Hints online, answers free with an account:
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Grade 8/9 mixed revision 10

53 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 Solve $3(x^2 - 4) \geqslant 2x^2 + 37$ [3 marks]

Answer .....

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X2 The function f is defined by [3 marks]

$$f(x) = \frac{2x + 5}{x - 3} \qquad x \neq 3$$

Find $f^{-1}(x)$.

Answer $f^{-1}(x) = \ldots$

X3 Use the iteration formula $x_{n+1} = \sqrt{3x_n + 5}$ with $x_0 = -1$ to find the value of x_3 [3 marks]
Give your answer correct to 4 decimal places.

Answer $x_3 = \ldots$

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X4 Here are the instructions for a number puzzle. [4 marks]

Think of a number.
Add 6 to your number and square the result.
Subtract 6 from your number and square the result.
Subtract the second result from the first result.
Divide by 24.
Prove that the final answer is always the number you first thought of.

X5 $x = 7.4$ correct to 1 decimal place.

(a) Write down the error interval for x. [2 marks]

Answer $\cdots \leq x < \ldots$

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(b) $y = 20 - 3x$ [2 marks]

Find the error interval for y.

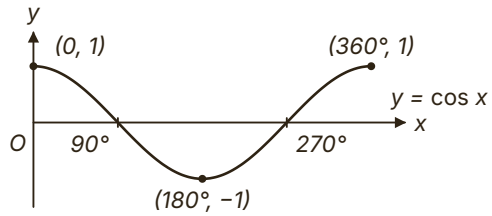
Answer $\ldots < y \leq \ldots$

Total for X5: 4 marks

X6 The diagram shows the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.

The graph of $y = \cos x$ is reflected in the x-axis and then translated by the vector $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$.

The new graph has equation $y = g(x)$.



(a) Write down an expression for $g(x)$. [1 mark]

Answer $g(x) = \ldots$

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(b) Write down the coordinates of the maximum point of $y = g(x)$ for $0^\circ \leqslant x \leqslant 360^\circ$. [1 mark]

Answer $(\ldots, \ldots)$

(c) Solve $g(x) = 1.5$ for $0^\circ \leqslant x \leqslant 360^\circ$. [3 marks]
You must show all your working.

Answer $x = \ldots$

Total for X6: 5 marks

X7 $x = 3 + \sqrt{5}$

(a) Show that $\dfrac{4}{x} = 3 - \sqrt{5}$. [2 marks]

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(b) Hence find the exact value of $x^2 + \frac{16}{x^2}$.

You must show all your working.

[3 marks]

Answer ...

Total for X7: 5 marks

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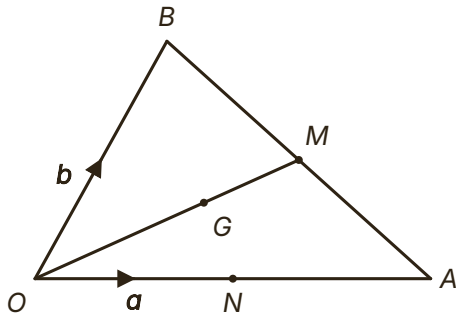
X8 OAB is a triangle. [5 marks]

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

M is the midpoint of AB and N is the midpoint of OA.

G is the point on OM such that $OG : GM = 2 : 1$.

Prove that G lies on the line BN, and that $BG : GN = 2 : 1$.



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X9 The point $P(6, 5)$ lies on the circle with equation $x^2 + y^2 = 61$ and centre O.
The tangent to the circle at P meets the x-axis at the point Q.

(a) Find the coordinates of Q. [3 marks]

Answer $(\ldots, \ldots)$

(b) Find the area of triangle OPQ. [2 marks]
Give your answer as a fraction.

Answer ...

Total for X9: 5 marks

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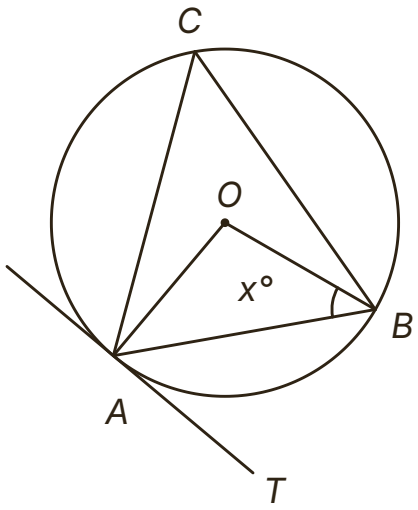
X10 A, B and C are points on a circle, centre O.
TA is the tangent to the circle at A.
Angle $OBA = x^\circ$
Diagram NOT accurately drawn



(a) Show that angle $ACB = (90 - x)^\circ$. [3 marks]
Give a reason for each stage of your working.

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(b) Prove that angle $TAB =$ angle ACB. [2 marks]

Total for X10: 5 marks

X11 The line with equation $y = x + 2$ meets the circle with equation $x^2 + y^2 = 12$ at the points A and B. [5 marks]

Find the exact coordinates of A and B.

Give your answers in surd form.

Answer $(\ldots, \ldots)$ and $(\ldots, \ldots)$

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X12

(a) Show that $\frac{2}{x+1} - \frac{1}{x-3} = 3$ can be written as $3x^2 - 7x - 2 = 0$ [3 marks]

(b) Hence solve $\frac{2}{x+1} - \frac{1}{x-3} = 3$ [3 marks]

Give your solutions correct to 2 decimal places.

Answer $x = \ldots$

Total for X12: 6 marks

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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**	Expand the bracket and collect the x^2 terms on one side.
	Hint 2	You should get $x^2 \geqslant 49$. Remember that a negative number squared is positive.
	Hint 3	$x^2 = 49$ when $x = 7$ or $x = -7$. Test a value such as $x = 0$: it does not work, so the answer is outside ± 7.
X2	**Hint 1**	Write $y = \dfrac{2x + 5}{x - 3}$ and multiply both sides by $x - 3$.
	Hint 2	Expand, then collect every term with x on one side and the other terms on the other side.
	Hint 3	Factorise: $x(y - 2) = 3y + 5$, then divide by $y - 2$.
X3	**Hint 1**	Substitute $x_0 = -1$ into $\sqrt{3x + 5}$ to get x_1. Take care with the negative number.
	Hint 2	$3 \times (-1) + 5 = 2$, so $x_1 = \sqrt{2}$. Now substitute x_1, not x_0, to get x_2.
	Hint 3	Multiply the whole of x_n by 3, add 5, then take the square root of the total. Use the unrounded values each time.
X4	**Hint 1**	Call the number n and write each instruction in algebra.
	Hint 2	Expand $(n + 6)^2$ and $(n - 6)^2$.
	Hint 3	When you subtract the second from the first, put the second in a bracket so every sign changes. The n^2 terms and the 36s cancel.
X5	**Hint 1**	x is to 1 decimal place, so it is within 0.05 of 7.4.
	Hint 2	Put each end of the interval for x into $20 - 3x$. Subtracting $3x$ means the larger x gives the smaller y.
	Hint 3	$x = 7.35$ gives -2.05 (included) and $x = 7.45$ gives -2.35 (not included). Write the interval with the smaller number on the left.

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X6

Hint 1 Reflecting $y = \cos x$ in the x-axis gives $y = -\cos x$. A translation by $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$ adds 1.

Hint 2 The maximum of $1 - \cos x$ is where $\cos x$ is smallest. For (c), rearrange $1 - \cos x = 1.5$ to get $\cos x$ on its own.

Hint 3 $\cos x = -0.5$. You know $\cos 60^\circ = 0.5$. Use the symmetry of the cosine graph about $x = 180^\circ$ to find two angles between 90° and 270°.

X7

Hint 1 For (a), rationalise $\dfrac{4}{3 + \sqrt{5}}$ by multiplying the top and the bottom by $3 - \sqrt{5}$.

Hint 2 For (b), notice that $\dfrac{16}{x^2} = \left(\dfrac{4}{x}\right)^2$, so you can use part (a).

Hint 3 Work out $(3 + \sqrt{5})^2$ and $(3 - \sqrt{5})^2$, then add them. The $\sqrt{5}$ terms cancel.

X8

Hint 1 Find $\overrightarrow{OM}$ first: go from O to A, then half of $\overrightarrow{AB}$.

Hint 2 $\overrightarrow{OG}$ is two thirds of $\overrightarrow{OM}$. Now find $\overrightarrow{BN}$ and $\overrightarrow{BG} = \overrightarrow{BO} + \overrightarrow{OG}$.

Hint 3 $\overrightarrow{BG} = \frac{1}{3}\mathbf{a} - \frac{2}{3}\mathbf{b}$ and $\overrightarrow{BN} = \frac{1}{2}\mathbf{a} - \mathbf{b}$. Write $\overrightarrow{BG}$ as a fraction of $\overrightarrow{BN}$ and say which point the two lines share.

X9

Hint 1 The tangent is perpendicular to OP. Find the gradient of OP, then the gradient of the tangent.

Hint 2 Write the tangent through $P(6, 5)$ and put $y = 0$ to find Q.

Hint 3 Put $y = 0$ into the tangent's equation to find Q. For the area, use OQ as the base and the height of P above the x-axis, which is 5.

X10

Hint 1 OA and OB are radii, so triangle OAB is isosceles.

Hint 2 Find angle AOB in terms of x, then use the angle at the centre.

Hint 3 For part (b), the tangent at A makes 90° with OA. Subtract angle OAB from 90° and compare with part (a).

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X11

Hint 1 Substitute $y = x + 2$ into $x^2 + y^2 = 12$ and simplify.

Hint 2 You get $x^2 + 2x - 4 = 0$, which does not factorise. Complete the square or use the quadratic formula.

Hint 3 $(x + 1)^2 = 5$ gives $x = -1 \pm \sqrt{5}$. Pair each value of x with its own value of $y = x + 2$.

X12

Hint 1 Multiply every term, including the 3, by $(x + 1)(x - 3)$.

Hint 2 $2(x - 3) - (x + 1) = 3(x + 1)(x - 3)$. Expand both sides and collect everything on one side.

Hint 3 For (b), use the formula with $a = 3$, $b = -7$, $c = -2$: the square root is $\sqrt{49 + 24}$.

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