Venn Diagrams and Set Notation

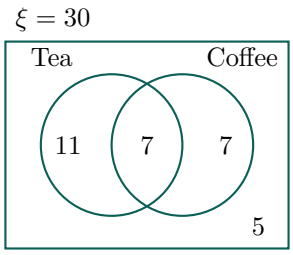
GCSE Mathematics • **Foundation Tier** • Grades 4–6 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 51 / 51

Show all your working. Marks are given for correct method as well as the final answer.

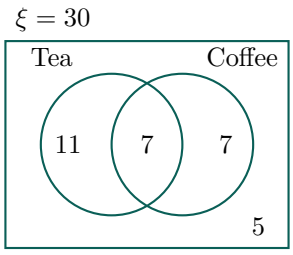
1. 30 people were asked about hot drinks. 18 like tea, 14 like coffee and 7 like both. Work out how many like tea only. **[2 marks]**



start with the OVERLAP: 7
tea only = 18 – 7 = 11
the 18 already includes the 7

Answer: 11

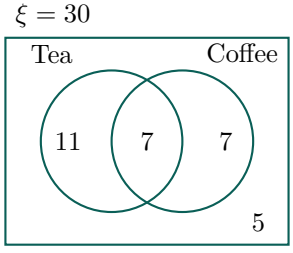
2. Using the same survey, work out how many like coffee only. **[2 marks]**



14 – 7 = 7

Answer: 7

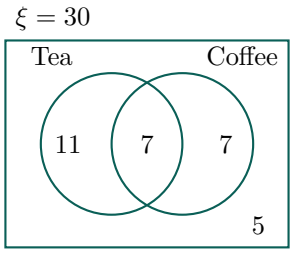
3. Using the same survey, work out how many like neither. **[3 marks]**



inside the circles: 11 + 7 + 7 = 25
30 – 25 = 5

Answer: 5

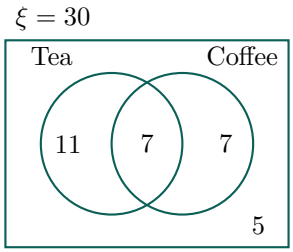
4. Using the same survey, work out how many like at least one of the two drinks. **[2 marks]**



everything inside the circles
11 + 7 + 7 = 25

Answer: 25

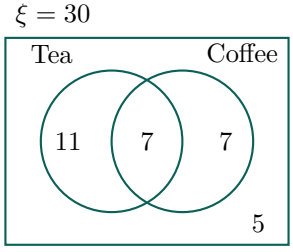
5. Using the same survey, work out the probability that a person chosen at random likes both. **[2 marks]**



7 in the overlap out of 30

Answer: $\frac{7}{30}$

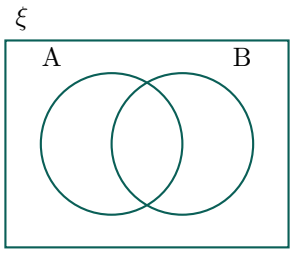
6. Using the same survey, work out the probability that a person chosen at random likes tea but not coffee. **[2 marks]**



tea only region

Answer: $\frac{11}{30}$

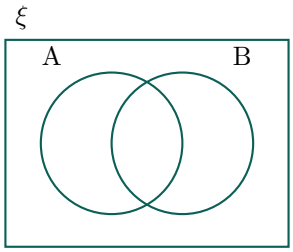
7. Write down what $A \cap B$ means. **[1 mark]**



intersection = the overlap

Answer: *in A AND in B*

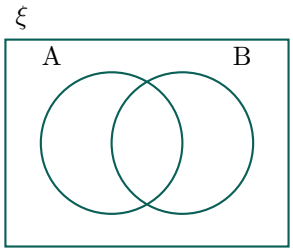
8. Write down what $A \cup B$ means. **[1 mark]**



union = everything in either circle

Answer: *in A OR in B (or both)*

9. Write down what A' means. **[1 mark]**



the complement of A
it includes things outside both circles

Answer: *everything NOT in A*

10. $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, A is the even numbers and B is the multiples of 3. List $A \cap B$. **[2 marks]**

even: 2 4 6 8 10
multiples of 3: 3 6 9
in both: 6

Answer: *{6}*

11. Using the same sets, list $A \cup B$. **[2 marks]**

everything in either list, written once each

Answer: *{2, 3, 4, 6, 8, 9, 10}*

12. Using the same sets, list A'. **[2 marks]**

everything in ξ that is not even

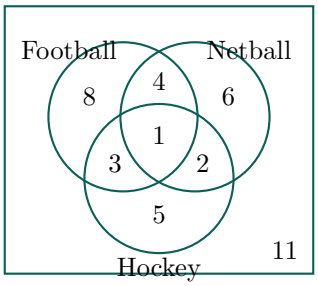
Answer: {1, 3, 5, 7, 9}

13. Using the same sets, work out $n(A \cup B)$. **[1 mark]**

n( ) means HOW MANY
count the union: 7 numbers

Answer: 7

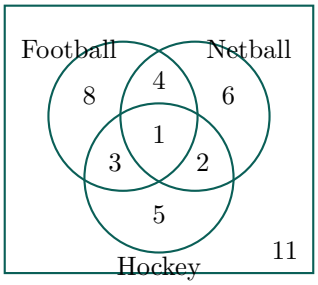
14. The Venn diagram shows which sports 40 pupils play. Work out how many play football. **[2 marks]**



add EVERY region inside the football circle
8 + 4 + 3 + 1
= 16

Answer: 16

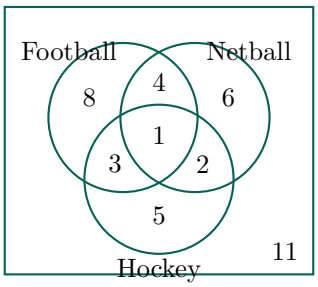
15. Using the same diagram, work out how many play exactly two sports. **[2 marks]**



the three two-way overlaps only
4 + 3 + 2 = 9
exactly two EXCLUDES the middle

Answer: 9

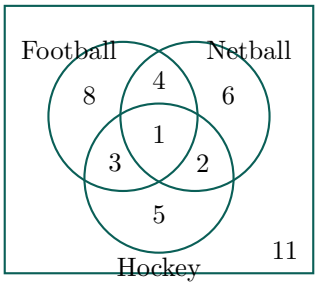
16. Using the same diagram, work out how many play no sport. **[3 marks]**



inside: 8 + 6 + 5 + 4 + 3 + 2 + 1 = 29
40 − 29 = 11

Answer: 11

17. Using the same diagram, work out the probability a pupil chosen at random plays all three sports. **[2 marks]**



the centre region is 1

Answer: $\frac{1}{40}$

18. 50 people were asked about two magazines. 28 read A, 22 read B and 9 read neither.

(a) Work out how many read both. **[4 marks]**

at least one = 50 − 9 = 41
28 + 22 = 50, but that counts the overlap twice
overlap = 50 − 41
= 9

(b) Work out how many read A only. **[2 marks]**

28 − 9
= 19

Answer: 9 both ; 19 read A only

19. In a class of 32, 20 study French, 15 study German and 4 study neither.

(a) Work out how many study both languages. **[4 marks]**

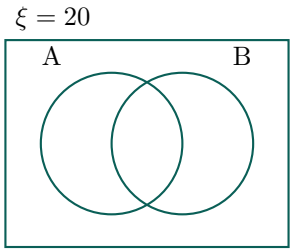
at least one = 32 − 4 = 28
20 + 15 = 35
both = 35 − 28
= 7

(b) Work out the probability that a pupil chosen at random studies German only. **[3 marks]**

German only = 15 − 7 = 8
$\frac{8}{32} = \frac{1}{4}$

Answer: _____ 7 both ; $\frac{1}{4}$ _____

20. ξ is the whole numbers from 1 to 20. A is the multiples of 4 and B is the multiples of 6.



(a) List $A \cap B$. **[3 marks]**

A: 4 8 12 16 20
B: 6 12 18
in both: {12}

(b) Work out $n(A \cup B)'$. **[3 marks]**

union: 4 6 8 12 16 18 20 → 7 numbers
not in the union: 20 − 7
= 13

Answer: _____ {12} ; 13 _____

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