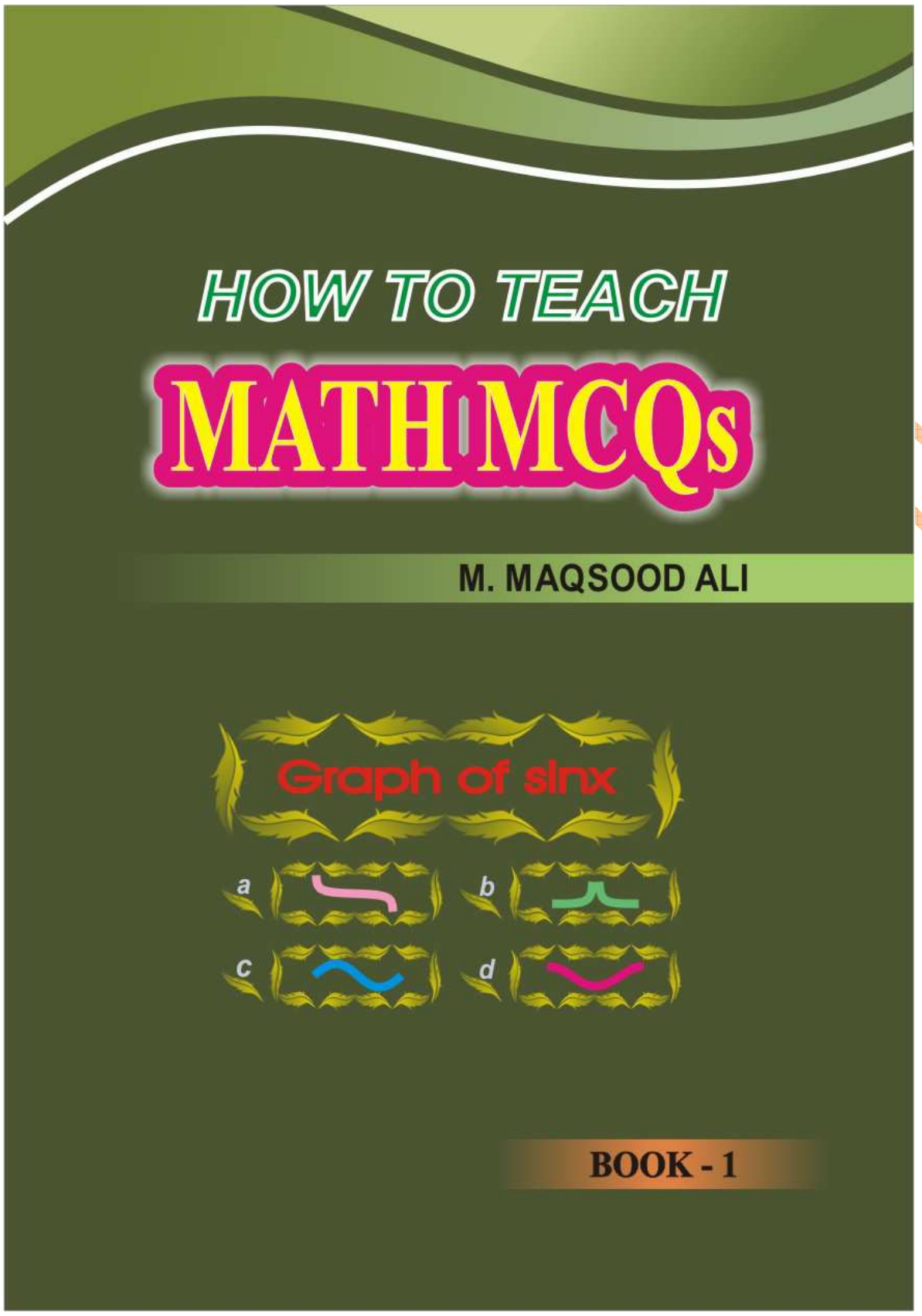
HOW TO TEACH
MATH MCQs
M. MAQSOOD ALI
Graph of sinx
a
b
c
d
BOOK - 1

Chapter 12

BINOMIAL THEOREM

Case-1: $n \in \mathbb{N}$.

i) $(a+b)^n = a^n + {}^nC_1 a^{n-1}b + C_2 a^{n-2}b^2 + {}^nC_3 a^{n-3}b^3 + \cdots + b^n$

ii) $(a-b)^n = a^n - {}^nC_1 a^{n-1}b + {}^nC_2 a^{n-2}b^2 - {}^nC_3 a^{n-3}b^3 + \cdots \pm b^n$

or

i) $(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \cdots + b^n$

ii) $(a-b)^n = a^n - na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 - \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \cdots \pm b^n$

MCQ- 1:

What is the first three terms of the expansion $(x-2y)^9$?

a) $x^9 - 18x^8y + 144x^7y^2$ b) $x^9 - 9x^8y + 144x^7y^2$

c) $x^9 - 18x^8y + 288x^7y^2$ d) $x^9 + 9x^8y + 144x^7y^2$

Solution:

$$(x-2y)^9$$

$$= x^9 - 9x^8(2y)^1 + \frac{9(9-1)}{2!}x^7(2y)^2$$

$$= x^9 - 9x^8(2y) + \frac{9.8}{2}x^7(4y^2)$$

$$= x^9 - 18x^8y + 144x^7y^2$$

The answer is (a).

MCQ- 2:

What is the first three terms of the expansion $(x^2 + 3y)^{10}$?

a) $x^{20} + 30x^{18}y + 990x^8y^2$ b) $x^{20} + 30x^{18}y + 135x^{16}y^3$

c) $x^{20} + 30x^{18}y + 405x^{16}y^2$ d) $x^{20} + 30x^{18}y + 120x^8y^4$

Solution:

Note: Do not expand to three terms. There is only third term is different in each option.

There are two options to confirm the answer.

i) Coefficients are different in four options. Calculate the coefficient only.

ii) Powers of x *and* y are different in four options. Calculate the power of x and y.

$$\frac{10.(10-1)}{2!}(x^2)^8(3y)^2$$

$$= \frac{10.9}{2}.x^{16}.9y^2$$

$$= 405x^{16}y^2$$

The answer is (c).

EXERCISE- 1

(1) $(x^2 + y)^{10}$ =? to three terms.

(a) $x^{20} + 10x^{18}y + 40x^{16}y^2$

(b) $x^{20} + 10x^{18}y + 45x^{16}y^2$

(c) $x^{20} + 8x^{16}y + 20x^{12}y$

(d) $x^{20} + 10x^{19}y + 90x^{18}y^2$

(2) $(x^3 - y^2)^8$ =? to three terms.

(a) $x^{24} + 8x^{21}y^2 + 32x^{20}y^4$

(b) $x^{24} + 8x^{21}y^2 + 56x^{18}y^4$

(c) $x^{24} + 8x^{21}y^2 + 48x^{18}y^3$

(d) $x^{24} + 8x^{21}y^2 + 28x^{18}y^4$

$(r+1)th$ TERM OF $(a+b)^n$

$$T_{r+1} = {}^nC_r \, a^{n-r} b^r$$

MCQ-3 :

What is the fifth term of $(2x+y)^{10}$?

(a) $64.{}^{10}C_4 \; x^4y^4$ (b) $32.{}^{10}C_6 \; x^6y^6$

(c) $32.{}^{10}C_5 \; x^5y^5$ (d) $64.{}^{10}C_4 \; x^6y^4$

Solution:

$$(2x+y)^{10}$$

$a = 2x \;,\; b = y \;,\; n = 10$

For fifth term

$r = 5 - 1 = 4$ {beacuse $r + 1 = 5$

$n - r = 10 - 4 = 6$

$$T_{r+1} = {}^nC_r a^{n-r} b^r$$

$$= {}^{10}C_4 . 2^6 . x^6 . y^4$$

$$= 64.{}^{10}C_4 \; x^6y^4$$

The answer is (d).

Shortcut:

$r = 4$ and $n - r = 10 - 4 = 6$

$n - r$: Power of a and r: Power of b

$\because a = 2x$ and $b = y$

$\therefore$ Power of x is 6 and y is 4.

The answer is (d).

EXERCISE-2

(1) What is the 3rd term of the expansion $(a^2 + 2b)^{10}$?

(a) 0 (b) $4\binom{10}{2}a^{12}b^6$ (c) $180a^{16}b^2$ (d) $-75a^{10}b^5$

(2) What is the 7th term of the expression $(a^3 + 2b^2)^9$?

(a) $-\binom{9}{7}a^9b^6$ (b) $64\binom{9}{7}a^9b^{12}$ (c) $64\binom{9}{6}a^9b^{12}$ (d) $-64\binom{9}{7}a^9b^{12}$

(3) What is the 5th term of the expansion $(x^2+2)^8$?

(a) $16\binom{8}{4}x^6$ (b) $32\binom{8}{5}x^6$ (c) $-8\binom{8}{4}x^6$ (d) $32\binom{8}{6}x^{10}$

(4) What is the 4th term of the expansion $(1+3b^2)^{12}$?

(a) $81\binom{12}{4}b^8$ (b) $27\binom{12}{3}b^6$ (c) $81\binom{12}{3}b^4$ (d) $9\binom{12}{4}b^6$

MIDDLE TERM

Middle term of $(a+b)^n$.

Case-1: **n is even.**

There is only one middle term.

$\left(\frac{n+2}{2}\right)th$ term is the middle term.

Case-2: n is odd:

There are two middle terms:

$\left(\frac{n+1}{2}\right)th$ and $\left(\frac{n+3}{2}\right)th$ terms are middle terms.

MCQ- 4:

What is the middle term of $(x+2y^3)^8$?

(a) (b) $16\ {}^8C_4x^4y^{12}$ (c) (d)

$$a = x\ ,\ b = 2y^3,\ n = 8$$

$$\frac{n+2}{2}$$

$$= \frac{8+2}{2}$$

$$= \frac{10}{2}$$

$$= 5$$

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MCQ- 7:

Which term of the expansion $(6x^3 + {}^{2}/_{x^3})^8$ is independent of x?

(a) 3th (b) 4th (c) 5th (d) 6th

Solution:

$$a = 6x^3 \quad , \quad b = {}^{2}/_{x^3} = 2x^{-3} \quad , \quad n = 8$$

$$n - r = 8 - r$$
$$3(8 - r) - 3r = 0$$
$$24 - 3r - 3r = 0$$
$$r = 4$$

$$T_{r+1} = T_{4+1} = T_5$$

The answer is (c).

EXERCISE-4

(1) What is the coefficient of x^6 in the expansion of $(1 + 2x^2)^6$?

(a) $4\binom{5}{3}$ (b) $8\binom{6}{2}$ (c) $8\binom{6}{3}$ (d) $4\binom{6}{2}$

(2) What is the coefficient of x^{12} in the expansion of $(1 + 3x^3)^{10}$?

(a) $27\binom{9}{3}$ (b) $81\binom{10}{4}$ (c) $27\binom{9}{4}$ (d) $81\binom{10}{3}$

(3) What is the term independent of x in the expansion of $(x + \frac{1}{x})^8$?

(a) $\binom{8}{4}$ (b) $\binom{8}{3}$ (c) $\binom{7}{4}$ (d) $\binom{8}{5}$

(4) What is the term independent of x in the expansion of $(x^2 + \frac{2}{x^2})^6$?

(a) 16 $\binom{6}{5}$ (b) 8 $\binom{5}{4}$ (c)16 $\binom{6}{4}$ (d) 8 $\binom{6}{3}$

(5) Which term of the expansion $\left(x^2 + \frac{1}{x}\right)^{20}$ involving x^7?

(a) 9^{th} (b) 10^{th} (c) 11^{th} (d) 12^{th}

(6) Which term of the expansion $\left(x^3 + \frac{1}{2x^2}\right)^{10}$ involving x^5?

(a) 5^{th} (b) 6^{th} (c) 7^{th} (d) 8^{th}

Case-2: $n = \pm {}^{p}/_{q}$; $(q \neq 1,\ q \neq 0)$ **or n is negative integers:**

(a) $(1+b)^n = 1 + nb + \frac{n(n-1)}{2!}b^2 + \frac{n(n-1)(n-2)}{3!}b^3 + \cdots$

(b) $(1-b)^n = 1 - nb + \frac{n(n-1)}{2!}b^2 - \frac{n(n-1)(n-2)}{3!}b^3 + \cdots$

MCQ-8 :

What are the first three terms of $(1+3x^5)^{-8}$?

(a) $1 - 24x^5 + 32x^{10}$ (b) $1 + 24x^5 + 108x^{10}$

(c) $1 - 24x^5 + 324x^{10}$ (d) $1 - 8x^5 + 648x^{10}$

Solution:

$$(1+3x^5)^{-8}$$

$$= 1 + (-8)(3x^5) + \frac{(-8)(-8-1)}{2!}(3x^5)^2$$

$$= 1 + (-8).(3x^5) + \frac{(-8)(-9)}{2}(9x^{10})$$

$$= 1 - 24x^5 + 324x^{10}$$

The answer is (c).

EXERCISE-5

(1) $(1+x)^{-6}$ =? to three terms.

(a) $1 - 6x + 21x^2$ (b) $1 - 6x + 15x^2$

(c) $1 - 6x + 42x^2$ (d) $1 - 6x + 12x^2$

(2) $(1-x)^{-8}$ =? to three terms.

(a) $1 + 6x + 24x^2$ (b) $1 + 4x + 48x^2$

(c) $1 + 8x + 28x^2$ (d) $1 + 8x + 36x^2$

$(r+1)th$ TERM OF $(1+b)^n$

$$T_{r+1} = \frac{n(n-1)(n-2)\ldots\ldots\{n-(r-1)\}}{r!}b^r$$

FIRST NEGATIVE TERM

For first negative term

$$n-(r-1)<0$$
$$n-r+1<0$$
$$r>n+1$$

Shortcut:

$$r=[n]+1$$

Note: (i) $[x]$ is called "least integer function".
For example,
$[3.05]=4,\ [6.97]=7,\ [54.2]=55,\ [0.4]=1$
(ii) $\lfloor x \rfloor$ is called "greatest integer function".
For example,
$\lfloor 3.05 \rfloor = 3, \lfloor 6.97 \rfloor = 6,\ \lfloor 54.2 \rfloor = 54,\ \lfloor 0.4 \rfloor = 0$

MCQ-9 :

What is the first negative term of $(1+2x^3)^{7/2}$?

(a) $-\frac{7}{8}\ x^{21}$ (b) $-\frac{7}{8}\ x^{18}$ (c) $-\frac{7}{8}x^{12}$ (d) $-\frac{7}{8}x^{15}$

Solution:

Note: First negative term depends on
$$n\ (n-1)\ (n-2)\ \ldots\ldots\ \{n-(n-r)\}$$
these are r factors.
The term will be negative, when a factor is negative. This factor can be calculated by last the factor $\{n-(r-1)\}$.

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EXERCISE-6

(1) What is the first negative term of $(1+2x^3)^{5/2}$?

(a) $-\frac{3}{7}x^{12}$ (b) $-\frac{5}{8}x^{12}$ (c) $-\frac{7}{8}x^{12}$ (d) $-\frac{2}{5}x^{12}$

(2) Which term of the expansion$(1+5x^2)^{15/2}$ is the first negative term ?

(a) 8^{th} (b) 9^{th} (c) 10^{th} (d) 11^{th}

TERM INVOLVING x^m

Term involving x^m, $(m \in \mathbb{N})$in the expansion of $(1+x^k)^n$can be found as

$$k\,r = m$$

MCQ-11 :

What is the term involving x^{12} in the expansion of $(1+2x^3)^{3/2}$?

(a) $\frac{9}{32}\,x^{12}$ (b) $\frac{1}{18}\,x^{12}$ (c) $\frac{3}{8}\,x^{12}$ (d) $-\frac{3}{128}\,x^{12}$

Solution:

$$(1+2x^3)^{3/2}$$

$$3r = 12$$

$$r = 4$$

There are 4 factors in T_{r+1}formula when b $= 2x^3$

$$T_{4+1} = \frac{\frac{3}{2}\cdot\frac{1}{2}\cdot\frac{-1}{2}\cdot\frac{-3}{2}}{4!}.(2x^3)^4$$

$$T_5 = \frac{9}{4.3.2.1}x^{12}$$

$$= \frac{3}{8}x^{12}$$

The answer is (c).

EXERCISE-7

(1) What is the term involving x^6 in the expansion of $(1+x^2)^{5/2}$?

(a) $\frac{5}{16}x^6$ (b) $\frac{3}{8}x^6$ (c) $\frac{7}{5}x^6$ (d) $\frac{9}{10}x^6$

(2) Which term of the expansion$(1-2x^5)^{-12/5}$ involving x^5?

(a) 4^{th} (b) 5^{th} (c) 1^{st} (d) 2^{nd}

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