GCSE MATHEMATICS

Venn Diagrams 2

AQA These questions have been taken or modified from previous AQA GCSE Mathematics Papers.

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer all questions.
- You must answer the questions in the spaces provided.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The quality of your written communication is specifically assessed in questions that are indicated with an asterisk (*).

Advice
- Read each question carefully before you start to answer it.
- In all calculations, show clearly how you work out your answer.
- Use the number of marks for the question as a guide to the amount of time you need to spend.
- Look at previous parts of the question, e.g. a), b), c) i) as there may be information there you need to answer later parts.
- Check your answer is realistic and appropriate.
- For calculator decimal numbers always write your full calculator display in the working out area and then, if you need to, round the answer on the answer line.

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1   The Venn Diagram shows two sets, A and B.
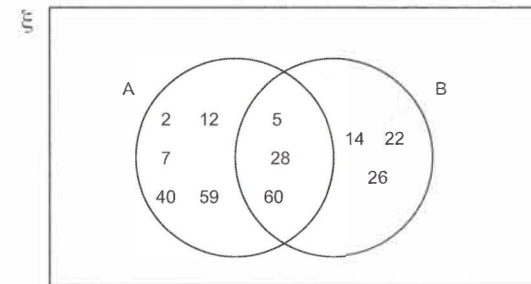
1 (a)   A number is selected at random from **set A**.

1 (a) (i)   What is the probability that it is an odd number?

Answer .... $\frac{3}{8}$ ....   [1 mark]

1 (a) (ii)   What is the probability that it is a factor of 120?

2, 12, 5, 40, 60

Answer .... $\frac{5}{8}$ ....   [1 mark]

1 (b)   A number is selected at random from A ∩ B.

What is the probability that it is a multiple of 4?

28 and 60

Answer .... $\frac{2}{3}$ ....   [2 marks]

2 The Venn diagram shows information about 60 students.

P = students who play the piano

G = students who play the guitar
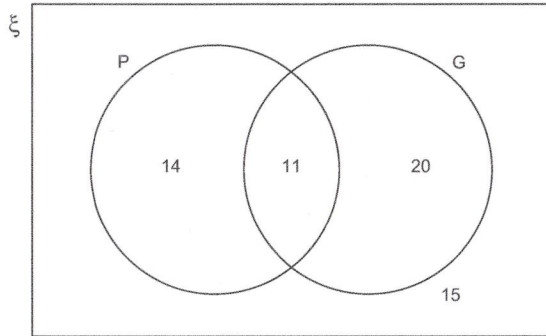
One of these 60 students is chosen at random.

2 (a) Work out the probability that the student plays the piano.

[1 mark]

$$\frac{25}{60} \quad or \quad \frac{5}{12}$$

Answer ....

2 (b) Work out the probability that the student plays the piano **and** the guitar.

[1 mark]

$$\frac{11}{60}$$

Answer ....

2 (c) One-tenth of the 60 students are male and do not play the piano or the guitar.

Work out the probability that the student is female and does not play the piano or the guitar.
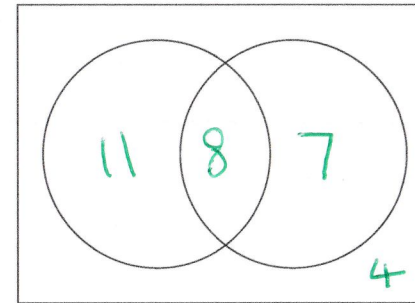
[2 marks]

$$\frac{1}{10} \times 60 = 6 \qquad 6 \text{ out of } 15 \text{ are male}$$

$$15 - 6 = 9$$

$$\frac{9}{60} \quad or \quad \frac{3}{20}$$

Answer ....

3 In a class of 30 students

19 have a brother
15 have a sister
4 do **not** have a brother or a sister.

How many students have a brother and a sister?
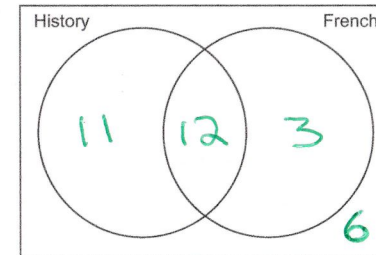You may use the Venn diagram to help you.

Answer .... 8 .... [4 marks]

4 (a) In a class there are 32 students.

23 take History.

15 take French.

6 do **not** take either of these subjects.
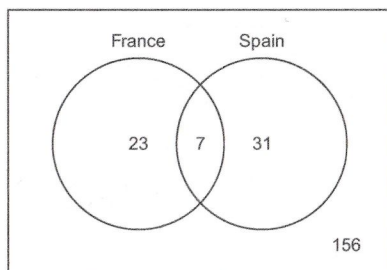
Use this information to fill in the Venn diagram below.

[3 marks]

4 (b) How many students take French but not History?

Answer .... $\frac{3}{32}$ .... [1 mark]

5 The Venn diagram shows the number of students in a year group who visited France and Spain last summer.

France   Spain

23   7   31

156

5 (a) What does the number 156 represent in the diagram?

The students in the year group who did not visit either France or Spain

[1 mark]

5 (b) How many students are there in the year group?

23 + 7 + 31 + 156

Answer   217   [1 mark]

5 (c) One student from the year group is chosen at random.

What is the probability that the student visited both Spain and France last summer?

Answer $\frac{7}{217}$ or $\frac{1}{31}$ [1 mark]

5 (d) A student from the year group visited Spain last summer.

What is the probability that this student also visited France?
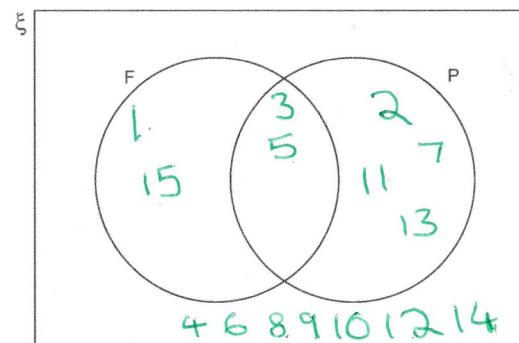
Answer $\frac{7}{38}$ [2 marks]

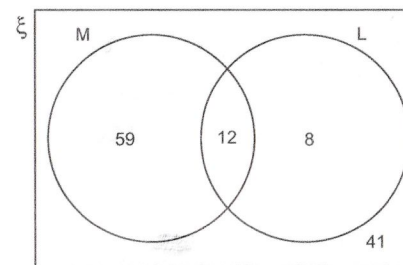**6** Write the numbers from 1 to 15 in this Venn Diagram.

[2 marks]

ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}

Set F = Factors of 15   Set P = Prime numbers

ξ

F   P

1   3   2
              5   7
15   11
                       13

4 6 8 9 10 12 14

7 The Venn diagram shows information about members of a club.
The number of men is shown in set M.
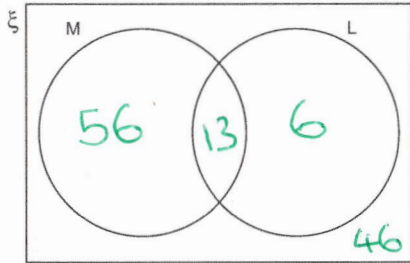The number of left-handed members is shown in set L.

ξ M   L

59   12   8

41

7 (a) How many members are in the club altogether?

59 + 12 + 8 + 41

Answer   120   [1 mark]

7 (b)   3 right-handed men leave.
1 left-handed man joins.

2 left-handed women leave.
5 right-handed women join.

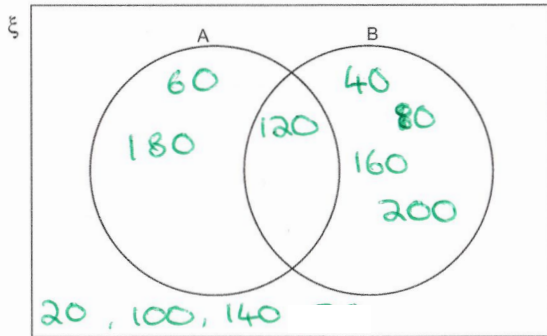Complete this Venn Diagram to show the members of the club now.

ξ
M   L

56   13   6

46

[1 mark]

8   ξ = { 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 }

Set A = multiples of 3   Set B = multiples of 8

8 (a)   Put these ten numbers into the diagram.

20   40   60   80   100   120   140   160   180   200

[2 marks]

ξ
A   B

60   40
180   120   80
160
200

20 , 100, 140

8 (b)   One of the ten numbers is chosen at random.

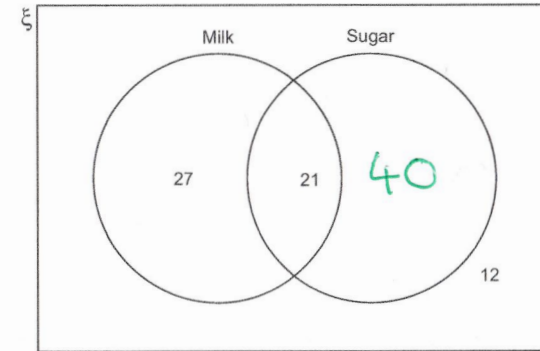Show that   the probability of **not** choosing a multiple of 3

is the same as

the probability of choosing a multiple of 3 or 8 or both.   **[1 mark]**

NOT Multiples of 3 = 7
                        ──
                        10

MULTIPLE OF 3, 8 or Both = 2+1+4 = 7
                                    ──
                                    10

9   100 men who drink coffee were asked if they have milk and sugar in their coffee.

Some of the results are shown in the Venn diagram.

ξ
Milk   Sugar

27   21   40

12

9 (a)   Complete the Venn diagram.   **[1 mark]**

9 (b)   What is the probability that one of the men, chosen at random,
has milk but **no** sugar in his coffee?

Answer   27
          ───   **[1 mark]**
          100

9 (c)   What is the probability that one of the men, chosen at random,
has **no** milk and **no** sugar in his coffee?

Answer   12   3
          ─── or ──   **[1 mark]**
          100   25

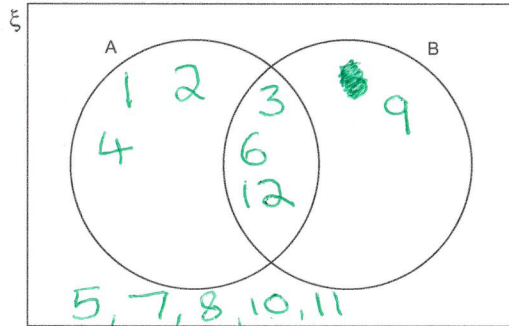**10 (a)** Write the numbers from 1 to 12 inclusive in the correct position in this Venn Diagram.

ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}

Set A = Factors of 12

Set B = Multiples of 3

ξ

A — 1 2 4 | 3 6 12 | 9 — B

5, 7, 8, 10, 11

[2 marks]

10 (b) Work out the Least Common Multiple (LCM) of the numbers in Set B.

$12 = 2 \times 2 \times 3$

$9 = 3 \times 3$

$2 \times 2 \times 3 \times 3 = 36$

Answer 36 [2 marks]

11 A car dealer has 9 **new** cars and 12 **red** cars in her showroom.
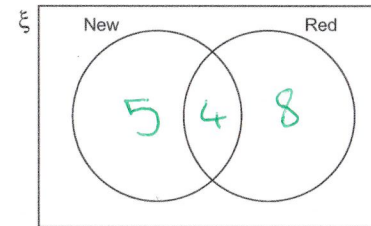There are no other cars.
She sells both new and used cars.
The ratio   new red cars : used red cars is 1 : 2

How many cars are in the showroom?
You may use the Venn diagram to help you.

[2 marks]

ξ   New   Red

5 4 8

$\dfrac{12}{3} = 4$ 1 : 2 → New Red : Used Red
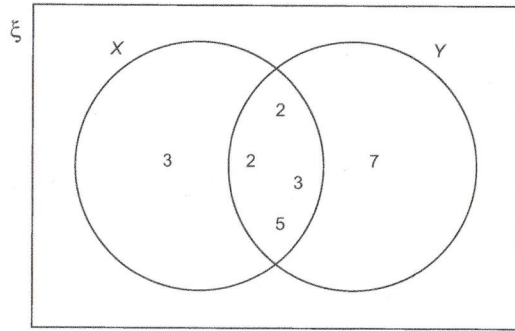   4 : 8

5 + 4 + 8

17

Answer 17

12　The Venn diagram shows the prime factors of two numbers, X and Y.

Work out the Highest Common Factor (HCF) and Least Common Multiple (LCM) of X and Y.

[2 marks]

$HCF = 2 \times 2 \times 3 \times 5 = 60$

$LCM = 3 \times 60 \times 7 = 1260$
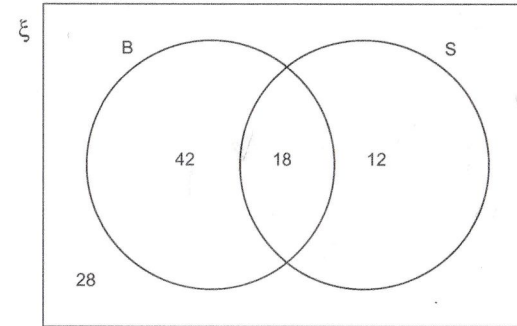
HCF _____ 60 _____

LCM _____ 1260 _____

13　The Venn diagram shows information about 100 children.

　　B is the set of boys.

　　S is the set of children who like skateboarding.

One child is chosen at random.

13 (a)　Circle the value of P(S′)

[1 mark]

0.28　　　　0.42　　　　（0.7）　　　　0.88

13 (b)　Use the values in the Venn diagram to show that　　$P(B \cap S) = P(B) \times P(S)$

[2 marks]

$P(B \cap S) = \dfrac{18}{100}$ or $\dfrac{9}{50}$

$P(B) \times P(S) = \dfrac{60}{100} \times \dfrac{30}{100}$

$= \dfrac{6}{10} \times \dfrac{3}{10} = \dfrac{18}{100} = \dfrac{9}{50}$