

Question 1:

Calculator Allowed: No

9. [Maximum mark: 7]

Consider the expression $\frac{1}{\sqrt{1+ax}} - \sqrt{1-x}$ where $a \in \mathbb{Q}$, $a \neq 0$.

The binomial expansion of this expression, in ascending powers of x , as far as the term in x^2 is $4bx + bx^2$, where $b \in \mathbb{Q}$.

- (a) Find the value of a and the value of b . [6]
(b) State the restriction which must be placed on x for this expansion to be valid. [1]

Question 2:

Calculator Allowed: No

[Maximum mark: 7]

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The values in the fourth row of Pascal's triangle are shown in the following table.

| | | | | |
|---|---|---|---|---|
| 1 | 4 | 6 | 4 | 1 |
|---|---|---|---|---|

- (a) Write down the values in the fifth row of Pascal's triangle. [2]
(b) Hence or otherwise, find the term in x^3 in the expansion of $(2x + 3)^5$. [5]

Question 3:

Calculator Allowed: Yes

5. [Maximum mark: 6]

Consider the expansion of $\frac{(ax+1)^9}{21x^2}$, where $a \neq 0$. The coefficient of the term in x^4 is $\frac{8}{7}a^5$.

Find the value of a .

Question 4:

Calculator Allowed: No

1. [Maximum mark: 5]

Find the term independent of x in the binomial expansion of $\left(2x^2 + \frac{1}{2x^3}\right)^{10}$.

Question 5:

Calculator Allowed: Yes

5. [Maximum mark: 6]

Consider the expansion of $(2+x)^n$, where $n \geq 3$ and $n \in \mathbb{Z}$.

The coefficient of x^3 is four times the coefficient of x^2 . Find the value of n .

Question 6:

Calculator Allowed: No

6. [Maximum mark: 5]

Consider the expansion of $\left(8x^3 - \frac{1}{2x}\right)^n$ where $n \in \mathbb{Z}^+$. Determine all possible values of n for which the expansion has a non-zero constant term.

Question 7:

Calculator Allowed: Yes

2. [Maximum mark: 5]

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Find the term in x^3 in the expansion of $\left(\frac{2}{3}x - 3\right)^8$.

Question 8:

Calculator Allowed: Yes

6. [Maximum mark: 7]

The coefficient of x^6 in the expansion of $(ax^3 + b)^8$ is 448.

The coefficient of x^6 in the expansion of $(ax^3 + b)^{10}$ is 2880.

Find the value of a and the value of b , where $a, b > 0$.

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8. [Maximum mark: 7]

Three boys and three girls are to sit on a bench for a photograph.

- (a) Find the number of ways this can be done if the three girls must sit together. [3 marks]
- (b) Find the number of ways this can be done if the three girls must all sit apart. [4 marks]

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Question 10:

Calculator Allowed: Yes

4. [Maximum mark: 6]

Fifteen boys and ten girls sit in a single line.

- (a) In how many ways can they be seated in a single line so that the boys and girls are in two separate groups? [3 marks]
- (b) Two boys and three girls are selected to go the theatre. In how many ways can this selection be made? [3 marks]

Question 11:

Calculator Allowed: Yes

3. [Maximum mark: 7]

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A team of 6 players is to be selected from 10 volleyball players, of whom 8 are boys and 2 are girls.

- (a) In how many ways can the team be selected? [2 marks]
- (b) In how many of these selections is exactly one girl in the team? [3 marks]
- (c) If the selection of the team is made at random, find the probability that exactly one girl is in the team. [2 marks]