Name	Date started	Target end date

WJEC Level 2 Additional Mathematics — Question Pack

Lengths, areas and volumes of pyramids, cylinders and sectors — often the 'quality of written communication' problem.

REVISE
.wales

Mensuration & 3D solids

Geometry · Level 2 Certificate (9550) · calculator allowed

Lengths, areas and volumes of pyramids, cylinders and sectors — often the 'quality of written communication' problem.

LEVEL 2 · 9550

Estimated time for entire question pack: ~2 hours 25 minutes

*At the Additional Maths pace of **~1.2 min/mark** (121 marks across 18 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.

Mensuration & 3D solids — what's examined

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

Solids Geometry

- Volume and surface area of pyramids and cylinders.
- Use Pythagoras for slant heights.
- Keep units consistent.

Sectors & arcs Geometry

- Arc length and sector area are fractions of the circle.
- Fraction = angle / 360°.
- Use exact π if asked.

Problem solving Method

- Set out a clear method — QWC marks reward this.
- State the formula before substituting.
- Round sensibly at the end.

Crib sheet »

Mensuration & 3D solids in one page

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

Cylinder

$$V = \pi r^2 h$$
$$\text{curved SA} = 2\pi rh$$

Pyramid

$$V = \tfrac{1}{3} \times \text{base area} \times \text{height}$$

Sector

$$\text{arc} = (\theta/360) \times 2\pi r$$
$$\text{area} = (\theta/360) \times \pi r^2$$

Slant heights

Use Pythagoras on the right triangle inside the solid to find slant edges or heights.

4. The diagram below shows a sector of a circle with radius 4·1 cm.

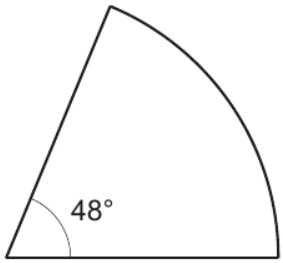


Diagram not drawn to scale

Calculate the area of this sector of a circle. [2]

.....

.....

.....

.....

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

A hollow cylindrical can has a volume of $23{\cdot}8\,\text{cm}^3$.

The area of the cross-section of this cylinder is $6{\cdot}8\,\text{cm}^2$.

A straight, thin metal rod is to be placed **completely within** this cylinder.

Calculate the longest possible length of this rod.

You must show all your working. [5 + 2 QWC]

20. The diagram below shows a slanted cone with a circular base, diameter 10·8 cm.

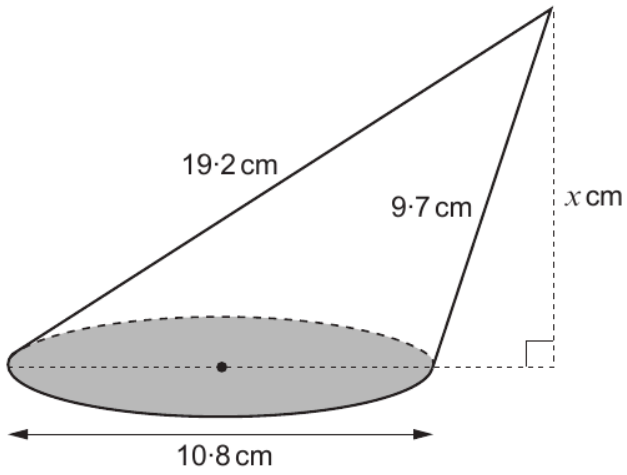


Diagram not drawn to scale

Calculate the value of x. [5]

END OF PAPER

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, $V = \frac{1}{3}\pi r^2 h$

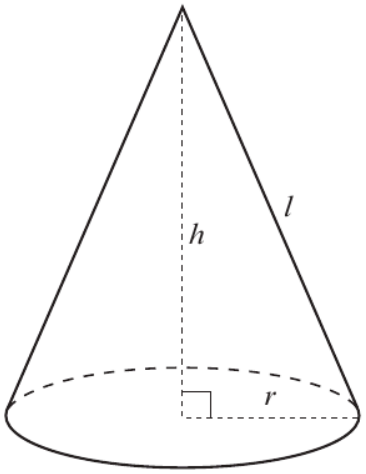


Diagram not drawn to scale

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]

8. Find, using an algebraic method, the coordinates of the points of intersection of

$$y = 4x^2 + 2x - 3 \quad \text{and} \quad 10x - 2y + 3 = 0 .$$

You must show all your working. [6]

12.

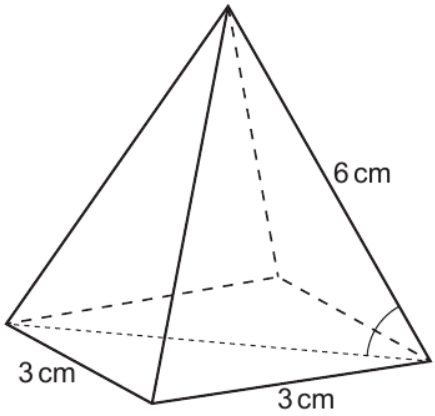


Diagram not drawn to scale

A square-based pyramid has base sides of length 3 cm and sloping edges of length 6 cm.

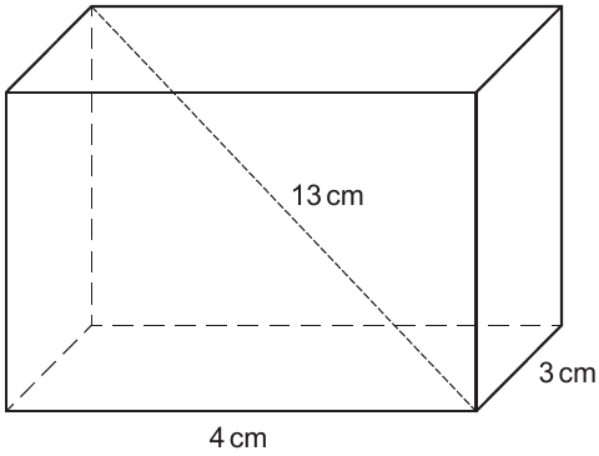
Calculate the angle between the diagonal of the base and the 6 cm sloping edge shown. [5]

13. Find the x**-coordinate** and the nature of each of the stationary points on the curve

$$y = \frac{x^3}{3} + x^2 - 15x.$$

You must show all your working. [7]

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]

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

The 3D shape below is such that:

- Trapezium *ABCG* is congruent to trapezium *FHDE*,
- all the other faces are rectangles.

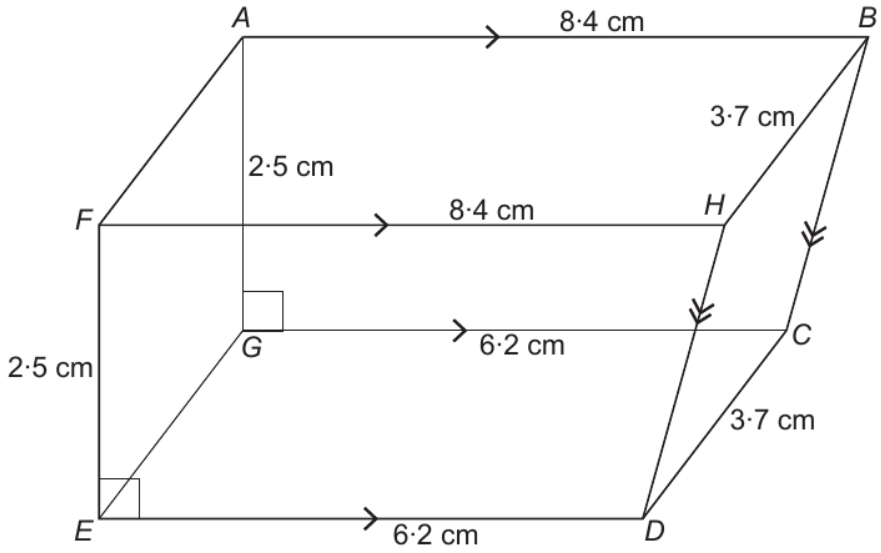


Diagram not drawn to scale.

Calculate $E\hat{C}B$.

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

6. *(a)* **Do not use a calculator** to answer this question.

Simplify $\frac{2}{6+\sqrt{3}}$.

Give your answer in the form $\frac{a+b\sqrt{c}}{d}$ where a, b, c and d are integers.

You **must** show all your working. [3]

(b) Showing all your working, simplify each of the following.

(i) $\frac{y^{-\frac{3}{5}} \times y^{\frac{4}{5}}}{y^{\frac{3}{4}}}$. [2]

(ii) $\frac{x^{\frac{2}{7}} + 6x^{\frac{3}{7}}}{2x^{\frac{2}{7}}}$. [2]

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

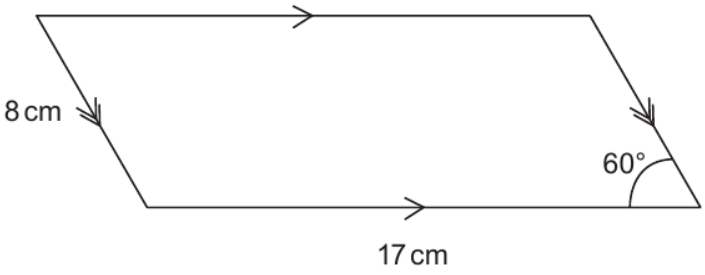


Diagram not drawn to scale

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]

9. The diagram shows a rectangular-based pyramid.
The length of the rectangular base is 4 cm and the width of the base is 3 cm.
Each slant edge of the pyramid is of length 6 cm.

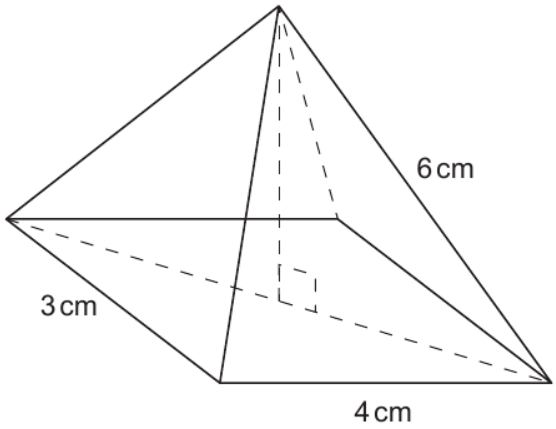


Diagram not drawn to scale

Calculate the perpendicular height of the pyramid.
You must show your working. [3]

The perpendicular height is cm

10. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 2x^{16}$. [2]

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

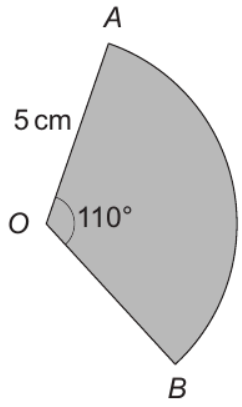
- $y = ax^3 + bx^2 + cx + d$
- $\frac{dy}{dx} = 12x^2 + 4x + 1$
- When $x = 1$, $y = 10$. [4]

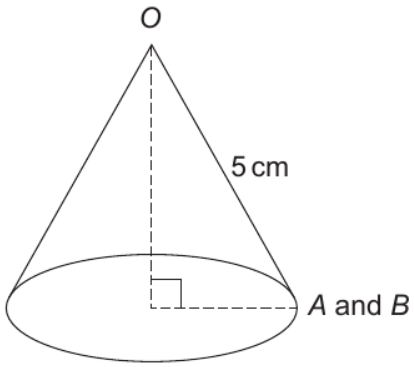
$a =$ ..... $b =$ ..... $c =$ ..... $d =$ .....

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

The volume of a cone = $\frac{1}{3}$ × *area of the base* × *perpendicular height.*

A thin piece of card in the shape of a sector of a circle has a centre *O*, and a radius of 5 cm, as shown below.
The card is used to form a cone by sticking *OA* and *OB* together with no overlap, such that the **arc** *AB* becomes the **circumference** of the base of the cone.





Diagrams not drawn to scale

Calculate the volume of the cone correct to 3 significant figures. [10]

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 3x^{20}$. [2]

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

- $y = ax^4 + bx^3 + c$
- $\frac{dy}{dx} = 12x^3 + 6x^2$
- when $x = 0$, $y = -6$ [3]

$a =$ ..... $b =$ ..... $c =$ .....

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

A cylindrical package is made with a radius of 4 cm and a height of 18 cm.
The net of the cylinder is drawn on a thin rectangular piece of card as shown in the sketch below.

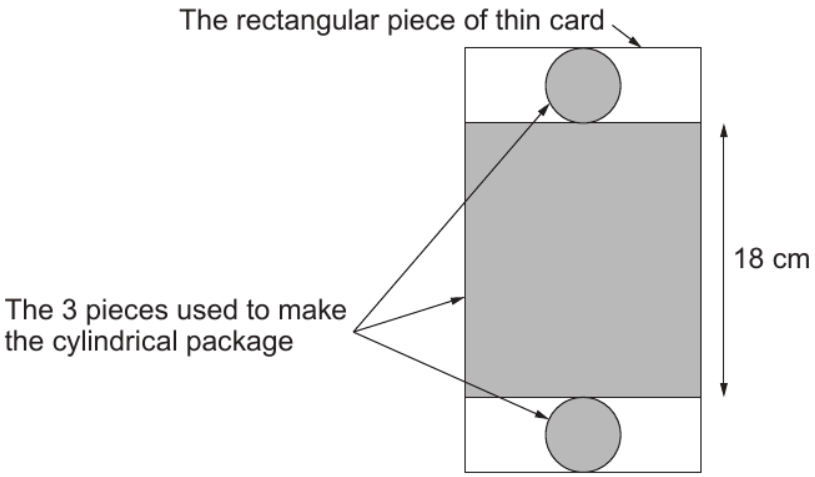


Diagram not drawn to scale

The circular ends of the package touch the rectangular piece of the net and the edges of the thin card exactly.

Calculate the area of the thin rectangular piece of card that is wasted in making this cylindrical package.
You must show all your working. [8]

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

Do not use a calculator to answer this question.
You **must** show all your working. [3]

(b) Showing all your working, simplify each of the following.

(i) $\frac{x^{-\frac{2}{5}} \times x^{\frac{17}{5}}}{x^{\frac{1}{2}}}$ [2]

(ii) $\frac{8x^{\frac{1}{9}} + x^{\frac{2}{9}}}{x^{\frac{2}{9}}}$ [2]

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

The length of a solid rectangular block is x cm.
The width of the block is 4 cm less than its length.
The height is 1 cm more than the length.
The total surface area of the rectangular block is 124 cm^2.

By showing that $x^2 - 2x = 22$, find the length of the rectangular block, giving your answer in its simplest surd form.
You must use an algebraic method and show all your working. [10]

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

11. A right square-based pyramid has a perpendicular height of 12 cm.
The area of the square base of the pyramid is 64 cm^2.

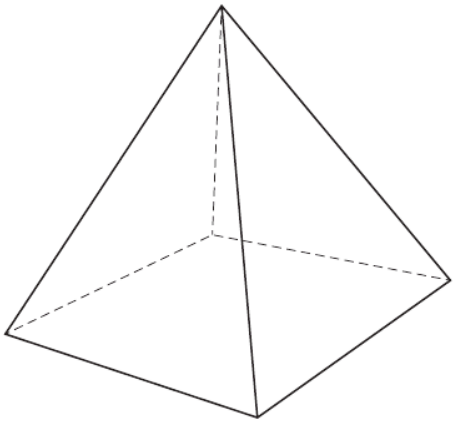


Diagram not drawn to scale

Calculate the angle between the diagonal of the base and one of the sloping edges of the pyramid. [7]

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

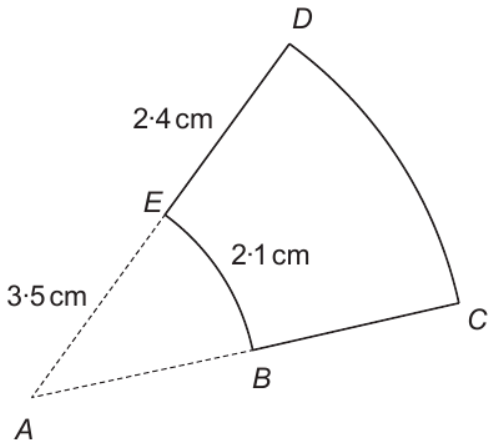


Diagram not drawn to scale

ADC is a sector of a circle, centre *A*.
AEB is a sector of another circle, also with centre *A*.
Calculate the perimeter of the shape *BCDE*.
You must show all your working. [8]

4. Prove that $\frac{2x}{3} - \frac{x-7}{4} + \frac{3x+1}{5} \equiv \frac{61x+117}{60}$. [4]

5. Given that $y = x^2 + 8x$, find $\frac{dy}{dx}$ from first principles. [5]

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.

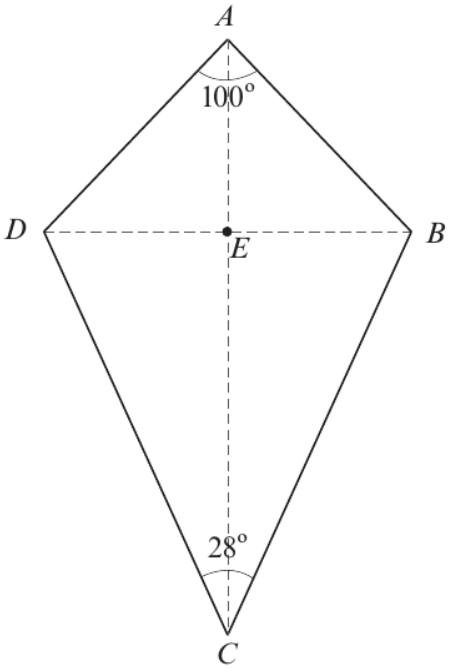


Diagram not drawn to scale

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]

13. Each edge of the base of a square based pyramid has a length of 4 cm. The length of each of the other edges of the pyramid is 6 cm. Calculate the perpendicular height of the pyramid, giving your answer in the form $a\sqrt{b}$.

[7]

14. The curved surface area of a cylinder of radius x cm and length $(3x + 2)$ cm is 32π cm^2. Form an equation in terms of x and solve it to find the length of the cylinder.

[7]

14. The curved surface area of a cylinder of radius x cm and length $(3x + 2)$ cm is 32π cm^2. Form an equation in terms of x and solve it to find the length of the cylinder.

[7]

15. The diagram shows a flexible piece of card in the form of a sector of a circle with centre A and radius 18 cm.

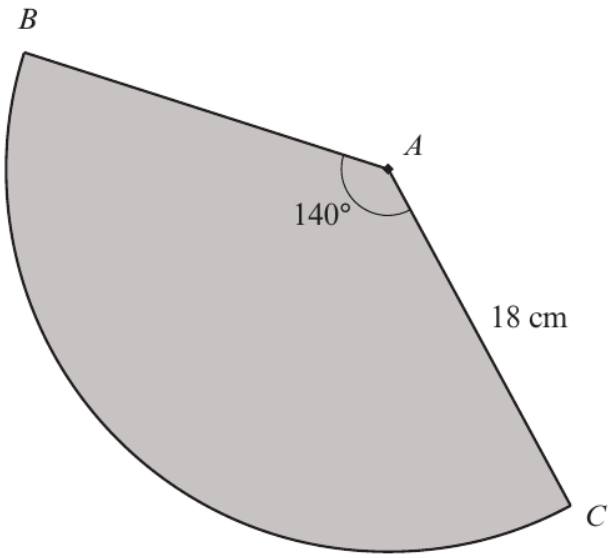


Diagram not drawn to scale

The card is bent and the edges AB and AC are taped together so that the card forms the curved surface of a cone with a circular base.
Calculate the radius of the circular base.

[4]