

Precalculus - The Binomial Theorem - Test Answer Key

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Worked solutions and scoring notes for the 9-question binomial theorem test. Use the scoring line under each solution to award partial credit.

Precalculus · Common Core State Standards: **A-APR.C.5**

Question 1 - Evaluate [2 pts]

$$C(9,4) = \frac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2 \cdot 1} = 126 \cdot \frac{7!}{4!3!} = C(7,3) = 35.$$

126 and 35

Scoring: 1 point each.

Question 2 - Expand [2 pts]

The coefficients are row 5: 1,5,10,10,5,1, and all powers of 1 are 1.

$$x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

Scoring: 1 point for the coefficients, 1 point for the powers.

Question 3 - Expand with a coefficient [2 pts]

$$(2x)^3 + 3(2x)^2(-3) + 3(2x)(9) + (-27).$$

$$8x^3 - 36x^2 + 54x - 27$$

Scoring: 1 point for the setup, 1 point for the simplified result.

Question 4 - A single term [2 pts]

$$k=2: C(6,2)x^4 \cdot 4^2 = 15 \cdot 16x^4.$$

$$240x^4$$

Scoring: 1 point for k and the setup, 1 point for the term.

Question 5 - Pascal's triangle [3 pts]

n=0	1					
n=1	1 1					
n=2	1 2 1					
n=3	1 3 3 1					
n=4	1 4 6 4 1					
n=5	1 5 10 10 5 1					

Row 4 is 1, 4, 6, 4, 1.

(a) 1,4,6,4,1. (b) $x^4 + 4x^3(2) + 6x^2(4) + 4x(8) + 16$. (c) Set $x=1$: $3^4 = 81$ (check: $1+8+24+32+16=81$).

1,4,6,4,1; $x^4 + 8x^3 + 24x^2 + 32x + 16$; 81

Scoring: 1 point for each part.

Question 6 - A coefficient [2 pts]

$5-k=2$, $k=3$: $C(5,3)(3x)^2(-2)^3 = 10 \cdot 9 \cdot (-8)x^2$.

-720

Scoring: 1 point for k , 1 point for the coefficient.

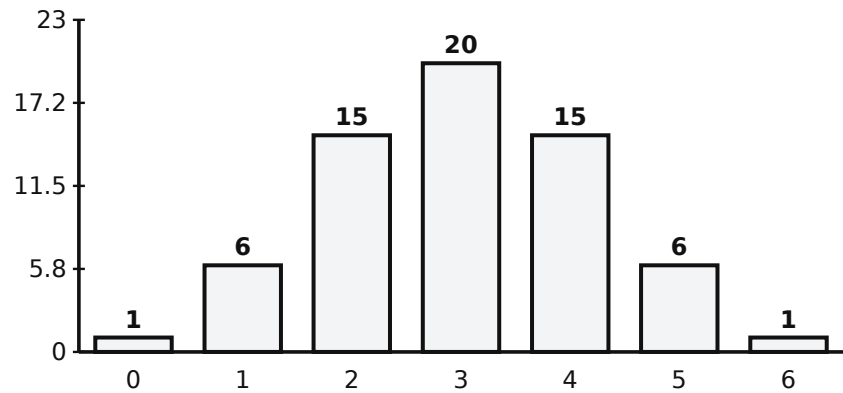
Question 7 - Constant term [2 pts]

General term: $C(9,k)(x^2)^{9-k}\left(\frac{1}{x}\right)^k = C(9,k)x^{18-3k}$. The exponent is 0 when $k=6$.

$C(9,6) = 84$

Scoring: 1 point for the exponent equation, 1 point for the value.

Question 8 - Probability [3 pts]



15 of the 64 outcomes have 2 heads.

(a) $C(6,2)=15$. (b) $2^6=64$. (c) $\frac{15}{64} \approx 0.234$.

15; 64; 0.234

Scoring: 1 point for each part.

Question 9 - Approximation [2 pts]

$$1+4(-0.02)+6(-0.02)^2=1-0.08+0.0024=0.9224.$$

0.9224

Scoring: 1 point for the terms, 1 point for the sum.

Total

20 points