

DP Analysis & Approaches SL / HL

Maths with Lemon

Lesson 1.6: The Binomial Theorem — Worksheet

Mathematician: _____

SL 1.9	Guidance, o
The binomial theorem	Expansion o ment of the t

Warm Up

Expand without using the binomial theorem.

a) $(x + 2)^2$

b) $(x + 2)^3$

c) $(x + 2)^4$

What patterns do you notice in the coefficients and powers? **The Binomial Theorem**

Complete:

$$(a + b)^n = \underline{\hspace{10cm}}$$

$$T_{r+1} = \underline{\hspace{10cm}}$$

The number of terms in $(a + b)^n$ is .

1. Fully Expanding

Expand fully:

$$(2 + x)^5$$

You Try: Expand fully:

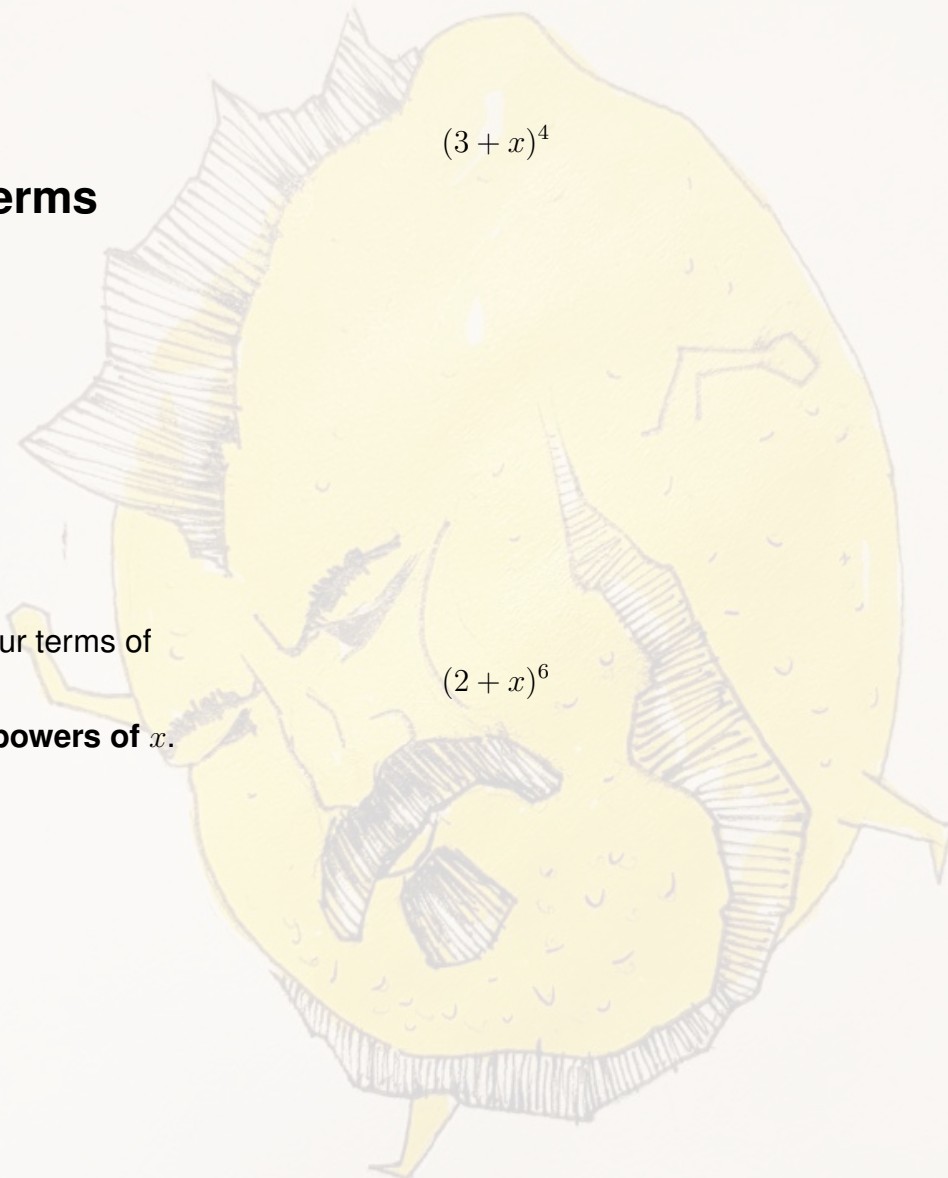
2. First Terms

Find the first four terms of

in **increasing powers of x** .

$$(3 + x)^4$$

$$(2 + x)^6$$



3. Paying Attention to the Order

Find the first four terms of

$$(1 + 2x)^7$$

in decreasing powers of x .

4. Identifying a Specified Coefficient

Find the coefficient of y^3 in

$$(2 - 3y)^7.$$

General term:

$$T_{r+1} =$$

Which value of r is required?

$$r = \boxed{}$$



5. Try It!

1. Find the coefficient of y^4 in

$$(2 + y)^9.$$

2. Find the coefficient of x^6 in

$$(1 - 2x)^{10}.$$

3. Find the coefficient of x^5 in

$$(5 + 3x)^7.$$



6. Multiple x -Terms

Find the coefficient of x^{27} in

$$(x^2 + 3x)^{15}.$$

Start with

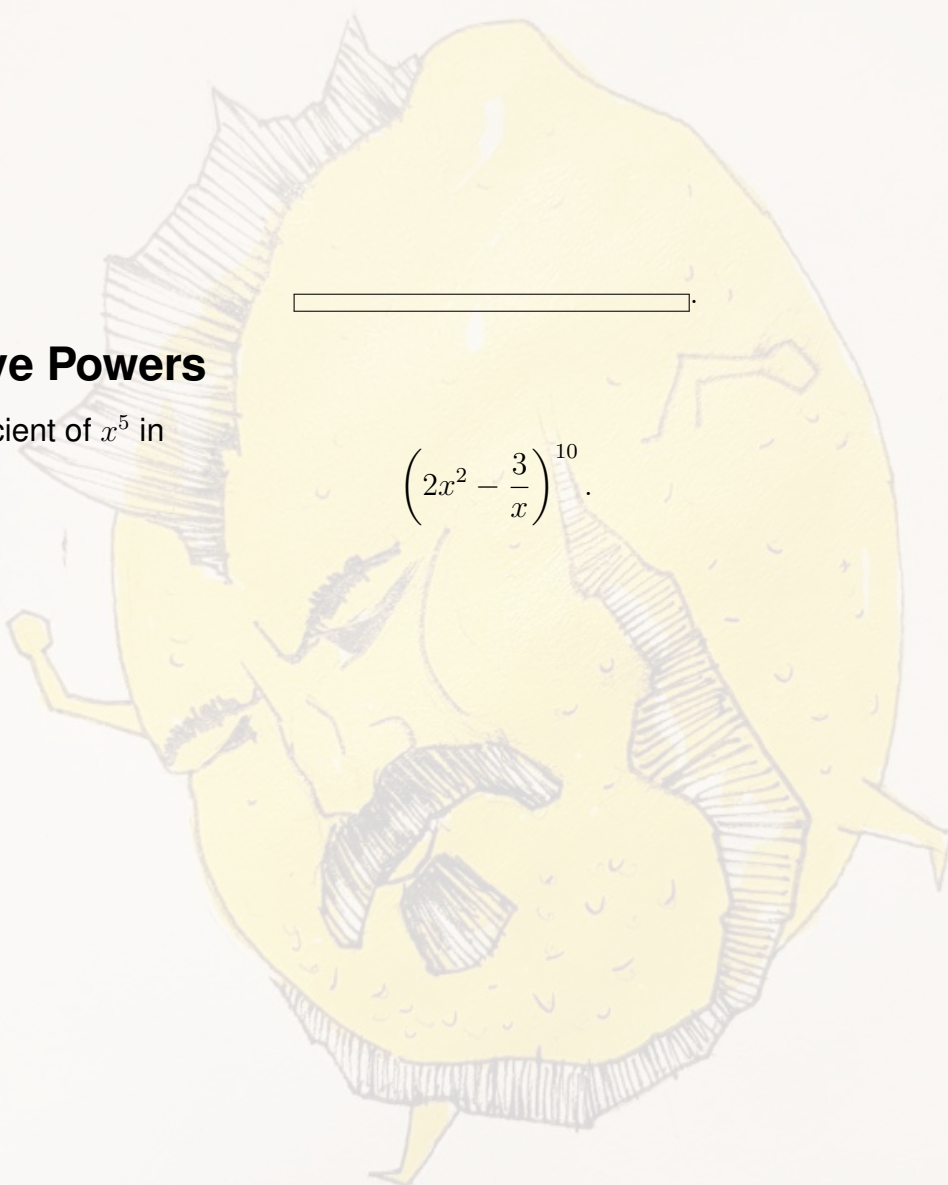
$$T_{r+1} = \binom{15}{r} (x^2)^{15-r} (3x)^r.$$

Simplify the power of x and solve for r . Hence the coefficient is

7. Negative Powers

Find the coefficient of x^5 in

$$\left(2x^2 - \frac{3}{x}\right)^{10}.$$



8. Constant Terms

Find the constant term in

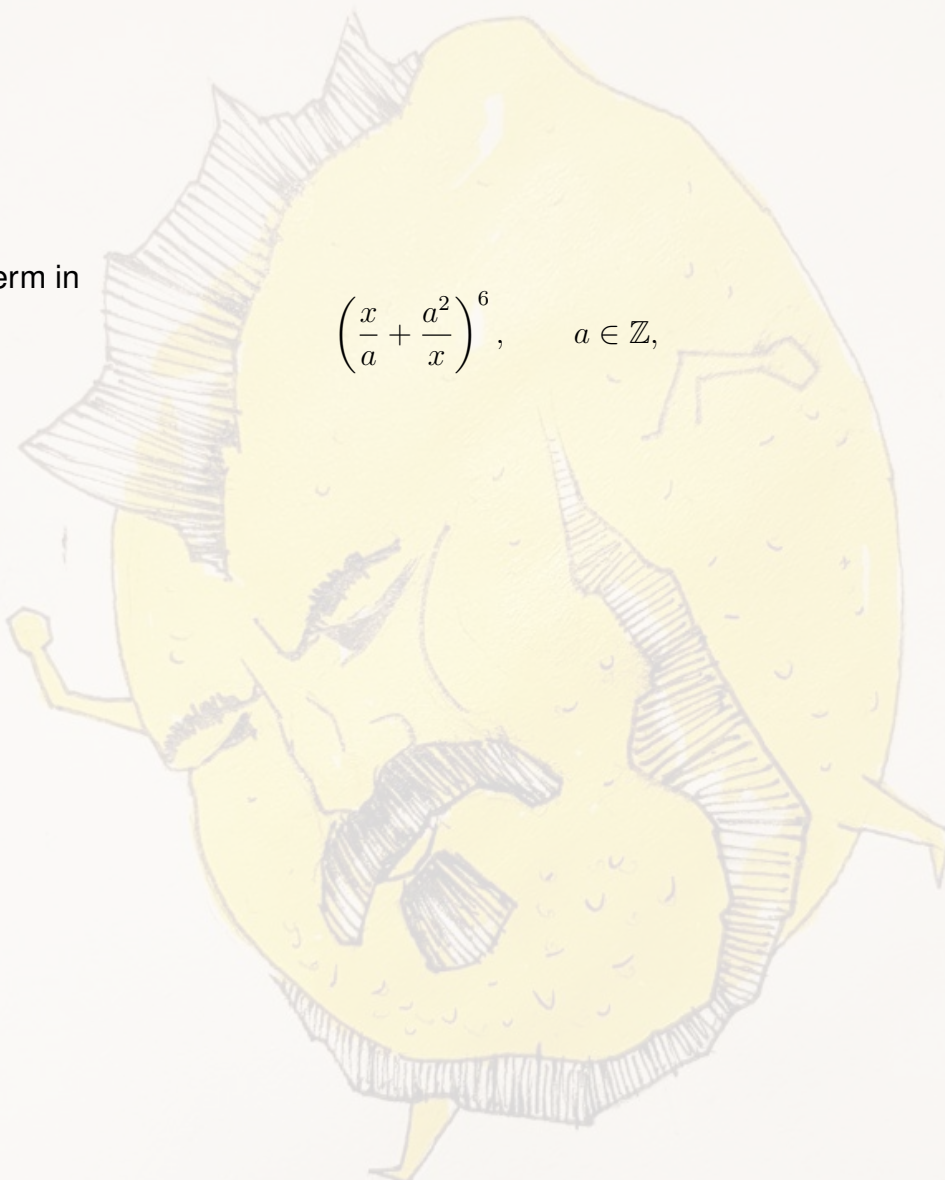
$$\left(x^2 + \frac{2}{x}\right)^6.$$

9. Challenge

The constant term in

$$\left(\frac{x}{a} + \frac{a^2}{x}\right)^6, \quad a \in \mathbb{Z},$$

is 1280. Find a .



10. Further Challenge

Find the smallest positive integer n for which the expansion of

$$x^{-2} \left(\frac{7}{x^3} + 5x^5 \right)^n$$

contains a term in x^{-9} .

11. Exam-Style Question 1

In the expansion of

$$(3x - 2)^{12},$$

the term in x^5 can be expressed as

$$\binom{12}{r} (3x)^p (-2)^q.$$

(a) Write down p , q and r .

[3]

(b) Find the coefficient of the term in x^5 .

[2]

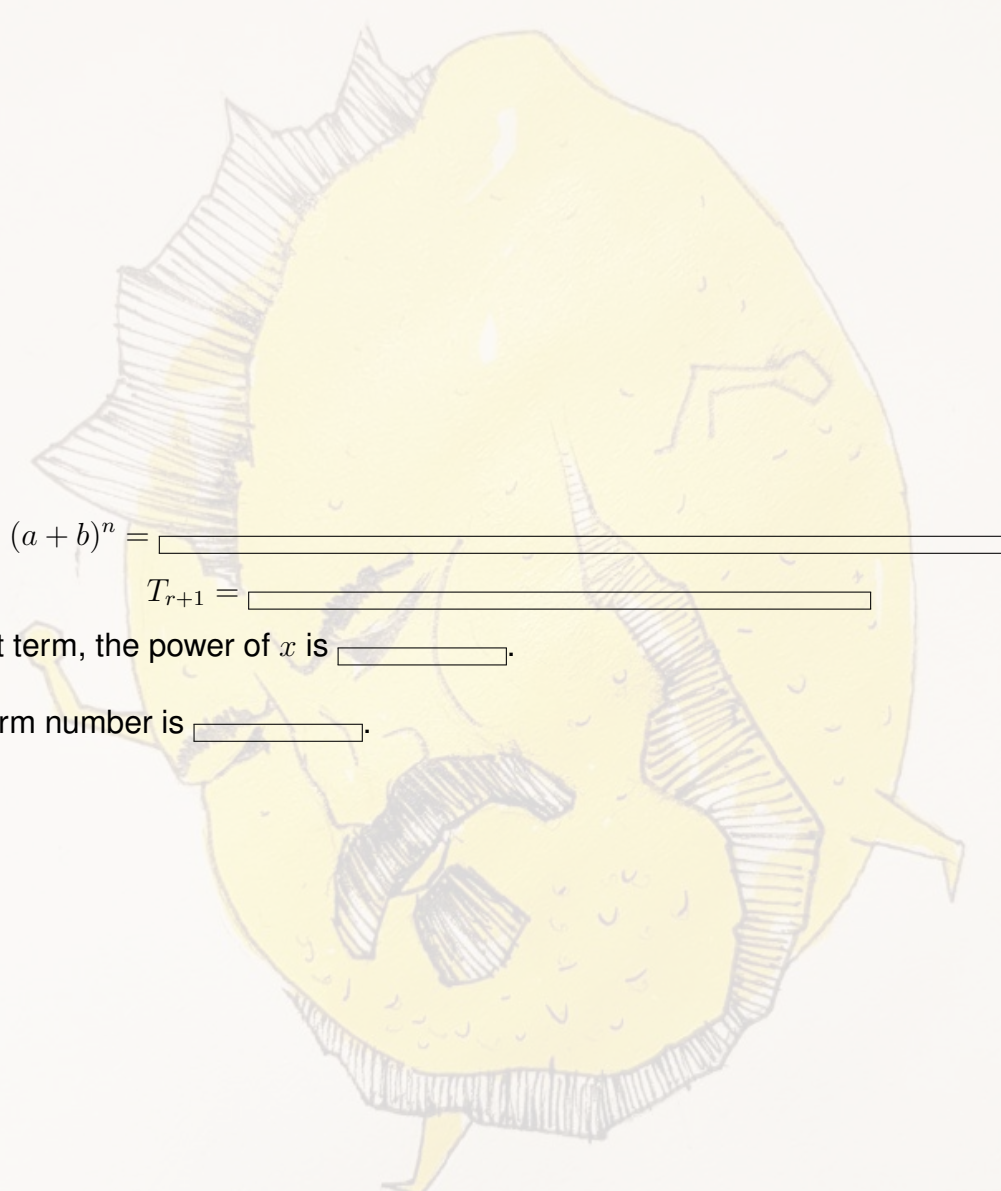
12. Exam-Style Question 2

The constant term in the expansion of

$$\left(\frac{x}{a} + \frac{a^2}{x}\right)^6, \quad a \in \mathbb{Z},$$

is 1280. Find a .

[7] **Final Check**


$$(a + b)^n = \text{_____}$$

$$T_{r+1} = \text{_____}$$

For a constant term, the power of x is _____.

If $r = 4$, the term number is _____.



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Mathematics made clear.