Name	Class

MATHS TEACHER HUB

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Probability equations

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

•Use **black** ink or ball-point pen.
•**Fill in the boxes** at the top of this page with your name, centre number and candidate number.
•Answer **all** questions.
•Answer the questions in the spaces provided
– *there may be more space than you need*.
•Diagrams are NOT accurately drawn, unless otherwise indicated.
•You must **show all your working out.**
•If the question is a **1H** question you are not allowed to use a calculator.
•If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

•The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question*.

Advice

•Read each question carefully before you start to answer it.
•Keep an eye on the time.
•Try to answer every question.
•Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

10 There are only red counters and yellow counters in bag **A**.

number of red counters : number of yellow counters = 3 : 5

There are only green counters and blue counters in bag **B**.
The number of counters in bag **B** is half the number of counters in bag **A**.

Given that there are x red counters in bag **A**,

use algebra to show that the total number of counters in bag **A** and bag **B** is $4x$

June 2024 – Paper 3H **(Total for Question 10 is 3 marks)**

16 There are only n orange sweets and 1 white sweet in a bag.

Saira takes at random a sweet from the bag and eats the sweet.
She then takes at random another sweet from the bag and eats this sweet.

Show that the probability that Saira eats two orange sweets is $\frac{n-1}{n+1}$

May 2024 – Paper 1H **(Total for Question 16 is 2 marks)**

18 Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on red is $\frac{1}{4}$

The probability that both spinner **A** and spinner **B** land on red is $\frac{1}{24}$

Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

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(Total for Question 18 is 4 marks)

22 There are only r red counters and g green counters in a bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{3}{7}$

The counter is put back in the bag.

2 more red counters and 3 more green counters are put in the bag.
A counter is taken at random from the bag.

The probability that the counter is green is $\frac{6}{13}$

Find the number of red counters and the number of green counters that were in the bag originally.

red counters .....

green counters .....

(Total for Question 22 is 5 marks)

22 There are only green pens and blue pens in a box.

There are three more blue pens than green pens in the box.
There are more than 12 pens in the box.

Simon is going to take at random two pens from the box.

The probability that Simon will take two pens of the same colour is $\frac{27}{55}$

Work out the number of green pens in the box.

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(Total for Question 22 is 6 marks)

22 There are y black socks and 5 white socks in a drawer.

Joshua takes at random two socks from the drawer.

The probability that Joshua takes one white sock and one black sock is $\frac{6}{11}$

(a) Show that $3y^2 - 28y + 60 = 0$

(4)

(b) Find the probability that Joshua takes two black socks.

(3)

(Total for Question 22 is 7 marks)

21 There are 10 pens in a box.

There are x red pens in the box.
All the other pens are blue.

Jack takes at random two pens from the box.

Find an expression, in terms of x, for the probability that Jack takes one pen of each colour.
Give your answer in its simplest form.

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 (Total for Question 21 is 5 marks)

22 There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.
She records the colour of the pen and then replaces it in the box.
Rita does this n times, where $n \geqslant 2$

Write down an expression, in terms of n, for the probability that Rita gets a blue pen at least once and a red pen at least once.

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(Total for Question 22 is 2 marks)

24 John has an empty box.
He puts some red counters and some blue counters into the box.

The ratio of the number of red counters to the number of blue counters is 1 : 4

Linda takes at random 2 counters from the box.

The probability that she takes 2 red counters is $\frac{6}{155}$

How many red counters did John put into the box?

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(Total for Question 24 is 4 marks)

24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.
The rest of the counters are green.

$$x : y = 1 : 3$$

Freda takes at random two counters from the box.

Find, in terms of x, an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\dfrac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

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(Total for Question 24 is 5 marks)