

### 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
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- (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  $a, b > 0$ .

### Question 9:

Calculator Allowed: Yes

8. [Maximum mark: 7]

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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]

### Question 10:

Calculator Allowed: Yes

4. [Maximum mark: 6]

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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]*

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]*