24 Some blood is found at a crime scene. The police know that it belongs to the **one** criminal involved.

A person's red blood cells can have type A antigens, type B antigens, both types or neither type.

In a population:

45% of people have type A antigens but not type B

9% of people have type B antigens but not type A

43% of people have neither type of antigen

3% of people have both types of antigen

An antibody test shows that there are type B antigens present in the red blood cells at the crime scene.

What is the probability that the criminal's red blood cells have **both** type A and type B antigens?

A $\frac{3}{100}$

B $\frac{1}{16}$

C $\frac{3}{25}$

D $\frac{1}{4}$

E $\frac{3}{4}$

2016

4 A bag contains only 8 beads.

The beads are identical in all respects except colour.
3 of the beads are black and the other 5 beads are white.
A bead is taken at random from the bag and not replaced.
A second bead is then taken at random from the bag.

What is the probability that both beads are black?

A $\frac{3}{32}$

B $\frac{3}{28}$

C $\frac{9}{64}$

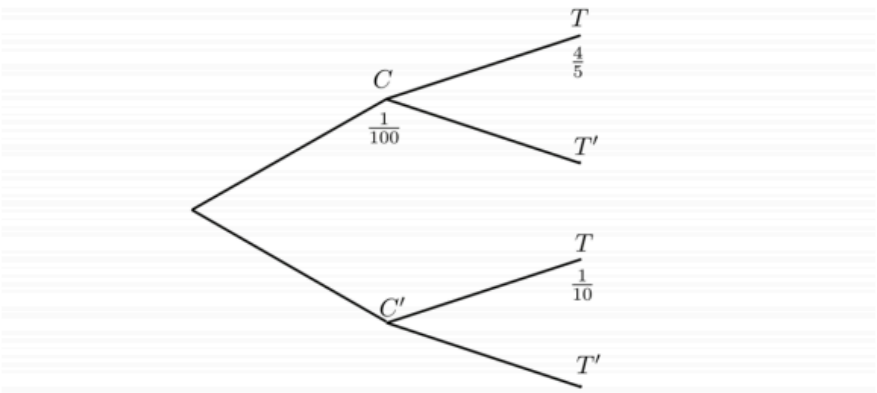
D $\frac{3}{14}$

E $\frac{37}{56}$

2015

24 A test is developed to detect a certain medical condition. The test is not perfect, and sometimes gives incorrect results. The behaviour of the test on 1000 randomly selected members of the population is shown in this tree diagram, where the following notation is used:

- C = has the condition
- C' = does not have the condition
- T = tests positive for the condition
- T' = tests negative for the condition



Three of the branches' proportions are shown in the tree diagram:

- $\frac{1}{100}$ of the 1000 people have the condition
- $\frac{4}{5}$ of those with the condition test positive for the condition
- $\frac{1}{10}$ of those without the condition test positive for the condition

A person is selected at random from these 1000 people, and tests positive for the condition.

What is the probability that this person has the condition?

2014

20 In a fairground game there are two bags, each of which contains 4 coloured balls. There are a total of 4 red balls, 3 yellow balls and 1 blue ball. The player chooses one of the bags and removes two balls without replacing them. If the two balls are the same colour then the player wins. The player is equally likely to choose either bag and the balls are arranged to give the smallest possible probability for the player to win.

What is the probability that the player wins?

A 1/6

B 1/4

C 9/24

D 1/2

E 3/4

2012

24 I have two six-sided dice, each with faces numbered from 1 to 6. One of the dice is fair, but the other is not – it will land on numbers 1 to 5 with equal probability, but lands on 6 with a different probability.

When I roll the dice the probability that I get a total of 12 is $\frac{1}{18}$.

What is the probability that I get a total of 2 when I roll the dice?

A $\frac{1}{72}$

B $\frac{1}{45}$

C $\frac{1}{36}$

D $\frac{1}{18}$

E $\frac{1}{9}$

2011

4 A bag contains *x* red balls, *y* blue balls and *z* yellow balls. One ball at random is taken out and replaced. A second ball at random is taken out and replaced.

If the balls are identical in all respects except colour and are well mixed, what is the probability that the first ball was red and the second blue?

A $(x+y)/(x+y+z)^2$

B $xy/(x+y+z)(x+z)$

C $xy/(x+y+z)^2$

D $(x+y)/(x+y+z)$

E $xy/(y+z)(x+z)$

2009