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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/04**

Paper 4 (Extended) **For examination from 2020**

SPECIMEN PAPER **2 hours 15 minutes**

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use your calculator value.

INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **18** pages. Blank pages are indicated.

Formula List

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

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

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

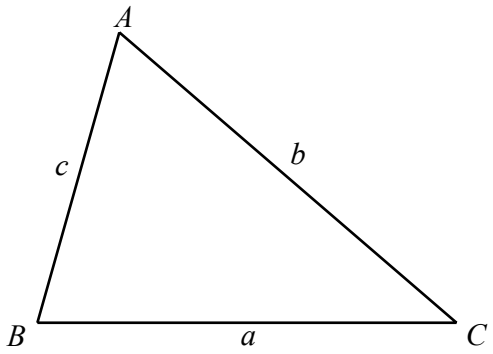
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

Volume, V, of cylinder of radius r, height h. $\quad V = \pi r^2 h$

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

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



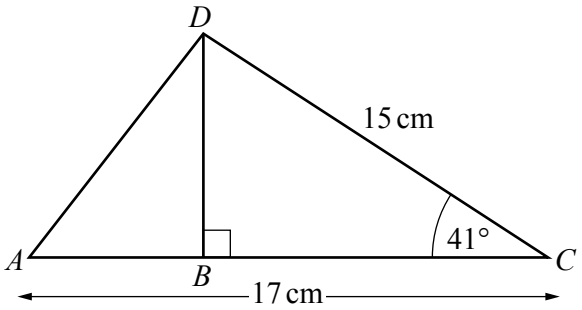
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



NOT TO SCALE

(a) Calculate the length of BD.

..... cm [2]

(b) Calculate the area of triangle ACD.

..... cm^2 [2]

(c) Use the cosine rule to find the length of AD.

..... cm [3]

2 **(a)** Jay buys a bicycle for $220.
He later sells it for $160.

Calculate his percentage loss.

.....% [3]

(b) A television has a sale price of $216 after a reduction of 10%.

Calculate the original price of the television.

$ ..... [3]

(c) The population of a village is 2180.
The population decreases by 3% each year.

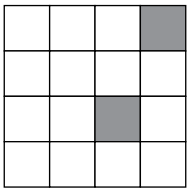
(i) Calculate the population in 20 years' time.

..... [3]

(ii) Calculate the number of whole years it takes for the population to decrease from 2180 to less than 1000.

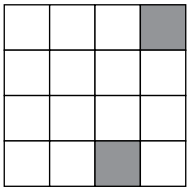
..... [2]

3 **(a)** **(i)** Shade in **one** more square so that the diagram has one line of symmetry.



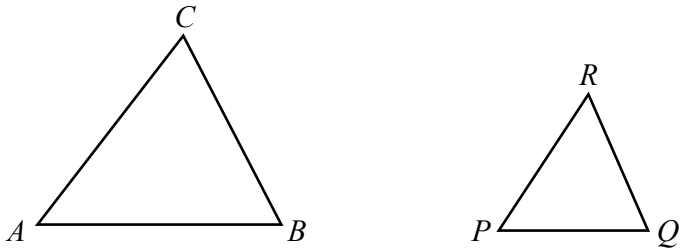
[1]

(ii) Shade in **two** more squares so that the diagram has rotational symmetry of order 2 and no lines of symmetry.



[1]

(b)



NOT TO SCALE

Triangle ABC and triangle PQR are mathematically similar.
$AB : PQ = 3 : 2$.

(i) $CB = 10.5$ cm.

Calculate the length of RQ.

..... cm [2]

(ii) The area of triangle ABC is $45\,\text{cm}^2$.

Calculate the area of triangle PQR.

..... cm^2 [2]

4 **(a)** The speeds, v km/h, of 120 cars passing under a bridge are measured.
The table shows the results.

Speed (v km/h)	$30 < v \leqslant 50$	$50 < v \leqslant 60$	$60 < v \leqslant 70$	$70 < v \leqslant 75$	$75 < v \leqslant 90$
Frequency	2	25	46	41	6

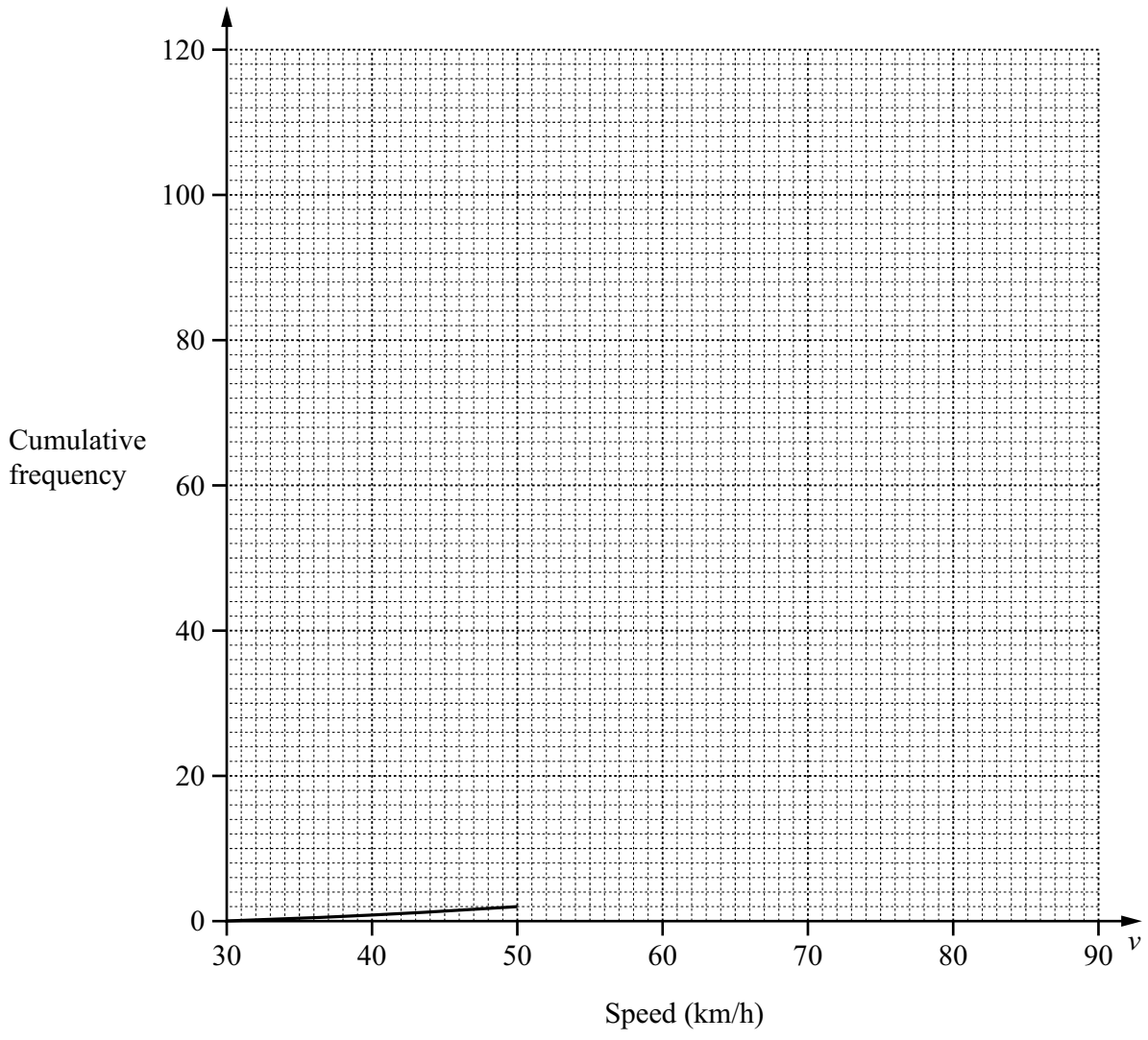
(i) Write down the interval that contains the lower quartile.

..... [1]

(ii) Calculate an estimate of the mean.

..... km/h [2]

(iii) Complete the cumulative frequency diagram for these 120 cars.



[3]

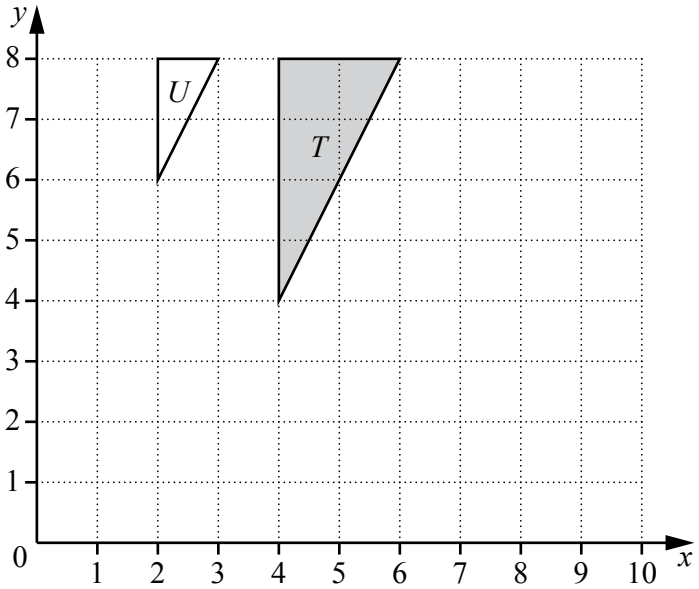
(b) The table below shows the monthly rainfall and the average midday temperatures of a city.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (r mm)	15	20	20	35	70	90	75	70	50	30	12	8
Temperature (t °C)	35	25	22	15	10	10	15	20	27	30	38	36

Find the equation of the line of regression, giving t in terms of r.

$t =$ ..... [2]

5



(a) (i) Describe fully the **single** transformation that maps triangle T onto triangle U.

.....

..... [3]

(ii) Describe fully the inverse of the transformation in **part (a)(i)**.

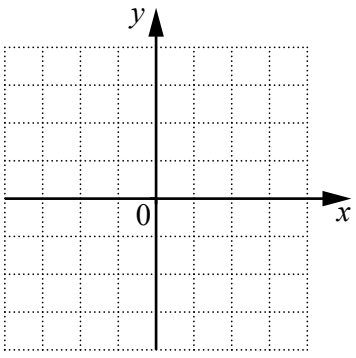
.....

..... [2]

(b) (i) Draw the image of triangle T under a reflection in the line $y = x$. [2]

(ii) Draw the image of triangle T under a rotation of 90° anti-clockwise about the point (6, 8). [2]

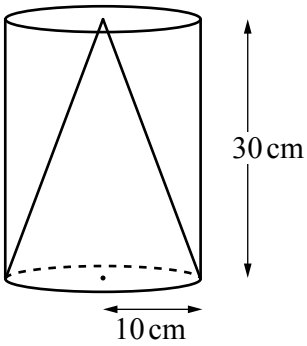
(c) Describe fully the **single** transformation equivalent to a rotation 90° clockwise about (0, 0) followed by a reflection in the line $y = -x$.
You may use the grid to help you.



.....

..... [3]

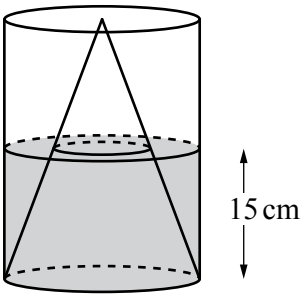
6 The diagram shows a solid cone inside a cylinder.
The base radius of the cone and the radius of the cylinder are both 10 cm.
The height of both the cone and the cylinder is 30 cm.



(a) Find the volume of the cylinder **not** occupied by the cone.

..... cm^3 [3]

(b) Water is poured into the cylinder until it reaches a depth of 15 cm.



(i) Calculate the volume of the part of the cone that is below the water level and show that it rounds to 2749 cm^3, correct to the nearest cubic centimetre.

[4]

(ii) Calculate the amount of water that has been poured into the cylinder.
Give your answer in litres.

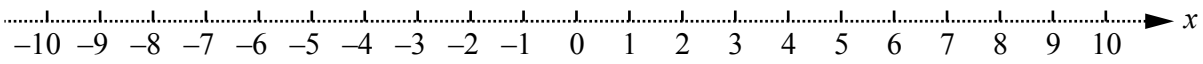
..... litres [3]

7 **(a)** **(i)** Solve the inequality.

$$2(x - 3) < 5(x + 3)$$

..... [3]

(ii) Show your answer to **part (a)(i)** on the number line.



[1]

(b) Solve the equation.

$$(x + 3)^2 + (x + 1)^2 = 25$$

Give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [6]

(c) Solve the equations.

(i) $\log x = 5 - x$

$x =$ ..... [3]

(ii) $\log x = |5 - x|$

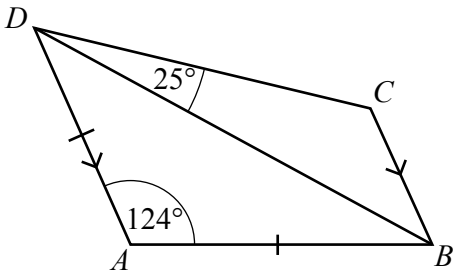
$x =$ ..... or $x =$ ..... [2]

(d) Simplify, giving your answer as a single fraction.

$$\frac{x}{x-1} - \frac{2}{x+1}$$

..... [3]

8 (a)



NOT TO SCALE

In the quadrilateral $ABCD$, $DA = AB$ and DA is parallel to CB.
Angle $DAB = 124°$ and angle $BDC = 25°$.

Calculate angle BCD.

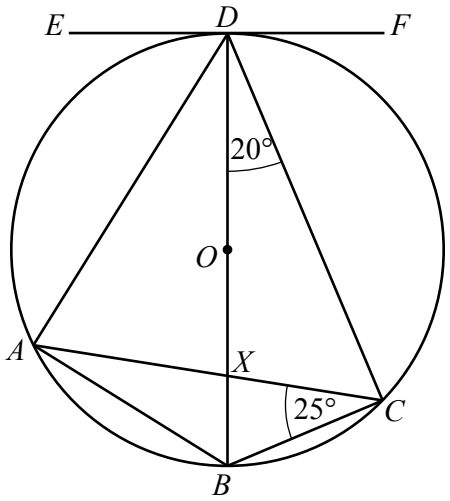
Angle BCD = ... [3]

(b) Nine of the angles of a 10-sided polygon are each 142°.

Calculate the other angle.

..... [3]

(c)



NOT TO SCALE

A, *B*, *C* and *D* lie on the circle, centre *O*.
BD is a diameter and *EDF* is a tangent at *D*.
AC and *BD* intersect at *X*.

Angle *BCA* = 25° and angle *BDC* = 20°.

Calculate

(i) angle *ADE*,

Angle *ADE* = ... [2]

(ii) angle *DAC*,

Angle *DAC* = ... [2]

(iii) angle *AXD*.

Angle *AXD* = ... [1]

9 **(a)** Kim walks 10 km at 4 km/h and then a further 6 km at 3 km/h.

Calculate Kim's average speed.

..... km/h [3]

(b) Chung runs at x km/h for 45 minutes and then at $(x - 2)$ km/h for 30 minutes.

Find an expression, in terms of x, for Chung's average speed in km/h.
Give your answer in its simplest form.

..... km/h [4]

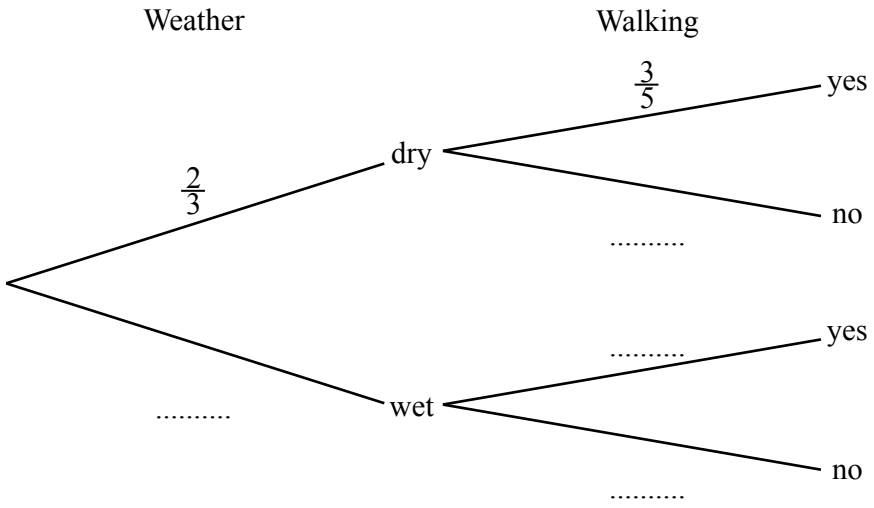
10 In this question, the weather is only considered to be either wet or dry.

When the weather is dry the probability that Sara will go walking is $\frac{3}{5}$.

When the weather is wet the probability that Sara will go walking is $\frac{1}{10}$.

The probability of a dry day is $\frac{2}{3}$.

(a) Complete the tree diagram.



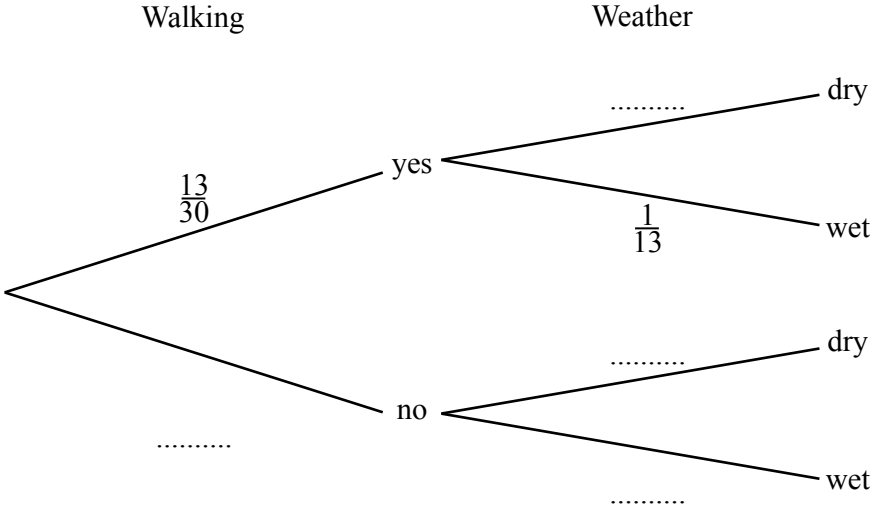
[3]

(b) Show that the probability that Sara goes walking is $\frac{13}{30}$.

[2]

(c) The probability that Sara does not go walking when the weather is wet is $\frac{9}{30}$.

Complete this tree diagram.



[3]

11 $f(x) = x^2 - 16$ $\quad g(x) = \dfrac{2}{x+1}$, $x \neq -1$ $\quad h(x) = 2^x$

(a) Find h(3).

..... [1]

(b) Find the range of g(x) for the domain $\{0, 1\}$.

..... [1]

(c) f($x - 2$) can be written as $(x + a)(x + b)$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [4]

(d) Find the inverse of

(i) g(x),

..... [3]

(ii) h(x).

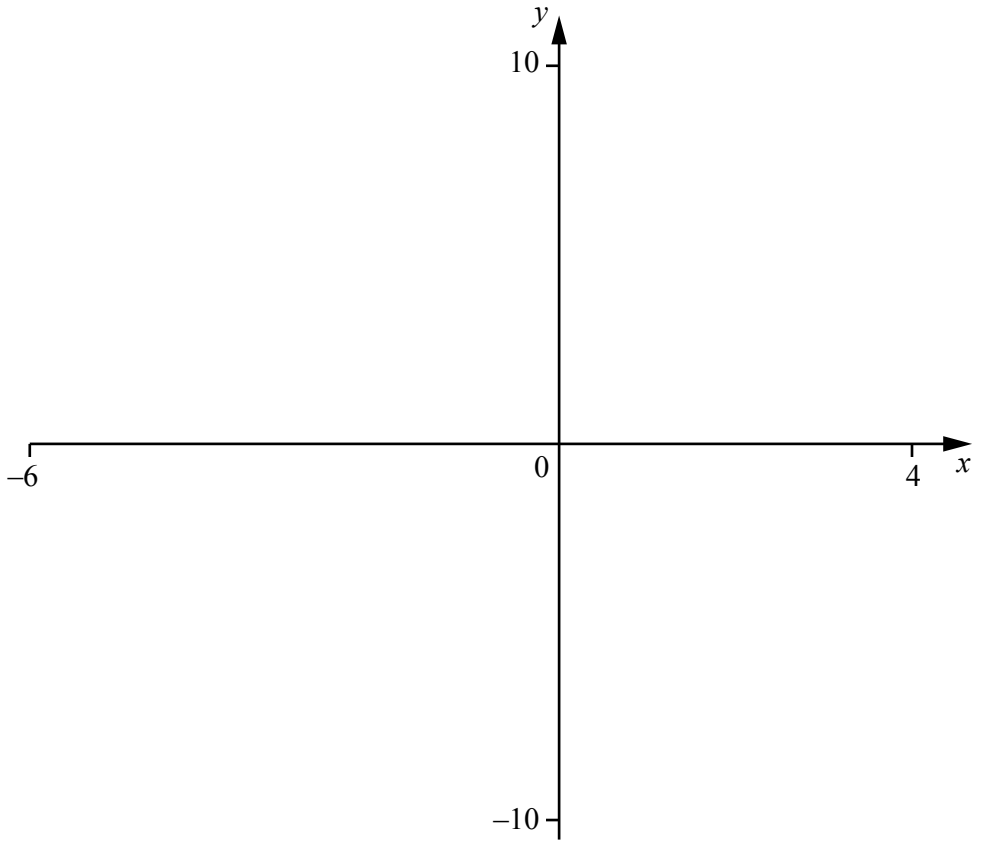
..... [2]

(e) Describe fully the **single** transformation that maps the graph of $y = f(x)$ onto the graph of $y = 2x^2 - 32$.

.....

..... [2]

12



(a) On the diagram, sketch the graphs of $y = \frac{12}{(x+2)}$ and $y = 2^x - 5$

for values of x between $x = -6$ and $x = 4$. [4]

(b) Write down the equation of each asymptote of the graph of

(i) $y = \frac{12}{x+2}$,

.....

..... [2]

(ii) $y = 2^x - 5$.

..... [1]

(c) Solve the inequality.

$$2^x - 5 > \frac{12}{x+2} \quad \text{for } x > 0.$$

..... [2]

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