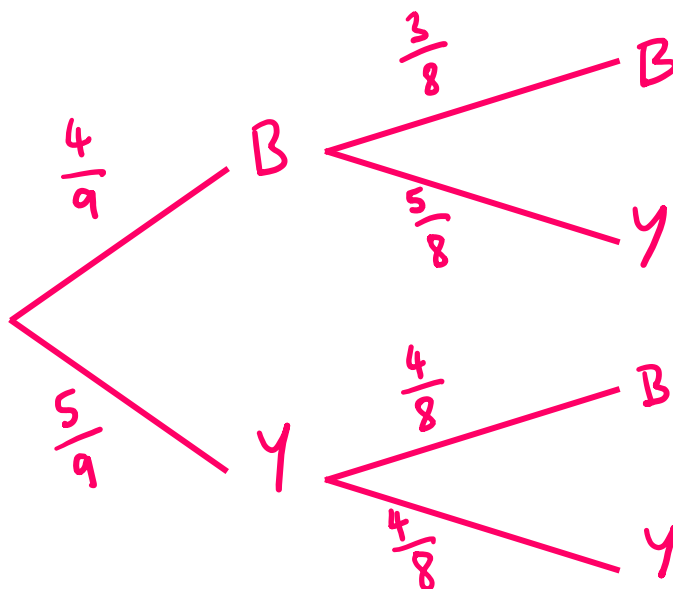REVISE THIS TOPIC

Simplified answers are ok too!

1   There are 4 blue counters and 5 yellow counters in a bag.

Two counters are taken at random from the bag **without** replacement.

Work out the probability that both counters taken are the **same** colour.   **[4 marks]**

$$P(B,B) = \frac{4}{9} \times \frac{3}{8} \qquad P(Y,Y) = \frac{5}{9} \times \frac{4}{8}$$

$$= \frac{12}{72} \qquad\qquad\qquad = \frac{20}{72}$$

$$\frac{12}{72} + \frac{20}{72} = \frac{32}{72}$$

Answer $\dfrac{32}{72}$

4

2 In a class there are 32 students.
13 of the students do higher tier maths and the other students do foundation.

Two of the students are selected at random from the class.

2 (a) Work out the probability that both students do higher tier maths. **[2 marks]**
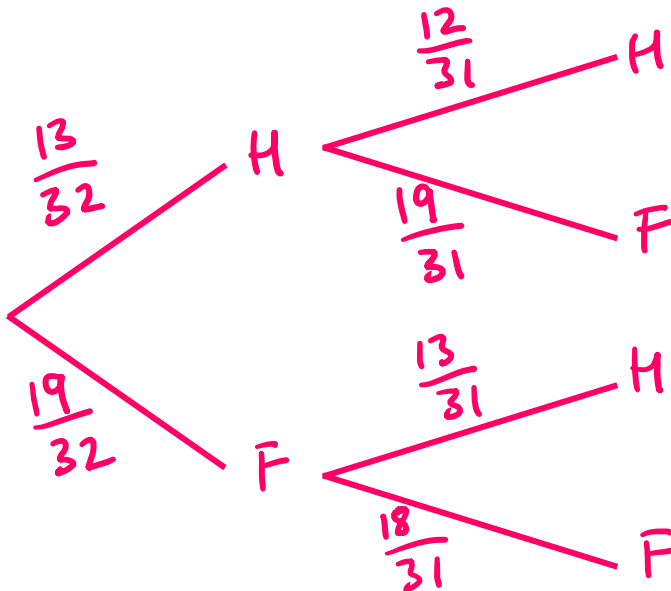
$$\frac{13}{32} \times \frac{12}{31} = \frac{156}{992}$$

Answer $\dfrac{156}{992}$

2 (b) Show that

P(exactly one of the selected students does higher tier maths) < 50% **[4 marks]**

$$P(H,F) = \frac{13}{32} \times \frac{19}{31} \qquad P(F,H) = \frac{19}{32} \times \frac{13}{31}$$

$$= \frac{247}{992} \qquad\qquad = \frac{247}{992}$$

$$\frac{247}{992} + \frac{247}{992} = \frac{494}{992} = 49.8\%$$

1st

3   Jamal's fruit bowl contains

      5 apples
      3 bananas
      3 oranges

On Saturday and Sunday he eats one piece of fruit from the bowl.
Assume he chooses the fruit to eat randomly.

3 (a) Work out the probability that on Saturday he picks a banana and then on Sunday
he picks an apple.   **[2 marks]**

$$P(B, A) = \frac{3}{11} \times \frac{5}{10}$$

Answer _____ $\dfrac{15}{110}$ _____

3 (b) Work out the probability that both pieces of fruit chosen are the same fruit.
                                                                                  [4 marks]

$$P(A, A) = \frac{5}{11} \times \frac{4}{10}$$
$$= \frac{20}{110}$$

$$P(B, B) = \frac{3}{11} \times \frac{2}{10}$$
$$= \frac{6}{110}$$

$$P(O, O) = \frac{3}{11} \times \frac{2}{10}$$
$$= \frac{6}{110}$$

$$\frac{20}{110} + \frac{6}{110} + \frac{6}{110}$$

Answer _____ $\dfrac{32}{110}$ _____

12

Turn over ▶

4   In a café there are 3 slices of chocolate cake and 5 slices of vanilla sponge cake.

Two customers visit the café and each randomly buys one slice of cake.

4 (a)   Work out the probability **at least** one of the customers had chocolate cake.

[4 marks]

Consider no chocolate

$$P(V,V) = \frac{5}{8} \times \frac{4}{8}$$

$$= \frac{20}{64}$$

$$P(\text{at least one } C) = 1 - P(\text{no } C)$$
$$= 1 - \frac{20}{64}$$

$$\frac{44}{64}$$

Answer _____ $\frac{44}{64}$ _____

4 (b)   A different café has 5 chocolate cake slices and 6 strawberry cheesecake slice. Each customer that enters also randomly buys once slice of cake.

Work out the probability that the first 3 customers all buy strawberry cake slices.

[2 marks]

$$P(S,S,S) = \frac{6}{11} \times \frac{5}{10} \times \frac{4}{9}$$

$$= \frac{120}{990}$$

$$\frac{120}{990}$$

Answer _____ $\frac{120}{990}$ _____

5 Beth's pencil case contains

4 red pens
5 green pens
7 black pens

Beth takes 3 pens at random from her pencil case.

5 (a) Work out the probability that all 3 pens the same colour. **[4 marks]**

$$P(R, R) = \frac{4}{16} \times \frac{3}{15} \times \frac{2}{14} = \frac{24}{3360}$$

$$P(G, G) = \frac{5}{16} \times \frac{4}{15} \times \frac{3}{14} = \frac{60}{3360}$$

$$P(B, B) = \frac{7}{16} \times \frac{6}{15} \times \frac{5}{14} = \frac{210}{3360}$$

$$\frac{24}{3360} + \frac{60}{3360} + \frac{210}{3360}$$

$$\frac{294}{3360}$$

Answer _____ $\frac{294}{3360}$ _____

5 (b) The first pen chosen is black.
Work out the probability that all three pens are different colours. **[3 marks]**

Black removed so 4R, 5G, 6B

$$P(R, G) = \frac{4}{15} \times \frac{5}{14} = \frac{20}{210}$$

$$P(G, R) = \frac{5}{15} \times \frac{4}{14} = \frac{20}{210}$$

$$\frac{20}{210} + \frac{20}{210} = \frac{40}{210}$$

$$\frac{40}{210}$$

Answer _____ $\frac{40}{210}$ _____

13

Turn over ▶

© 1stclassmaths

6 There are 9 identical boxes on a gameshow.
6 of the boxes are empty and the remaining 3 boxes contain different prizes.
A gameshow contestant must select 3 boxes that will all be opened.

6 (a) Show that the probability that the contestant wins all 3 prizes is greater than 1%
[2 marks]

$$P(W,W,W) = \frac{3}{9} \times \frac{2}{8} \times \frac{1}{7}$$

$$= \frac{6}{504} \quad (1.19\%)$$

6 (b) Work out the probability that the contestant wins at least one prize. **[4 marks]**

Consider **no** prizes

$$P(L,L,L) = \frac{6}{9} \times \frac{5}{8} \times \frac{4}{7}$$

$$= \frac{120}{504} \qquad 1 - \frac{120}{504}$$

$$\frac{384}{504}$$

Answer _____ $\frac{384}{504}$

6 (c) Work out the probability that the contestant wins **exactly one** prize. **[4 marks]**

$$P(W,L,L) = \frac{3}{9} \times \frac{6}{8} \times \frac{5}{7} = \frac{90}{504}$$

$$P(L,W,L) = \frac{6}{9} \times \frac{3}{8} \times \frac{5}{7} = \frac{90}{504}$$

$$P(L,L,W) = \frac{6}{9} \times \frac{5}{8} \times \frac{3}{7} = \frac{90}{504}$$

$$\frac{90}{504} + \frac{90}{504} + \frac{90}{504} = \frac{270}{504}$$

Answer _____ $\frac{270}{504}$

7 Students who arrive late to school must enter through the late gate.

P(the **first student** to arrive late is in Year 11) = 0.4

For all students after the first student to arrive,

If the previous student was in Year 11, P(this student is in Year 11) = 0.75
If the previous student was not in Year 11, P(this student is in Year 11) = 0.1

7 (a) Work out the probability that the first student is in Year 11 and the second is not.

[2 marks]

$$P(Y11, \text{not } Y11) = 0.4 \times 0.25$$
$$= 0.1$$

Answer _____ 0.1 _____

7 (b) Work out the probability **exactly two** of the first three students are in Year 11.

[4 marks]

$$P(Y11, Y11, \text{not } Y11) = 0.4 \times 0.75 \times 0.25$$
$$= 0.075$$

$$P(Y11, \text{not } Y11, Y11) = 0.4 \times 0.25 \times 0.1$$
$$= 0.01$$

$$P(\text{not } Y11, Y11, Y11) = 0.6 \times 0.1 \times 0.75$$
$$= 0.045$$

$$0.075 + 0.01 + 0.045 = 0.13$$

Answer _____ 0.13 _____

16

Turn over ►

8 A car showroom has 5 blue cars and 3 white cars for sale.

Assume that each of the cars has an equal chance of being sold.

On Monday 3 of the cars from the showroom are sold.

8 (a) Work out the probability that all three cars sold are the same colour.

[4 marks]

$$P(B,B,B) = \frac{5}{8} \times \frac{4}{7} \times \frac{3}{6} = \frac{60}{336}$$

$$P(W,W,W) = \frac{3}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{6}{336}$$

$$\frac{60}{336} + \frac{6}{336} = \frac{66}{336}$$

Answer $\dfrac{66}{336}$

8 (b) Work out the probability that there is only one white car left in the showroom.

[4 marks]

$$P(W,W,B) = \frac{3}{8} \times \frac{2}{7} \times \frac{5}{6} = \frac{30}{336}$$

$$P(W,B,W) = \frac{3}{8} \times \frac{5}{7} \times \frac{2}{6} = \frac{30}{336}$$

$$P(B,W,W) = \frac{5}{8} \times \frac{3}{7} \times \frac{2}{6} = \frac{30}{336}$$

$$\frac{30}{336} + \frac{30}{336} + \frac{30}{336} = \frac{90}{336}$$

Answer $\dfrac{90}{336}$

9 There are 5 green counters and 2 yellow counters in a bag.

One counter is taken at random from the bag.
Two counters of the opposite colour are then added to the bag.

A final counter is taken at random from the bag.

9 (a) Work out the probability that both counters removed from the bag are yellow.

[2 marks]

$$P(Y,Y) = \frac{2}{7} \times \frac{1}{8}$$

$$= \frac{2}{56}$$

Answer $\dfrac{2}{56}$

9 (b) Work out the probability that there are more green counters left in the bag than there are yellow counters left in the bag.

[4 marks]

$$P(Y,Y) = \frac{2}{56}$$

$$P(G,Y) = \frac{5}{7} \times \frac{4}{8} = \frac{20}{56}$$

$$P(Y,G) = \frac{2}{7} \times \frac{7}{8} = \frac{14}{56}$$

$$\frac{2}{56} + \frac{20}{56} + \frac{14}{56}$$

Answer $\dfrac{36}{56}$

14

Turn over ▶

10 Tim's toy box contains some cars and some lorries that are red, white or blue.

	Car	Lorry
Red	3	1
White	6	3
Blue	5	2

4
9
7

Tim takes two toys from his toy box at random.

10 (a) Work out the probability that one toy is a car and the other is a lorry. **[4 marks]**

$$P(C, L) = \frac{14}{20} \times \frac{6}{19} = \frac{84}{380}$$

$$P(L, C) = \frac{6}{20} \times \frac{14}{19} = \frac{84}{380}$$

$$\frac{84}{380} + \frac{84}{380} = \frac{168}{380}$$

Answer $\dfrac{168}{380}$

10 (b) Work out the probability that both toys are different colours. **[4 marks]**

$$P(R, R) = \frac{4}{20} \times \frac{3}{19} = \frac{12}{380}$$
$$P(W, W) = \frac{9}{20} \times \frac{8}{19} = \frac{72}{380}$$
$$P(B, B) = \frac{7}{20} \times \frac{6}{19} = \frac{42}{380}$$

$+ \quad \dfrac{126}{380}$
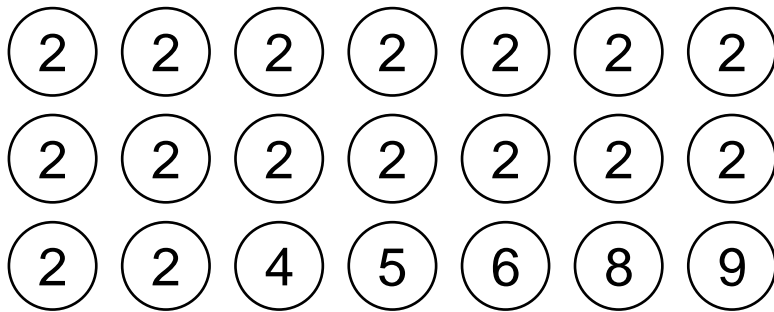
$$P(\text{different colour}) = 1 - \frac{126}{380}$$

Answer $\dfrac{254}{380}$

© 1stclassmaths

1st

11   A bag contains the following numbered counters.

2 2 2 2 2 2 2
2 2 2 2 2 2 2
2 2 4 5 6 8 9

Two of the counters are taken from the bag at random.

Work out the probability that the product of the numbers on the two counters is a square number.   **[5 marks]**

$$P(2,2) = \frac{16}{21} \times \frac{15}{20} = \frac{240}{420}$$

$$P(2,8) = \frac{16}{21} \times \frac{1}{20} = \frac{16}{420}$$

$$P(8,2) = \frac{1}{21} \times \frac{16}{20} = \frac{16}{420}$$

$$P(4,9) = \frac{1}{21} \times \frac{1}{20} = \frac{1}{420}$$

$$P(9,4) = \frac{1}{21} \times \frac{1}{20} = \frac{1}{420}$$

$$\frac{240}{420} + \frac{16}{420} + \frac{16}{420} + \frac{1}{420} + \frac{1}{420} = \frac{274}{420}$$

Answer _____ $\frac{274}{420}$ _____

13

© 1stclassmaths