

# Combinations (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. A restaurant menu has 8 starters, 12 mains and 6 desserts.

A customer can choose from the following meals

- a starter and a main,
- a main and a dessert,
- a starter, a main and a dessert.

Show that there are 744 different ways of choosing a meal at this restaurant.

$$\begin{aligned}
 S+M &= 8 \times 12 = 96 \\
 M+D &= 12 \times 6 = 72 \\
 S+M+D &= 8 \times 12 \times 6 = 576 \\
 &\quad \underline{744}
 \end{aligned}
 \quad \text{so 744 different ways}$$

[3]

2. There are 17 men and 26 women in a choir.

The choir is going to sing at a concert.

One of the men and one of the women are going to be chosen to make a pair to sing the first song.

(a) Work out the number of different pairs that can be chosen.

$$\begin{array}{r}
 26 \\
 17 \\
 \hline
 260 \\
 182 \\
 \hline
 442
 \end{array}
 \quad 17 \times 26 = 442$$

.....442..... [2]

Two of the men are to be chosen to make a pair to sing the second song.

Ben thinks the number of different pairs that can be chosen is 136

Mark thinks the number of different pairs that can be chosen is 272

(b) Who is correct, Ben or Mark?

Give a reason for your answer.

$$\frac{1}{2}n^2 - \frac{1}{2}n \Rightarrow \frac{1}{2} \times 17^2 - \frac{1}{2} \times 17$$

$$144.5 - 8.5 = 136$$

so Ben is correct.

$$\begin{array}{r}
 17 \\
 17 \\
 \hline
 170 \\
 169 \\
 \hline
 289
 \end{array}
 \quad \begin{array}{r}
 144.5 \\
 2 \overline{)289.0} \\
 \hline
 144.5
 \end{array}$$

[1]

3. There are 14 boys and 12 girls in a class.

Work out the total number of ways that 1 boy and 1 girl can be chosen from the class.

$$\begin{array}{r} 14 \\ \times 12 \\ \hline 140 \\ 28 \\ \hline 168 \end{array} \quad \text{so } 168 \text{ ways.}$$

[2]

4. Marie has 25 cards.

Each card has a different symbol on it.

Marie gives one card to Shelley and one card to Pauline.

a) In how many different ways can Marie do this?

$$\frac{1}{25} \times \frac{1}{24} = \frac{1}{600} \Rightarrow 600 \text{ different ways.}$$

..... [2]

There are 12 boys and 10 girls in David's class.

David is going to pick three different students from his class and write their names in a list in order.

The order will be

$$P(B_1) = \frac{1}{12} \quad \frac{1}{12} \times \frac{1}{10} \times \frac{1}{11}$$

$$P(G_1) = \frac{1}{10} = \frac{1}{1320}$$

$$P(B_2) = \frac{1}{11}$$

boy
girl
boy

or

girl
boy
girl

$$P(G_1) = \frac{1}{10} \quad \frac{1}{10} \times \frac{1}{12} \times \frac{1}{9}$$

$$P(B_1) = \frac{1}{12} = \frac{1}{1080}$$

$$P(G_2) = \frac{1}{9}$$

b) How many different lists can David write?

$$1320 + 1080 = 2400$$

so 2400 different lists

..... [3]

5. Tony and Ian are each buying a new car.

There are three upgrades that they can select:

- metallic paint (10 different choices)
- alloy wheels (5 different choices)
- music system (3 different choices).

$$P(M) = \frac{1}{10}$$

$$P(A) = \frac{1}{5}$$

$$P(Mu) = \frac{1}{3}$$

$$\frac{1}{10} \times \frac{1}{5} \times \frac{1}{3} = \frac{1}{150}$$

a) Tony selects all 3 upgrades.

Show that there are 150 different possible combinations.

$\Rightarrow$  there are 150 different combinations [1]

b) Ian selects 2 of these upgrades.

Show that there are 95 different possible combinations.

$$P(M) = \frac{1}{10} \quad P(A) = \frac{1}{5} \quad P(M_u) = \frac{1}{3}$$

$$\Rightarrow \frac{1}{10} \times \frac{1}{5} \text{ or } \frac{1}{10} \times \frac{1}{3} \text{ or } \frac{1}{5} \times \frac{1}{3}$$

$$\frac{1}{50} \text{ or } \frac{1}{30} \text{ or } \frac{1}{15} \Rightarrow 50 + 30 + 15 = 95$$

$\Rightarrow$  there are 95 different possible combinations.

[3]

6. A menu has a choice of 3 starters, 5 main courses and 4 desserts.

How many different choices of a 3-course meal are possible?

Circle your answer.

12

23

60

972

[1]

$$P(S) = \frac{1}{3} \quad P(M) = \frac{1}{5} \quad P(D) = \frac{1}{4}$$

$$\frac{1}{3} \times \frac{1}{5} \times \frac{1}{4} = \frac{1}{60} \Rightarrow 60 \text{ different combinations.}$$