Past Papers Worksheet P4 Probability of Combined Events IGCSE Mathematics 0580

1. The table shows information about the time, t minutes, taken for each of 150 girls to complete an essay.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	10	26	34	58	22

(a) A girl is chosen at random.
Work out the probability that she took more than 100 minutes to complete the essay. [1]
(b) Two girls are chosen at random.
Work out the probability that, to complete the essay,
(i) they both took 65 minutes or less, [2]
(ii) one took 65 minutes or less and the other took more than 100 minutes. [3]
0580/43/O/N/17 Q4)

2. Kai and Ann carry out a survey on the distances travelled, in kilometres, by 200 cars.
Kai completes this frequency table for the data collected.

Distance ($d$km)	$80 < d \leqslant 100$	$100 < d \leqslant 150$	$150 < d \leqslant 200$	$200 < d \leqslant 300$	$300 < d \leqslant 400$
Frequency	7	33	76	52	32

(a) One car is picked at random.
Find the probability that the car has travelled more than 300km. [1]
(b) Two of the 200 cars are picked at random.
(i) Find the probability that both cars have travelled 150km or less [2]
(ii) one car has travelled more than 200km and the other car has travelled 100km or less.[3]
0580/42/O/N/22 Q3)

3. The time, t minutes, taken by each of 80 people to travel to work is recorded.
The table shows information about these times.

Time (t minutes)	$0 < t \leqslant 5$	$5 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 35$	$35 < t \leqslant 60$
Frequency	3	7	18	28	24

(i) One of these 80 people is chosen at random.
Find the probability that this person took longer than 10 minutes to travel to work.
Give your answer as a fraction in its simplest form. [2]
(ii) Two people are chosen at random from those taking 20 minutes or less to travel to work. Calculate the probability that one of these people took 5 minutes or less and the other took more than 5 minutes. [3]
0580/43/M/J/22 Q5(b)

4. The heights, h metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

Height (h metres)	$1.3 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.6$	$1.6 < h \leqslant 1.7$	$1.7 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	7	18	30	24	27	14

(i) One boy is chosen at random from the club.
Find the probability that this boy has a height greater than 1.8m. [1]
(ii) Three boys are chosen at random from the club.
Calculate the probability that one of the boys has a height greater than 1.8m and the other
two boys each have a height of 1.4m or less. [4]
0580/41/M/J/20 Q2 (b)

5. Robert buys one energy saving bulb and one halogen bulb.
The probability that the energy saving bulb lasts longer than 3500 hours is 9/10 .
The probability that the halogen bulb lasts longer than 3500 hours is 3/5 .
Work out the probability that exactly one of the bulbs will last longer than 3500 hours. [4]
0580/41/O/N/14 Q6) (c)

6. Gareth has 8 sweets in a bag.
4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.
(a) He chooses two of the sweets at random.
Find the probability that the two sweets have different flavours. [4]
(b) Gareth now chooses a third sweet.
Find the probability that **none** of the three sweets is lemon flavoured. [2]
0580/42/M/J/15 Q11)

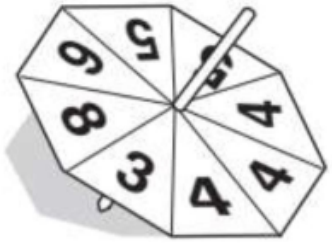
7. One of these 7 cards is chosen at random.

(a) Write down the probability that the card
(i) shows the letter A, [1]
(ii) shows the letter A or B, [1]
(iii) does not show the letter B. [1]
(b) Two of the cards are chosen at random, without replacement.
Find the probability that
(i) both show the letter A, [2]
(ii) the two letters are different. [3]
(c) Three of the cards are chosen at random, without replacement.
Find the probability that the cards do not show the letter C. [2]
0580/43/M/J/15 Q5)

8. Coins are put into a machine to pay for parking cars.
The probability that the machine rejects a coin is 0.05 .
(a) Adhira puts 2 coins into the machine.
(i) Calculate the probability that the machine rejects **both** coins. [2]
(ii) Calculate the probability that the machine accepts **at least** one coin. [1]
(b) Raj puts 4 coins into the machine.
Calculate the probability that the machine rejects **exactly one** coin. [3]
0580/43/M/J/16 Q4)

9. 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 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]
0580/42/O/N/18 Q12)

10. Sandra has a fair eight-sided spinner.
The numbers on the spinner are 3, 4, 4, 4, 5, 5, 6 and 8. Sandra spins the spinner twice and records each number it lands on



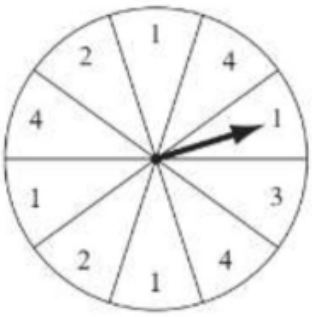
Find the probability that
(a) both numbers are 8, [2]
(b) the two numbers are not both 8, [1]
(c) one number is odd and one number is even, [2]
(d) the total of the two numbers is at least 13, [3]
(e) the second number is bigger than the first number. [3]
0580/43/O/N/16 Q5)

11. Regan is playing a game with these six number cards.

−3	−2	2	3	5	7

(a) She takes two cards at random, without replacement, and multiplies the two numbers to give a score. Find the probability that
(i) the score is 35 [3]
(ii) the score is a positive number.[3]
(b) Regan now takes three cards at random from the six cards, without replacement, and adds the three numbers to give a total. Find the probability that her total is 5. [4]
0580/43/O/N/22 Q7)

12. The diagram shows a circular board, divided into 10 numbered sectors.



When the arrow is spun it is equally likely to stop in any sector.

(a) Complete the table below which shows the probability of the arrow stopping [1]

Number	1	2	3	4
Probability		0.2		0.3

(b) The arrow is spun once.

Find

(i) the most likely number, [1]

(ii) the probability of a number less than 4. [1]

(c) The arrow is spun twice.

Find the probability that

(i) both numbers are 2, [1]

(ii) the first number is 3 and the second number is 4, [2]

(iii) the two numbers add up to 4. [3]

(d) The arrow is spun several times until it stops at a number 4.

Find the probability that this happens on the third spin. [2]

0580/43/M/J/10 Q3)

13. In this question write any probability as a fraction.

Navpreet has 15 cards with a shape drawn on each card.
5 cards have a square, 6 cards have a triangle and 4 cards have a circle drawn on them.

(a) Navpreet selects a card at random.
Write down the probability that the card has a circle drawn on it.. [1]

(b) Navpreet selects a card at random and replaces it.
She does this 300 times.
Calculate the number of times she expects to select a card with a circle drawn on it. [1]

(c) Navpreet selects a card at random, replaces it and then selects another card.
Calculate the probability that
(i) one card has a square drawn on it and the other has a circle drawn on it, [3]
(ii) neither card has a circle drawn on it. [3]

(d) Navpreet selects two cards at random, without replacement.
Calculate the probability that
(i) only one card has a triangle drawn on it, [3]
(ii) the two cards have different shapes drawn on them. [4]

0580/42/F/M/15 Q6)

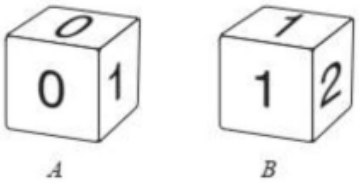
14. (a) A bag contains red beads and green beads.
There are 80 beads altogether.
The probability that a bead chosen at random is green is 0.35 .
(i) Find the number of red beads in the bag. [2]
(ii) Marcos chooses a bead at random and replaces it in the bag.
He does this 240 times.
Find the number of times he would expect to choose a green bead. [1]
(b) A different bag contains 2 blue marbles, 3 yellow marbles and 4 white marbles.
Huma chooses a marble at random, notes the colour, then replaces it in the bag.
She does this three times.
Find the probability that
(i) all three marbles are yellow, [2]
(ii) all three marbles are different colours. [3]
(c) Another bag contains 2 green counters and 3 pink counters.
Teresa chooses three counters at random **without** replacement.
Find the probability that she chooses more pink counters than green counters. [4]
0580/41/O/N/17 Q9)

15. (a) A bag contains 4 red marbles and 2 yellow marbles.
Behnaz picks two marbles at random without replacement.
Find the probability that
(i) the marbles are both red, [2]
(ii) the marbles are not both red. [1]
(b) Another bag contains 5 blue marbles and 2 green marbles.
Bryn picks one marble at random without replacement.
If this marble is not green, he picks another marble at random without replacement.
He continues until he picks a green marble.
Find the probability that he picks a green marble on his first, second or third attempt. [4]
0580/43/O/N/19 Q8)

16. In this question, give all your answers as fractions.
The letters of the word NATION are printed on 6 cards.

(a) A card is chosen at random.
Write down the probability that
(i) it has the letter T printed on it, [1]
(ii) it does not have the letter N printed on it, [1]
(iii) the letter printed on it has no lines of symmetry. 1]
(b) Lara chooses a card at random, replaces it, then chooses a card again.
Calculate the probability that only one of the cards she chooses has the letter N printed on it. [3]
(c) Jacob chooses a card at random and does not replace it.
He continues until he chooses a card with the letter N printed on it.
Find the probability that this happens when he chooses the 4th card. [3]
0580/43/M/J/14 Q6)

17. The diagram shows two fair dice.



The numbers on dice A are 0, 0, 1, 1, 1, 3.

The numbers on dice B are 1, 1, 2, 2, 2, 3.

When a dice is rolled, the score is the number on the top face.

(a) Dice A is rolled once.

Find the probability that the score is not 3. [1]

(b) Dice A is rolled twice.

Find the probability that the score is 0 both times. [2]

(c) Dice A is rolled 60 times.

Calculate an estimate of the number of times the score is 0. [1]

(d) Dice A and dice B are each rolled once.

The product of the scores is recorded.

(i) Complete the possibility diagram.

Dice B \ Dice A	0	0	1	1	1	3
3	0	0				
2	0	0				
2	0	0				
2	0	0				
1	0	0				
1	0	0	1	1	1	3

(ii) Find the probability that the product of the scores is

(a) 2, [1]

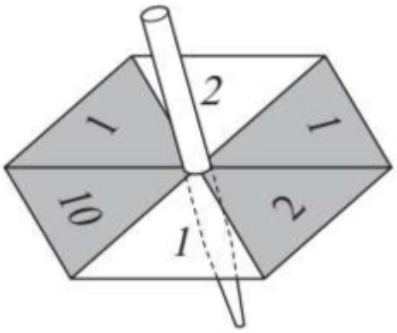
(b) greater than 3. [1]

(e) Eva keeps rolling dice B until 1 is scored.

Find the probability that this happens on the 5th roll. [2]

0580/42/O/N/17 Q7)

18. The diagram shows a spinner with six numbered sections.



Some of the sections are shaded.
Each time the spinner is spun it stops on one of the six sections.
It is equally likely that it stops on any one of the sections.
(a) The spinner is spun once.
Find the probability that it stops on
(i) a shaded section, [1]
(ii) a section numbered 1, [1]
(iii) a shaded section numbered 1, [1]
(iv) a shaded section or a section numbered 1. [1]
(b) The spinner is now spun twice.
Find the probability that the total of the two numbers is
(i) 20, [2]
(ii) 11. [2]
(c) (i) The spinner stops on a shaded section.
Find the probability that this section is numbered 2. [1]
(ii) The spinner stops on a section numbered 2.
Find the probability that this section is shaded. [1]
(d) The spinner is now spun until it stops on a section numbered 2.
The probability that this happens on the nth spin is 16/243.
Find the value of n. [2]
0580/42/M/J/10 Q3)

19. (a) The diagram shows two sets of cards.

Set *A*	1	1	2	2	2
Set *B*	0	1	1	1	2

(i) Jojo chooses two cards at random from Set A without replacement.
Find the probability that the two cards have the same number. [3]

(ii) Jojo replaces the two cards.
Kylie then chooses one card at random from Set A and one card at random from Set B.
Find the probability that the two cards have the same number.[3]

(iii) Who is the most likely to choose two cards that have the same number?
Show all your working. [1]

(b) Lena chooses three cards at random from Set C without replacement.

Set *C*	4	4	5	5	5

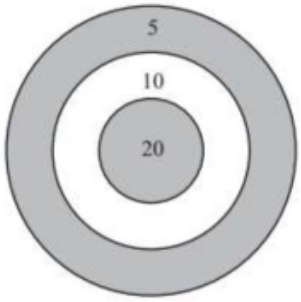
Find the probability that the third card chosen is numbered 4.

0580/43/M/J/18 Q4)

20. Kiah plays a game.

The game involves throwing a coin onto a circular board.

Points are scored for where the coin lands on the board.



If the coin lands on part of a line or misses the board then 0 points are scored.

The table shows the probabilities of Kiah scoring points on the board with one throw.

Points scored	20	10	5	0
Probability	x	0.2	0.3	0.45

(a) Find the value of x. [2]

(b) Kiah throws a coin fifty times.

Work out the expected number of times she scores 5 points. [1]

(c) Kiah throws a coin two times.

Calculate the probability that

(i) she scores either 5 or 0 with her first throw, [2]

(ii) she scores 0 with her first throw and 5 with her second throw, [2]

(iii) she scores a total of 15 points with her two throws. [3]

(d) Kiah throws a coin three times.

Calculate the probability that she scores a total of 10 points with her three throws. [5]

0580/42/M/J/16 Q5)

21. The probability that Andrei cycles to school is r.

(a) Write down, in terms of r, the probability that Andrei **does not** cycle to school. [1]

(b) The probability that Benoit **does not** cycle to school is 1.3 - r.

The probability that both Andrei and Benoit **do not** cycle to school is 0.4 .

(i) Complete the equation in terms of r.

(.....) x (.....) = 0.4 [1]

(ii) Show that this equation simplifies to $10r^2 - 23r + 9 = 0$.[3]

(iii) Solve by factorisation $10r^2 - 23r + 9 = 0$[3]

(iv) Find the probability that Benoit **does not** cycle to school. [1]

0580/42/M/J/19 Q3)

22. (a) Angelo has a bag containing 3 white counters and x black counters.

He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\cdots\cdots}{\cdots\cdots} \quad [2]$$

(ii) The probability that Angelo takes two black counters is 7/15.

(a) Show that $4x^2 - 25x - 21 = 0$. [4]

(b) Solve by factorization $4x^2 - 25x - 21 = 0$. [3]

(c) Write down the number of black counters in the bag. [1]

(b) Esme has a bag with 5 green counters and 4 red counters.

She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour. [4]

0580/43/M/J/19 Q8)

23. Bag A contains 3 black balls and 2 white balls.
Bag B contains 1 black ball and 3 white balls.

(a) A ball is taken at random from each bag.
(i) Show that a black ball is more likely to be taken from bag A than from bag B.
[1]
(ii) Find the probability that the two balls have different colours. [3]
(b) The balls are returned to their original bags.
Three balls are taken at random from bag A, without replacement.
Find the probability that
(i) they are all black, [2]
(ii) they are all white. [1]
(c) The balls are returned to their original bags.
A ball is taken at random from bag A and its colour is recorded.
This ball is then placed in bag B.
A ball is then taken at random from bag B.
Find the probability that the ball taken from bag B has a different colour to the ball taken from bag A. [3]
0580/43/O/N/18 Q7)

24. 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, [2]

(ii) ten spaces with his next throw. [3]

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

Explain your answer. [2]

(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.

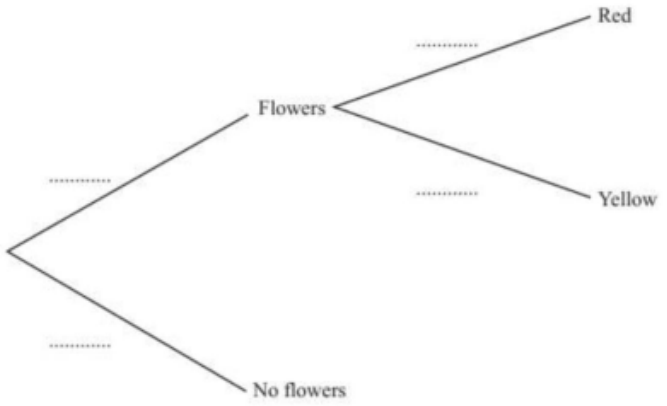
If his next throw takes him to 99, he has to move back to 96.

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. [5]

0580/42/O/N/14 Q10)

25. The probability that a plant will produce flowers is 7/8
The flowers are either red or yellow.
If the plant produces flowers, the probability that the flowers are red is 3/4.
(a) (i) Complete the tree diagram by writing a probability beside each branch.[2]



(ii) Calculate the probability that a plant, chosen at random, will produce red flowers. [2]
(iii) Two plants are chosen at random.
Calculate the probability that both will produce red flowers. [2]
(b) Alphonse buys 200 of these plants.
Calculate the number of plants that are expected to produce flowers. [2]
(c) Gabriel has 1575 plants with red flowers.
Estimate the total number of plants that Gabriel has. [2]
0580/42/O/N/16 Q5)

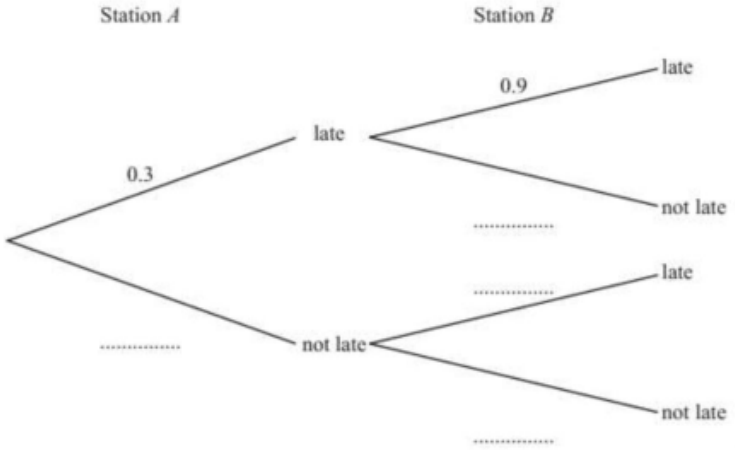
26. A train stops at station A and then at station B.

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.

(ii) This train makes 250 journeys.

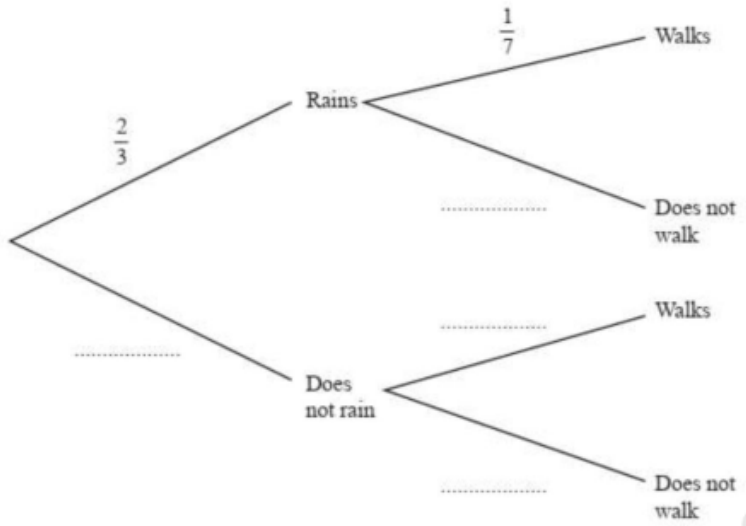
Find the number of journeys that the train is expected to be late at one or both of the stations. [1]

(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]

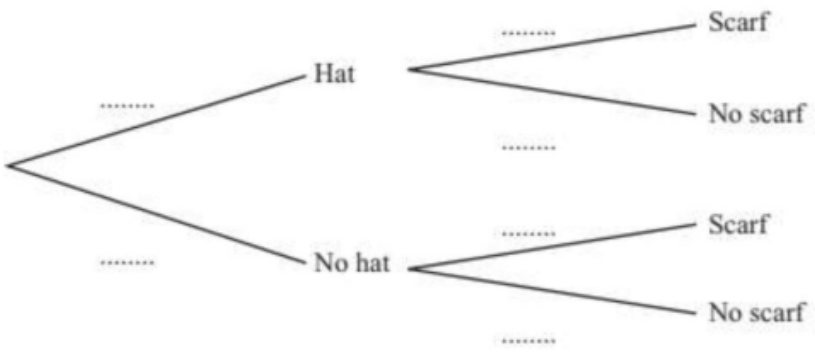
0580/41/O/N/16 Q7)

27. Each morning the probability that it rains is 2/3 .
If it rains, the probability that Asha walks to school is 1/7 .
If it does not rain, the probability that Asha walks to school is 4/7 .
(a) Complete the tree diagram. [2]



(b) Find the probability that it rains and Asha walks to school. [2]
(c) (i) Find the probability that Asha does not walk to school. [3]
(ii) Find the expected number of days Asha does not walk to school in a term of 70 days. [2]
(d) Find the probability that it rains on exactly one morning in a school week of 5 days. [2]
0580/42/M/J/17 Q6)

28. In this question, give all your answers as fractions.
When Ivan goes to school in winter, the probability that he wears a hat is 5/8.
If he wears a hat, the probability that he wears a scarf is 2/3.
If he does not wear a hat, the probability that he wears a scarf is 1/6.
(a) Complete the tree diagram [3]



(b) Find the probability that Ivan
(i) does not wear a hat and does not wear a scarf, [2]
(ii) wears a hat but does not wear a scarf, [2]
(iii) wears a hat or a scarf but not both. [2]
(c) If Ivan wears a hat and a scarf, the probability that he wears gloves is
7/10. Calculate the probability that Ivan does **not** wear all three of hat, scarf and gloves. [3]
0580/42/M/J/13 Q8)

29. Tanya plants some seeds.

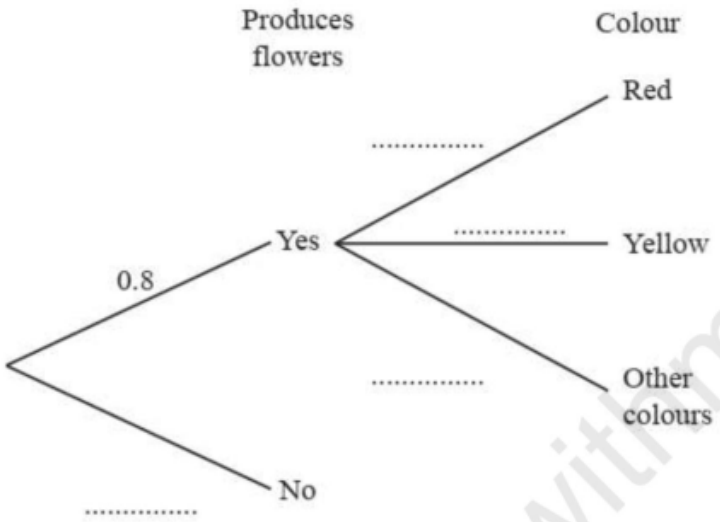
The probability that a seed will produce flowers is 0.8 .

When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.[1]

(b) (i) Complete the tree diagram. [2]



(ii) Find the probability that a seed chosen at random produces red flowers. [2]

(iii) Tanya chooses a seed at random. Find the probability that this seed does not produce red flowers and does not produce yellow flowers. [3]

(c) Two of the seeds are chosen at random.

Find the probability that one produces flowers and one does not produce flowers. [3]

0580/42/M/J/20 Q7)

30. Katrina puts some plants in her garden.
The probability that a plant will produce a flower is 7/10.
If there is a flower, it can only be red, yellow or orange.
When there is a flower, the probability it is red is 2/3
and the probability it is yellow is 1/4
(a) Draw a tree diagram to show **all** this information.
Label the diagram and write the probabilities on each branch.
[5]
(b) A plant is chosen at random.
Find the probability that it will **not** produce a yellow flower.[3]
(c) If Katrina puts 120 plants in her garden, how many orange flowers would she expect? [2]
0580/43/M/J/11 Q7)

Answers

1) (a) 11/75 (b) (i)3/745 (ii)44/ 2235	16) (a)(i)1/6 (ii)2/3 (iii)1/3 (b)4/9 (c)2/15
2) (a)4/25 (b)(i)39/995 (ii)147/4975	17) (a) 5/6 (b) 1/9 (c) 20 (d)(i) 3 3 3 9, 2 2 2 6, 2 2 2 6, 2 2 2 6, 1 1 1 3 (ii)(a) 1/4 (ii)(b) 1/9 (e)16/243
3) (i)7/8 (ii)25/126	18) (a) (i)2/3 (ii) 1/2(iii)1/3 (iv)5/6 (b)(i)1/36 (ii)1/6 (c)(i)1/4 (ii)1/2 (d) 5 (but not from rounding)
4) (i)7/60 (ii)21/20060	19) (a)(i)2/5 (ii)9/25 (iii)Jojo , eg. 2/5 > 9/25(b)2/5
5))21/50	20) (a) 0.05 (b) 15 (c) (i) 0.75 (ii) 0.135 (iii) 0.12 (d) 0.243
6) (a)19/28 (b)5/28	21) (a) 1 – r (b)(i) (1 – r) (1.3 – r) [= 0.4] (iii) (5r – 9)(2r −1)= 0 and r=9/5 & ½ (iv)0.8
7) (a) (i)4/7 (ii)6/7 (iii)5/7 (b) (i)2/7 (ii)2/3 (c)4/7	22) (a)(i)(x-1)/(x + 2) (ii)(a) x/(x+3) x (x-1)/(x + 2) = 7/15 (ii)(b) (4 x + 3)(x – 7) [= 0] , 7 and -3/4 (ii)(c) 7 (b)1/6
8) (a)(i)1/400 (ii)399/400 (b) 6859/40000	23) (a)(i)3/5 > 1/4 (ii)11/20 (b)(i)1/10 (ii) 0 (c)11/25
9) (a)(ii)62/95 (b)5/57	24) (a)(i)1/36 (a)(ii)1/12 (b) 7 Refers to most combinations oe (c)47/432
10) (a)1/64 (b)63/64 (c)15/32 (d)7/64 (e)3/8	25) (a)(i) 7/8,1/8,3/4,1/4 (ii)21/32 (iii)441/1024 (b) 175 (c) 2400
11) (a) 0.4, 0.1 (b) (i)1 (ii)0.7 (b) (i) 1 (ii) 0.7 (c) (i) 0.04 (ii) 0.03 (iii) 0.12 (d) 0.147	26) (a) 0.7, 0.1 or , 0.2, 0.8 oe (b) (i) 0.44 oe (ii) 110 (c) If late at first two stations then certain to be late at station C (0.3 x 0.9 x x = 0.27 , so x = 1)
12) (a)(i)1/15 (ii)7/15 (b)1/10	27) (a)1/3,6/7 ,4/7 , 3/7 (b)2/21 (c)(i)15/21 (c)(ii)50 (d)10/243
13) (a)4/15 (b)80 (c)(i)8/45 (ii)121/225 (d) (i)18/35 (ii)74/105	28) (a)5/8 , 3/8, 2/3, 1/3, 1/6, 5/6 (b) (i)5/16 (ii)5/24 (iii)13/48 (c)17/24
14) (a)(i)52 (ii) 84 (b)(i)1/27 (ii)16/81 (c)7/10	29) a)0.1 (b)(i)0.2 , 0.6, 0.3, 0.1 (ii) 0.48 (iii) 0.28 (c)0.32
15) (a)(i)2/5 (ii)3/5 (b)5/7	30) (a) labels flower and not flower 7/10 and 3/10 , three branches after flowers , clear labels for colours 2/3 , 1/4 , 1/12 (b) 33/40 (c)7