

Tree diagrams and frequency trees

Exam questions

Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class

Teacher

Time allowed: 105 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 12): you must not use a calculator.
- **Section B** (questions 13 to 23): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 92.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Q	Mark	Q	Mark
1		13	
2		14	
3		15	
4		16	
5		17	
6		18	
7		19	
8		20	
9		21	
10		22	
11		23	
12			
TOTAL			

Section A

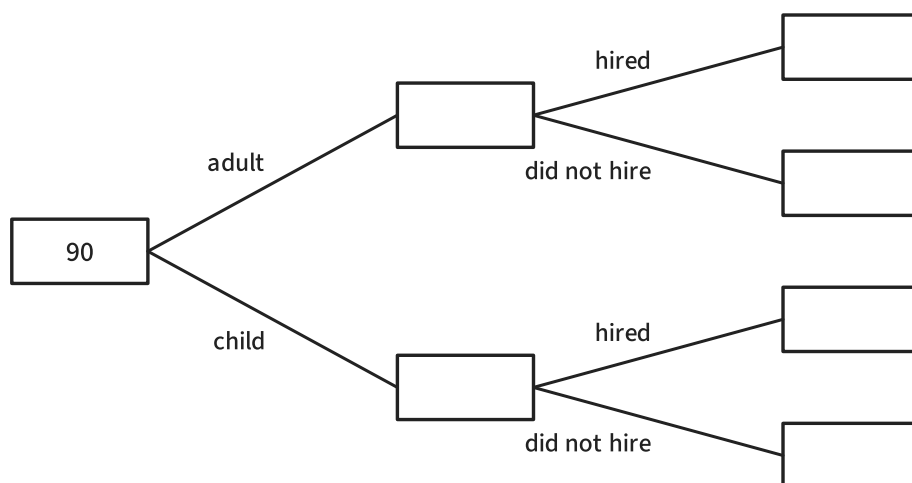


You must not use a calculator

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outside
the box

- 1 90 people visit a climbing centre one day.
 36 of the people are adults. The rest are children.
 20 of the adults hire climbing shoes.
 13 of the children do **not** hire climbing shoes.

(a) Complete the frequency tree.



[3 marks]

- (b) One of the 90 people is chosen at random.
 Write down the probability that this person is a child who hired climbing shoes.

Answer _____

[1 mark]

2

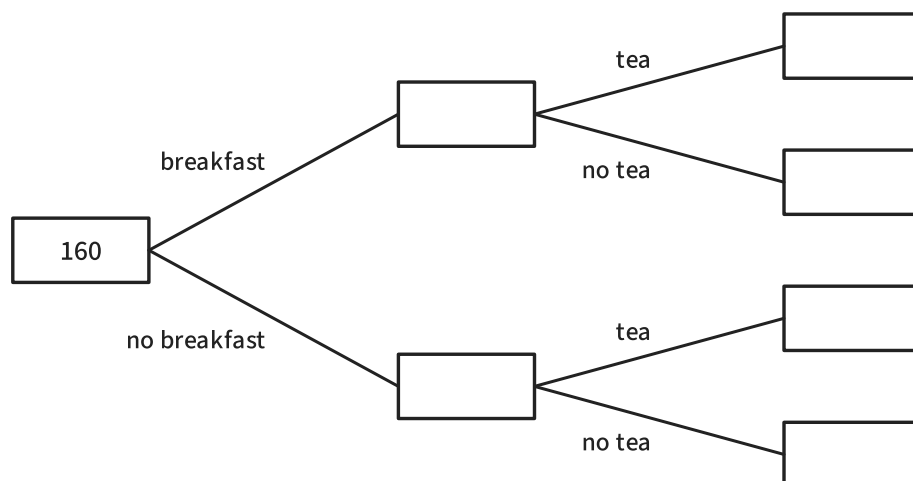
A café served 160 customers one morning.

$\frac{3}{8}$ of the customers ordered breakfast.

$\frac{5}{6}$ of the customers who ordered breakfast also ordered tea.

40% of the customers who did not order breakfast ordered tea.

(a) Complete the frequency tree.



[3 marks]

(b) What fraction of the 160 customers ordered tea?
Give your answer in its simplest form.

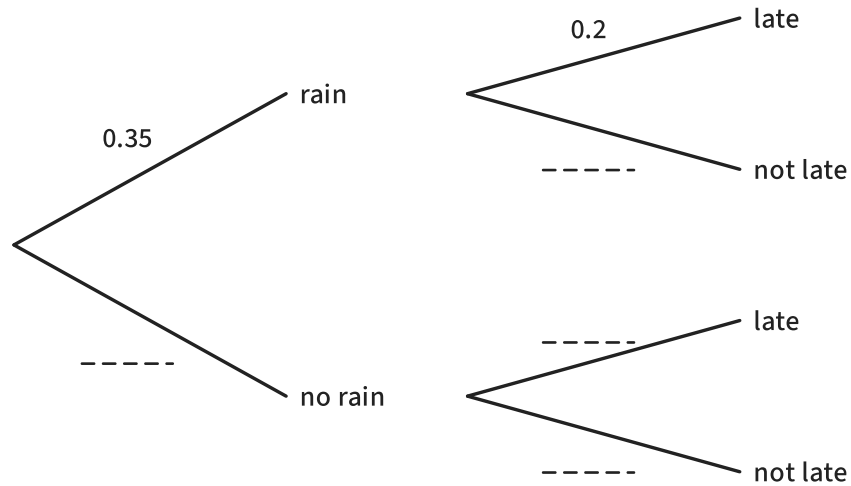
Answer _____

[2 marks]

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- 3** The probability that it rains on a school day is 0.35
 The probability that Ravi's bus is late on a school day is 0.2
 These two events are independent.

(a) Complete the tree diagram.



[2 marks]

- (b)** Work out the probability that it rains **and** Ravi's bus is late.

Answer _____

[2 marks]

- 4** Kim plays one game of chess and one game of draughts.
The probability that she wins the game of chess is 0.7
The probability that she wins the game of draughts is 0.6
The two events are independent.

Kim says,

“The probability that I win both games is $0.7 + 0.6 = 1.3$ ”

- (a)** Explain how you know Kim is wrong without working anything out.

[1 mark]

- (b)** Work out the probability that Kim wins both games.

Answer _____

[1 mark]

- (c)** Work out the probability that Kim wins neither game.

Answer _____

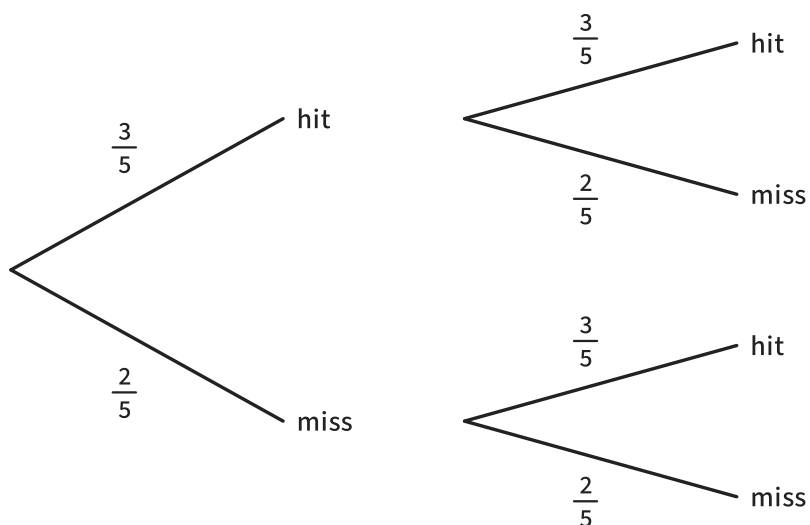
[2 marks]

5

An archer shoots two arrows at a target.

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

The tree diagram shows this information.



Work out the probability that she hits the target with exactly one of the two arrows.

Answer _____

[3 marks]

6

Leah takes a ferry and then a bus to work.

The probability that the ferry is late is 0.3

Whether the bus is late is independent of whether the ferry is late.

The probability that both the ferry and the bus are late is 0.12

Work out the probability that the bus is **not** late.

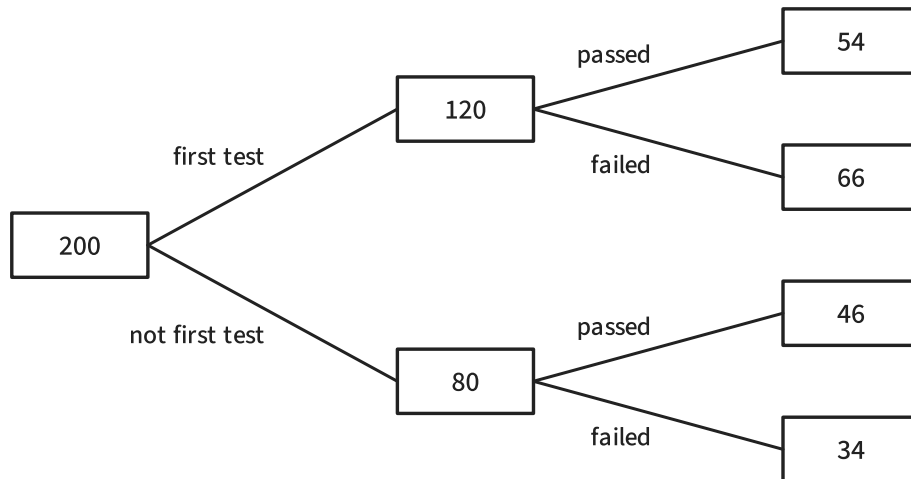
Answer _____

[3 marks]

7

The frequency tree shows information about 200 people who took a driving test.

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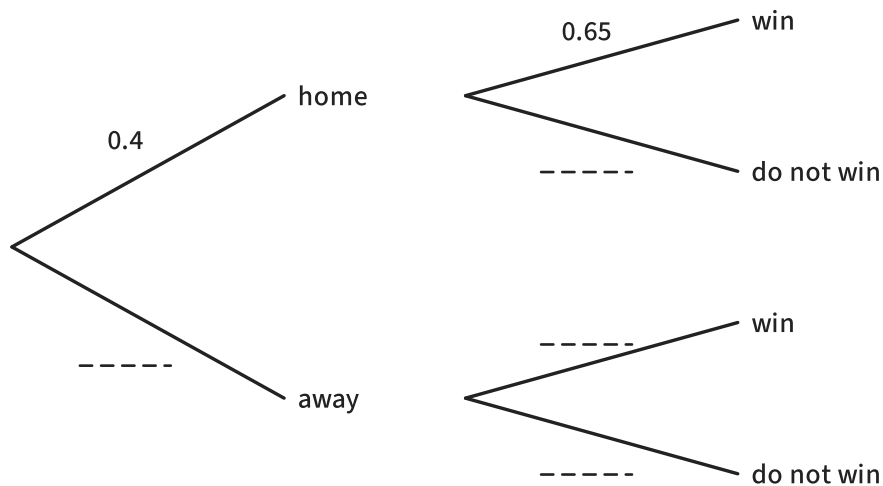
One of the people who **passed** is chosen at random.
Work out the probability that this was their first test.

Answer _____

[2 marks]

- 8** The probability that a netball team's next match is at home is 0.4
 If the match is at home, the probability that the team wins is 0.65
 If the match is away, the probability that the team wins is 0.3

(a) Complete the tree diagram.



[2 marks]

(b) Work out the probability that the team wins its next match.

Answer _____

[2 marks]

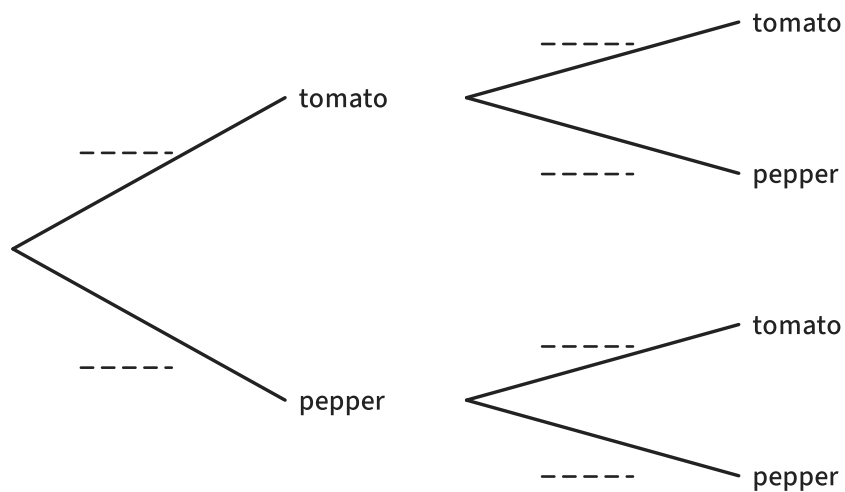
9

A tray has 9 tomato plants and 6 pepper plants.

Cal takes two plants from the tray at random to give to a neighbour.

Work out the probability that both plants are the same type.

You may use the tree diagram to help you.



Answer _____

[4 marks]

10

A playlist has 10 songs.

4 of the songs are by The Larks.

Mo puts the playlist on shuffle. It plays 3 different songs from the playlist, chosen at random.

Work out the probability that exactly one of the 3 songs is by The Larks.

Answer _____

[4 marks]

11

Priya and Kwame play a game with 8 sealed envelopes.

3 of the envelopes each have a gold star inside. The other 5 envelopes are empty.

They take turns to choose one of the unopened envelopes at random and open it.

Priya goes first.

The first person to open an envelope with a gold star inside wins the game.

Work out the probability that Priya wins the game.

Answer _____

[4 marks]

12

A box contains 5 red pens and n blue pens.

Two pens are taken from the box at random, without replacement.

The probability that one pen of each colour is taken is $\frac{10}{21}$

(a) Show that $n^2 - 12n + 20 = 0$

[4 marks]

(b) There are more blue pens than red pens in the box.
Work out the number of blue pens.

Answer _____

[2 marks]

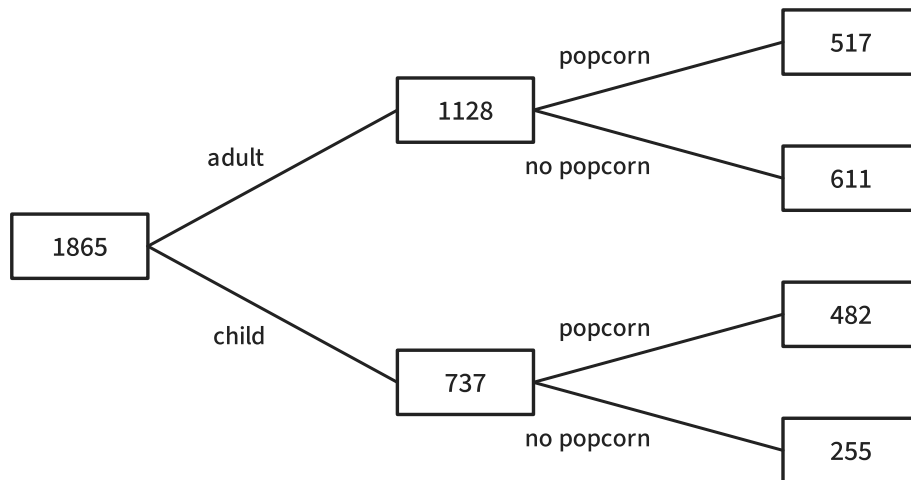
Section B



You may use a calculator

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- 13** The frequency tree shows information about the 1865 customers at a cinema on Saturday.



- (a)** How many of the customers bought popcorn?

Answer _____

[1 mark]

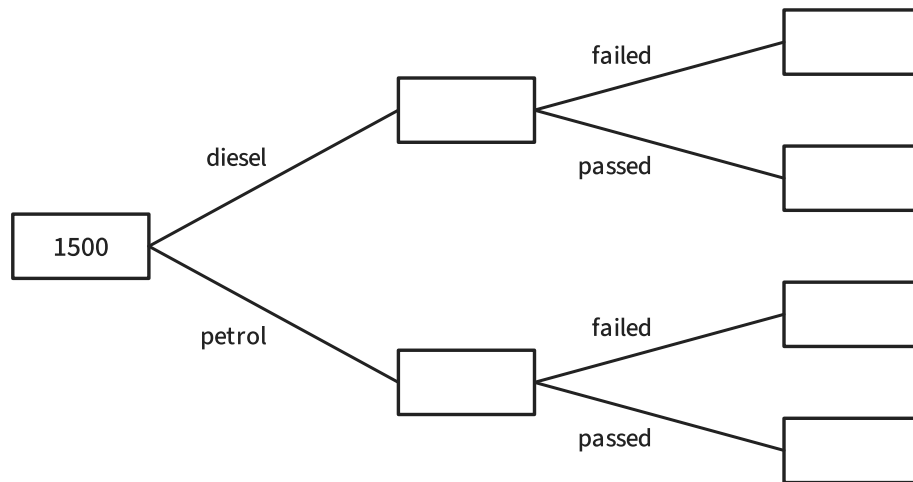
- (b)** One of the customers is chosen at random.
Work out the probability that this customer is a child who did **not** buy popcorn.
Give your answer as a decimal correct to 2 decimal places.

Answer _____

[2 marks]

- 14** 1500 cars had an MOT test at a garage.
 36% of the cars were diesel. The rest were petrol.
 15% of the diesel cars failed the test.
 112 of the petrol cars failed the test.

(a) Complete the frequency tree.



[3 marks]

- (b) One of the 1500 cars is chosen at random.
 Work out the probability that it failed the test.
 Give your answer to 3 decimal places.

Answer _____

[2 marks]

15

A quiz contestant answers two questions.

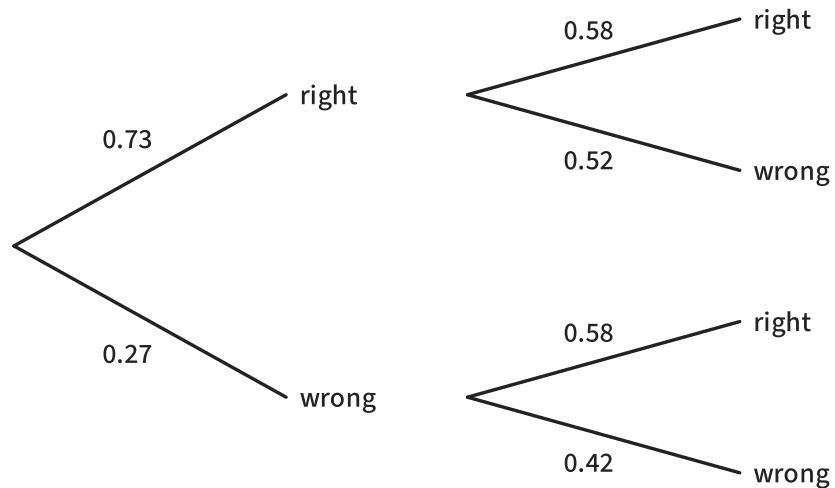
The probability that she gets the first question right is 0.73

The probability that she gets the second question right is 0.58

The two events are independent.

Ava draws this tree diagram. She has made one mistake.

(a) What is the mistake?



[1 mark]

(b) Work out the probability that she gets the first question right and the second question wrong.

Answer _____

[2 marks]

- 16** In a game, a player spins a spinner and rolls a fair six-sided dice.
The probability that the spinner lands on red is 0.4
A player wins if the spinner lands on red **and** the dice lands on 6

The game is played 300 times.

Work out an estimate for the number of times a player wins.

Answer _____

[3 marks]

- 17** Max drives through three sets of traffic lights on his way to college.
For each set, the probability that the lights are green when he reaches them is 0.45
The sets of lights work independently.

Work out the probability that at least one set of lights is green when he reaches it.

Answer _____

[3 marks]

- 18** A bottling line has two machines, a filler and a capper.
On any working day
the probability that the filler breaks down is 0.035
the probability that the capper breaks down is 0.052
The machines break down independently of each other.
The line stops on any day when at least one of the machines breaks down.

The line runs on 250 days in a year.

Work out an estimate for the number of days in a year when the line stops.

Answer _____

[4 marks]

- 19** A tray holds 30 eggs.
4 of the eggs are cracked.
Asif takes 3 eggs from the tray at random to make a cake.

Work out the probability that at least one of the eggs Asif takes is cracked.
Give your answer to 3 decimal places.

Answer _____

[4 marks]

20

A bakery takes cake orders in the shop and online.
60% of the orders are taken in the shop. The rest are taken online.
3% of the orders taken in the shop have a mistake in them.
5% of the orders taken online have a mistake in them.

An order is chosen at random. It has a mistake in it.

Work out the probability that the order was taken online.
Give your answer to 3 decimal places.

Answer _____

[4 marks]**21**

Nadia takes two free throws in a basketball game.
The probability that she scores with each throw is p .
The two throws are independent.
The probability that she scores with at least one of the two throws is 0.8704

(a) Work out the value of p .

Answer _____

[3 marks]

(b) Nadia scores with at least one of the two throws.
Work out the probability that she scores with both throws.

Answer _____

[2 marks]

22

Zainab plays three games of squash against her coach.

The probability that she wins the first game is 0.6

If she wins a game, the probability that she wins the next game is 0.7

If she loses a game, the probability that she wins the next game is 0.45

- (a)** Work out the probability that Zainab wins exactly two of the three games.

Answer _____

[3 marks]

- (b)** Zainab wins exactly two of the three games.
Work out the probability that she won the first game.
Give your answer to 3 decimal places.

Answer _____

[2 marks]

23

Sian makes two dives in a competition.

The probability that her first dive scores more than 8 points is p .

If her first dive scores more than 8 points, the probability that her second dive scores more than 8 points is $p + 0.15$

If her first dive does not score more than 8 points, the probability that her second dive scores more than 8 points is $p - 0.2$

The probability that both of her dives score more than 8 points is 0.3

- (a) Work out the value of p .
Give your answer to 3 decimal places.

Answer _____

[3 marks]

- (b) Work out the probability that exactly one of her dives scores more than 8 points.
Give your answer to 3 decimal places.

Answer _____

[3 marks]

END OF QUESTIONS