Hints online, answers free with an account:
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Grade 8/9 mixed revision 1

48 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 The point $P(4, -9)$ lies on the circle with equation $x^2 + y^2 = 97$. [3 marks]
Find an equation of the tangent to the circle at P.
Give your answer in the form $y = mx + c$.

Answer $y = \ldots$

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X2 A, B, C and D are points on a circle. [3 marks]

Angle $BAD = (4x + 10)^\circ$

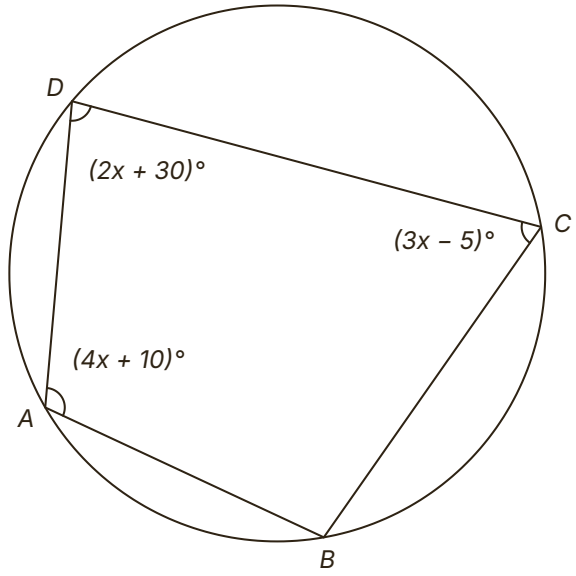
Angle $BCD = (3x - 5)^\circ$

Angle $ADC = (2x + 30)^\circ$

Work out the size of angle ABC.

Give a reason for each stage of your working.

Diagram NOT accurately drawn



Answer Angle $ABC = \ldots^\circ$

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X3 $f(x) = 2x^2 - 12x + 23$

(a) Write $f(x)$ in the form $a(x + b)^2 + c$, where a, b and c are integers. [2 marks]

Answer ...

(b) Hence write down the coordinates of the turning point of the graph of $y = f(x + 4) - 6$. [1 mark]

Answer $(\ldots, \ldots)$

Total for X3: 3 marks

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X4 Write $\dfrac{5+\sqrt{3}}{2-\sqrt{3}}$ in the form $a+b\sqrt{3}$, where a and b are integers. [3 marks]

You must show all your working.

Answer ...

X5 n is an integer.

(a) Prove that the sum of any three consecutive integers is a multiple of 3. [2 marks]

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(b) Prove that the mean of any four consecutive integers is never an integer. [2 marks]

Total for X5: 4 marks

X6 Solve the inequality $(x-1)(x+6) > 3x+18$ [4 marks]
You must show all your working.

Answer .....

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X7 The functions f and g are such that [4 marks]

$$f(x) = 2x + a \qquad g(x) = x^2 - 3x$$

where a is a constant.
Given that $gf(1) = 10$, find the two possible values of a.
You must show all your working.

Answer $a = \ldots$ or $a = \ldots$

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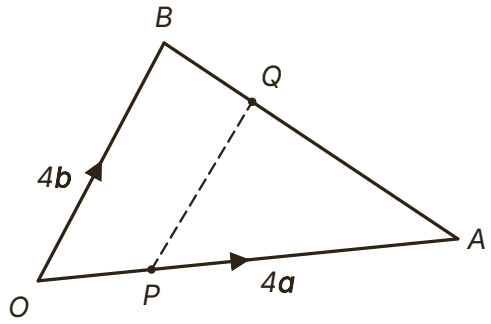
X8 OAB is a triangle.

$\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 4\mathbf{b}$.

P is the point on OA such that $OP : PA = 1 : 3$.

Q is the point on AB such that $AQ : QB = 3 : 1$.

Diagram NOT accurately drawn



(a) Find $\overrightarrow{AB}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. [1 mark]

Answer $\overrightarrow{AB} = \ldots$

(b) Prove that PQ is parallel to OB, and find the ratio $PQ : OB$. [3 marks]

Total for X8: 4 marks

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X9 Solve the simultaneous equations [5 marks]

$$x^2 + y^2 = 41$$

$$y = 2x - 3$$

You must show all your working.

Answer $x = \ldots, y = \ldots$ or $x = \ldots, y = \ldots$

X10 This question is about the expression $\dfrac{2}{x-3} + \dfrac{5}{x+2}$.

(a) Write $\dfrac{2}{x-3} + \dfrac{5}{x+2}$ as a single fraction in its simplest form. [2 marks]

Answer .....

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(b) Hence solve $\dfrac{2}{x-3}+\dfrac{5}{x+2}=1$

[3 marks]

Give your answers in the form $a \pm \sqrt{b}$, where a and b are integers.

Answer $x = \ldots$

Total for X10: 5 marks

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X11 Priya cycles 1250 m, correct to the nearest 10 m. [5 marks]
Her time is 96.4 seconds, correct to 1 decimal place.
Work out the upper bound for her average speed in kilometres per hour.
Give your answer correct to 3 significant figures.
You must show all your working.

Answer ... km/h

X12 The equation $x^3 - 5x - 7 = 0$ has one real solution.

(a) Show that $x^3 - 5x - 7 = 0$ can be rearranged to give $x = \sqrt[3]{5x + 7}$ [2 marks]

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(b) Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt[3]{5x_n + 7}$ three times to find an estimate for the solution of $x^3 - 5x - 7 = 0$

Give your answer correct to 4 decimal places.

[3 marks]

Answer $x_3 = \ldots$

Total for X12: 5 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 tangent at P is perpendicular to the radius OP. Start by finding the gradient of OP.

Hint 2 The gradient of OP is $-\frac{9}{4}$. The gradient of the tangent is the negative reciprocal of this.

Hint 3 Use $y-(-9)=\frac{4}{9}(x-4)$ and rearrange into the form $y=mx+c$. Take care with the sign of -9.

X2

Hint 1 Which pairs of angles in a cyclic quadrilateral add up to $180°$?

Hint 2 Angles BAD and BCD are opposite each other. Use them to form an equation in x.

Hint 3 $7x+5=180$. Find x, then work out angle ADC. Angle ABC is opposite angle ADC.

X3

Hint 1 Take out the factor 2 from the first two terms: $2(x^2-6x)+23$.

Hint 2 Complete the square inside the bracket: $x^2-6x=(x-3)^2-9$. Multiply the -9 by 2 before adding the 23.

Hint 3 The turning point of $y=a(x+b)^2+c$ is $(-b,c)$. Replacing x by $x+4$ moves the graph 4 units to the left, not to the right; the -6 moves it 6 down.

X4

Hint 1 To remove the surd from the denominator, multiply the top and the bottom by the same expression.

Hint 2 Use $2+\sqrt{3}$, because $(2-\sqrt{3})(2+\sqrt{3})$ has no surd in it.

Hint 3 The denominator becomes $4-3=1$. Expand $(5+\sqrt{3})(2+\sqrt{3})$ and collect the terms; remember $\sqrt{3}\times\sqrt{3}=3$.

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X5

Hint 1 Write three consecutive integers using one letter: n, $n+1$, $n+2$.

Hint 2 Add them and take out a common factor of 3. For part (b), add four consecutive integers and divide by 4.

Hint 3 The sum of four consecutive integers is $4n+6$. Write $\dfrac{4n+6}{4}$ as n plus a fraction and explain why that is not a whole number.

X6

Hint 1 Expand the left-hand side, then move every term to one side so that the right-hand side is 0.

Hint 2 You should get $x^2+2x-24>0$. Factorise it to find the critical values.

Hint 3 The critical values are -6 and 4. Sketch $y=x^2+2x-24$: it is above the x-axis to the left of -6 and to the right of 4.

X7

Hint 1 Work out $f(1)$ first. It is an expression in a.

Hint 2 $gf(1)$ means put $f(1)$ into g: $gf(1)=(2+a)^2-3(2+a)$.

Hint 3 Set $(2+a)^2-3(2+a)$ equal to 10, expand and collect to get $a^2+a-12=0$, then factorise.

X8

Hint 1 Go round the triangle: $\overrightarrow{AB}=\overrightarrow{AO}+\overrightarrow{OB}$.

Hint 2 P is a quarter of the way from O to A, so $\overrightarrow{PA}=3\mathbf{a}$. Q is three quarters of the way from A to B, so $\overrightarrow{AQ}=\frac{3}{4}\overrightarrow{AB}$.

Hint 3 Work out $\overrightarrow{PQ}=\overrightarrow{PA}+\overrightarrow{AQ}$ and simplify. If the answer is a number times $\mathbf{b}$, compare that number with the 4 in $\overrightarrow{OB}=4\mathbf{b}$.

X9

Hint 1 Replace y in the first equation by $2x-3$.

Hint 2 Expand $(2x-3)^2$ carefully, collect terms and rearrange to a quadratic equal to 0.

Hint 3 You should get $5x^2-12x-32=0$, which factorises as $(5x+8)(x-4)=0$. Find y for each value of x using $y=2x-3$.

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X10

Hint 1 The common denominator is $(x-3)(x+2)$. Multiply each numerator by the bracket it is missing.

Hint 2 For (b), use part (a): multiply both sides by $(x-3)(x+2)$ to get $7x-11=(x-3)(x+2)$.

Hint 3 Expand and collect the terms to get $x^2-8x+5=0$. Complete the square: $(x-4)^2=11$.

X11

Hint 1 Write down the bounds of the distance and of the time. The distance is to the nearest 10 m, so the half-unit is 5 m.

Hint 2 Speed is distance divided by time. For the largest speed, divide the largest distance by the smallest time.

Hint 3 Work out $1255\div 96.35$ to get m/s, then multiply by 3600 and divide by 1000 to change to km/h.

X12

Hint 1 For part (a), get x^3 on its own on one side, then take the cube root.

Hint 2 For part (b), put $x_0=2$ into the formula to get x_1, then put x_1 in to get x_2, and so on.

Hint 3 $x_1=\sqrt[3]{17}=2.5712\ldots$. Keep every digit on your calculator (use the ANS key) and work out x_2 and x_3 the same way; round only at the end.

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