Surname	Centre Number	Candidate Number
First name(s)		0



# **GCSE**

3300U60-1



# **WEDNESDAY, 10 NOVEMBER 2021 - MORNING**

# MATHEMATICS UNIT 2: CALCULATOR-ALLOWED HIGHER TIER

1 hour 35 minutes

#### **ADDITIONAL MATERIALS**

A calculator will be required for this examination.

A ruler, a protractor and a pair of compasses may be required.

#### **INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer all the questions in the spaces provided.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for all work written on the additional page.

Take  $\pi$  as 3·14 or use the  $\pi$  button on your calculator.

#### **INFORMATION FOR CANDIDATES**

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

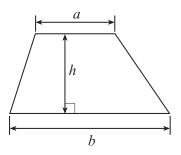
In question **9**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Ex	For Examiner's use only					
Question	Maximum Mark	Mark Awarded				
1.	3					
2.	4					
3.	4					
4.	5					
5.	3					
6.	9					
7.	3					
8.	3					
9.	5					
10.	6					
11.	3					
12.	7					
13.	4					
14.	8					
15.	3					
Total	70					

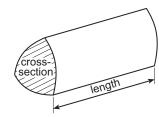


## Formula List - Higher Tier

Area of trapezium =  $\frac{1}{2}(a+b)h$ 



Volume of prism = area of cross-section × length

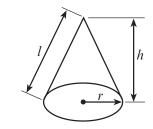


Volume of sphere =  $\frac{4}{3}\pi r^3$ Surface area of sphere =  $4\pi r^2$ 



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

Curved surface area of cone =  $\pi r l$ 

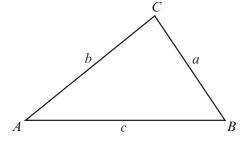


In any triangle ABC

Sine rule 
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule  $a^2 = b^2 + c^2 - 2bc \cos A$ 

Area of triangle =  $\frac{1}{2}ab \sin C$ 



# The Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$  where  $a \ne 0$  are given by  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$ 

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

# **Annual Equivalent Rate (AER)**

AER, as a decimal, is calculated using the formula  $\left(1+\frac{i}{n}\right)^n-1$ , where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.



2(3a - 7) cm

Diagram not drawn to scale

(5a + 4) cm

A rectangle has sides of length 2(3a-7) cm and (5a+4) cm.

Form an expression, in terms of a, for the perimeter of this rectangle. You must simplify your expression.

[3]	
[3]	



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One i	s in North Wales and the other is in S	South Wales.	
The p	ie charts below show the distribution	of its 96 part-time staff and its 150 full-time	ne staff.
	North Wales South Wales	North Wales  144°  South Wales	
	96 part-time staff	150 full-time staff	
A per	son is chosen at random from the co is the probability that this person wo	mpany's 246 staff members.	[4]
			······································
<u></u>			
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···········			



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	solution of the equation $3 + 2 = 20$
	$x^3 + 3x = 20$
ie	es between 2 and 3.
Us Yo	se the method of trial and improvement to find this solution correct to 1 decimal place. ou must show all your working.
••••	



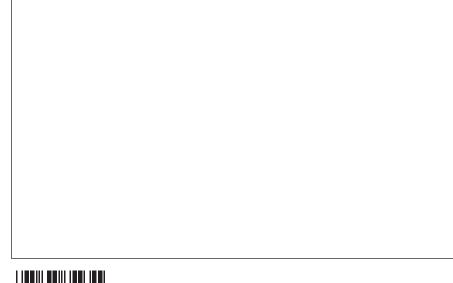
4.	Show that the triangle below is <b>not</b> a right-angled triangle.	[5]
	$(5x-17)^{\circ}$	
	$(2x+9)^{\circ} \qquad (x+20)^{\circ}$	
	Diagram not drawn to scale	
		············
		······································
		•••••
		•



Calculate the length of the side AB in the triangle shown below.

[3]

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9	
$\supset$	
0	
0	
က	1
က	C



5.

6.	(a)	(i)	Expand $x(x^2 + 7)$ . [2]
		(ii)	Expand and simplify $(x-5)(3x-4)$ . [2]
	(b)	On N At th	The buys and sells antique clocks. Monday, Sarah had $n$ clocks. We end of the day on Tuesday, she had 5 times as many clocks as she had on Monday. Wednesday, she sold 27 clocks.
		(i)	At the end of the day on Wednesday, Sarah had fewer clocks than she had on Monday. Write an inequality, in terms of $n$ , that shows this information. [2]
		(ii)	Solve your inequality to find the greatest number of clocks that Sarah could have had on the Monday. [3]
		<u></u>	
		*********	



7. A number, when increased by 4%, is equal to N. Which of the following calculations would give you the original number? (a) Circle your answer.

[1]

$$N \times 1.04$$

previous diagram.

$$N \div 1.04$$

$$N \times 1.4$$
  $N \div 1.4$ 

$$N \div 1.4$$

$$N-4$$

The number shown on each diagram below is 20% greater than the number shown on the (b)

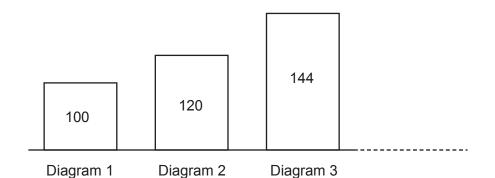


Diagram not drawn to scale

Find the number that should be shown on Diagram 6.

	9 - 1	

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[2]

factorise $x^2 - 4x - 12$ , and hence solve $x^2 - 4x - 12 = 0$ .	[3]
	······································
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**9.** In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

A circle with centre *O* is shown below. The radius of the circle is 7·3 cm.

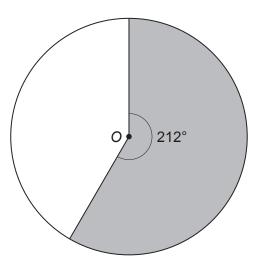


Diagram not drawn to scale

Calculate the perimeter of the shaded region. You must show all your working.	[3 + 2 OCW]



		y = 65 when Find an expr	x = 51.84. ession for $y$ in	terms of x.		[3]
		Line the ever	rancian you fou	and in part (i) to cor	anlote the following to	hlo [2]
	(ii)	x	51.84	15·21	mplete the following ta	ble. [2]
		y	65		78	
(b)		known that $c$ is	s directly prop	ortional to the squa	are of $d$ .	
	Wha Circl	t happens to a e the correct s	c if $d$ is doubled statement below $c$ is	c is	c is	c is
c		A IL	iplied by 2	divided by 4	multiplied by 4	squared



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**11.** The table below shows the value of d and the value of e. It also shows the degree of accuracy of each value.

Value	Degree of accuracy
<i>d</i> = 64	Nearest whole number
e = 8·6	1 decimal place

Use the formula

$$c = \frac{d^2}{e}$$

to calculate the **least** possible value of c.

You must show all your working.

You must show all your working.	[3]
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Examiner only

# **12.** The diagram shows a quadrilateral *DEFG*.

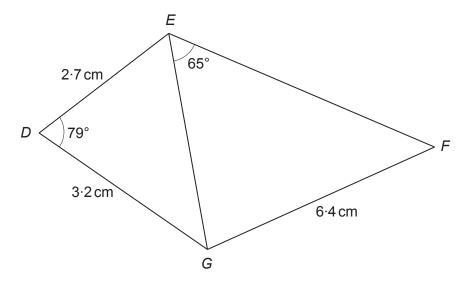


Diagram not drawn to scale

Calculate the size of $\widehat{\mathit{EFG}}$ .	[7]
	•••••
	••••••



13.	Simplify the following expression. $\frac{6x^2 - 9x}{4x^2 - 9}$	[4]	only
		·····•	
		······•	
		•••••	
		·····•	



## **14.** Triangle *ABC* is shown below.

The length of AC is (x-1) cm.

The length of *BC* is (2x + 3) cm.

The size of  $\widehat{ACB}$  is 30°.

The area of triangle ABC is 6 cm<sup>2</sup>.

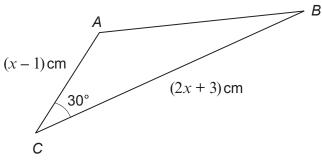


Diagram not drawn to scale

(a)	Show that	[3]
	$2x^2 + x - 27 = 0.$	
•••••		
• • • • • • • • • • • • • • • • • • • •		····•
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		<b>.</b>



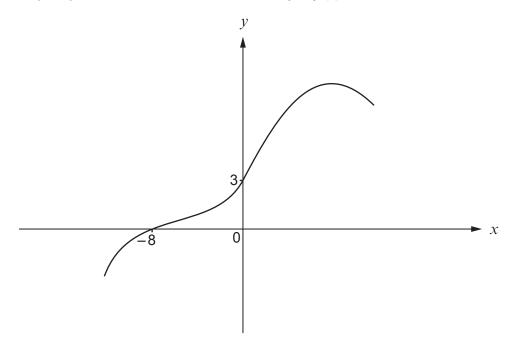
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only

(b)	Solve the equation	
	$2x^2 + x - 27 = 0.$	
	You must use an algebraic method and show all your working. Give your answers correct to 2 decimal places.	
(c)	Evaluate the length of AC.	
(c)	Evaluate the length of <i>AC</i> . You must justify any decision that you make.	
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(c)	Evaluate the length of AC. You must justify any decision that you make.	
(c)	Evaluate the length of AC. You must justify any decision that you make.	
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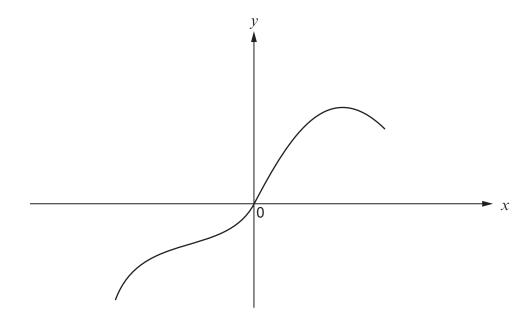
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**15.** The following diagram shows a sketch of the curve y = f(x).



In each of the following questions, the graph of y = f(x) has been transformed.

(a)



Circle the only possible equation of the transformed curve.

[1]

$$y = f(x) - 3$$

$$y = f(x - 3)$$

$$y = \frac{1}{3} f(x)$$

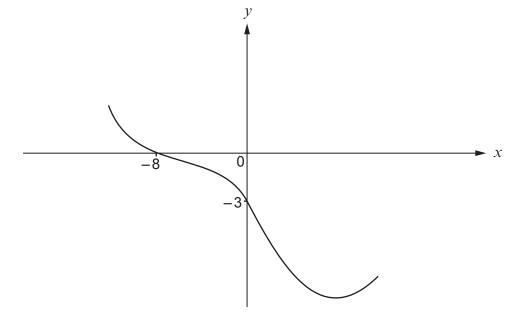
$$y = f(x) - 3$$
  $y = f(x - 3)$   $y = \frac{1}{3} f(x)$   $y = f(x + 3)$   $y = f(x) + 3$ 

$$y = f(x) + 3$$

(b)



Examiner only



Circle the only possible equation of the transformed curve.

[1]

$$v = f(x) - 6$$

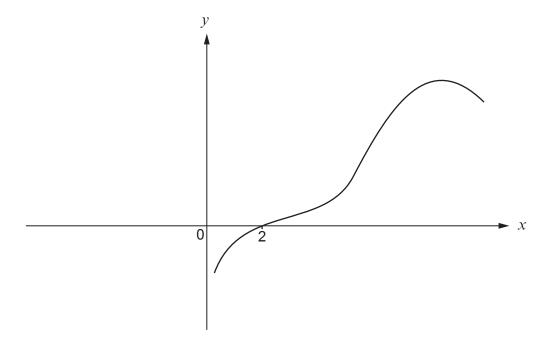
$$y = -f(x)$$

$$y = f(x) - 6$$
  $y = -f(x)$   $y = f(x + 8)$   $y = f(x) + 6$   $y = f(-x)$ 

$$y = f(x) + 6$$

$$y = f(-x)$$

(c)



Circle the only possible equation of the transformed curve.

[1]

$$y = f(x) + 10$$

$$y = f(x) + 10$$
  $y = f(x + 10)$   $y = -4f(x)$   $y = f(x - 10)$   $y = f(x) - 10$ 

$$y = -4f(x)$$

$$v = f(x - 10)$$

$$v = f(x) - 10$$

### **END OF PAPER**



Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examiner only



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