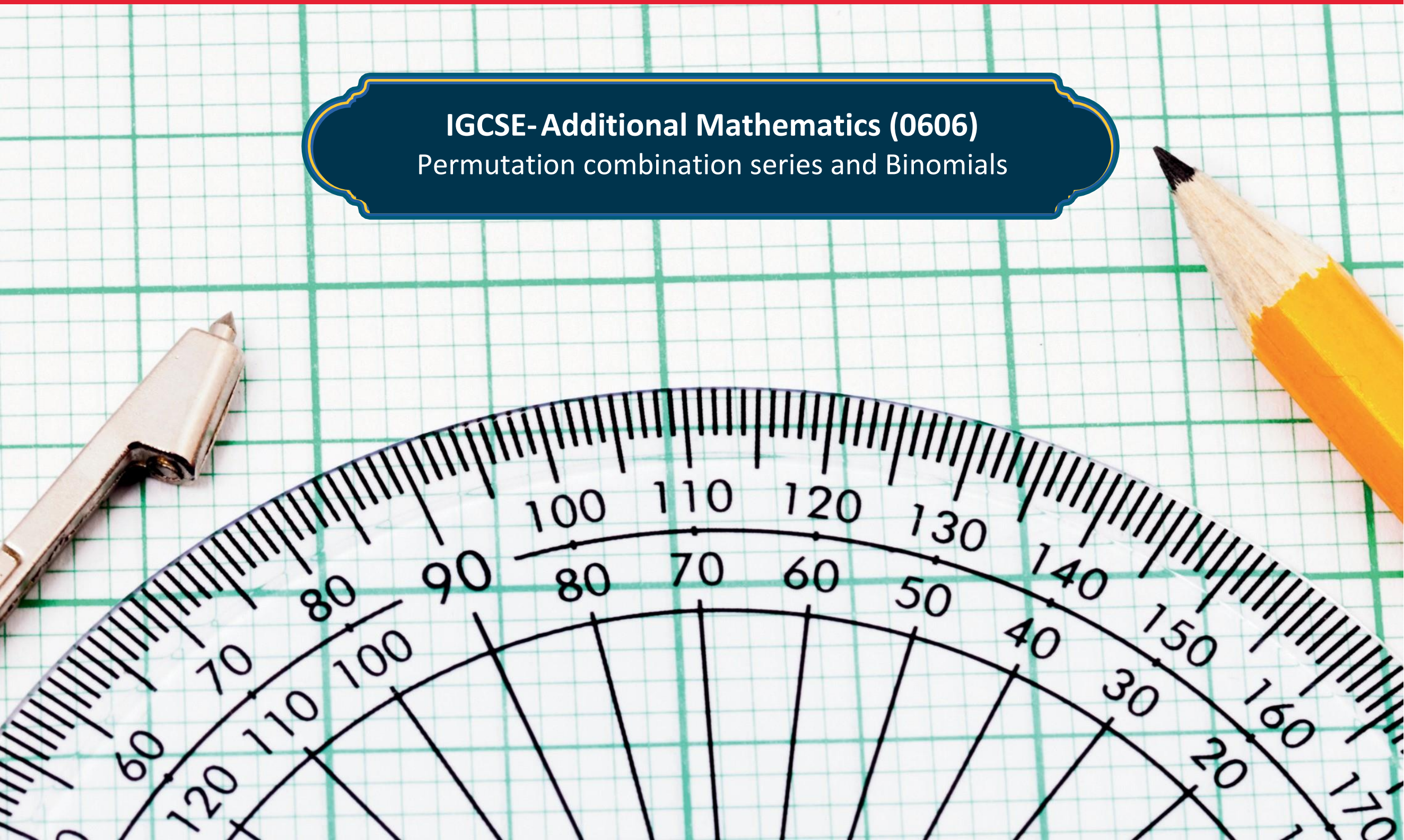




# MATH TOPICAL WORKSHEETS

# IGCSE-Additional Mathematics (0606)

## Permutation combination series and Binomials





1 Given that  $45 \times {}^nC_4 = (n+1) \times {}^{n+1}C_5$ , find the value of  $n$ .

(4 marks)

**2 (a)** The first 5 terms of a sequence are given below.

4   -2   1   -0.5   0.25

(i) Find the 20th term of the sequence.

[2]

(ii) Explain why the sum to infinity exists for this sequence and find the value of this sum.

[2]

**(4 marks)**

(b) The tenth term of an arithmetic progression is 15 times the second term. The sum of the first 6 terms of the progression is 87.

(i) Find the common difference of the progression.

[4]

(ii) For this progression, the  $n$ th term is 6990. Find the value of  $n$ .

[3]

- 3** (i) Find how many different 5-digit numbers can be formed using five of the eight digits 1, 2, 3, 4, 5, 6, 7, 8 if each digit can be used once only.

[2]

- (ii) Find how many of these 5-digit numbers are greater than 60 000.

[2]

**(4 marks)**

- 4 (a)** A geometric progression has a first term of 3 and a second term of 2.4. For this progression, find the sum of the first 8 terms.

**(3 marks)**

- (b)** Find the sum to infinity.

**(1 mark)**

- (c)** Find the least number of terms for which the sum is greater than 95% of the sum to infinity.

**(4 marks)**

- 5 The first three terms in the expansion of  $(a + bx)^5 (1 + x)$  are  $32 - 208x + cx^2$ . Find the value of each of the integers  $a$ ,  $b$  and  $c$ .

**(7 marks)**

- 6 (i) Find how many different 5-digit numbers can be formed using the digits 1, 3, 5, 6, 8 and 9. No digit may be used more than once in any 5-digit number.
- (ii) How many of these 5-digit numbers are odd?
- (iii) How many of these 5-digit numbers are odd and greater than 60 000?

**(5 marks)**



**7 (a)** The 7th and 10th terms of an arithmetic progression are 158 and 149 respectively.

Find the common difference and the first term of the progression.

**(3 marks)**

**(b)** Find the least number of terms of the progression for their sum to be negative.

**(3 marks)**

- 8 (a)** The sum of the first 4 terms of an arithmetic progression is 38 and the sum of the next 4 terms is 86. Find the first term and the common difference.

**(5 marks)**

- (b)** The third term of a geometric progression is 12 and the sixth term is -96. Find the sum of the first 10 terms of this progression.

- 9 A team of 3 people is to be selected from 4 men and 5 women. Find the number of different teams that could be selected which include at least 2 women.

**(2 marks)**



**10 (a)** In an arithmetic sequence, the 20<sup>th</sup> term is 10% of the sum of the first 25 terms.

The sum of the 20<sup>th</sup> term and the 21<sup>st</sup> term is 73.

Find the 8<sup>th</sup> term.

**(6 marks)**

(b) In a geometric sequence, the sum to infinity is 64 and the sum of the first 7 terms is  $\frac{127}{2}$ .

Find the ratio of the 4<sup>th</sup> term to the 7<sup>th</sup> term, giving your answer in the form  $m : 1$ .

**(6 marks)**

**11 (a)** A 4-digit number is created where each digit must be greater than or equal to 3. The same digit must not appear more than once.

(i) Find the number of 4-digit numbers that can be created.

(ii) Find the number of 4-digit numbers that can be created that are less than 9000.

**(3 marks)**



- (b) A shelf holds 5 horror books, 6 romance books and 4 travel books. I choose six books from the shelf to read.

Find the number of selections possible in the following cases:

- (i) I choose an equal number of each type of book,
- (ii) I choose 4 horror books and at least 1 travel book.

**(5 marks)**

- 12** The first 3 terms in the expansion of  $(3 - ax)^5$ , in ascending powers of  $x$ , can be written in the form  $b - 81x + cx^2$ . Find the value of each of  $a$ ,  $b$  and  $c$ .

**(5 marks)**

- 13 (a)** In an arithmetic progression, the 5th term is equal to  $\frac{1}{3}$  of the 16th term. The sum of the 5th term and the 16th term is equal to 33.

Find the sum of the first 10 terms of this progression.

**(6 marks)**



- (b) In a geometric progression, the sum of the first two terms is equal to 16. The sum to infinity is equal to 25.

Find the possible values of the first term.

14 In the expansion of  $\left(1 + \frac{x}{2}\right)^n$  the coefficient of  $x^4$  is half the coefficient of  $x^6$ .

Find the value of the positive constant  $n$ .

**(6 marks)**

**15** (i) Find the first 3 terms in the expansion of  $(1 + 3x)^6$ , in ascending powers of  $x$ . Simplify the coefficient of each term.

(ii) When the expansion of  $(1 + 3x)^6(a + x)^2$  is written in ascending powers of  $x$ , the first three terms are  $4 + 68x + bx^2$ , where  $a$  and  $b$  are constants. Find the value of  $a$  and the value of  $b$ .

**(5 marks)**

- 16 (a)** A photographer takes 12 different photographs. There are 3 photographs of sunsets, 4 of oceans and 5 of mountains.

The photographs are arranged in a line on a wall.

- (i) Find the number of possible arrangements if the first photograph is of a sunset and the last photograph is of an ocean.
- (ii) Find the number of possible arrangements if all the photographs of mountains are next to each other.

**(4 marks)**

**(b)** Three of the photographs are selected for a competition.

(i) Find the number of different possible selections if no photograph of a sunset is chosen.

(ii) Find the number of different possible selections if one photograph of each type (sunset, ocean, mountain) is chosen.

**(4 marks)**



- 17** (i) Find how many different 5-digit numbers can be formed using the digits 1, 2, 3, 5, 7 and 8, if each digit may be used only once in any number.

[1]

- (ii) How many of the numbers found in part (i) are not divisible by 5?

[1]

- (iii) How many of the numbers found in part (i) are even and greater than 30 000?

[4]

18

[Maximum mark: 6]

Find the term independent of  $x$  in the expansion of  $\frac{1}{x^3} \left( \frac{1}{3x^2} - \frac{x}{2} \right)^9$ .

19

(a) Write down the quadratic expression  $2x^2 + x - 3$  as the product of two linear factors. *[1 mark]*

(b) Hence, or otherwise, find the coefficient of  $x$  in the expansion of  $(2x^2 + x - 3)^8$ . *[4 marks]*

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