Two-Way Tables & Probability

Practice Worksheet (Foundation · Target Grade 5)

I Do

Fin asks 60 students in Year 10 whether they prefer rugby, football or tennis.
The two-way table gives some information about the results.

	Rugby	Football	Tennis	Total
Boys	14			32
Girls		11	12	
Total	19		18	60

(a) Complete the two-way table.

(3 marks)

(b) One of the 60 students is chosen at random.
Write down the probability that this student is a girl who prefers tennis.

..... *(1 mark)*

(Total for Question is 4 marks)

We Do

Emily asks 80 students in Year 9 whether they prefer art, drama or music.
The two-way table gives some information about the results.

	Art	Drama	Music	Total
Boys	12			42
Girls		15	14	
Total	21		26	80

(a) Complete the two-way table.

(3 marks)

(b) One of the 80 students is chosen at random.
Write down the probability that this student is a boy who prefers drama.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 1

Ash asks 100 people at a cinema whether they bought popcorn, nachos or sweets.
The two-way table gives some information about the results.

	Popcorn	Nachos	Sweets	Total
Adults		18		56
Children	22		15	
Total	48	25		100

(a) Complete the two-way table.

(3 marks)

(b) One of the 100 people is chosen at random.
Write down the probability that this person is an adult who bought sweets.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 2

Michelle asks 90 students in Year 7 and Year 8 how they travel to school.
The two-way table gives some information about the results.

	Walk	Bus	Car	Total
Year 7	16		11	
Year 8		19		46
Total	35	36		90

(a) Complete the two-way table.

(3 marks)

(b) One of the **Year 8** students is chosen at random.
Write down the probability that this student travels to school by car.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 3

Rob surveys 120 visitors at a museum about whether they prefer the History, Science or Art gallery.

- 65 of the visitors are adults.
- 24 of the adults prefer the History gallery.
- 23 of the children prefer the Science gallery.
- A total of 42 visitors prefer the History gallery.
- A total of 35 visitors prefer the Art gallery, of whom 21 are adults.

(a) Complete the two-way table below to show this information.

	History	Science	Art	Total
Adults				
Children				
Total				120

(3 marks)

(b) One of the visitors who prefers the **Science** gallery is chosen at random.
Write down the probability that this visitor is a child.

..... *(1 mark)*

(Total for Question is 4 marks)

Challenge 1

Zoe records the lunch choices of 150 students in Year 10 and Year 11. Each student chose Pasta, Salad or a Sandwich.

- 40% of the 150 students are in Year 10.
- $\frac{1}{3}$ of the Year 10 students chose Pasta.
- 25 of the Year 10 students chose a Sandwich.
- A total of 52 students chose Pasta.
- 28 of the Year 11 students chose Salad.

(a) Complete the two-way table below.

	Pasta	Salad	Sandwich	Total
Year 10				
Year 11				
Total				150

(3 marks)

(b) One of the students who chose a **Sandwich** is chosen at random.
Work out the probability that this student is in Year 11.
Give your answer as a fraction in its simplest form.

..... *(2 marks)*

(Total for Question is 5 marks)

Challenge 2

Mark asks 160 members of a gym whether they prefer swimming, running or cycling.

- The ratio of male members to female members is $3 : 5$.
- 25% of the male members prefer swimming.
- 35 female members prefer cycling.
- For the remaining female members, the ratio of those who prefer swimming to those who prefer running is $2 : 3$.
- A total of 64 members prefer running.

(a) Complete the two-way table below.

	Swimming	Running	Cycling	Total
Male				
Female				
Total				160

(3 marks)

(b) Mark chooses one member at random from those who do **not** prefer cycling.
Work out the probability that this member is male.
Give your answer as a fraction in its simplest form.

..... *(2 marks)*

(Total for Question is 5 marks)

Extreme Challenge

Catherine surveys all the students in Year 12 and Year 13 at a college about which foreign language they study: French, Spanish or German. Each student studies exactly one language.

The incomplete two-way table shows the number of students in each category, in terms of x.

	French	Spanish	German	Total
Year 12	$x + 4$	$2x$	10	
Year 13	x	$x + 8$	12	
Total				

One of the students who studies **Spanish** is chosen at random.

The probability that this student is in **Year 12** is $\frac{3}{5}$.

(a) Work out the value of x.
Show all of your algebraic working clearly.

$x =$ ..... *(3 marks)*

(b) One student is chosen at random from the entire college.
Work out the probability that this student is in Year 13 and studies French.
Give your answer as a fraction in its simplest form.

..... *(3 marks)*

(Total for Question is 6 marks)

Worked Answers

I Do (Fin)
(a) Completed rows:
Boys: 14, **12**, **6**, Total $= 32$.
Girls: **5**, 11, 12, Total $=$ **28**.
Total: 19, **23**, 18, Grand Total $= 60$.
(b) $\mathbf{\frac{12}{60}}$ *(simplifies to* $\mathbf{\frac{1}{5}}$*)*.

We Do (Emily)
(a) Completed rows:
Boys: 12, **18**, **12**, Total $= 42$.
Girls: **9**, 15, 14, Total $=$ **38**.
Total: 21, **33**, 26, Grand Total $= 80$.
(b) $\mathbf{\frac{18}{80}}$ *(simplifies to* $\mathbf{\frac{9}{40}}$*)*.

You Do 1 (Ash)
(a) Completed rows:
Adults: **26**, 18, **12**, Total $= 56$.
Children: 22, **7**, 15, Total $=$ **44**.
Total: 48, 25, **27**, Grand Total $= 100$.
(b) $\mathbf{\frac{12}{100}}$ *(simplifies to* $\mathbf{\frac{3}{25}}$*)*.

You Do 2 (Michelle)
(a) Completed rows:
Year 7: 16, **17**, 11, Total $=$ **44**.
Year 8: **19**, 19, **8**, Total $= 46$.
Total: 35, 36, **19**, Grand Total $= 90$.
(b) Out of the 46 Year 8 students, 8 travel by car: $\mathbf{\frac{8}{46}}$ *(simplifies to* $\mathbf{\frac{4}{23}}$*)*.

You Do 3 (Rob)
(a) Adults Total $= 65 \implies$ Children Total $= 120 - 65 = 55$.
Adults: History $= 24$, Science $= 65 - 24 - 21 = 20$, Art $= 21$, Total $= 65$.
Children: History $= 42 - 24 = 18$, Science $= 23$, Art $= 35 - 21 = 14$, Total $= 55$.
Totals: History $= 42$, Science $= 43$, Art $= 35$, Grand Total $= 120$.
(b) Out of the 43 Science visitors, 23 are children: $\mathbf{\frac{23}{43}}$.

Challenge 1 (Zoe)

(a) 1. Year 10 Total $= 40\%$ of $150 = 60 \implies$ Year 11 Total $= 150 - 60 = 90$.
2. Year 10 Pasta $= \frac{1}{3} \times 60 = 20$; Year 10 Sandwich $= 25 \implies$ Year 10 Salad $= 60 - 20 - 25 = 15$.
3. Year 11 Pasta $= 52 - 20 = 32$; Year 11 Salad $= 28 \implies$ Year 11 Sandwich $= 90 - 32 - 28 = 30$.
4. Column totals: Pasta $= 52$, Salad $= 15 + 28 = 43$, Sandwich $= 25 + 30 = 55$.

(b) Out of the 55 students who chose a Sandwich, 30 are in Year 11:
$\frac{30}{55} = \mathbf{\frac{6}{11}}$.

Challenge 2 (Mark)

(a) 1. Split 160 in the ratio $3 : 5$ (8 parts; 1 part $= 20$):
Male Total $= 60$, Female Total $= 100$.
2. Male Swimming $= 25\%$ of $60 = 15$.
3. Female Cycling $= 35 \implies$ Remaining females $= 100 - 35 = 65$.
Split 65 in the ratio $2 : 3$ (5 parts; 1 part $= 13$):
Female Swimming $= 26$, Female Running $= 39$.
4. Male Running $= 64 - 39 = 25 \implies$ Male Cycling $= 60 - 15 - 25 = 20$.
5. Column totals: Swimming $= 15 + 26 = 41$, Running $= 64$, Cycling $= 20 + 35 = 55$.

(b) Members who do not prefer cycling $= 160 - 55 = 105$.
Male members who do not prefer cycling $= 15 + 25 = 40$.
Probability $= \frac{40}{105} = \mathbf{\frac{8}{21}}$.

Extreme Challenge (Catherine)

(a) Total students studying Spanish $= 2x + (x + 8) = 3x + 8$.
Set up the probability equation for Year 12 Spanish students:
$\frac{2x}{3x + 8} = \frac{3}{5}$
Cross-multiply:
$5(2x) = 3(3x + 8)$
$10x = 9x + 24 \implies \mathbf{x = 24}$.

(b) Substitute $x = 24$ into the table:
- Year 12: French $= 28$, Spanish $= 48$, German $= 10$ (Total $= 86$).
- Year 13: French $= 24$, Spanish $= 32$, German $= 12$ (Total $= 68$).
- Grand Total $= 86 + 68 = 154$.

Probability of selecting a Year 13 student who studies French:
$\frac{24}{154} = \mathbf{\frac{12}{77}}$.