Hints online, answers free with an account:
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Grade 8/9 mixed revision 5

46 marks

Date

X Exam questions

Edexcel GCSE Higher style. Show all your working. The hints are at the end of the sheet. Use one at a time.

X1 A circular pond has an area of 72 m², correct to 2 significant figures. [3 marks]
Work out the lower bound for the radius of the pond.
Give your answer correct to 3 significant figures.

Answer ... m

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X2 Kim uses the iteration formula $x_{n+1} = 2 + \dfrac{1}{x_n^2}$ with $x_0 = 2$

(a) Find the value of x_3 [2 marks]

Give your answer correct to 4 decimal places.

Answer $x_3 = \ldots$

(b) Explain what the value of x_3 is an estimate of. [1 mark]

Give an equation in your answer.

Total for X2: 3 marks

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X3 The curve C has equation $y = x^2 + 2x - 5$. [3 marks]

C is translated by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ to give the curve D.

Find an equation of D. Give your answer in the form $y = x^2 + bx + c$.

Answer $y = \ldots$

X4 Write $\dfrac{\sqrt{50} - \sqrt{8}}{\sqrt{2} + 1}$ in the form $a + b\sqrt{2}$, where a and b are integers. [3 marks]

You must show all your working.

Answer ...

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X5 Prove algebraically that the recurring decimal $0.2\dot{3}\dot{6}$ can be written as $\frac{13}{55}$ [3 marks]

X6 Solve $2x^2 + 7x \geqslant 15$ [4 marks]

Give your answer using set notation.

Answer .....

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X7 The functions f and g are such that

$$f(x) = \frac{3}{x-2} \qquad g(x) = x^2 - 6$$

(a) Write down the value of x that must be excluded from any domain of f. [1 mark]

Answer $x = \ldots$

(b) Find the values of x that must be excluded from any domain of fg. [3 marks]
Give your answers in surd form.

Answer $x = \ldots$

Total for X7: 4 marks

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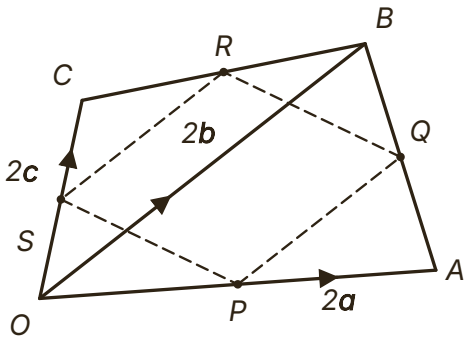
X8 $OABC$ is a quadrilateral. [4 marks]

$\overrightarrow{OA} = 2\mathbf{a}$, $\overrightarrow{OB} = 2\mathbf{b}$ and $\overrightarrow{OC} = 2\mathbf{c}$.

P, Q, R and S are the midpoints of OA, AB, BC and CO.

Prove that $PQRS$ is a parallelogram.



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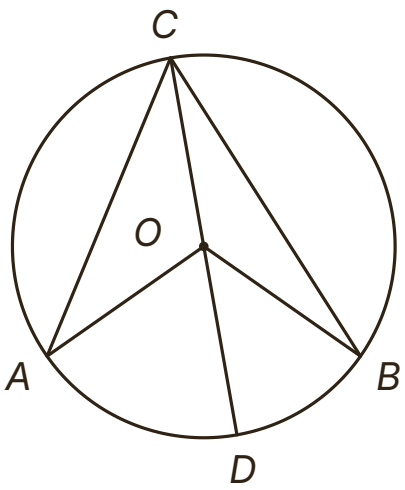
X9 A, B and C are points on a circle, centre O. [4 marks]

CD is a diameter of the circle.

Prove that angle $AOB = 2\times$ angle ACB.

You must not use the circle theorem about the angle at the centre in your proof.

Diagram NOT accurately drawn



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X10 The line L has equation $y = 34 - 4x$.
The circle C has equation $x^2 + y^2 = 68$.

(a) Show that L is a tangent to C. [3 marks]

(b) Find the coordinates of the point where L touches C. [1 mark]

Answer $(\ldots, \ldots)$

Total for X10: 4 marks

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X11 Solve $\dfrac{x}{x-3} + \dfrac{6}{x+3} = \dfrac{18}{x^2-9}$ [5 marks]

You must show all your working.

Answer $x = \ldots$

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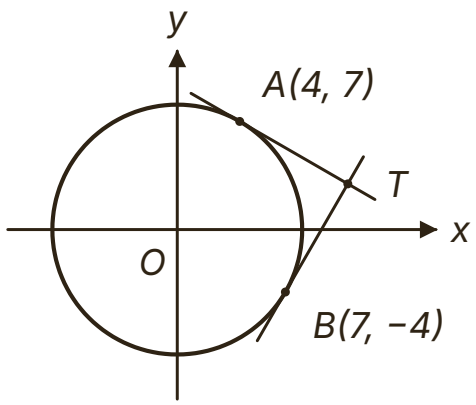
X12 The points $A(4, 7)$ and $B(7, -4)$ lie on the circle with equation $x^2 + y^2 = 65$.

The tangent to the circle at A and the tangent to the circle at B meet at the point T.

Diagram NOT accurately drawn



(a) Find an equation of the tangent to the circle at A. [3 marks]

Answer ...

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(b) Find the coordinates of T. [3 marks]

You must show all your working.

Answer $(\ldots, \ldots)$

Total for X12: 6 marks

F How did it go?

Colour one circle on each line.

	Not yet	Nearly	Yes
I can prove results with vectors, algebra and circle theorems, giving a reason for each step.	○	○	○
I can find tangents to circles and solve non-linear simultaneous equations and quadratic inequalities.	○	○	○
I can work with composite and inverse functions, algebraic fractions, surds and transformations of graphs.	○	○	○
I can use bounds with division and subtraction, and find roots by iteration.	○	○	○

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Hints

Use one hint at a time. Cover the ones below it with a sheet of paper.

X1

Hint 1 The area is to 2 significant figures, so it lies between 71.5 and 72.5.

Hint 2 Rearrange $A = \pi r^2$ to make r the subject.

Hint 3 Use the lower bound of the area: $r = \sqrt{71.5 \div \pi}$.

X2

Hint 1 Put $x_0 = 2$ into $2 + \dfrac{1}{x^2}$ to get x_1, then continue.

Hint 2 $x_1 = 2.25$. Keep the unrounded values on your calculator for x_2 and x_3.

Hint 3 If the values settle at a number, that number makes the formula balance with $x_{n+1} = x_n = x$. Write that equation down.

X3

Hint 1 A translation by $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ moves the curve 3 right and 4 down.

Moving right 3 means replacing x by $x - 3$.

Hint 2 Write $y = (x-3)^2 + 2(x-3) - 5$, then subtract 4.

Hint 3 Expand $(x-3)^2 = x^2 - 6x + 9$ and $2(x-3) = 2x - 6$, collect the terms and subtract 9. Check: the turning point should move from $(-1, -6)$ to $(2, -10)$.

X4

Hint 1 Simplify $\sqrt{50}$ and $\sqrt{8}$ first, using square factors.

Hint 2 The numerator becomes a multiple of $\sqrt{2}$. Now remove the surd from the denominator.

Hint 3 Multiply the top and the bottom by $\sqrt{2} - 1$; the denominator is $2 - 1 = 1$. Then expand $3\sqrt{2}(\sqrt{2} - 1)$.

X5

Hint 1 Let $x = 0.2363636\ldots$ Only the 36 repeats, not the 2.

Hint 2 Multiply by 10 and by 1000 so that both numbers have the same digits after the decimal point.

Hint 3 Subtract to get $990x = 234$, then simplify $\dfrac{234}{990}$ by dividing the top and bottom by common factors.

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X6

Hint 1 Move the 15 to the left so that the right-hand side is 0.

Hint 2 Factorise $2x^2 + 7x - 15$ and find the critical values.

Hint 3 The critical values are -5 and $\frac{3}{2}$, and the inequality holds outside them. Two separate regions are joined with $\cup$, and each is written as $\{x : \dots\}$.

X7

Hint 1 A value of x is excluded when it makes a denominator 0.

Hint 2 $fg(x)$ means put $g(x)$ into f, so the denominator of $fg(x)$ is $g(x) - 2$.

Hint 3 Solve $x^2 - 6 - 2 = 0$. A square root gives two values.

X8

Hint 1 Write the position of each midpoint from O. The midpoint of AB is $\frac{1}{2}(\overrightarrow{OA} + \overrightarrow{OB})$ from O.

Hint 2 Find $\overrightarrow{PQ}$ and $\overrightarrow{SR}$, which are opposite sides of $PQRS$, as differences of position vectors.

Hint 3 Both $\overrightarrow{PQ}$ and $\overrightarrow{SR}$ simplify to the same vector. State what that tells you about their lengths and directions, and why that makes $PQRS$ a parallelogram.

X9

Hint 1 Let angle $ACO = x$ and angle $BCO = y$.

Hint 2 OA and OC are both radii, so triangle OAC is isosceles. Write the angles of triangle OAC in terms of x.

Hint 3 Angle AOD is an exterior angle of triangle OAC, so it equals $x + x$. Do the same in triangle OBC and add the two angles at O.

X10

Hint 1 A line is a tangent to a circle if it meets the circle at exactly one point. Substitute $y = 34 - 4x$ into $x^2 + y^2 = 68$.

Hint 2 Simplify to a quadratic and divide through by 17.

Hint 3 The quadratic is $x^2 - 16x + 64 = 0$. Write it as a square to show it has only one solution, then find y from the line.

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X11

Hint 1 Factorise $x^2 - 9$. It is the common denominator of all three fractions.

Hint 2 Multiply every term by $(x-3)(x+3)$: $x(x+3) + 6(x-3) = 18$.

Hint 3 Solve $x^2 + 9x - 36 = 0$, then check each solution in the original denominators.

X12

Hint 1 The tangent at a point is perpendicular to the radius to that point. Find the gradient of OA first.

Hint 2 The tangent at A has gradient $-\frac{4}{7}$ and passes through $(4, 7)$. Find the tangent at B the same way, using the gradient of OB.

Hint 3 The tangent at B has gradient $\frac{7}{4}$. Write both tangents in the form $ax + by = c$ and eliminate one variable to find T.

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