bag B.

The probability that Stephan picks a red counter is 0.4 .
The probability that Stephan and Jen both pick a red counter is 0.25 .

Find the probability that Stephan and Jen both pick a blue counter.

..... [4]

05. 0580_s24_qp_22 Q: 23



The Venn diagram shows information about the number of students in a class.
Some study English (E), some study French (F), some study Spanish (S) and some do not study any of these languages.

(a) Find $\mathrm{n}\left((E \cup F)' \cup S\right)$.

..... [1]

(b) One student is picked at random from those who study Spanish.

Find the probability that this student studies exactly two languages.

..... [2]

---

06. 0580_s24_qp_23 Q: 5

In a city, the probability that it will rain today is 0.15 .

Find the probability that it will not rain today in this city.

..... [1]

---

07. 0580_m23_qp_22 Q: 24

The probability of Jamie hitting a target is $\frac{1}{3}$.

The probability that he hits the target for the first time on his nth attempt is $\frac{64}{2187}$.

Find the value of n.

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

---

08. 0580_s23_qp_21 Q: 5

Eric has four colours of paint.
The table shows the probability that he uses each colour.

Colour	Red	Blue	Green	Yellow
Probability	0.3	0.35	0.13	x

Find the value of x.

$x =$ ..... [2]

---

09. 0580_s23_qp_21 Q: 15

A bag contains 5 green buttons, 2 blue buttons and 6 white buttons.
Maya takes two buttons at random from the bag, without replacement.

Calculate the probability that one button is green and the other button is not green.

..... [3]

---

10. 0580_s23_qp_22 Q: 5

A spinner is spun.
The possible outcomes are A, B, C or D.
The probability of spinning A, C or D is shown in the table.

Letter on spinner	A	B	C	D
Probability	0.2		0.05	0.35

Complete the table.

[2]

---

11. 0580_s23_qp_22 Q: 23

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]

12. 0580_s23_qp_23 Q: 7

A spinner has five sides.
Each side is painted red, blue, green, yellow or orange.
The table shows some of the probabilities of the spinner landing on each colour.

Colour	Red	Blue	Green	Yellow	Orange
Probability	0.3	0.16	0.18	0.25	

(a) Complete the table. [2]

(b) Dan spins the spinner once.

Find the probability that the spinner lands on red or blue.

..... [2]

---

13. 0580_w23_qp_23 Q: 6

Rama asks a group of students how they travel to school.
The table shows the probability of how a student, chosen at random, travels to school.

	Bus	Walk	Car	Other
Probability	0.4	0.32	0.17	

(a) Complete the table.

[2]

(b) There are 1800 students at the school.

Find the expected number of students that walk to school.

..... [1]

---

14. 0580_s22_qp_22 Q: 6

Some cards have either a square, a circle or a triangle drawn on them.
Piet chooses one of the cards at random.

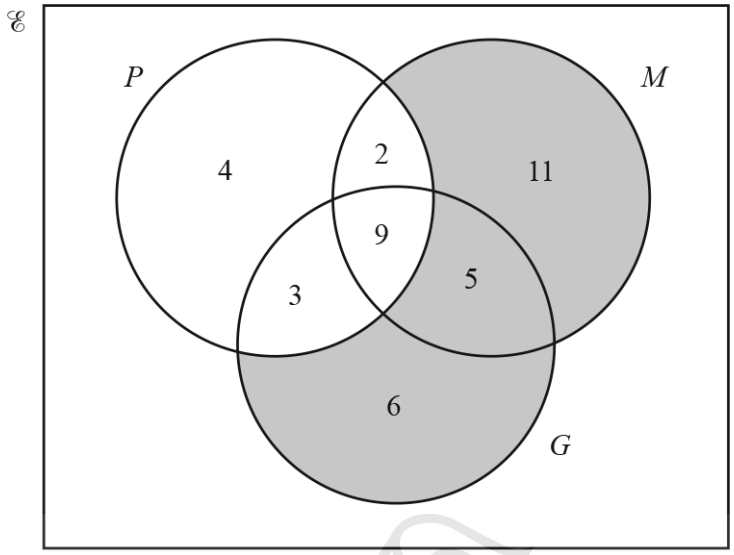
Complete the table to show the probability of choosing a card with each shape.

Shape	Square	Circle	Triangle
Probability	0.2	0.32	

[2]

15. 0580_s22_qp_22 Q: 16

The Venn diagram shows the number of students in a class of 40 who study physics (P), mathematics (M) and geography (G).



(a) Use set notation to describe the shaded region.

..... [1]

(b) Find $n((P \cap G) \cup M')$.

..... [1]

(c) A student is chosen at random from those studying geography.

Find the probability that this student also studies physics or mathematics but not both.

..... [2]

16. 0580_s22_qp_23 Q: 1

The probability of picking a red sweet from a bag is 0.05 .

Find the probability of not picking a red sweet.

..... [1]

17. 0580_w22_qp_21 Q: 25

A bag contains 5 red balls, 4 blue balls and 3 green balls.

(a) **(i)** Megan picks a ball at random.

Write down the probability that the ball is red or blue.

..... [1]

(ii) Megan replaces the ball.
She picks a ball at random, notes the colour and replaces the ball.
She repeats this 60 times.

Calculate the number of times the ball is expected to be red or blue.

..... [1]

(b) Mick picks 2 of the 12 balls at random, without replacement.

Calculate the probability that the balls are different colours.

..... [4]

(c) Marie picks balls at random, without replacement, from the 12 balls.
When she picks a green ball she stops.

The probability that she picks a green ball on pick n is $\frac{21}{220}$.

Find the value of n.

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

18. 0580_w22_qp_22 Q: 19

Katy picks a number at random from the numbers 2, 3 and 5.
She then picks a number at random from the numbers 5, 6, 7 and 9.
When she adds the two numbers the answer is even.

Find the probability that **exactly one** of the numbers picked is a 5.

..... [3]

---

19. 0580_w22_qp_23 Q: 6

A spinner can land on the colours green, black or red.
The table shows the probabilities of the spinner landing on green or black.

Colour	Green	Black	Red
Probability	$\frac{2}{5}$	$\frac{1}{4}$	

(a) Complete the table. [2]

(b) Chang spins the spinner 120 times.

Find the expected number of times it lands on green.

..... [1]

---

20. 0580_s21_qp_21 Q: 17

A bag contains 3 blue buttons, 8 white buttons and 5 red buttons.
Two buttons are picked at random from the bag, without replacement.

Work out the probability that the two buttons are either both red or both white.

..... [3]

---

21. 0580_s21_qp_22 Q: 1

The probability that Jane wins a game is $\frac{7}{10}$.

(a) Find the probability that Jane does not win the game.

..... [1]

(b) Jane plays this game 50 times.

Find the number of times she is expected to win the game.

..... [1]

---

22. 0580_s21_qp_23 Q: 26

Malik goes to a shop every day to buy bread.

On any day, the probability that Malik goes to the shop in the morning is 0.7 .

If he goes in the morning, the probability that there is bread for Malik to buy is 0.95 .
If he goes later, the probability that there is bread for Malik to buy is 0.6 .

Calculate the probability that, on any day, there is bread for Malik to buy.

..... [3]

23. 0580_w21_qp_22 Q: 7

Katy has 5 white flowers, x red flowers and $(2x+1)$ yellow flowers.
She picks a flower at random.

The probability that it is white is $\frac{1}{12}$.

Find the probability that it is yellow.

..... [4]

24. 0580_w21_qp_22 Q: 16

Sachin picks a number at random from the first three multiples of 3.
He then picks a number at random from the first three prime numbers.
He adds the two numbers to find a score.

(a) Complete the table.

		Multiples of 3		
		3		9
Prime numbers	2	5		11
	3	6		

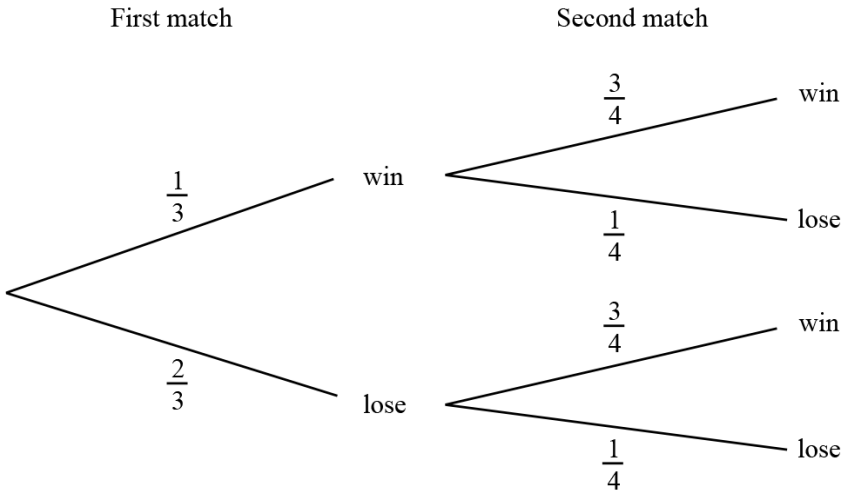
[2]

(b) Given that the score is even, find the probability that one of the numbers he picks is 9.

..... [2]

25. 0580_P20_QP_20 Q: 22

A soccer team plays two matches.
The tree diagram shows the probability of the team winning or losing the matches.



Find the probability that the soccer team wins at least one of the two matches.

..... [3]

26. 0580_s20_QP_21 Q: 4

A bag contains blue, red, yellow and green balls only.
A ball is taken from the bag at random.
The table shows some information about the probabilities.

Colour	Blue	Red	Yellow	Green
Probability	0.15	0.2		0.43

(a) Complete the table.

[2]

(b) Abdul takes a ball at random and replaces it in the bag.
He does this 200 times.

Find how many times he expects to take a red ball.

..... [1]

---

27. 0580_s20_QP_23 Q: 5

Sofia has a bag containing 8 blue beads and 7 red beads only.
She takes one bead out of the bag at random and replaces it.
She does this 90 times.

Find the number of times she expects to take a red bead.

..... [2]

---

28. 0580_w20_qp_23 Q: 11

A bag contains 7 red discs, 5 green discs and 2 pink discs.

(a) Helen takes one disc at random, records the colour and replaces it in the bag.
She does this 140 times.

Find how many times she expects to take a green disc.

..... [2]

(b) Helen adds 9 green discs and some pink discs to the discs already in the bag.
The probability of taking a green disc is now $\frac{2}{7}$.

Find the number of pink discs that Helen added to the bag.

..... [2]

---

29. 0580_m19_QP_22 Q: 6

The probability that a sweet made in a factory is the wrong shape is 0.0028 .
One day, the factory makes 25 000 sweets.

Calculate the number of sweets that are expected to be the wrong shape.

..... [2]

---

30. 0580_s19_QP_21 Q: 11

1	2	3	4	5

The diagram shows five cards.
Two of the cards are taken at random, without replacement.

Find the probability that both cards show an even number.

..... [2]

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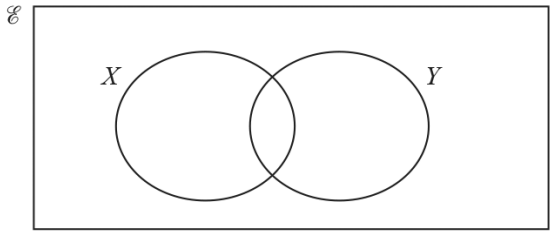
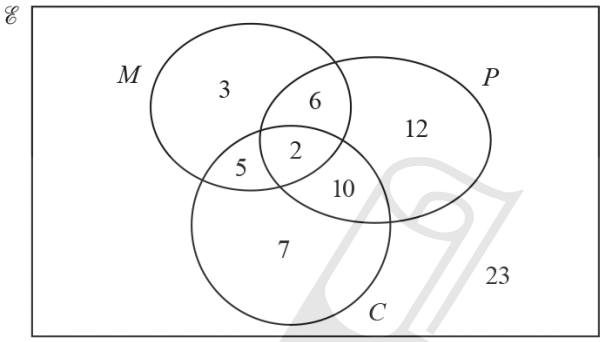
31. 0580_s19_QP_22 Q: 21

(a) In the Venn diagram, shade $X' \cap Y$.



[1]

(b) The Venn diagram below shows information about the number of gardeners who grow melons (M), potatoes (P) and carrots (C).



(i) A gardener is chosen at random from the gardeners who grow melons.

Find the probability that this gardener does not grow carrots.

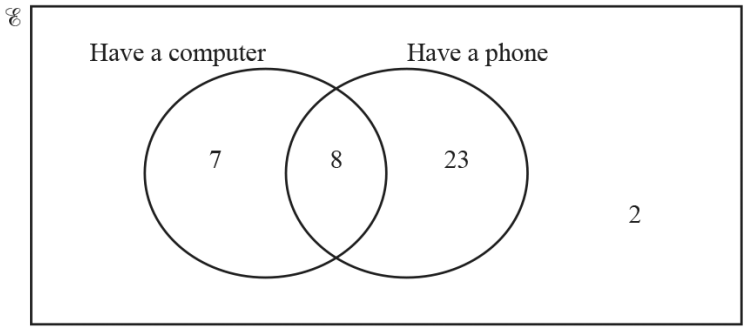
..... [2]

(ii) Find $n((M \cap P) \cup C')$.

..... [1]

32. 0580_s19_QP_23 Q: 20

(a) 40 children were asked if they have a computer or a phone or both.
The Venn diagram shows the results.

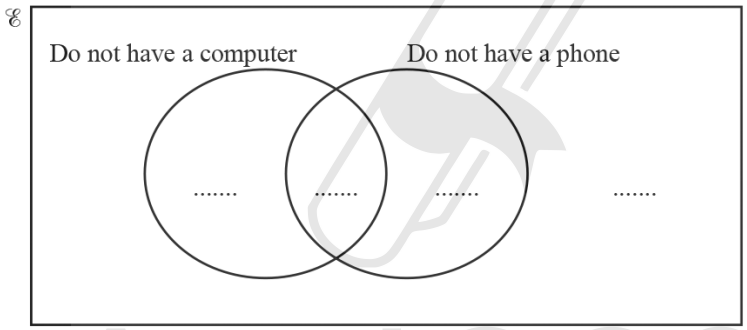


(i) A child is chosen at random from the children who have a computer.

Write down the probability that this child also has a phone.

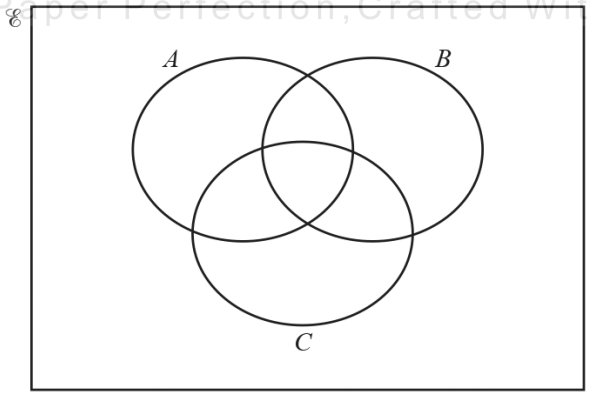
..... [1]

(ii) Complete the Venn diagram.



[2]

(b) In this Venn diagram, shade the region $(A \cup B') \cap C$.



[1]

33. 0580_w19_QP_21 Q: 20

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]

---

34. 0580_w19_QP_22 Q: 18

Harris is taking a driving test.
The probability that he passes the driving test at the first attempt is 0.6 .
If he fails, the probability that he passes at any further attempt is 0.75 .

Calculate the probability that Harris

(a) passes the driving test at the second attempt,

..... [2]

(b) takes no more than three attempts to pass the driving test.

..... [2]

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35. 0580_m18_QP_22 Q: 22

Samira and Sonia each have a bag containing 20 sweets.
In each bag, there are 5 red, 6 green and 9 yellow sweets.

(a) Samira chooses one sweet at random from her bag.

Write down the probability that she chooses a yellow sweet.

..... [1]

(b) Sonia chooses two sweets at random, without replacement, from her bag.

(i) Show that the probability that she chooses two green sweets is $\frac{3}{38}$.

[2]

(ii) Calculate the probability that the sweets she chooses are **not** both the same colour.

..... [4]

36. 0580_s18_QP_21 Q: 20

(a) A box contains 3 blue pens, 4 red pens and 8 green pens only.
A pen is chosen at random from the box.

Find the probability that this pen is green.

..... [1]

(b) Another box contains 7 black pens and 8 orange pens only.
Two pens are chosen at random from this box without replacement.

Calculate the probability that at least one orange pen is chosen.

..... [3]

37. 0580_s18_QP_22 Q: 24

Box A and box B each contain blue and green pens only.
Raphael picks a pen at random from box A and Paulo picks a pen at random from box B.

The probability that Raphael picks a blue pen is $\frac{2}{3}$.

The probability that both Raphael and Paulo pick a blue pen is $\frac{8}{15}$.

(a) Find the probability that Paulo picks a blue pen.

..... [2]

(b) Find the probability that both Raphael and Paulo pick a green pen.

..... [3]

---

38. 0580_s18_QP_23 Q: 7

The probability that Kim wins a game is 0.72 .
In one year Kim will play 225 games.

Work out an estimate of the number of games Kim will win.

..... [2]

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39. 0580_w18_QP_21 Q: 22

A group of 200 people were asked which city they would like to visit next.
The table shows the results.

City	London	Paris	New York	Tokyo
Number of people	50	48	56	46

(a) A person from the group is chosen at random.

Write down the probability that this person would like to visit either Paris or Tokyo next.

..... [2]

(b) Two people are chosen at random from the group of 200.

Find the probability that one person would like to visit London next and the other person would like to visit New York next.
Give your answer as a percentage.

..... % [3]

40. 0580_s17_QP_21 Q: 8

Simon has two boxes of cards.
In one box, each card has one shape drawn on it that is either a triangle or a square.
In the other box, each card is coloured either red or blue.

Simon picks a card from each box at random.
The probability of picking a triangle card is t.
The probability of picking a red card is r.

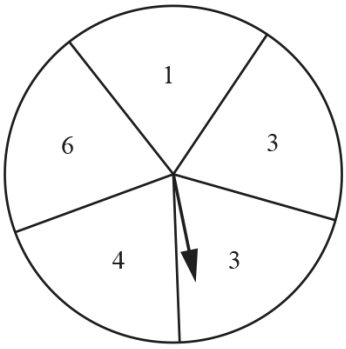
Complete the table for the cards that Simon picks, writing each probability in terms of r and t.

Event	Probability
Triangle and red	
Square and red	$(1-t)r$
Triangle and blue	
Square and blue	

[3]

41. 0580_s17_QP_21 Q: 20

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]

42. 0580_s17_QP_22 Q: 2

The probability that Stephanie wins her next tennis match is 0.85 .

Find the probability that Stephanie does not win her next tennis match.

..... [1]

---

43. 0580_s17_QP_23 Q: 6

The probability that Pedro scores a goal in any match is $\frac{2}{5}$.

Calculate the probability that Pedro scores a goal in each of the next two matches.

..... [2]

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44. 0580_m16_QP_22 Q: 21

Dan either walks or cycles to school.
The probability that he cycles to school is $\frac{1}{3}$.

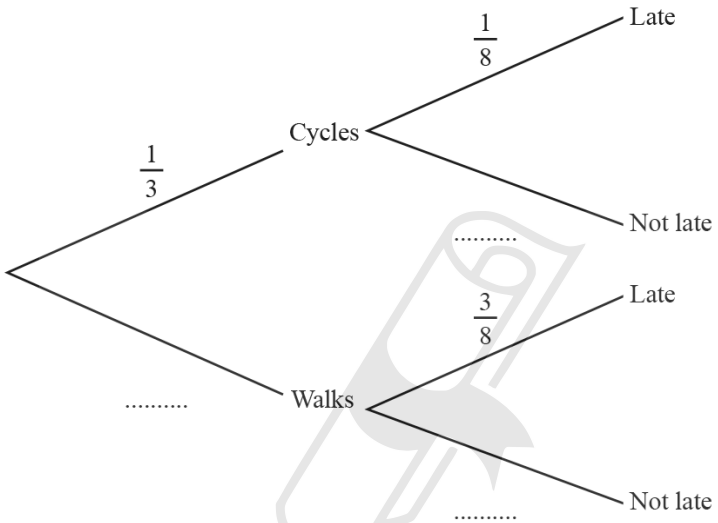
(a) Write down the probability that Dan walks to school.

..... [1]

(b) When Dan cycles to school the probability that he is late is $\frac{1}{8}$.

When Dan walks to school the probability that he is late is $\frac{3}{8}$.

Complete the tree diagram.



[2]

(c) Calculate the probability that

(i) Dan cycles to school and is late,

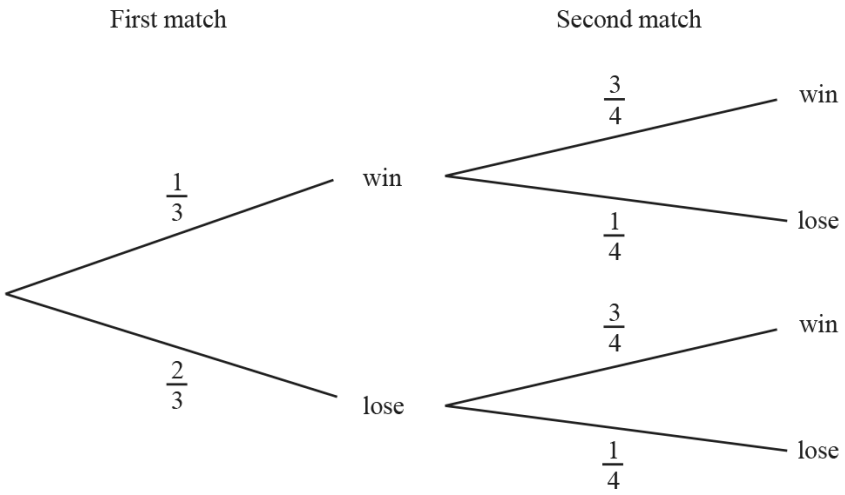
..... [2]

(ii) Dan is not late.

..... [3]

45. 0580_s16_QP_21 Q: 19

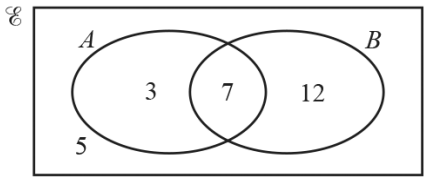
The probability of a cricket team winning or losing in their first two matches is shown in the tree diagram.



Find the probability that the cricket team wins at least one match.

..... [3]

46. 0580_s16_QP_21 Q: 22



The Venn diagram shows the numbers of elements in each region.

(a) Find $n(A \cap B')$.

..... [1]

(b) An element is chosen at random.

Find the probability that this element is in set B.

..... [1]

(c) An element is chosen at random from set A.

Find the probability that this element is also a member of set B.

..... [1]

(d) On the Venn diagram, shade the region $(A \cup B)'$. [1]

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47. 0580_s16_QP_23 Q: 11

Hattie has a box of coloured pens.
She takes a pen at random from the box.
The probability that she takes a red pen is 0.4 .

(a) Work out the probability that she does not take a red pen.

..... [1]

(b) The box contains only blue, red and green pens.
There are 15 blue pens and 15 green pens.

Complete the table.

Colour of pen	Blue	Red	Green
Number of pens	15		15
Probability		0.4	

[2]

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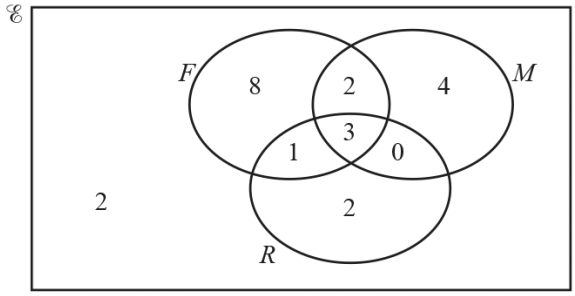
48. 0580_w16_QP_22 Q: 15



The Venn diagram shows the number of people who like films (F), music (M) and reading (R).

(a) Find

(i) $n(M)$,

..... [1]

(ii) $n(R \cup M)$.

..... [1]

(b) A person is chosen at random from the people who like films.

Write down the probability that this person also likes music.

..... [1]

(c) On the Venn diagram, shade $M' \cap (F \cup R)$. [1]

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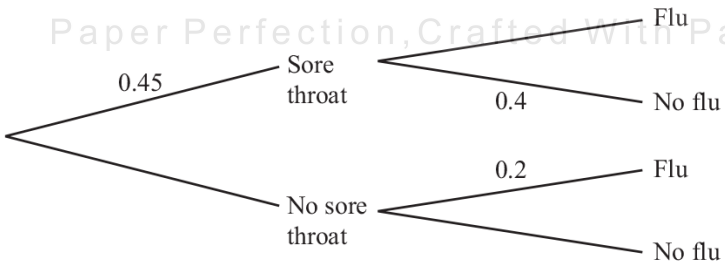
49. 0580_P15_QP_20 Q: 10

In a flu epidemic 45% of people have a sore throat.
If a person has a sore throat the probability of **not** having flu is 0.4.
If a person does not have a sore throat the probability of having flu is 0.2.



Calculate the probability that a person chosen at random has flu.

Answer ..... [4]

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50. 0580_s15_QP_21 Q: 5

Paul and Sammy take part in a race.

The probability that Paul wins the race is $\frac{9}{35}$.

The probability that Sammy wins the race is 26%.

Who is more likely to win the race?
Give a reason for your answer.

Answer ..... because ..... [2]

---

51. 0580_s15_QP_22 Q: 5

A biased 4-sided dice is rolled.
The possible scores are 1, 2, 3 or 4.
The probability of rolling a 1, 3 or 4 is shown in the table.

Score	1	2	3	4
Probability	0.15		0.3	0.35

Complete the table. [2]

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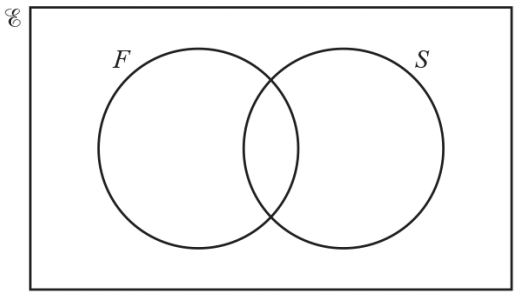
52. 0580_s15_QP_23 Q: 16

(a) In this part, you may use this Venn diagram to help you answer the questions.



In a class of 30 students, 25 study French (F), 18 study Spanish (S).
One student does not study French or Spanish.

(i) Find the number of students who study French and Spanish.

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

(ii) One of the 30 students is chosen at random.

Find the probability that this student studies French but not Spanish.

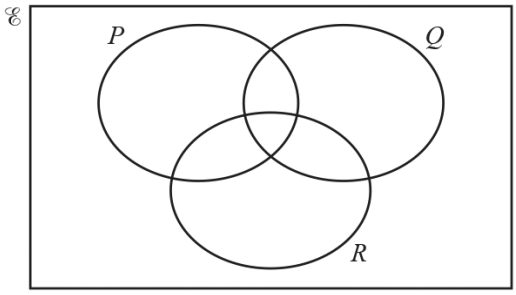
Answer(a)(ii) ..... [1]

(iii) A student who does not study Spanish is chosen at random.

Find the probability that this student studies French.

Answer(a)(iii) ..... [1]

(b)



On this Venn diagram, shade the region $R \cap (P \cup Q)'$. [1]

53. 0580_w15_QP_21 Q: 20

The table shows the probability that a person has blue, brown or green eyes.

Eye colour	Blue	Brown	Green
Probability	0.4	0.5	0.1

Use the table to work out the probability that two people, chosen at random,

(a) have blue eyes,

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

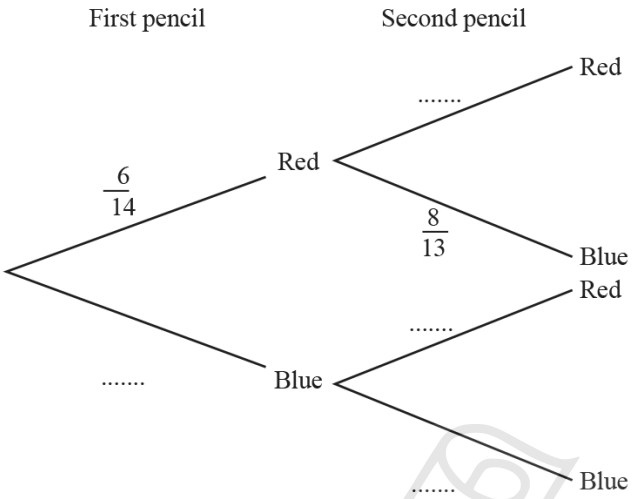
(b) have different coloured eyes.

Answer(b) ..... [4]

54. 0580_w15_QP_22 Q: 23

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]

55. 0580_w15_QP_23 Q: 4

The probability that it will rain on any day is $\frac{1}{5}$.

Calculate an estimate of the number of days it will rain in a month with 30 days.

Answer ..... [1]

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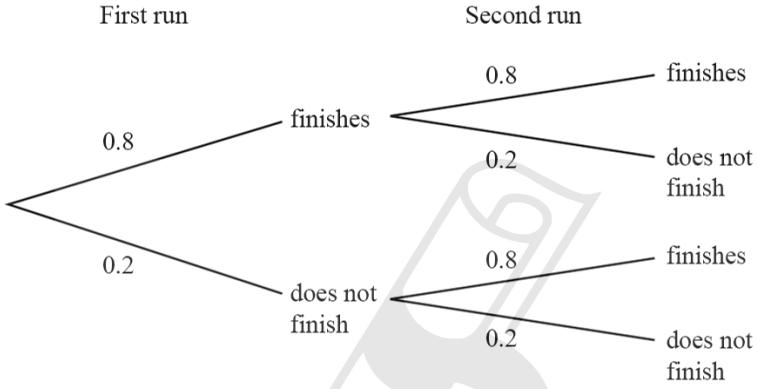
56. 0580_w15_QP_23 Q: 18

Samira takes part in two charity runs.
The probability that she finishes each run is 0.8 .



Find the probability that Samira finishes at least one run.

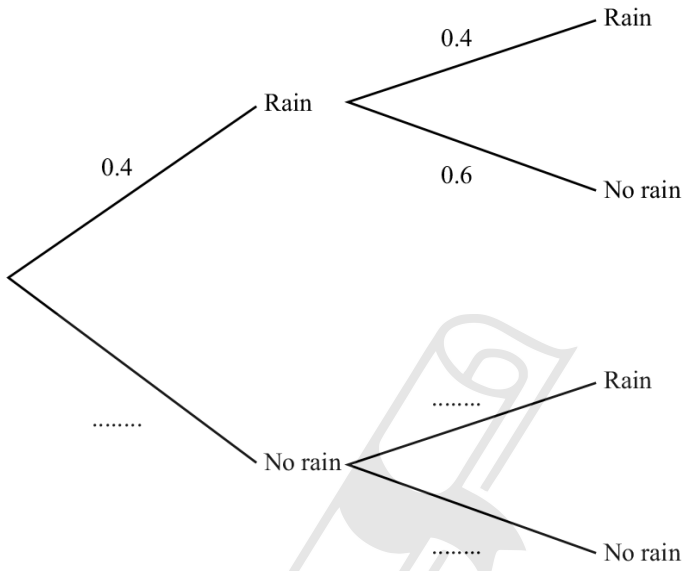
Answer ..... [3]

---

57. 0580_w14_QP_21 Q: 18

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 0.2 .
On Sunday it rained.

(a) Complete the tree diagram for Monday and Tuesday.

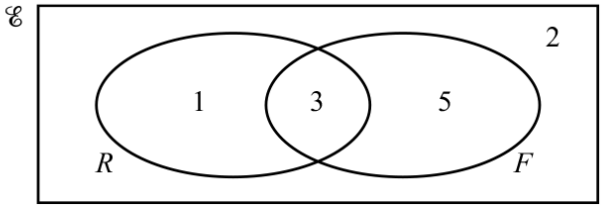


[2]

(b) Find the probability that it rains on at least one of the two days shown in the tree diagram.

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

58. 0580_s13_QP_21 Q: 12



11 students are asked if they like rugby (R) and if they like football (F).
The Venn diagram shows the results.

(a) A student is chosen at random.

What is the probability that the student likes rugby **and** football?

Answer(a) ..... [1]

(b) On the Venn diagram shade the region $R' \cap F'$. [1]

---

59. 0580_s13_QP_23 Q: 2

The Ocean View Hotel has 300 rooms numbered from 100 to 399.
A room is chosen at random.

Find the probability that the room number ends in zero.

Answer ..... [2]

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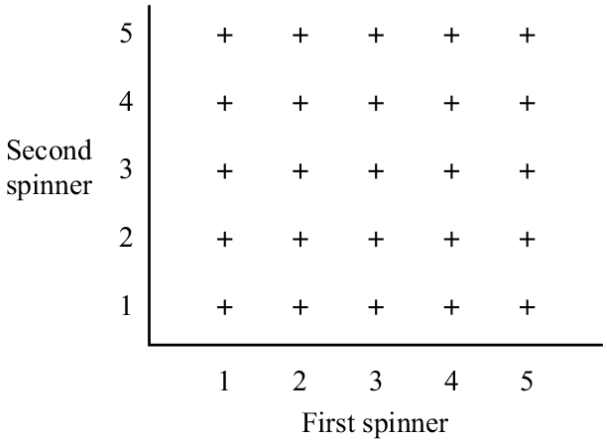
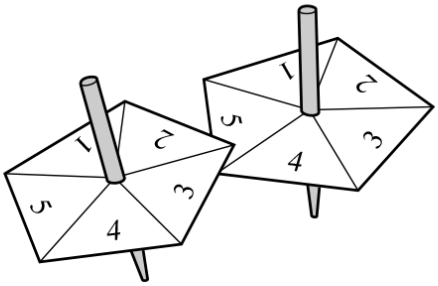
60. 0580_s13_QP_23 Q: 12

Two spinners have sections numbered from 1 to 5.
Each is spun once and each number is equally likely.
The possibility diagram is shown below.





Find the probability that

(a) both spinners show the same number,

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

(b) the sum of the numbers shown on the two spinners is 7.

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

61. 0580_w13_QP_21 Q: 6

S	P	A	C	E	S

One of the 6 letters is taken at random.

(a) Write down the probability that the letter is S.

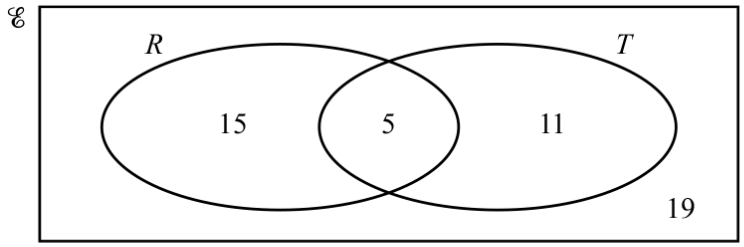
Answer(a) ..... [1]

(b) The letter is replaced and again a letter is taken at random.
This is repeated 600 times.

How many times would you expect the letter to be S?

Answer(b) ..... [1]

62. 0580_w13_QP_21 Q: 22



The Venn diagram shows the number of red cars and the number of two-door cars in a car park.
There is a total of 50 cars in the car park.
R = {red cars} and T = {two-door cars}.

(a) A car is chosen at random.

Write down the probability that

(i) it is red and it is a two-door car,

Answer(a)(i) ..... [1]

(ii) it is not red and it is a two-door car.

Answer(a)(ii) ..... [1]

(b) A two-door car is chosen at random.

Write down the probability that it is not red.

Answer(b) ..... [1]

(c) Two cars are chosen at random.

Find the probability that they are both red.

Answer(c) ..... [2]

(d) On the Venn diagram, shade the region $R \cup T'$. [1]

63. 0580_s12_QP_21 Q: 21

In this question, give all your answers as fractions.

A box contains 3 red pencils, 2 blue pencils and 4 green pencils.
Raj chooses 2 pencils at random, without replacement.

Calculate the probability that

(a) they are both red,

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

(b) they are both the same colour,

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

(c) exactly one of the two pencils is green.

Answer(c) ..... [3]