# Conditional Probability - Worksheet

**Skill**

**Group A - Two way tables and Venn diagrams**

Determine the probability using the associated table:

| | Red | Blue | Purple |
|---|---|---|---|
| Male | 7 | 4 | 3 |
| Female | 4 | 5 | 6 |

Work out the probability of:

**1)** A male given that they wear a red t-shirt

**2)** They wear a blue t-shirt given that they are female

**3)** They wear a red or blue t-shirt given that they are male

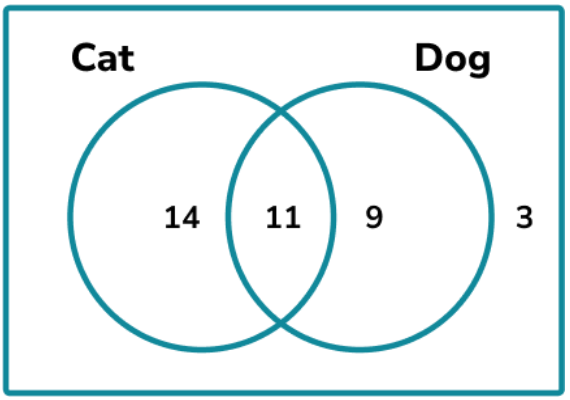
| Age | Milk | White | Dark |
|---|---|---|---|
| 0-19 | 7 | 10 | 1 |
| 20-39 | 8 | 5 | 3 |
| 40-59 | 6 | 1 | 5 |

Work out the probability of:

**4)** They are aged $0$ - $19$ given that they prefer white chocolate

**5)** They prefer dark chocolate given that they are aged $40$ - $59$

**6)** They didn't prefer dark chocolate given that they are aged $20$ - $39$



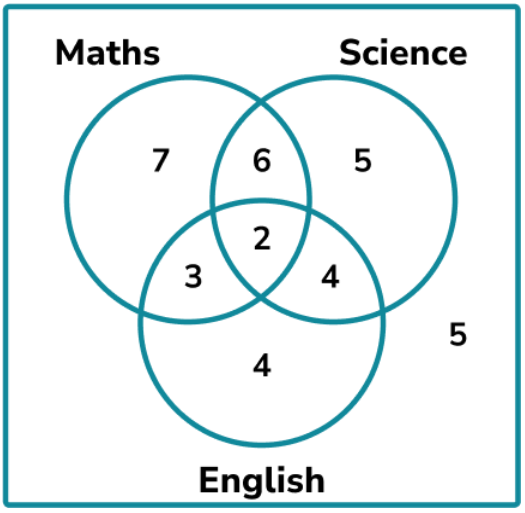

Work out the probability that someone:

**7)** Likes cats given that they like dogs

**8)** Doesn't like dogs given that they like cats

**9)** Likes both animals given that they like cats

# Conditional Probability - Worksheet




Work out the probability that someone:

**10)** Likes Maths given that they like Science

**11)** Likes English given that they like Maths and Science

**12)** Doesn't like English given that they like Maths

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**Group B - One event given another**

Work out the probability of each event given the condition:

**1)** A bag contains 4 blue counters and 10 green counters. I pick one green counter. The counter is NOT replaced. What is the probability the next counter is green?

**2)** A bag contains 4 blue counters and 10 green counters. I pick one green counter. The counter is NOT replaced. What is the probability the next counter is blue?

**3)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat a milk chocolate. What is the probability the next chocolate I eat is a milk chocolate?

**4)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat a milk chocolate. What is the probability the next chocolate I eat is a white chocolate?

**5)** A set of cards are numbered 1 to 5. I pick a 3 from the set of cards. The card is NOT replaced. I pick a second card. What is the probability it is a 5?

**6)** A set of cards are numbered 1 to 5. I pick a 3 from a pack of cards. The card is NOT replaced. I pick a second card. What is the probability it is not a 3?

# Conditional Probability - Worksheet

**7)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat an orange sweet. What is the probability the next sweet I eat is an orange sweet?

**8)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat a strawberry sweet. What is the probability the next sweet I eat is an orange sweet?

**9)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat a lemon sweet. What is the probability the next sweet I eat is an orange sweet?

**10)** A bag contains 4 blue counters and 10 green counters. I pick two green counters. The counters are NOT replaced. What is the probability the next counter is green?

**11)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat 2 milk chocolates. What is the probability the next chocolate I eat is a milk chocolate?

**12)** A bag contains 4 blue counters and 10 green counters. I pick 1 blue counter and 1 green counter. The counters are NOT replaced. What is the probability the next counter is green?

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**Group C - Combined events**

Work out each probability required:

**1)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability they are both silver?

**2)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability I pick two pears?

**3)** A zoo has 4 lions, 3 tigers and 2 bears. I pick two animals. What is the probability they are both tigers?

**4)** A drawer contains 6 red, 10 green and 4 blue socks. I pick two socks. What is the probability I pick two blue socks?

**5)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability they are both the same colour?

**6)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability I pick two different pieces of fruit?

# Conditional Probability - Worksheet

**7)** A zoo has 4 lions, 3 tigers and 2 bears. I pick two animals. What is the probability they are both the same?

**8)** A drawer contains 6 red, 10 green and 4 blue socks. I pick two socks. What is the probability I pick one blue sock and one red sock?

**9)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability that I don't pick any silver counters?

**10)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability that I pick at least 1 pear?

**11)** A bag contains 7 silver counters and 3 gold counters. I pick three counters from the bag. What is the probability they are all the same colour?

**12)** A box contains 7 milk, 4 white and 5 dark chocolates. I pick 3 chocolates. What is the probability they are all the same type?

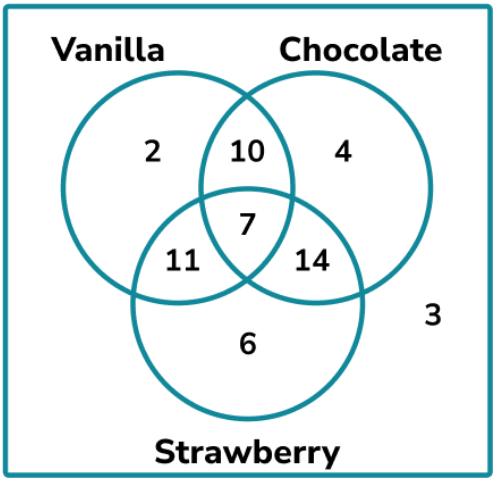
# Conditional Probability - Worksheet

## Applied

**1)** The Venn diagram shows the number of people who like vanilla, chocolate or strawberry ice cream.

One person is picked at random.

Find the probability that the chosen person **only** likes vanilla given that they **don't** like chocolate.




**2)** **(a)** There are 21 chocolates in a box of chocolates.

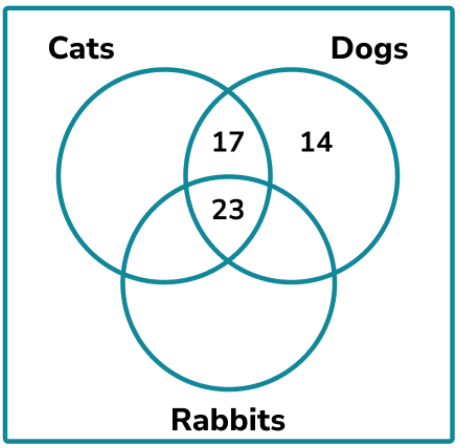
There are $x$ milk chocolates.
I pick out one chocolate at random.
It is a milk chocolate.
I then pick out a second chocolate.
What is the probability the second chocolate is also a milk chocolate?
Give your answer in terms of $x$.

**(b)** The probability the second chocolate is a milk chocolate is $\frac{1}{2}$.
How many milk chocolates were in the box to begin with?

# Conditional Probability - Worksheet

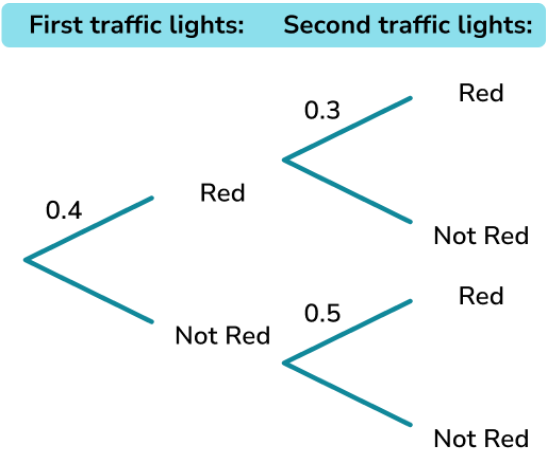
**3)** 100 people were asked whether they like cats, dogs or rabbits as pets.
62 said they liked dogs.
7 said they liked rabbits only.
50 said they liked rabbits.
10 said they didn't like any.

**(a)** Complete the Venn diagram:




**(b)** A person is picked at random. Calculate the probability that they like two animals, given that they like cats.

**4)** John drives through two sets of traffic lights on his way to work. He records the probability of travelling through each red light in a probability tree:




Given that the second set of lights was red, find the probability that the first set of lights was red.

# Conditional Probability - Exam Questions

**1)** The table shows the age and gender of students in a primary school.

| | Male | Female | Total |
|---|---|---|---|
| 4-6 | | 19 | 35 |
| 7-9 | 21 | | 38 |
| 10-11 | | 14 | 25 |
| Total | 48 | | |

**(a)** Complete the two way table **(2)**

**(b)** One student is chosen at random. Find the probability that the student is aged $7 - 9$ given that they are female.

.....

**(2)**

**(4 marks)**

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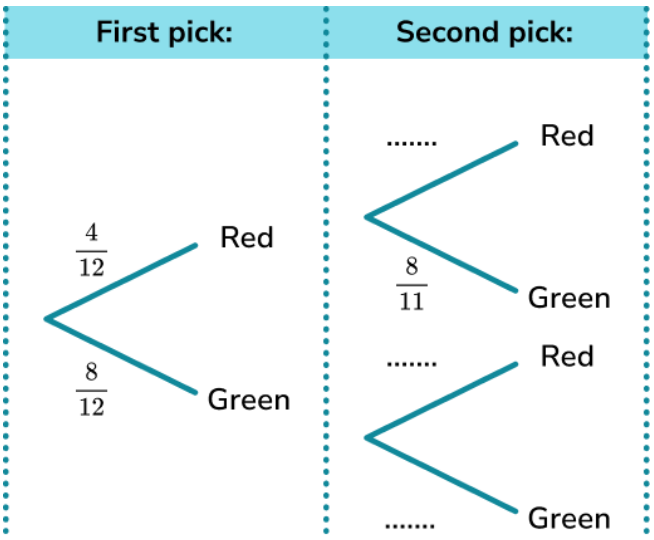
**2)** **(a)** A bag contains 4 red marbles and 8green marbles. Two marbles are picked from the bag. Complete the tree diagram below.




**(2)**

**(b)** Find the probability that both marbles are the same colour.

.....

**(3)**

**(5 marks)**

# Conditional Probability - Exam Questions

**3)** **(a)** There are $x$ pieces of fruit in a box. 5 of them are bananas. The probability of picking 2 bananas is $\frac{2}{9}$. Prove that $x^2 - x - 90 = 0$.

.....

**(4)**

**(b)** Find $x$, the number of pieces of fruit in the box.

.....

**(2)**

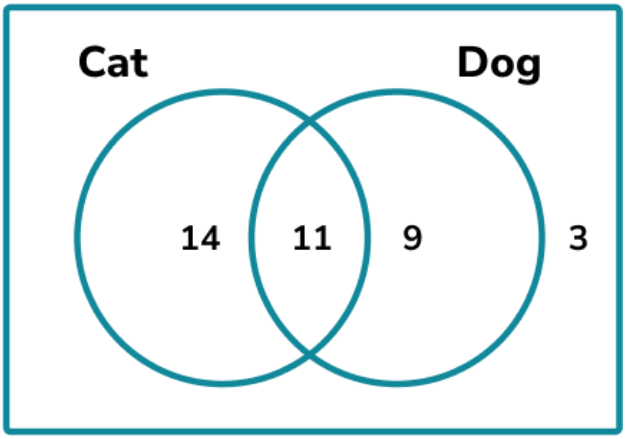
**(6 marks)**

# Conditional Probability - Answers

<table>
<tr><th></th><th>Question</th><th>Answer</th></tr>
<tr><td></td><td>Skill Questions</td><td></td></tr>
<tr><td>Group A</td><td>
Determine the probability using the associated table:
<table>
<tr><th></th><th>Red</th><th>Blue</th><th>Purple</th></tr>
<tr><td>Male</td><td>7</td><td>4</td><td>3</td></tr>
<tr><td>Female</td><td>4</td><td>5</td><td>6</td></tr>
</table>
Work out the probability of:<br>
1) A male given that they wear a red t-shirt<br>
2) They wear a blue t-shirt given that they are female<br>
3) They wear a red or blue t-shirt given that they are male
<table>
<tr><th>Age</th><th>Milk</th><th>White</th><th>Dark</th></tr>
<tr><td>0-19</td><td>7</td><td>10</td><td>1</td></tr>
<tr><td>20-39</td><td>8</td><td>5</td><td>3</td></tr>
<tr><td>40-59</td><td>6</td><td>1</td><td>5</td></tr>
</table>
Work out the probability of:<br>
4) They are aged 0 - 19 given that they prefer white chocolate<br>
5) They prefer dark chocolate given that they are aged 40 - 59<br>
6) They didn't prefer dark chocolate given that they are aged 20 - 39
</td><td>
1) $\frac{7}{11}$<br>
2) $\frac{5}{15}$ or $\frac{1}{3}$<br>
3) $\frac{11}{14}$<br>
4) $\frac{10}{16}$ or $\frac{5}{8}$<br>
5) $\frac{5}{12}$<br>
6) $\frac{13}{16}$
</td></tr>
</table>

# Conditional Probability - Answers

**Group A contd**

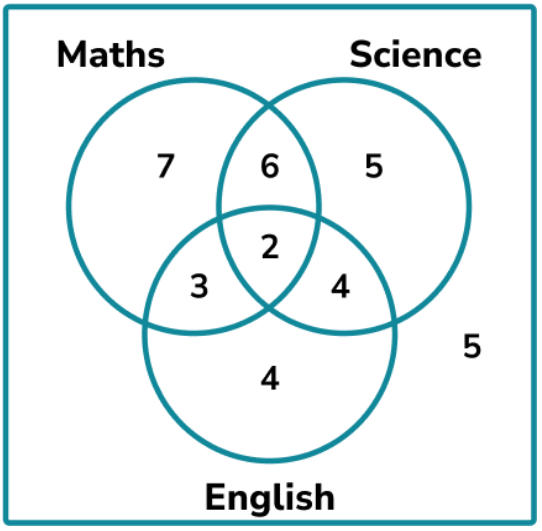



Work out the probability that someone:

**7)** Likes cats given that they like dogs — **7)** $\frac{11}{20}$

**8)** Doesn't like dogs given that they like cats — **8)** $\frac{14}{25}$

**9)** Likes both animals given that they like cats — **9)** $\frac{11}{25}$




Work out the probability that someone:

**10)** Likes Maths given that they like Science — **10)** $\frac{8}{17}$

**11)** Likes English given that they like Maths and Science — **11)** $\frac{2}{8}$ **or** $\frac{1}{4}$

**12)** Doesn't like English given that they like Maths — **12)** $\frac{13}{18}$

# Conditional Probability - Answers

| | | |
|---|---|---|
| Group B | Work out the probability of each event given the condition: | |
| | **1)** A bag contains 4 blue counters and 10 green counters. I pick one green counter. The counter is NOT replaced. What is the probability the next counter is green? | **1)** $\frac{9}{13}$ |
| | **2)** A bag contains 4 blue counters and 10 green counters. I pick one green counter. The counter is NOT replaced. What is the probability the next counter is blue? | **2)** $\frac{4}{13}$ |
| | **3)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat a milk chocolate. What is the probability the next chocolate I eat is a milk chocolate? | **3)** $\frac{6}{15}$ **or** $\frac{2}{5}$ |
| | **4)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat a milk chocolate. What is the probability the next chocolate I eat is a white chocolate? | **4)** $\frac{4}{15}$ |
| | **5)** A set of cards are numbered 1 to 5. I pick a 3 from the set of cards. The card is NOT replaced. I pick a second card. What is the probability it is a 5? | **5)** $\frac{1}{4}$ |
| | **6)** A set of cards are numbered 1 to 5. I pick a 3 from a pack of cards. The card is NOT replaced. I pick a second card. What is the probability it is not a 3? | **6)** $\frac{4}{4}$ **or** 1 |
| | **7)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat an orange sweet. What is the probability the next sweet I eat is an orange sweet? | **7)** 0 |
| | **8)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat a strawberry sweet. What is the probability the next sweet I eat is an orange sweet? | **8)** $\frac{1}{11}$ |
| | **9)** A packet of sweets contains 7 strawberry sweets, 4 lemon sweets and 1 orange sweet. I eat a lemon sweet. What is the probability the next sweet I eat is an orange sweet? | **9)** $\frac{1}{11}$ |

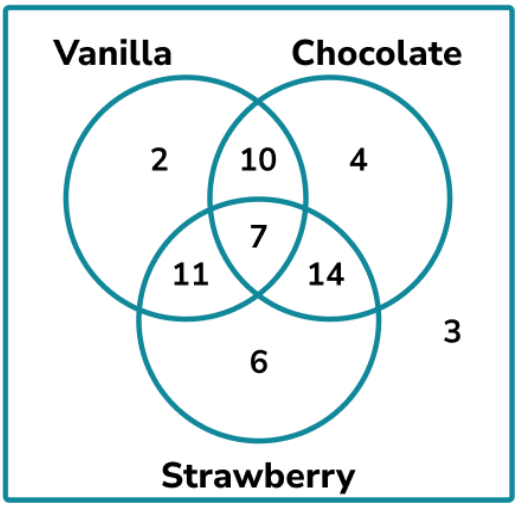
# Conditional Probability - Answers

| | | |
|---|---|---|
| Group B contd | **10)** A bag contains 4 blue counters and 10 green counters. I pick two green counters. The counters are NOT replaced. What is the probability the next counter is green? | **10)** $\frac{8}{12}$ **or** $\frac{2}{3}$ |
| | **11)** A box contains 7 milk, 4 white and 5 dark chocolates. I eat 2 milk chocolates. What is the probability the next chocolate I eat is a milk chocolate? | **11)** $\frac{5}{14}$ |
| | **12)** A bag contains 4 blue counters and 10 green counters. I pick 1 blue counter and 1 green counter. The counters are NOT replaced. What is the probability the next counter is green? | **12)** $\frac{9}{12}$ **or** $\frac{3}{4}$ |
| Group C | Work out each probability required: | |
| | **1)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability they are both silver? | **1)** $\frac{7}{10} \times \frac{6}{9} = \frac{42}{90}$ or $\frac{7}{15}$ |
| | **2)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability I pick two pears? | **2)** $\frac{6}{10} \times \frac{5}{9} = \frac{30}{90}$ **or** $\frac{1}{3}$ |
| | **3)** A zoo has 4 lions, 3 tigers and 2 bears. I pick two animals. What is the probability they are both tigers? | **3)** $\frac{3}{9} \times \frac{2}{8} = \frac{6}{72}$ **or** $\frac{1}{12}$ |
| | **4)** A drawer contains 6 red, 10 green and 4 blue socks. I pick two socks. What is the probability I pick two blue socks? | **4)** $\frac{4}{20} \times \frac{3}{19} = \frac{12}{380}$ **or** $\frac{3}{95}$ |
| | **5)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability they are both the same colour? | **5)** $(\frac{7}{10} \times \frac{6}{9}) + (\frac{3}{10} \times \frac{2}{9})$ $= \frac{42}{90} + \frac{6}{90} = \frac{48}{90}$ **or** $\frac{8}{15}$ |

# Conditional Probability - Answers

| | | |
|---|---|---|
| Group C contd | **6)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability I pick two different pieces of fruit? | **6)** $(\frac{4}{10} \times \frac{3}{9}) + (\frac{6}{10} \times \frac{5}{9})$ $= \frac{12}{90} + \frac{30}{90} = \frac{48}{90}$ **or** $\frac{8}{15}$ |
| | **7)** A zoo has 4 lions, 3 tigers and 2 bears. I pick two animals. What is the probability they are both the same? | **7)** P(LL)+P(TT)+P(BB)= $(\frac{4}{9} \times \frac{3}{8}) + (\frac{3}{9} \times \frac{2}{8}) + (\frac{2}{9} \times \frac{1}{8})$ $= \frac{12}{72} + \frac{6}{72} + \frac{2}{72} = \frac{20}{72}$ **or** $\frac{5}{18}$ |
| | **8)** A drawer contains 6 red, 10 green and 4 blue socks. I pick two socks. What is the probability I pick one blue sock and one red sock? | **8)** $\left(\frac{4}{20} \times \frac{6}{19}\right) + \left(\frac{6}{20} \times \frac{4}{19}\right)$ $= \frac{24}{380} + \frac{24}{380} = \frac{48}{380}$ **or** $\frac{12}{95}$ |
| | **9)** A bag contains 7 silver counters and 3 gold counters. I pick two counters from the bag. What is the probability that I don't pick any silver counters? | **9)** P(no silver)=P(both gold)= $\frac{3}{10} \times \frac{2}{9} = \frac{6}{90}$ **or** $\frac{1}{15}$ |
| | **10)** A bowl contains 4 apples and 6 pears. I pick two pieces of fruit. What is the probability that I pick at least 1 pear? | **10)** 1-P(AA) $1 - \left(\frac{4}{10} \times \frac{3}{9}\right) = 1 - \frac{12}{90}$ $= \frac{78}{90}$ **or** $\frac{13}{15}$ |
| | **11)** A bag contains 7 silver counters and 3 gold counters. I pick three counters from the bag. What is the probability they are all the same colour? | **11)** P(SSS)+P(GGG) $= (\frac{7}{10} \times \frac{6}{9} \times \frac{5}{8}) + (\frac{3}{10} \times \frac{2}{9} \times \frac{1}{8})$ $= \frac{210}{720} + \frac{6}{720} = \frac{216}{720}$ **or** $\frac{3}{10}$ |
| | **12)** A box contains 7 milk, 4 white and 5 dark chocolates. I pick 3 chocolates. What is the probability they are all the same type? | **12)** P(MMM)+P(WWW)+P(DDD) $= (\frac{7}{16} \times \frac{6}{15} \times \frac{5}{14})$ $+ (\frac{4}{16} \times \frac{3}{15} \times \frac{2}{14})$ $+ (\frac{5}{16} \times \frac{4}{15} \times \frac{3}{14})$ $= \frac{210}{3360} + \frac{24}{3360} + \frac{60}{3360}$ $= \frac{294}{3360}$ **or** $\frac{7}{80}$ |

# Conditional Probability - Answers

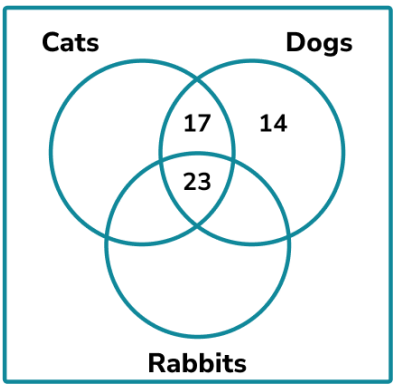
| | Question | Answer |
|---|---|---|
| | Applied Questions | |
| **1)** | The venn diagram shows the number of people who like vanilla, chocolate or strawberry ice cream. One person is picked at random. Find the probability that the chosen person **only** likes vanilla given that they **don't** like chocolate.<br>  <br> | $\frac{2}{22}$ **or** $\frac{1}{11}$ |
| **2)** | **a)** There are 21 chocolates in a box of chocolates.<br>There are $x$ milk chocolates.<br>I pick out one chocolate at random.<br>It is a milk chocolate.<br>I then pick out a second chocolate.<br>What is the probability the second chocolate is also a milk chocolate?<br>Give your answer in terms of $x$.<br><br>**b)** The probability the second chocolate is a milk chocolate is $\frac{1}{2}$.<br><br>How many milk chocolates were in the box to begin with? | **a)** $\frac{x-1}{20}$<br><br>**b)** $\frac{x-1}{20} = \frac{1}{2}$<br>$x - 1 = 10$<br>$x = 11$ |

# Conditional Probability - Answers

**3)**

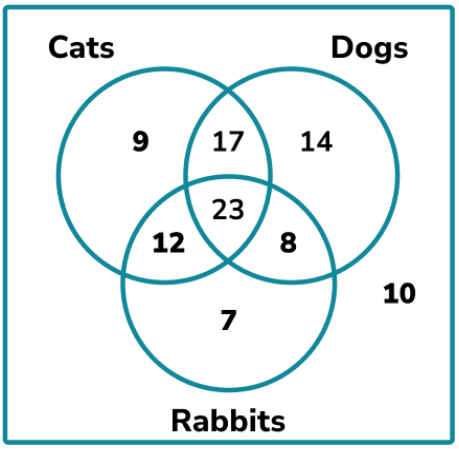
100 people were asked whether they like cats, dogs or rabbits as pets.
62 said they liked dogs.
7 said they liked rabbits only.
50 said they liked rabbits.
10 said they didn't like any.

**a)** Complete the Venn diagram:




**b)** A person is picked at random.
Calculate the probability that they like two animals, given that they like cats.

**a)**



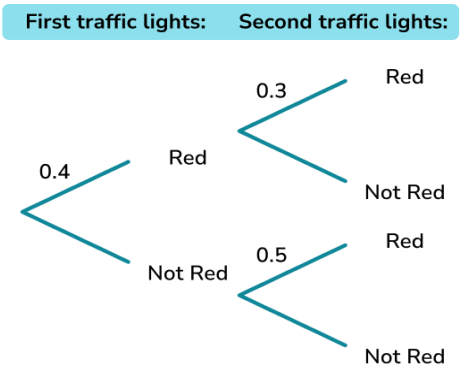

**b)** Number of people who like cats is

$9 + 12 + 17 + 23 = 61$

P(like two animals given that they like cats) $= \frac{12+17}{61} = \frac{29}{61}$

**4)**

John drives through two sets of traffic lights on his way to work. He records the probability of travelling through each red light in a probability tree:




Given that the second set of lights was red, find the probability that the first set of lights was red.

P(second set Red) =

$P(R, R) + P(not\ R, R)$

$= (0.4 \times 0.3) + (0.6 \times 0.5)$

$= 0.12 + 0.30$

$= 0.42$

P(First set red, given that second are red) =

$\frac{0.12}{0.42} = \frac{12}{42} = \frac{2}{7}$

# Conditional Probability - Mark Scheme

| | Question | Answer | |
|---|---|---|---|
| | Exam Questions | | |
| 1) | The table shows the age and gender of students in a primary school. | | |

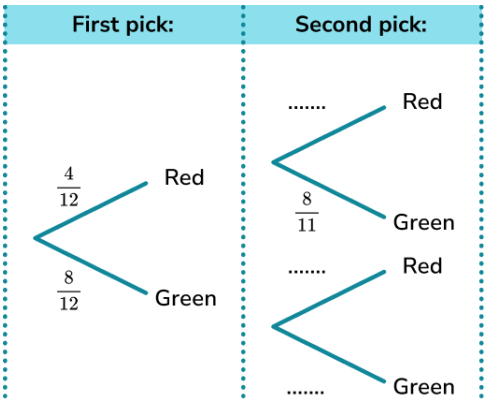
| | Male | Female | Total |
|---|---|---|---|
| 4-6 | | 19 | 35 |
| 7-9 | 21 | | 38 |
| 10-11 | | 14 | 25 |
| Total | 48 | | |

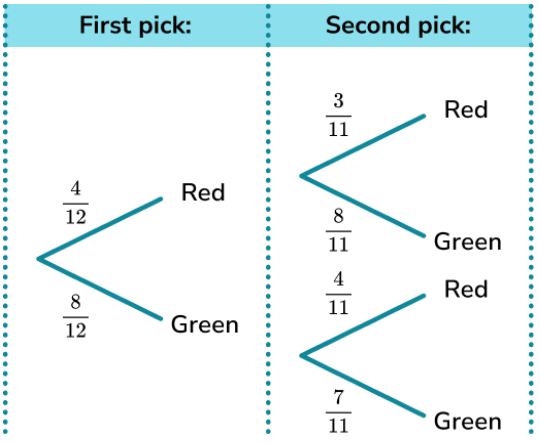
| | | | |
|---|---|---|---|
| **(a)** | Complete the two way table | **(a)**<br>For 2 correct boxes<br>For all boxes correct | **(1)**<br>**(1)** |

| | | | |
|---|---|---|---|
| | | **(a)**

| | Male | Female | Total |
|---|---|---|---|
| 4-6 | **16** | 19 | 35 |
| 7-9 | 21 | **17** | 38 |
| 10-11 | **11** | 14 | 25 |
| Total | 48 | **50** | **98** | | |

| | | | |
|---|---|---|---|
| **(b)** | One student is chosen at random. Find the probability that the student is aged 7-9 given that they are female. | **(b)** 17 **or** 50 **seen**<br>$\frac{17}{50}$ | **(1)**<br>**(1)** |
| **2)** **(a)** | A bag contains 4 red marbles and 8 green marbles. Two marbles are picked from the bag. Complete the tree diagram below. | **(a)** $\frac{3}{11}$<br>For fully correct tree diagram | **(1)**<br>**(1)** |




| | | | |
|---|---|---|---|
| **(b)** | Find the probability that both marbles are the same colour. | **(b)** P(red and red) = $\frac{12}{132}$ **or**<br>P(green and green) = $\frac{56}{132}$<br>$\frac{12}{132} + \frac{56}{132}$<br>$= \frac{68}{132}$ | **(1)**<br>**(1)**<br>**(1)** |

# Conditional Probability - Mark Scheme

| | | | |
|---|---|---|---|
| **3) (a)** | There are $x$ pieces of fruit in a box. 5 of them are bananas. The probability of picking 2 bananas is $\frac{2}{9}$. Prove that $x^2 - x - 90 = 0$. | **(a)** P(banana 1) $= \frac{5}{x}$<br>P(banana 2) $= \frac{4}{x-1}$<br>$\frac{5}{x} \times \frac{4}{x-1} = \frac{2}{9}$ **oe**<br>Correct method to show $x^2 - x - 90 = 0$<br>E.g.<br>$\frac{20}{x^2-x} = \frac{2}{9}$<br>$180 = 2x^2 - 2x$<br>$90 = x^2 - x$<br>$x^2 - x - 90 = 0$ | **(1)**<br>**(1)**<br>**(1)**<br><br><br><br><br>**(1)** |
| **(b)** | Find $x$, the number of pieces of fruit in the box. | **(b)** $(x - 10)(x + 9) = 0$<br>$x = 10$ **only** | **(1)**<br>**(1)** |