GCSE

wjec cbac

3300U50-1

MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER TIER

MONDAY, 12 NOVEMBER 2018 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

The use of a calculator is not permitted in 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 continuation page at the back of the booklet. Question numbers must be given for all work written on the continuation page.

Take π as 3·14.

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

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	3	
3.	4	
4.	3	
5.	3	
6.	6	
7.	6	
8.	5	
9.	4	
10.	3	
11.	3	
12.	5	
13.	4	
14.	3	
15.	8	
16.	4	
17.	7	
18.	2	
Total	80	

CJ*(A18-3300U50-1)

Formula List - Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$
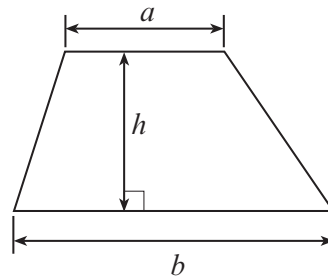
Volume of prism = area of cross-section × length
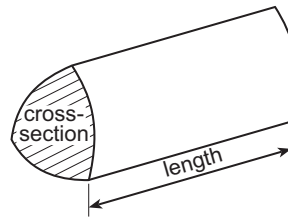
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
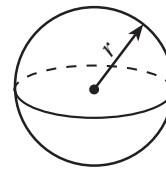
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$
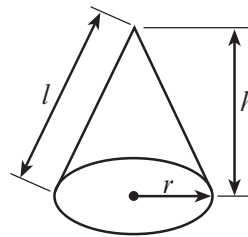
In any triangle ABC

    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 = $\frac{1}{2}ab\sin C$
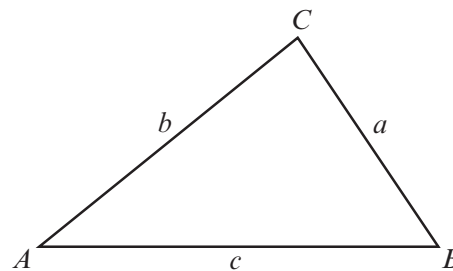
The Quadratic Equation

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

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.

1. *(a)* Expand $3x(x^2 - 2)$. [2]

....

....

(b) Make g the subject of the formula $f = 2 - 3g$. [2]

....

....

....

....

(c) (i) Solve $7x - 3 < 29$. [2]

....

....

....

....

....

....

(ii) What is the greatest integer value of x that satisfies the above inequality? [1]

....

© WJEC CBAC Ltd. (3300U50-1) **Turn over.**

2. Two straight lines, *AB* and *AC*, are shown below.

The point *P* is

- equidistant from line *AB* and line *AC*,
- 6 cm from point *B*,
- **more** than 10 cm from point *A*.

Show clearly the position of point *P*. [3]
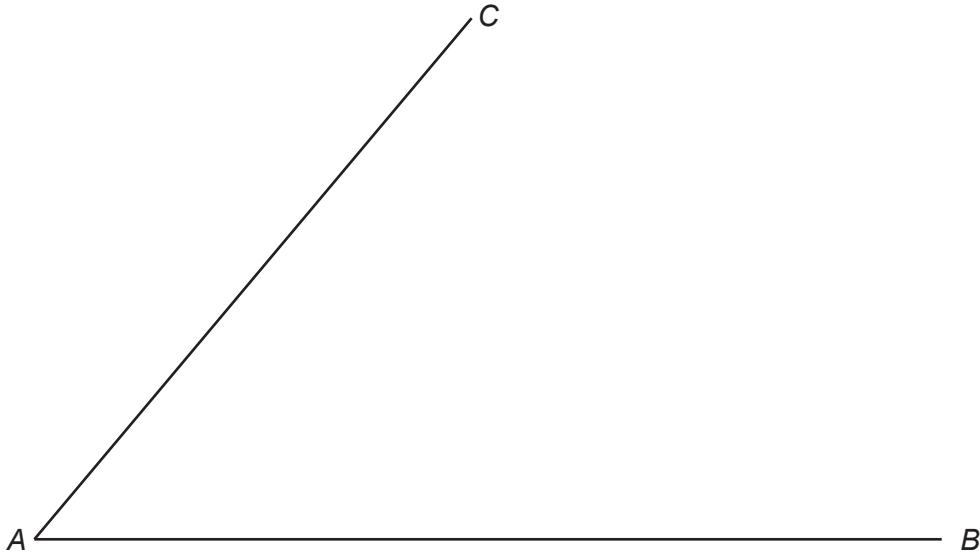
3. *(a)* Share £720 in the ratio 2 : 7. [2]

....

....

....

....

....

(b) Calculate the value of the reciprocal of 0·2. [2]

....

....

....

© WJEC CBAC Ltd. (3300U50-1)

4. The diagram below shows an empty cylinder, with radius 10 cm and height 20 cm.
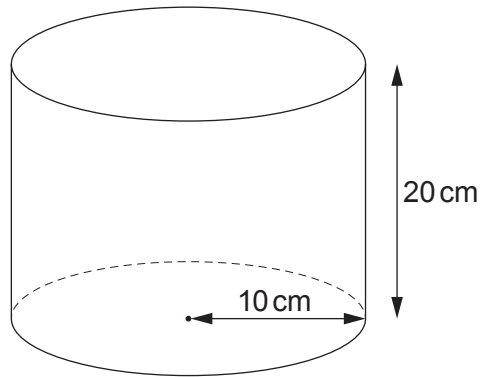
Diagram not drawn to scale

(a) Using π = 3·14, calculate the volume of the cylinder. [2]

....

....

....

....

(b) What is the greatest **whole** number of litres that this cylinder can hold? [1]

....

.... litres

© WJEC CBAC Ltd. (3300U50-1) **Turn over.**

3300U501
05

5. Five numbers are listed below.

3   3   6   13   15

Write down another set of five **positive whole** numbers such that

- all the numbers are **less than** 20,
- the median of the new set of numbers is greater than the median of the set shown above,
- the mean of the new set of numbers is less than the mean of the set shown above,
- the range of the new set of numbers is less than the range of the set shown above.

Your set of whole numbers must be written in the boxes.   [3]

Space for working:

....

....

....

....

....

....

....

....

....

....

....

My five positive whole numbers are

☐   ☐   ☐   ☐   ☐

6. *(a)* Circle the correct answer for each of the following statements.

(i) $\left(\sqrt{7}\right)^4$ is equal to [1]

$\sqrt{28}$ 28 $\sqrt{14}$ 14   49

....

(ii) 12^0 is equal to [1]

0   1   1·2   12   120

....

(iii) $\sqrt{3^2 \times 5^2}$ is equal to [1]

35^2 15^2 15   35 15^4

....

(iv) 3^{-4} is equal to [1]

-12 $\dfrac{1}{81}$ -81 $\dfrac{1}{12}$ $\dfrac{3}{4}$

....

(b) 4×2^{28} can be written as 2^n.
What is the value of n? [2]

....

....

....

....

....

$n =$ ....

Turn over.

7. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

A, *B* and *C* are points on the circumference of a circle with centre *O*.

$A\hat{C}B = 74°$.

Diagram not drawn to scale

Calculate the value of x.
You must state any angle property of a circle that you use.
You must show all your working.   [4 + 2 OCW]

....

....

....

....

....

....

....

....

....

....

....

....

© WJEC CBAC Ltd.   (3300U50-1)

8. A biased six-sided dice is thrown a total of 1000 times.
The graph shows the relative frequency of throwing a 'six' after 200, 400, 600, 800 and 1000 throws.
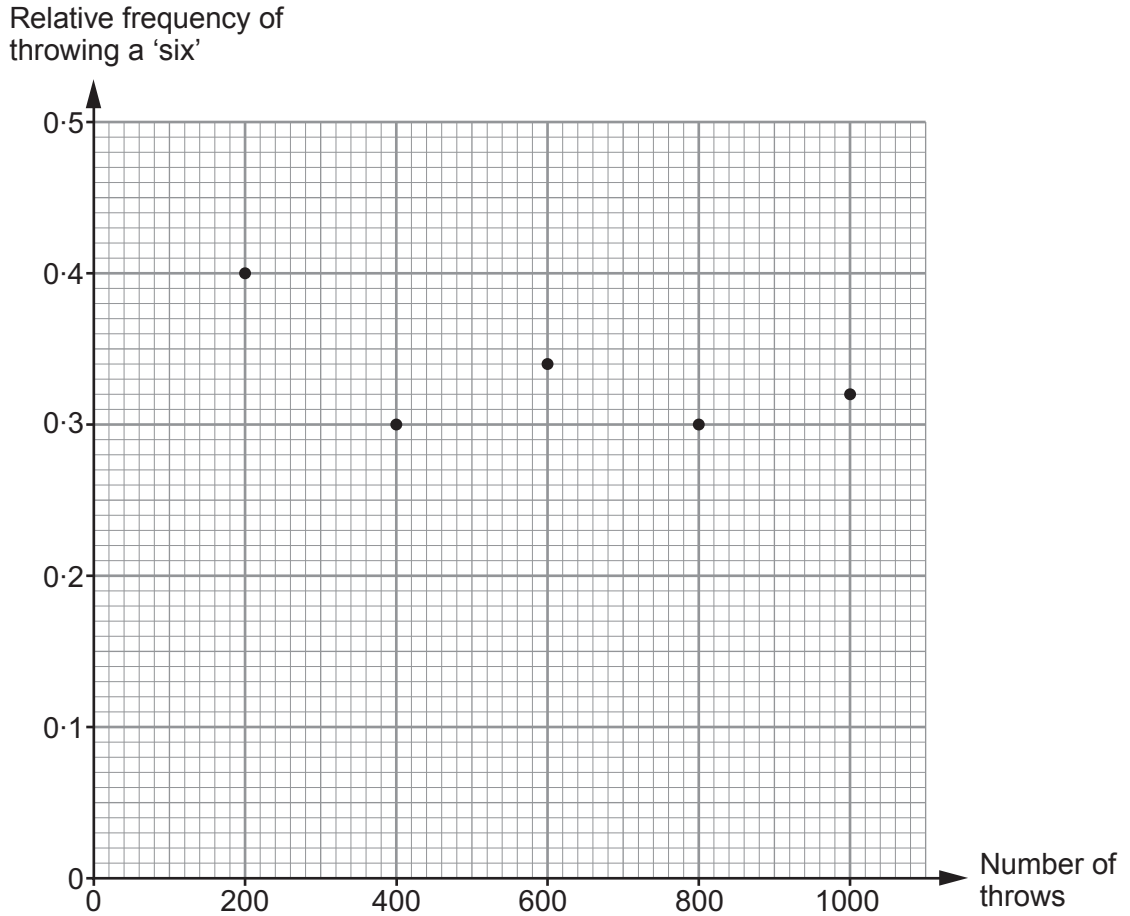
(a) Which of the following is the best estimate for the probability of throwing a 'six' with this dice?
Circle your answer. [1]

    0·4   0·3   0·5   0·32   0·34

(b) (i) How many 'sixes' were thrown in the first 600 throws of the dice? [2]

....

....

(ii) How many **more** 'sixes' were recorded for these 600 throws than you would expect when a **fair** six-sided dice is thrown 600 times? [2]

....

....

Turn over.

9. A cuboid has sides x cm, 5 cm and 7 cm.
The total surface area of the cuboid is 142 cm^2.

Form an equation in terms of x.
Solve the equation to find x. [4]

(3300U50-1)

10. Describe fully the **single** transformation which maps triangle A onto triangle B.   [3]

....

....

....

....

© WJEC CBAC Ltd.   (3300U50-1)   **Turn over.**
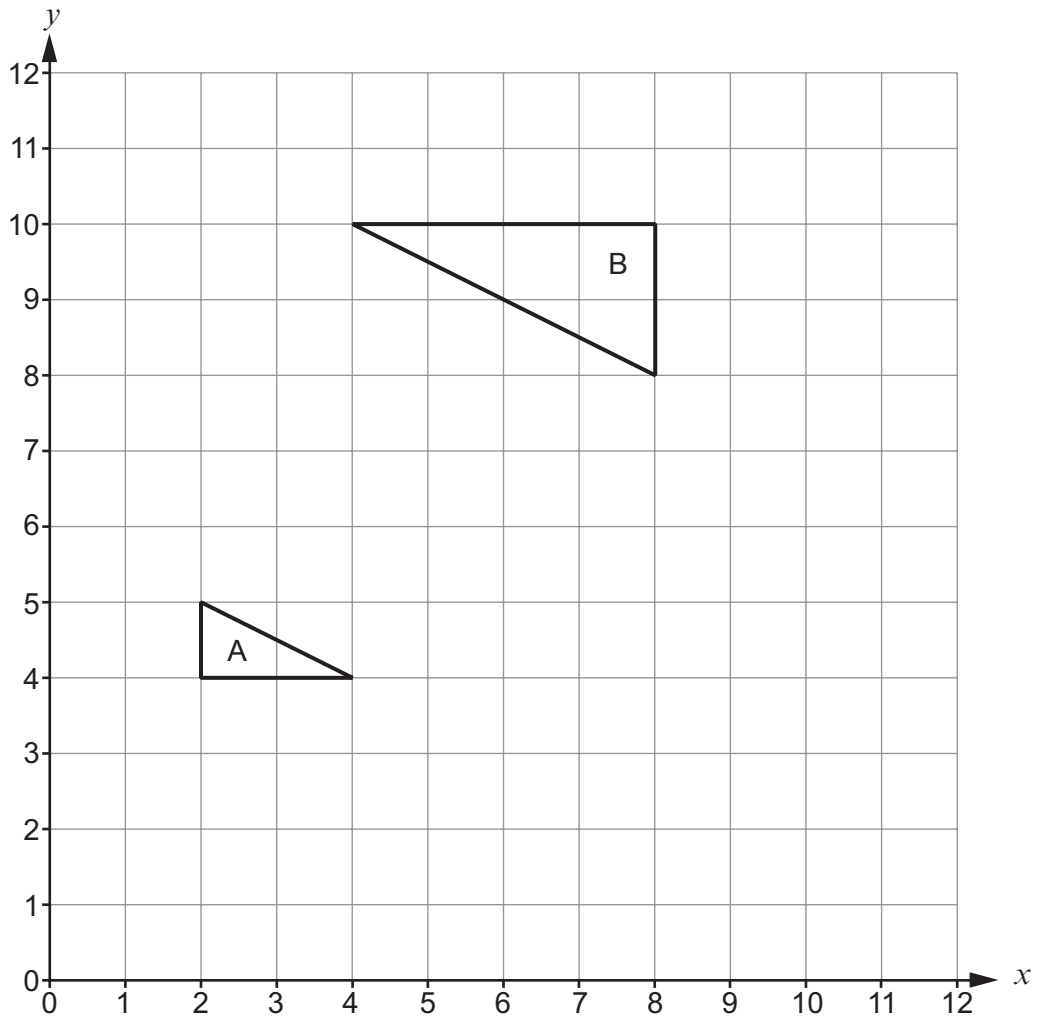
11. Using the axes below, find the region which satisfies the following inequalities.

$$x \geqslant -1$$
$$y + 2x \leqslant 1$$
$$y \geqslant x$$

Make sure that you **clearly indicate the region** that represents your answer. [3]

....

....

....

....

© WJEC CBAC Ltd. (3300U50-1)

12. Catrin is measuring the force between a pair of magnets in a physics laboratory. It is known that the force, F, between the magnets is inversely proportional to the square of the distance, d, between them.

Catrin measures the force to be 4 newtons when the distance between the magnets is 10 m.

What is the distance between the magnets when the force is 100 newtons? [5]

© WJEC CBAC Ltd. (3300U50-1) **Turn over.**

13. Rearrange the following formula to make c the subject.

$$\frac{6c - 3d}{c + 2} = g$$

[4]

....
....
....
....
....
....
....
....
....
....

(3300U50-1)

14. In the diagram below, *AC* and *BD* are diameters of a circle, centre *O.*

AO = 30 cm and $A\hat{O}B$ = 20°.

Diagram not drawn to scale

A second circle has an area which equals the total shaded area above.

Calculate the radius of the second circle. [3]

....

....

....

....

....

....

....

....

....

....

....

(3300U50-1) **Turn over.**

15. *(a)* Express $0\cdot3\dot{7}$ as a fraction. [2]

....

....

....

....

....

....

....

....

(b) (i) Calculate $\left(\sqrt{8} - \sqrt{2}\right)^2$. [2]

....

....

....

....

....

(ii) Calculate $\dfrac{\sqrt{6} \times \sqrt{20}}{\sqrt{3}}$.

Give your answer in the form $a\sqrt{b}$, where a and b are integers, and b is as small as possible. [2]

....

....

....

....

....

© WJEC CBAC Ltd. (3300U50-1)

(c)   Evaluate $16^{-\frac{3}{2}}$.   [2]

16. Simplify the following expression.

$$\frac{4x^2 - 7x - 2}{4x - 8}$$ [4]

© WJEC CBAC Ltd.   (3300U50-1)   **Turn over.**

17. A box contains 4 red balls, 5 yellow balls and 1 green ball.
Two balls are to be chosen at random, without replacement.

(a) Find the probability of choosing 1 red ball and 1 green ball. [3]

(b) Find the probability that the two balls chosen will **not** be the same colour. [4]

© WJEC CBAC Ltd. (3300U50-1)

18. The graph shows a sketch of the curve with equation $y = x^2 + 2$.
The lowest point of the curve has coordinates (0, 2).

(0, 2)
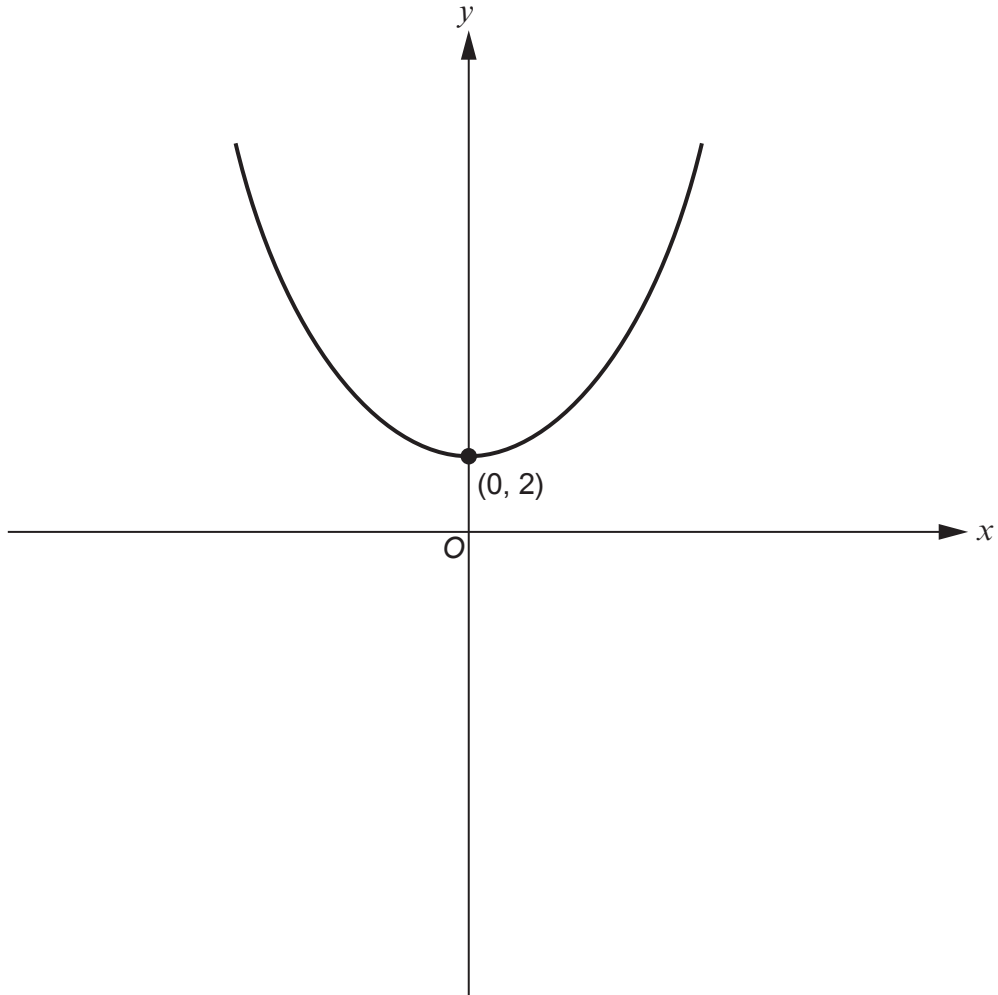
On the same axes, sketch the graph of the curve with equation $y = (x - 4)^2 + 2$.
Indicate clearly the coordinates of the lowest point on the new curve. [2]

END OF PAPER

(3300U50-1)

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

(3300U50-1)