

CANDIDATE
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MATHEMATICS (US)

0444/23

Paper 2 (Extended)

October/November 2014

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Center number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

CALCULATORS MUST NOT BE USED IN THIS PAPER.

All answers should be given in their simplest form.

If work is needed for any question it must be shown in the space provided.

The number of points is given in parentheses [] at the end of each question or part question.

The total of the points for this paper is 70.

This document consists of **12** printed pages.

* 8 5 6 7 9 5 1 4 6 3 *

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

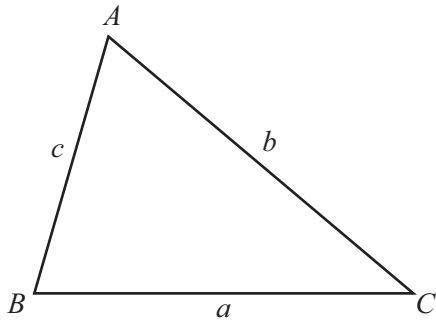
Lateral surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

Surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$



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

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

$$\text{Area} = \frac{1}{2}bc \sin A$$

1 $\$1 = 95 \text{ Yen } (\text{¥})$

Change \$300 into Yen.

Answer ¥ [2]

2 Write the following in order of size, smallest first.

0.34 $\frac{3}{5}$ 0.6^2 3.6%

Answer < < < [2]
smallest

3 Work out $4 \times 10^{-5} \times 6 \times 10^{12}$.
 Give your answer in scientific notation.

Answer [2]

4 The four sector angles in a pie chart are $2x^\circ$, $3x^\circ$, $4x^\circ$ and 90° .

Find the value of x .

Answer $x =$ [2]

- 5 A train takes 0.8 hours to travel 56 km.

Work out the average speed of the train in kilometers per hour.

Answer km/h [2]

- 6 Solve the equation.

$$2(\sqrt[3]{y}) = 16$$

Answer $y =$ [2]

- 7 Find the range of the function $f: x \rightarrow x^2 + 1$ for the domain $\{-2, -1, 0, 1, 2\}$.

Answer { } [2]

- 8 Simplify.

$$\sqrt{80} + \sqrt{45}$$

Answer [2]

- 9 $\sin x^\circ = \frac{\sqrt{3}}{2}$ and $0 \leq x \leq 360$.

Find the values of x .

Answer $x =$ [2]

10 Solve the equation.

$$\frac{2x+5}{3} = 8$$

Answer $x =$ [3]

11 Find the interior angle of a regular polygon with 18 sides.

Answer [3]

12 Solve for x .

$$y = 2 + \sqrt{x-8}$$

Answer $x =$ [3]

- 13 y varies inversely as $(x + 5)$.
 $y = 6$ when $x = 3$.

Find y when $x = 7$.

Answer $y =$ [3]

- 14 Complete the statement about the graph of $y = 3 \sin 2x^\circ$.

It has amplitude, period and passes through the point $(90, \dots\dots\dots)$. [3]

- 15 Maryah borrows \$12 000 to start a business.
The loan is for 2 years at a rate of 5% per year compound interest.
The loan has to be paid back at the end of the 2 years.

Calculate the total amount to be paid back.

Answer \$..... [3]

- 16 (a) Here are the first three terms of a sequence.

$$U_1 = 1^3 \qquad U_2 = 1^3 + 2^3 \qquad U_3 = 1^3 + 2^3 + 3^3$$

The n th term is given by $U_n = \frac{1}{4}n^2(n+1)^2$.

Work out the value of U_{10} .

Answer(a) $U_{10} =$ [2]

- (b) Here are the first three terms of another sequence.

$$V_1 = 2^3 \qquad V_2 = 2^3 + 4^3 \qquad V_3 = 2^3 + 4^3 + 6^3$$

By comparing this sequence with the sequence in **part (a)**, find a formula for the n th term, V_n .

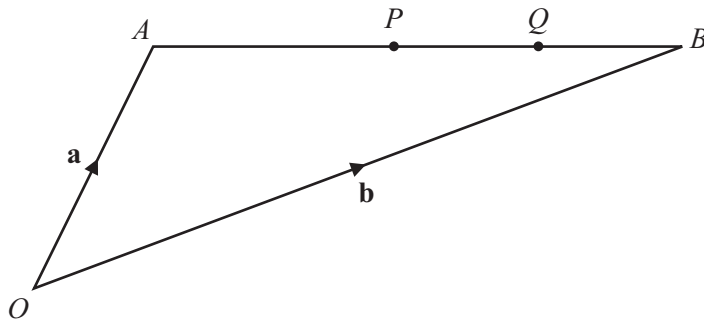
Answer(b) $V_n =$ [1]

17 Write as a single fraction, in its simplest form.

$$\frac{3}{2x} + \frac{2x}{3} + 3 + 2x$$

Answer [4]

18



The diagram shows two points, P and Q , on a straight line AB .

P is the midpoint of AB and Q is the midpoint of PB .

O is the origin, $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$.

Write down, in terms of \mathbf{a} and \mathbf{b} , in its simplest form

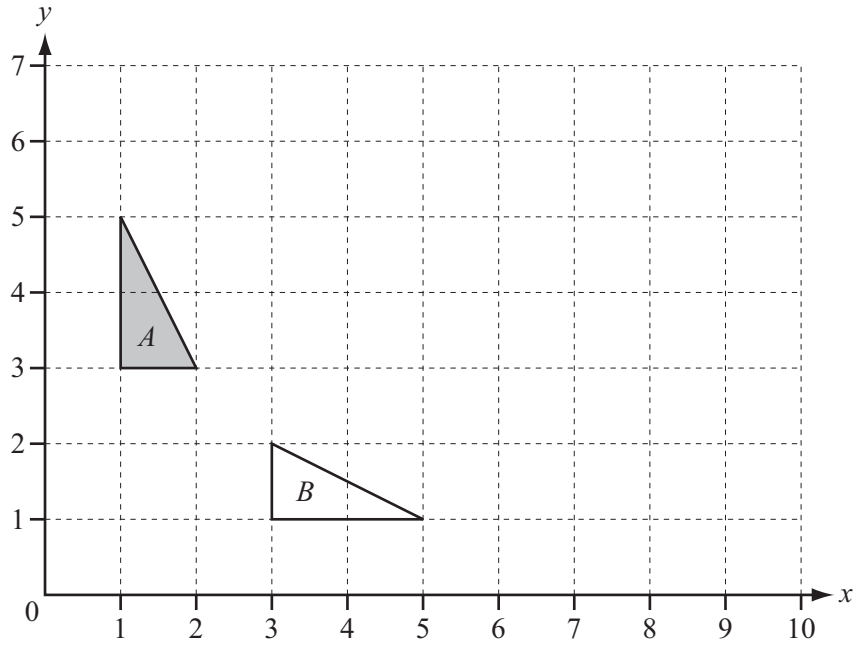
(a) \vec{AP} ,

Answer(a) $\vec{AP} = \dots\dots\dots$ [2]

(b) the position vector of Q .

Answer(b) [2]

19



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer(a)

..... [2]

(b) On the grid, draw the image of triangle *A* under a stretch, factor 3, with the *y*-axis invariant. [2]

20

$$f(x) = (x - 3)^2$$

$$g(x) = \frac{x - 1}{4}$$

$$h(x) = x^3$$

Find

(a) $h(f(1))$,

Answer(a) [2]

(b) $g^{-1}(x)$,

Answer(b) $g^{-1}(x) =$ [2]

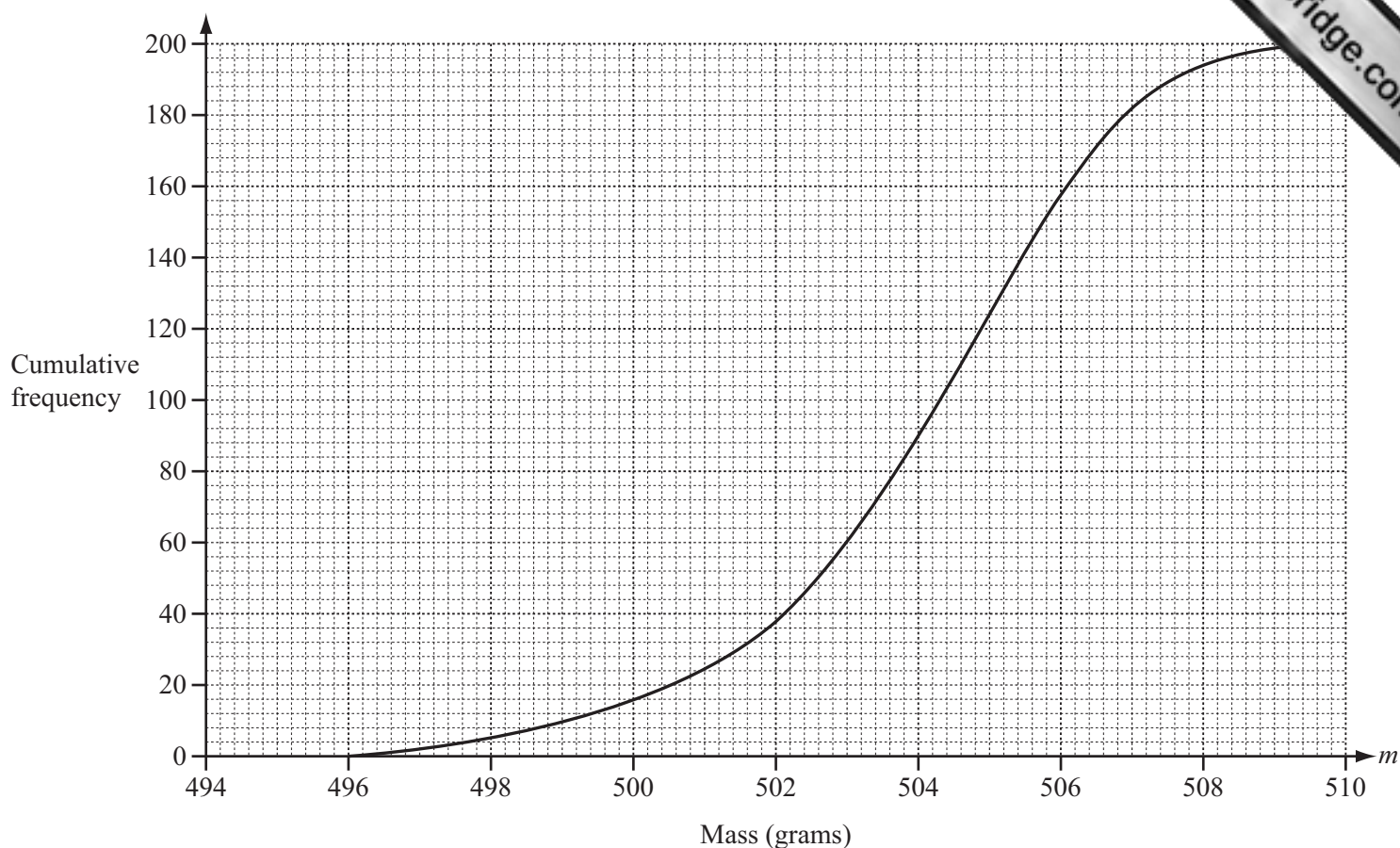
(c) $g(h(x))$,

Answer(c) $g(h(x)) =$ [1]

(d) the solution to the equation $f(x) = 0$.

Answer(d) $x =$ [1]

- 21 The mass, m grams, of cornflakes in each of 200 boxes is recorded. The cumulative frequency diagram shows the results.



- (a) Use the diagram to estimate the inter-quartile range.

Answer(a) g [2]

- (b) Find the probability that a box chosen at random has a mass of 500 grams or less.

Answer(b) [2]

- (c)

Mass (m grams)	$496 < m \leq 500$	$500 < m \leq 504$	$504 < m \leq 508$	$508 < m \leq 510$
Frequency	16	74	104	6

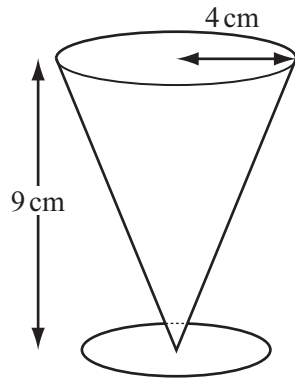
The data in this frequency table is to be shown in a histogram.

Complete the frequency density table below.

Mass (m grams)	$496 < m \leq 500$	$500 < m \leq 504$	$504 < m \leq 508$	$508 < m \leq 510$
Frequency density	4			

[2]

Question 22 is printed on the next page.



NOT TO SCALE

The diagram shows a glass, in the shape of a cone, for drinking milk.
The cone has a radius of 4 cm and height 9 cm.
The volume of a bottle of milk is $636\pi \text{ cm}^3$.

(a) How many of these glasses can be completely filled from the bottle?

Answer(a) [4]

(b) Find the volume of milk left in the bottle.
Give your answer in terms of π .

Answer(b) cm^3 [3]

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