Name	Date started	Target end date

WJEC Level 2 Additional Mathematics — Question Pack

Using f(a) to find the remainder when a polynomial is divided by (x−a), and testing for and using factors.

REVISE
.wales

Remainder & factor theorem

Algebra · Level 2 Certificate (9550) · calculator allowed

Using f(a) to find the remainder when a polynomial is divided by (x−a), and testing for and using factors.

LEVEL 2 · 9550

Estimated time for entire question pack: ~1 hours 54 minutes

*At the Additional Maths pace of **~1.2 min/mark** (95 marks across 12 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed throughout this qualification.

Remainder & factor theorem — what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

Remainder theorem Algebra

- Remainder on dividing f(x) by (x−a) is f(a).
- For (x+a) use f(−a).
- Substitute carefully.

Factor theorem Algebra

- If f(a) = 0 then (x−a) is a factor.
- Use it to factorise cubics.
- Then factorise the quadratic part.

Method Method

- Show the substitution f(a).
- State the conclusion (factor / remainder).
- Divide or compare coefficients to finish.

Crib sheet »

Remainder & factor theorem in one page

Quick-reference notes — revisit before each question. Don’t use during the questions.

Remainder theorem

$$f(x) \div (x - a) \Rightarrow \text{remainder} = f(a)$$

Factor theorem

$$f(a) = 0 \Rightarrow (x - a) \text{ is a factor}$$

Watch the sign

Dividing by (x + 2) means evaluating **f(−2)**.

Factorising a cubic

Find one factor with the theorem, divide it out, then factorise the remaining quadratic.

5. (a) Find the remainder when $2x^3 - 3x^2 - 4x + 1$ is divided by $x + 2$. [2]

(b) (i) Show that $x - 3$ is a factor of $x^3 + 4x^2 - 9x - 36$. [2]

(ii) **Hence** factorise $x^3 + 4x^2 - 9x - 36$.
Do not use a calculator to answer this part of the question.
You must show all your working. [4]

6. (a) Find the remainder when $4x^3 - 2x^2 - x$ is divided by $x + 5$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 - 6x^2 - 13x + 42$. [2]

(ii) **Hence** factorise $x^3 - 6x^2 - 13x + 42$. [4]

7. *You will be assessed on the quality of your written communication in this question.*

Total surface area of a cone, $A = \pi r(r + l)$

Volume of a cone, $V = \frac{1}{3}\pi r^2 h$

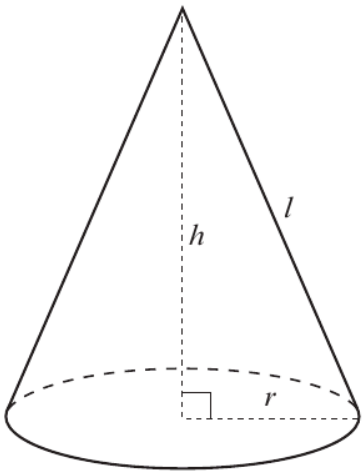


Diagram not drawn to scale

The total surface area of a cone is 326·4 cm^2.
The radius of the base of the cone is 5·6 cm.

Calculate the volume of the cone.

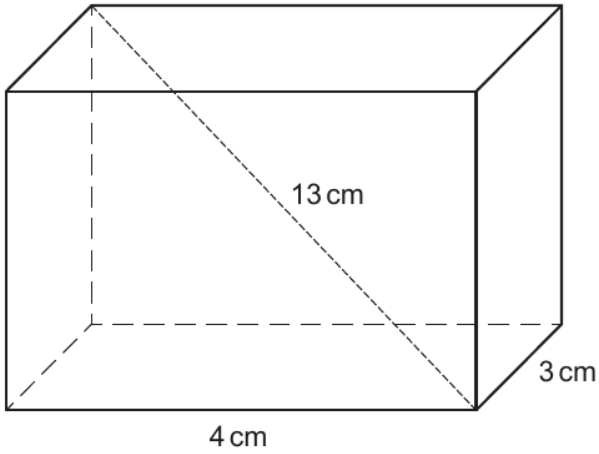
You must show all your working. [7 + 2 QWC]

6. (a) Find the remainder when $3x^3 + 4x^2 + 3x + 1$ is divided by $x - 2$. [2]

(b) (i) Show that $x + 6$ is a factor of $x^3 + x^2 - 24x + 36$. [2]

(ii) **Hence** factorise $x^3 + x^2 - 24x + 36$. [4]

7. *You will be assessed on the quality of your written communication in this question.*



The diagram is not drawn to scale.

Calculate the total surface area of the cuboid.
You must show all your working. [5 + 2 QWC]

7. *(a)* Find the remainder when $x^3 + 8x^2 - 2x + 6$ is divided by $x - 3$. [2]

(b) (i) Show that $x + 3$ is a factor of $x^3 + x^2 - 41x - 105$. [2]

(ii) **Hence** factorise $x^3 + x^2 - 41x - 105$. [4]

8. Find the coordinates and nature of each of the stationary points on the curve $y = 4x^3 - 3x^2 + 20$.

You must show all your working. [7]

5. *(a)* Find the remainder when $2x^3 - x^2 + 2x + 1$ is divided by $x + 3$. [2]

(b) (i) Show that $x + 2$ is a factor of $x^3 - 6x^2 - 49x - 66$. [2]

(ii) **Hence** factorise $x^3 - 6x^2 - 49x - 66$. [4]

6. *You will be assessed on the quality of your written communication in this question.*

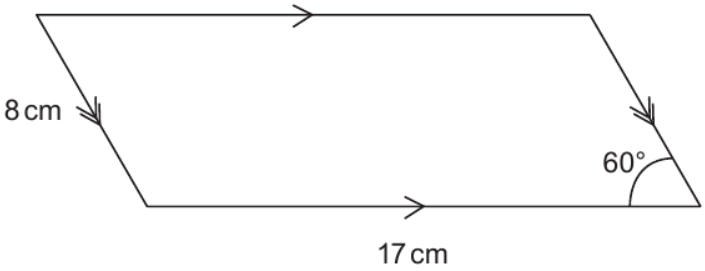


Diagram not drawn to scale

You **must not** use your calculator in answering this question.

Calculate the area of the parallelogram in cm^2.
Give your answer in the form $a\sqrt{b}$. [6]

4. *(a)* Find the remainder when $2x^3 - 5x^2 + 8x - 6$ is divided by $x + 4$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 + 9x^2 + 8x - 60$. [2]

(ii) **Hence** factorise $x^3 + 9x^2 + 8x - 60$. [4]

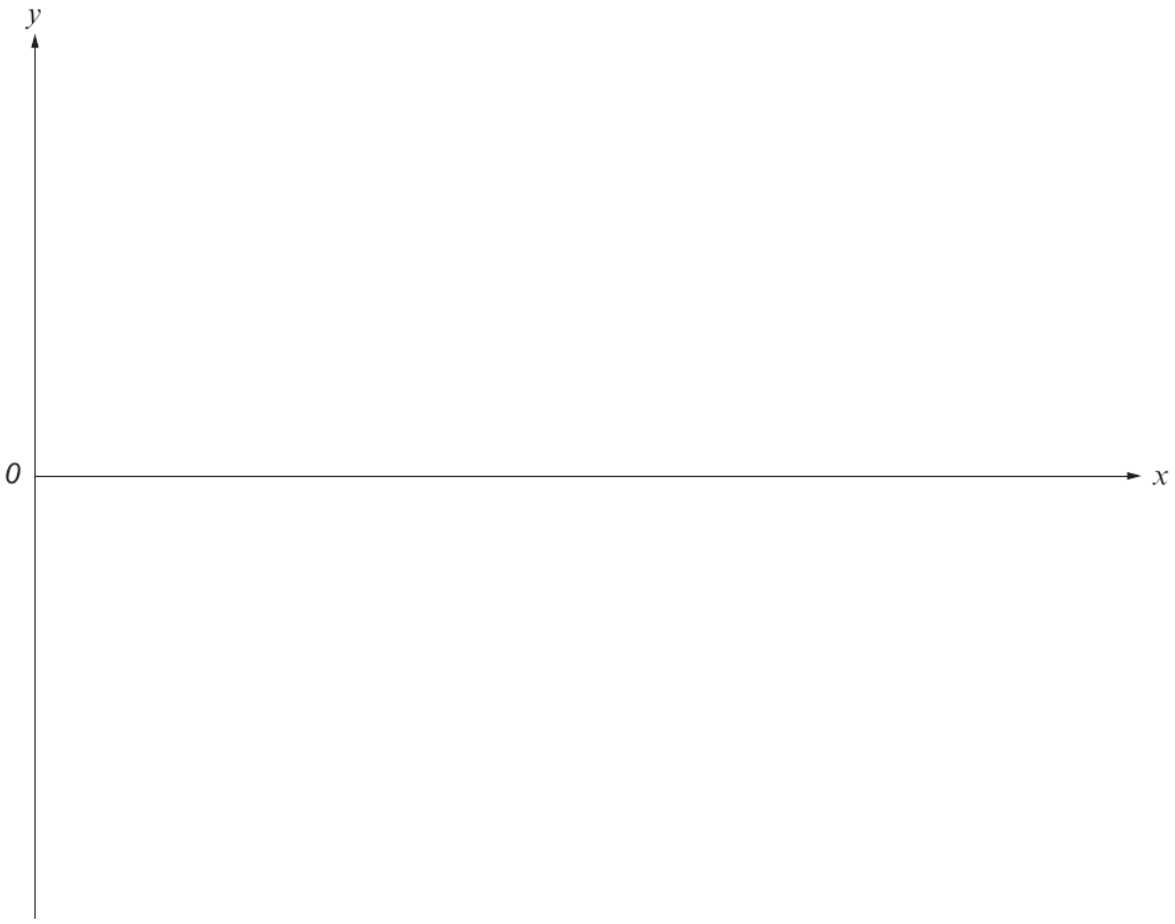
5. Find the coordinates of the points of intersection of the curve $y = 4x^2 + 8x - 3$ and the straight line $y = 3x - 1$.
Use an algebraic method and give your answers correct to 2 decimal places. [6]

10. *(a)* Find the remainder when $x^3 + 6x^2 - x - 30$ is divided by $x - 4$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 + 6x^2 - x - 30$. [2]

(ii) **Hence** factorise $x^3 + 6x^2 - x - 30$. [4]

11. *(a)* Use the axes below to sketch the graph of $y = -3\cos x + 5$ for values of x from 0° to 360°. You must label any important values on the axes. [3]



(b) State the maximum and minimum values of $y = -3\cos x + 5$. [2]

Maximum value .....

Minimum value .....

7. *(a)* Find the remainder when $3x^3 - 2x^2 + 5x - 1$ is divided by $x + 2$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 + 8x^2 + x - 42$. [2]

(ii) **Hence** factorise $x^3 + 8x^2 + x - 42$. [4]

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^{10}$. [2]

(b) Given the following facts, find the values of a, b and c.

- $y = ax^5 + bx + c$
- $\frac{d^2y}{dx^2} = 20x^3$
- when $x = 0$, $y = 5$
- when $x = 1$, $y = 9$ [3]

10. *(a)* Find the remainder when $x^3 + 5x^2 + 2x - 8$ is divided by $x - 3$. [2]

(b) (i) Show that $x - 1$ is a factor of $x^3 + 5x^2 + 2x - 8$. [2]

(ii) **Hence** factorise $x^3 + 5x^2 + 2x - 8$. [4]

11.

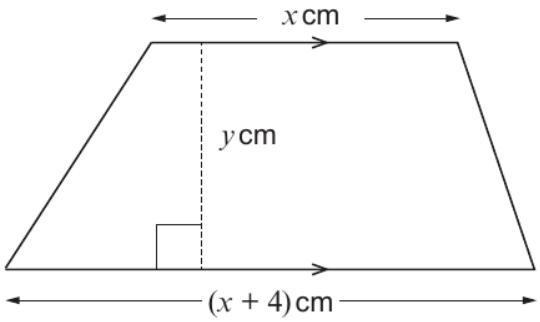


Diagram not drawn to scale

The area of the trapezium in the diagram is 28 cm^2.
A rectangle of length $(x + y)$ cm and width y cm has an area of 43 cm^2.

(a) Show that $xy = 28 - 2y$ and $xy = 43 - y^2$. [3]

(b) Hence write down a quadratic equation in terms of y to calculate the lengths of the parallel sides of the trapezium.
You must use an algebraic method, **not** a trial and improvement method. [4]

8. *(a)* Find the remainder when $7x^3 - 4x^2 + x - 2$ is divided by $x - 2$.

[2]

(b) (i) Show that $x + 3$ is a factor of $x^3 + 4x^2 - 17x - 60$.

[2]

(ii) **Hence**, factorise $x^3 + 4x^2 - 17x - 60$.

9. A pyramid stands on a horizontal surface.
The base of the pyramid is in the shape of a kite.
The base of the pyramid is shown below.

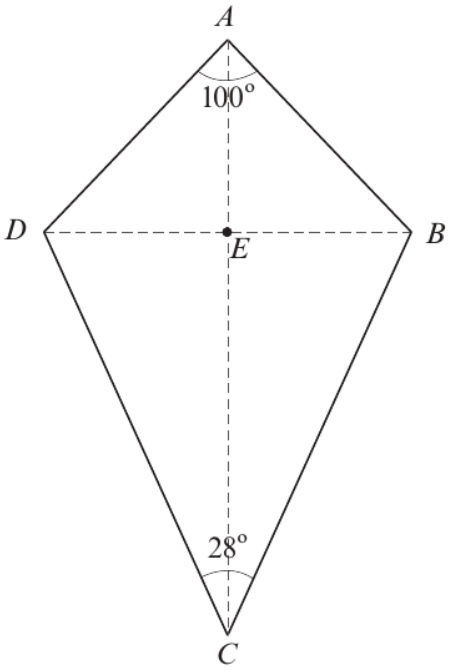


Diagram not drawn to scale

The apex (top vertex) of the pyramid is vertically above E.
The vertical height of the pyramid is 17·3 cm.
The length of BD is 12·6 cm and the angles are as shown on the diagram.
Use the line EC to calculate the angle of elevation of the apex of the pyramid from the point C.

[7]

4. *(a)* Given that $f(x) = x^3 - 2x^2 - 9x + 18$, evaluate $f(-3)$.

Write down what this tells you about $f(x)$.

[3]

(b) Factorise $x^3 - 2x^2 - 9x + 18$.

[4]

5. Use the facts below to find the value of the constant a.

$$y = ax^3$$

$$\frac{dy}{dx} = 135 \text{ when } x = 3$$

[4]

6. *(a)* Simplify $\frac{3}{2+\sqrt{5}}$, leaving your answer in surd form.

[3]

(b) Simplify $(\sqrt{3}+2)^2 - (\sqrt{3}-2)^2$, leaving your answer in surd form.

[3]

5. *(a)* Find the remainder when $6x^3 - 13x^2 + x + 2$ is divided by $x + 3$.

[2]

(b) (i) Show that $x - 2$ is a factor of $6x^3 - 13x^2 + x + 2$.

[2]

(ii) **Hence** factorise $6x^3 - 13x^2 + x + 2$.

[4]

End of question pack