UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

MATHEMATICS (US) **0444/21**

Paper 2 (Extended) **May/June 2013**

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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 **15** printed pages and **1** blank page.

Formula List

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

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

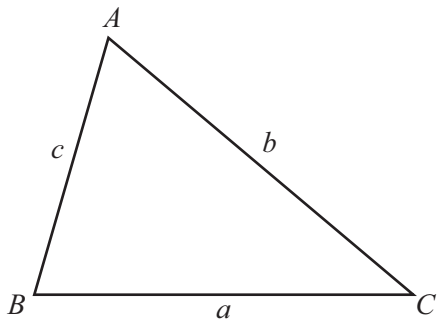
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

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

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



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

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

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

1 One January day in Munich, the temperature at noon was 3°C.
At midnight the temperature was –8°C.

Write down the difference between these two temperatures.

Answer ..... °C [1]

---

2 **(a)** Simplify 0.6^3 .

Answer(a) ..... [1]

(b) Write your answer to **part (a)** correct to 2 significant figures.

Answer(b) ..... [1]

---

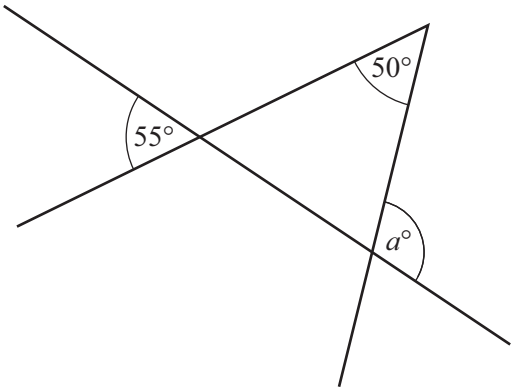
3 Pedro and Eva do their homework.
Pedro takes 84 minutes to do his homework.

The ratio Pedro's time : Eva's time = 7 : 6.

Work out the number of minutes Eva takes to do her homework.

Answer ..... min [2]

4



NOT TO SCALE

Use the information in the diagram to find the value of a.

Answer $a =$ ..... [2]

---

5 Simplify $1\frac{1}{2} \div \frac{3}{16}$.

Answer ..... [2]

---

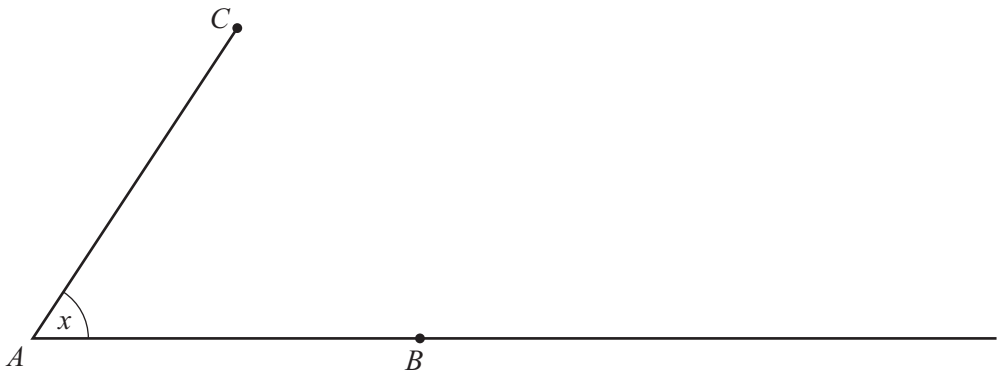
6 Factor completely.

$12xy - 3x^2$

Answer ..... [2]

---

7 In this question use a straight edge and compass only.
Copy angle x to obtain a line through B which is parallel to the line AC.



[2]

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8 Solve the inequality.

$$3x - 1 \leqslant 11x + 2$$

Answer ..... [2]

---

9 Simplify $\sqrt{20} + \sqrt{125}$.

Answer ..... [2]

---

10 Factor completely.

$$ap + bp - 2a - 2b$$

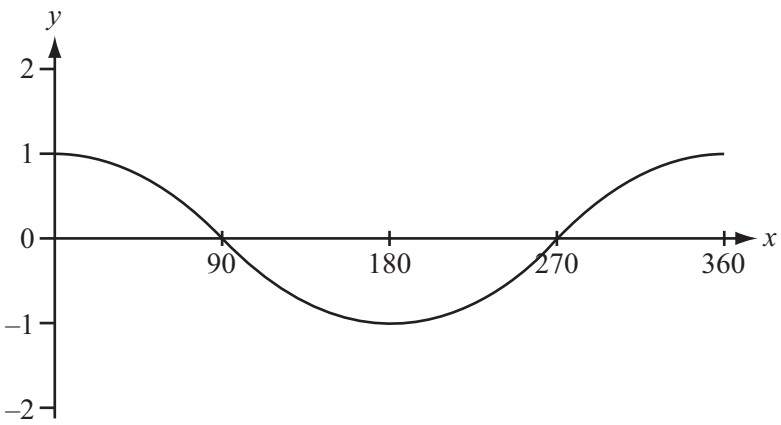
Answer ..... [2]

---

11 Write $(27x^{12})^{\frac{1}{3}}$ in its simplest form.

Answer ..... [2]

12



The diagram shows the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.

On the same diagram, sketch the graph of $y = 2\cos(\frac{1}{2}x)$. [2]

---

13 Martina changed $200 into Brazilian reals (BRL).
The exchange rate was $1 = BRL 2.038 .

Work out how much Martina received.

Answer BRL ..... [2]

---

14 The volume of a sphere is 36π cm^3.

Find the radius of the sphere.

Answer ..... cm [3]

---

15 A water pipe has cross-sectional area 1.5 cm^2.
Water flows through the pipe at a rate of 20 cm/s.

Work out the time taken for 6 liters of water to flow through the pipe.
Give your answer in minutes and seconds.

Answer ..... min ..... s [3]

---

16 Find the equation of the line passing through the points (0, –1) and (3, 5).

Answer ..... [3]

---

17 **(a)** Factor $x^2 + x - 30$.

Answer(a) ..... [2]

(b) Simplify $\dfrac{(x-5)(x+4)}{x^2+x-30}$.

Answer(b) ..... [1]

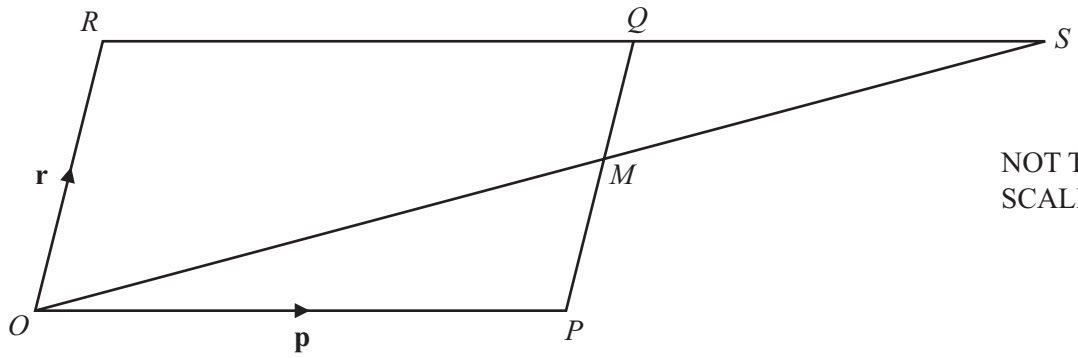
---

18 t varies inversely as the square root of u.
$t = 3$ when $u = 4$.

Find t when $u = 49$.

Answer $t =$ ..... [3]

19



NOT TO SCALE

OPQR is a parallelogram, with *O* the origin.
M is the midpoint of *PQ*.
OM and *RQ* are extended to meet at *S*.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.

(a) Find, in terms of **p** and **r**, in its simplest form,

(i) $\overrightarrow{OM}$,

Answer(a)(i) $\overrightarrow{OM} =$ ..... [1]

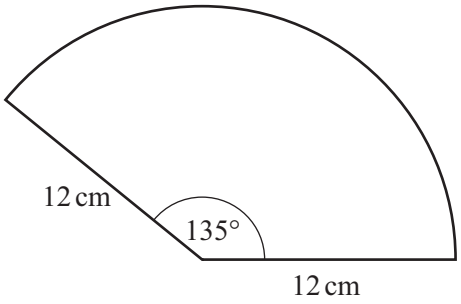
(ii) the position vector of *S*.

Answer(a)(ii) ..... [1]

(b) When $\overrightarrow{PT} = -\frac{1}{2}\mathbf{p} + \mathbf{r}$, what can you write down about the position of *T*?

Answer(b) ..... [1]

20



NOT TO SCALE

The diagram shows a sector of a circle of radius 12 cm with an angle of 135°.

Work out the perimeter of the sector in terms of π.

Answer ..... cm [3]

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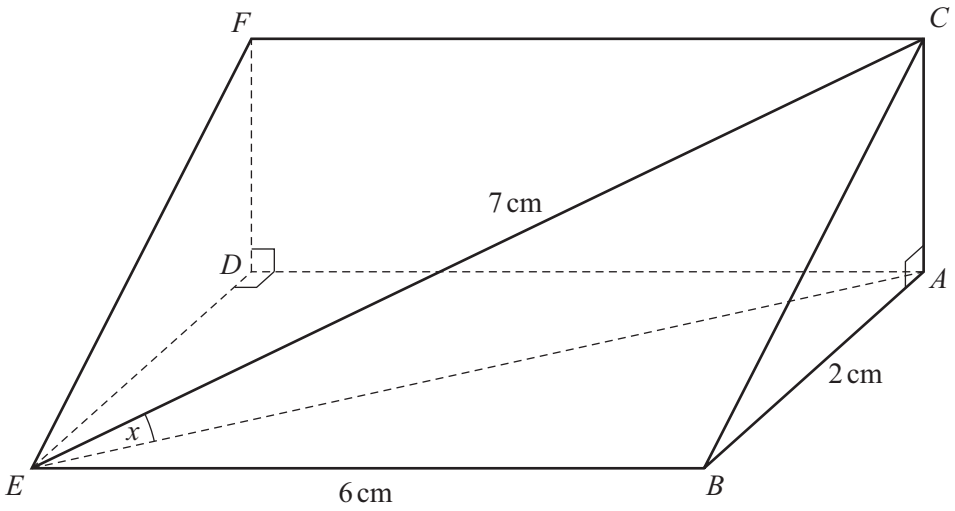
21 Write as a single fraction in its lowest terms.

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

Answer ..... [3]

22



NOT TO SCALE

The diagram shows a triangular prism of length 6 cm.
Triangle ABC is a cross-section of the prism.
Angle $BAC = 90°$, $AB = 2$ cm and $CE = 7$ cm.

Find the value of $\sin x$.

Answer $\sin x =$ ..... [4]

23 **(a)** Solve for h.

$$A = 2\pi rh + 2\pi r^2$$

Answer(a) $h =$ ..... [2]

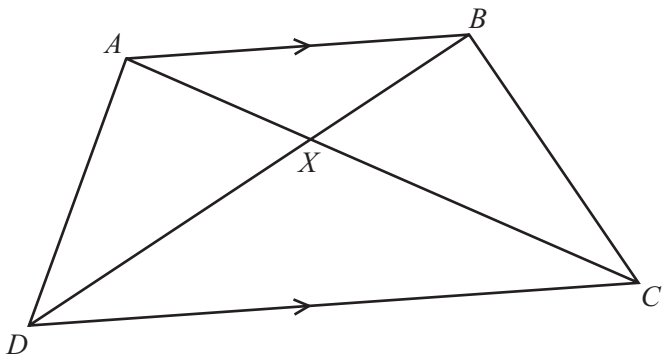
(b)

x	–1	0	1	2	3
y	1	2	4	8	16

From the table above, find an equation connecting y and x.

Answer(b) ..... [2]

24



NOT TO SCALE

$ABCD$ is a trapezoid.
The diagonals intersect at X.

(a) Explain why triangle ABX and triangle CDX are similar.

Answer(a)

[2]

(b) $AX = 2$ cm, $XC = 5$ cm and $AB = 4$ cm.

Find CD.

Answer(b) $CD =$ .....cm [2]

---

25 Find the *n*th term of each sequence.

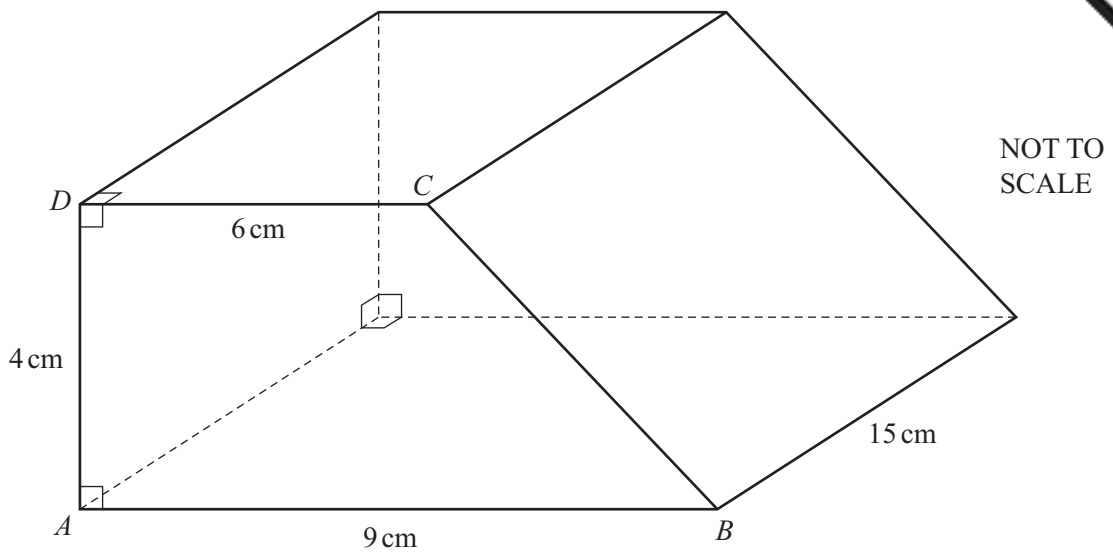
(a) 8, 3, –2, –7, –12, ...

Answer(a) ..... [2]

(b) –1, 2, 7, 14, 23, ...

Answer(b) ..... [2]

26



NOT TO SCALE

The diagram shows a solid prism of length 15 cm.
The cross section of the prism is the trapezoid $ABCD$.
Angle DAB = angle CDA = 90°.
AB = 9 cm, DC = 6 cm and AD = 4 cm.

Calculate the **total** surface area of the prism.

Answer ..... cm^2 [5]

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