Binomial Theorem MCQs for Entry Test Preparation

Multiple Choice Questions

1. What is the first term in the expansion of $(1 - x)^{-1}$?
   a) 1
   b) -1
   c) x
   d) $-x$
2. The coefficient of x^2 in $(1 + 2x)^{-1}$ is:
   a) 4
   b) -4
   c) 2
   d) -2
3. Expand $(2 + x)^{-2}$ up to x^2. What is the coefficient of x^2?
   a) $\frac{1}{2}$
   b) $\frac{3}{4}$
   c) $\frac{1}{4}$
   d) $\frac{3}{2}$
4. The condition for the validity of $(1 - 3x)^{1/2}$ is:
   a) $|x| < \frac{1}{3}$
   b) $|x| < 1$

c) $|x| < 3$

d) $|x| < \frac{1}{9}$

5. The coefficient of x^3 in $(1+x)^{-1/3}$ is:

a) $\frac{1}{27}$

b) $-\frac{1}{27}$

c) $\frac{10}{81}$

d) $-\frac{10}{81}$

6. Approximate $\sqrt{1.02}$ to three decimal places using binomial theorem.

a) 1.009

b) 1.010

c) 1.011

d) 1.012

7. What is the coefficient of x in $(1-2x)^{-1/2}$?

a) $\frac{1}{2}$

b) $-\frac{1}{2}$

c) 1

d) -1

8. The product $(1+x)^2(1-x)^{-1}$ up to x^2 has a coefficient of x^2 as:

a) 1

b) 2

c) 3

d) 4

9. Approximate $\frac{1}{\sqrt{1-0.01}}$ neglecting x^2 and higher.

a) 1.005

b) 1.010

c) 1.015

d) 1.020

10. The coefficient of x^n in $(1+x)^3(1-x)^{-2}$ is:

    a) $3n+1$

    b) $6n$

    c) $3n+3$

    d) $6n+1$

11. Find the sum of the series $1 - \frac{1}{3}x + \frac{2}{9}x^2 - \cdots$ if it matches $(1-x/3)^{-1}$.

    a) $\frac{3}{3-x}$

    b) $\frac{3}{3+x}$

    c) $\frac{1}{3-x}$

    d) $\frac{1}{3+x}$

12. The coefficient of x^2 in $(1+x-x^2)^{-1}$ is:

    a) 1

    b) 2

    c) 3

    d) 0

13. Approximate $(0.98)^{-1/2}$ to three decimal places.

    a) 1.010

    b) 1.015

    c) 1.020

    d) 1.025

14. If $x \approx 1$, $3x^2 - 2x$ is approximately:

    a) x^2

    b) x

    c) $2x$

    d) x^3

15. The coefficient of x^3 in $(1-2x+x^2)^{1/2}$ is:

    a) $\frac{3}{4}$

b) $-\frac{3}{4}$

c) $\frac{1}{2}$

d) $-\frac{1}{2}$

16. What is the validity condition for $(3-x)^{-1/3}$?

a) $|x| < 3$

b) $|x| < 1$

c) $|x| < \frac{1}{3}$

d) $|x| < 9$

17. The sum of $1 + \frac{2}{5}x + \frac{3}{25}x^2 + \cdots$ identified as $(1 + x/5)^2$ is:

a) $\frac{25}{25-2x}$

b) $\frac{25}{25+x}$

c) $\frac{5}{5-x}$

d) $\frac{5}{5+x}$

18. Approximate $\sqrt[3]{1.03}$ to three decimal places.

a) 1.010

b) 1.009

c) 1.011

d) 1.012

19. The coefficient of x^n in $(1-x)^2(1+x)^{-1}$ is:

a) $(-1)^n(n+1)$

b) $(-1)^n n$

c) $n-1$

d) $2n$

20. If $x \approx 0$, show $\frac{1+x}{1-2x} \approx$:

a) $1 + 3x$

b) $1 - 3x$

c) $1 + x$

d) $1 - x$

Answers and Explanations

1. **Answer: a) 1**
   Explanation: The expansion of $(1 - x)^{-1}$ starts with 1, as per $(1 + x)^n$ where $n = -1$.

2. **Answer: a) 4**
   Explanation: For $(1 + 2x)^{-1}$, the general term is $(-1)^r(2x)^r$. For x^2, $r = 2$, coefficient is 4.

3. **Answer: c)** $\frac{1}{4}$
   Explanation: $(2 + x)^{-2} = \frac{1}{4}(1 + \frac{x}{2})^{-2} \approx \frac{1}{4}(1 - x + \frac{3}{4}x^2)$, coefficient of x^2 is $\frac{1}{4}$.

4. **Answer: a)** $|x| < \frac{1}{3}$
   Explanation: Validity requires $|-3x| < 1 \implies |x| < \frac{1}{3}$.

5. **Answer: d)** $-\frac{10}{81}$
   Explanation: General term: $\binom{-1/3}{3}(-1)^3 = -\frac{10}{81}$.

6. **Answer: b) 1.010**
   Explanation: $\sqrt{1.02} = (1 + 0.02)^{1/2} \approx 1 + 0.01 = 1.010$.

7. **Answer: b)** $-\frac{1}{2}$
   Explanation: Coefficient of x in $(1 - 2x)^{-1/2}$ is $\binom{-1/2}{1}(-2) = -\frac{1}{2}$.

8. **Answer: c) 3**
   Explanation: $(1 + x)^2(1 - x)^{-1} = (1 + 2x + x^2)(1 + x + x^2)$, coefficient of x^2 is 3.

9. **Answer: a) 1.005**
   Explanation: $(1 - 0.01)^{-1/2} \approx 1 + \frac{1}{2}(0.01) = 1.005$.

10. **Answer: d)** $6n + 1$
    Explanation: Expand and match coefficients, resulting in $6n + 1$ for x^n.

11. **Answer: a)** $\frac{3}{3-x}$
    Explanation: $(1 - \frac{x}{3})^{-1} = \frac{1}{1-\frac{x}{3}} = \frac{3}{3-x}$.

12. **Answer: b) 2**
    Explanation: $(1 + x - x^2)^{-1} \approx 1 + x + 2x^2$, coefficient of x^2 is 2.

13. **Answer: a) 1.010**
    Explanation: $(0.98)^{-1/2} = (1 - 0.02)^{-1/2} \approx 1 + 0.01 = 1.010$.

14. **Answer: b)** x
Explanation: Let $x = 1 + h$, then $3(1 + 2h) - 2(1 + h) \approx h = x - 1$.

15. **Answer: b)** $-\frac{3}{4}$
Explanation: Expand $(1 + x - 2x^2)^{1/2}$, coefficient of x^3 is $-\frac{3}{4}$.

16. **Answer: a)** $|x| < 3$
Explanation: $(3 - x)^{-1/3}$ valid if $|\frac{x}{3}| < 1 \implies |x| < 3$.

17. **Answer: b)** $\frac{25}{25+x}$
Explanation: $(1 + \frac{x}{5})^2 = \frac{(5+x)^2}{25}$, sum is $\frac{25}{25+x}$.

18. **Answer: a) 1.010**
Explanation: $(1.03)^{1/3} \approx 1 + \frac{1}{3}(0.03) = 1.010$.

19. **Answer: a)** $(-1)^n(n + 1)$
Explanation: $(1 - x)^2(1 + x)^{-1}$, coefficient matches $(-1)^n(n + 1)$.

20. **Answer: a)** $1 + 3x$
Explanation: $\frac{1+x}{1-2x} \approx 1 + x + 2x + 3x = 1 + 3x$.