

Home Gameboard Maths Binomial: All Rational n 2ii

Binomial: All Rational n 2ii



Part A Expansion

Expand $(1+4x)^{\frac{1}{2}}$ in ascending powers of x, up to and including the term in x^2 , simplifying the coefficients.

The following symbols may be useful: x

Part B Values of x

State the set of values of x for which the expansion is valid. You may use the symbols $<> \ = \ x$ and |x| which can be entered as abs(x).

The following symbols may be useful: <, >, abs(), x

Part C Value of k

In the expansion of

$$(1+kx)(1+4x)^{\frac{1}{2}},$$

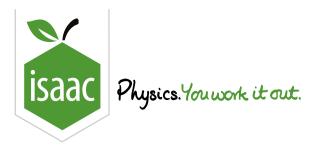
the coefficient of x is 7. Find the value of the constant k and hence the coefficient of x^2 .

State the value of k.

The following symbols may be useful: k

State the coefficient of x^2 .

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Binomial: All Rational n 4ii

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Part A Expansion

Expand $(2+x)^{-2}$ in ascending powers of x up to and including the term in x^3 .

The following symbols may be useful: x

Part B Set of Values

State the set of values of x for which the expression is valid. You may use the symbols <>=x and |x| which can be entered as abs(x).

The following symbols may be useful: <, >, abs(), x

Part C Coefficient

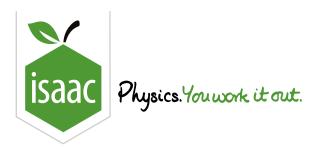
Hence find the coefficient of x^3 in the expansion of $\frac{1+x^2}{(2+x)^2}$.

The following symbols may be useful: x

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<u>STEM SMART Single Maths 28 - Binomial Theorem - Rational n</u>



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Binomial: All Rational n 1i

Binomial: All Rational n 1i



Part A Partial Fractions

Given that
$$\frac{3x+4}{(1+x)(2+x)^2}\equiv \frac{A}{1+x}+\frac{B}{2+x}+\frac{C}{(2+x)^2}$$
, find A , B , and C .

 ${\rm Find}\ A.$

The following symbols may be useful: A

 ${\rm Find}\ B.$

The following symbols may be useful: ${\tt B}$

 ${\rm Find}\; C.$

The following symbols may be useful: c

Part B Expand

Hence or otherwise expand $\frac{3x+4}{(1+x)(2+x)^2}$ in ascending powers of x, up to and including the term in x^2 .

The following symbols may be useful: \boldsymbol{x}

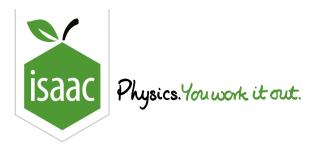
Part C Values of xState the set of values of x for which the expansion in the above part is valid. What form does your answer take? Choose from the list below, where a and b are constants and a < b, and then find a and/or b. x < a $x \leq a$ $x \geq a$ a < x < b $a \leq x \leq b$ $() \quad x < a \text{ or } x > b$ $x \leq a$ or $x \geq b$ Write down the value of a. Write down the value of b (or if your chosen form has no b, write "n").

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The following symbols may be useful: n

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Binomial: All Rational n 3i

Binomial: All Rational n 3i



Find the coefficient of x^2 in the expansion in ascending powers of x of

$$\sqrt{rac{1+ax}{4-x}}$$

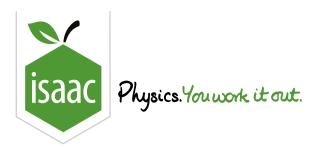
giving your answer in terms of a.

The following symbols may be useful: a

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Home Gameboard Maths Algebra Series Binomial Expansion 1

Binomial Expansion 1



Rewrite each of the following expressions in the form $a(1+b)^n$, where |b| < 1. Hence, using the appropriate binomial expansion, find the value of each of them correct to 4 dp.

Part A $\sqrt{36.1}$

Rewrite $\sqrt{36.1}$ in the form $a(1+b)^n$, where |b|<1 and $n=\frac{1}{2}$. Hence, using the appropriate binomial expansion, find the value correct to 4 dp.

Give the value of a.

Give the value of b as a simplified fraction.

Using the binomial theorem, evaluate $\sqrt{36.1}$ correct to 4 dp.

Part B $\sqrt[3]{1.09}$

Rewrite $\sqrt[3]{1.09}$ in the form $a(1+b)^n$, where |b|<1 and $n=\frac{1}{3}$. Hence, using the appropriate binomial expansion, find the value correct to 4 dp.

Give the value of a.

Give the value of b as a simplified fraction.

Using the binomial theorem, evaluate $\sqrt[3]{1.09}$ correct to 4 dp.

Part C $1/\sqrt{1.04}$

Rewrite $\frac{1}{\sqrt{1.04}}$ in the form $a(1+b)^n$, where |b|<1 and $n=-\frac{1}{2}$. Hence, using the appropriate binomial expansion, find the value correct to 4 dp.

Give the value of a.

Give the value of b as a simplified fraction.

Using the binomial theorem, evaluate $\frac{1}{\sqrt{1.04}}$ correct to 4 dp.

Part D	$\sqrt[3]{125.4}$
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Rewrite $\sqrt[3]{125.4}$ in the form $a(1+b)^n$, where |b|<1 and $n=\frac{1}{3}$. Hence, using the appropriate binomial expansion, find the value correct to 4 dp.

Give the value of a.

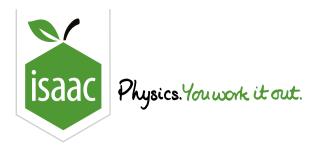
Give the value of \boldsymbol{b} as a simplified fraction.

Using the binomial theorem, evaluate $\sqrt[3]{125.4}$ correct to 4 dp.

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Binomial: All Rational n 5i

Binomial: All Rational n 5i



Part A Expansion

Expand $(1-3x)^{-\frac{1}{3}}$ in ascending powers of x, up to and including the term in x^3 .

The following symbols may be useful: x

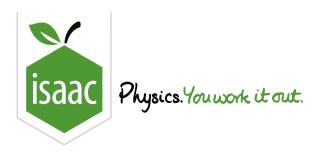
Part B Coefficient of x^3

Hence find the coefficient of x^3 in the expansion of $(1-3(x+x^3))^{-\frac{1}{3}}$

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Home Gameboard Maths Algebra Series Maclaurin Series - Potential due to Dipole

Maclaurin Series - Potential due to Dipole



Part A Potential on the axis

An electric dipole consists of two charges +q and -q separated in the z direction by a very small distance a. The electric potential V(z) a distance z away from the centre of the dipole in a direction along the line joining the two charges is given by

$$V(z) = rac{q}{4\pi\epsilon_0}\left(rac{1}{z-rac{a}{2}} - rac{1}{z+rac{a}{2}}
ight).$$

Find an approximate expression for V(z) (assume that $z\gg a$ and obtain the first non-zero term in the Maclaurin (or binomial) expansion of V(z)).

The following symbols may be useful: a, epsilon_0, pi, q, z

Part B Potential in any direction

An electric dipole consists of two charges +q and -q separated by a distance a. The electric potential V a distance r from the centre of the dipole in a direction making an angle θ to the line joining the two charges is given approximately by

$$Vpprox rac{q}{4\pi\epsilon_0}\left(rac{1}{\sqrt{r^2-ar\cos heta}}-rac{1}{\sqrt{r^2+ar\cos heta}}
ight).$$

Assuming that $r\gg a$ show that $Vpprox rac{A\cos heta}{r^2}$ and find an expression for A.

The following symbols may be useful: a, epsilon_0, pi, q, r

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