UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

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NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS   **0607/04**

Paper 4 (Extended)   **For Examination from 2010**

SPECIMEN PAPER

2 hours 15 minutes

Candidates answer on the Question Paper

Additional Materials: Graphics calculator
                          Geometrical Instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.

Answer **all** the questions.

Unless instructed otherwise, give your answers exactly or to three significant figures as appropriate.
Answers in degrees should be given correct to one decimal place.
For π, use your calculator value.

You must show all relevant working to gain full marks and you will be given marks for correct methods even if your answer is incorrect.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 120.

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Formula List

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

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

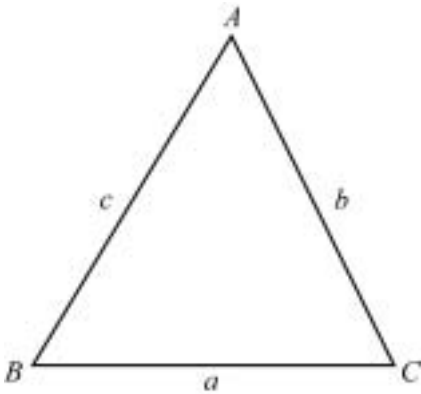Curved surface area, A, of cone of radius r, sloping edge l. $\qquad A = \pi rl$

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

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

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

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

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

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

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

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

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Answer **all** the questions.

1 A train departs at 08 50 each morning. It travels 252 km and arrives at its destination at 11 05.

(a) Calculate the average speed of the train, in km/h.

Answer(a) .... km/h [2]

(b) One day, the train departed at 08 50 but, due to delays, the average speed was reduced by 10%.

Calculate

  (i) the new arrival time,

Answer(b)(i) .... [4]

  (ii) the percentage increase in the journey time.

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

(c) The length of the train is 400 metres. It passes through a forest of length 5.5 kilometres at 162 km/h.
Calculate the time the train takes to pass completely through the forest, giving your answer in minutes.

Answer(c) .... minutes [3]

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2 $f(x) = \dfrac{5}{1-x}$.

(a) Find f(–9).

Answer(a) .... [1]

(b) Solve f(x) = 2.

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

(c) Find $f^{-1}(x)$.

Answer(c)$f^{-1}(x) =$ .... [4]

3 **(a)** M and R are single transformations.

M is a reflection in the *x*-axis and R is an anti-clockwise rotation of 90° about the origin.

(i) Find the image of the point (5, 7) under the transformation M.

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

(ii) Find the single transformation equivalent to M followed by R.

Answer(a)(ii) .... [3]

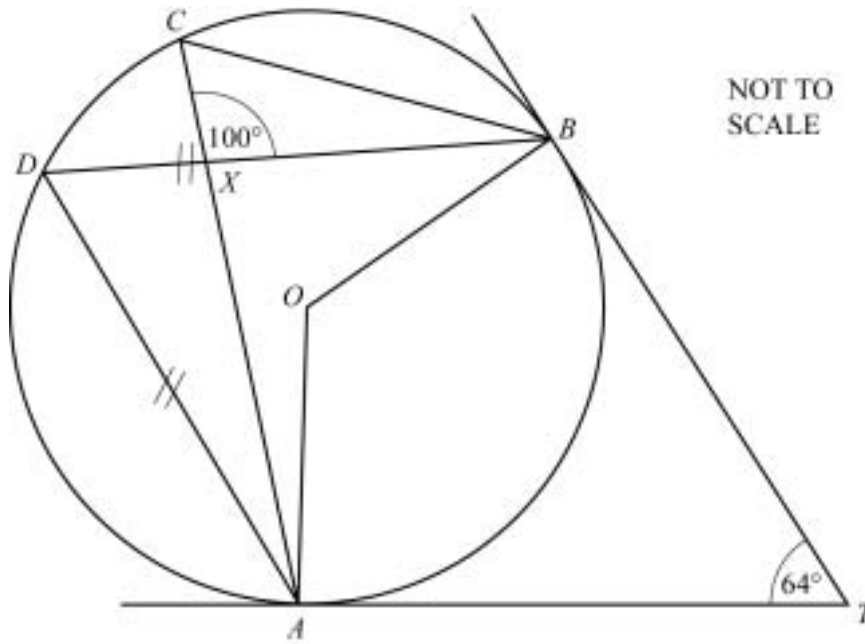**(b)** T and U are translations represented by vectors **p** and **q**.

$$\mathbf{p} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

$$c\mathbf{p} + d\mathbf{q} = \begin{pmatrix} 0 \\ 21 \end{pmatrix}.$$

Find the values of *c* and *d*.

Answer(b) c = ... , *d =* .... [4]

4

In the diagram, *A*, *B*, *C* and *D* lie on the circle, centre *O*.
TA and *TB* are tangents at *A* and *B*. The lines *AC* and *BD* cross at *X*.
AD = *BD*, angle *ATB* = 64° and angle *CXB* = 100°.

(a) Calculate

  (i) angle *AOB*,

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

  (ii) angle *OAB*,

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

  (iii) angle *BAD*,

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

  (iv) angle *CAO*.

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

(b) Explain why *OATB* is a cyclic quadrilateral.

Answer(b) ....

.... [1]

5 **(a)** Solve the equation $8x^2 = 7x + 3$, giving your answers correct to 2 decimal places.

Answer(a) .... [4]

(b) Solve the inequality $8x^2 < 7x + 3$, giving your answers correct to 2 decimal places.

Answer(b) .... [1]

6 *A* is the point (0, 2) and *B* is the point (3, 8).

(a) Find the equation of the straight line which passes through *A* and *B*.

Answer(a) .... [3]

(b) Find the equation of the line perpendicular to *AB*, which passes through the mid-point of *AB*. Give your answer in the form $ax + by = d$ where *a*, *b* and *d* are integers.

Answer(b) .... [5]

7

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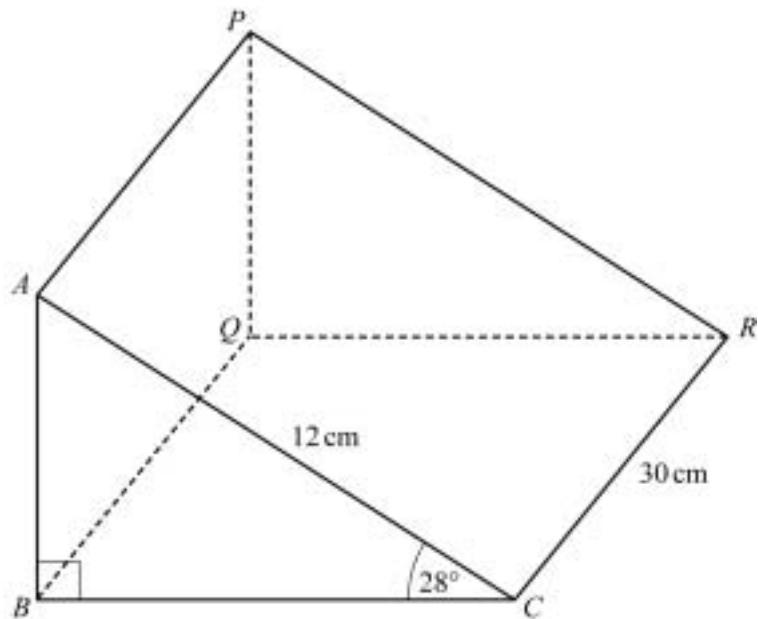
The diagram shows a triangular prism of length 30 cm.
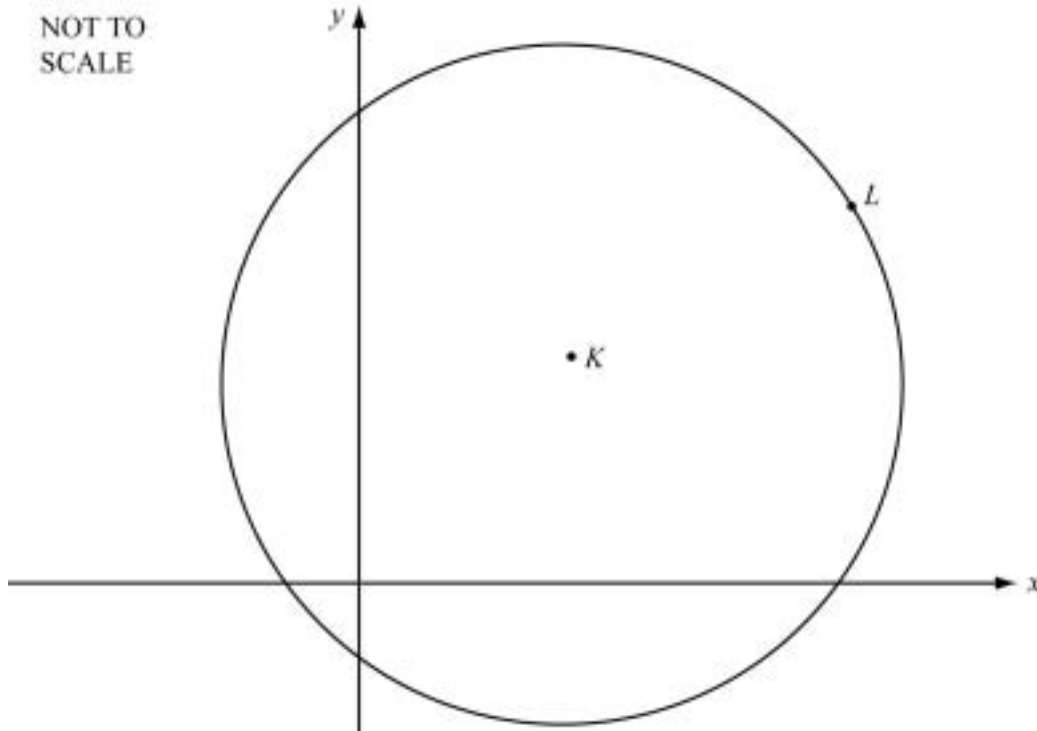The triangular cross-section, *ABC*, has angle *ABC* = 90°, angle *ACB* = 28° and *AC* = 12 cm.

(a) Calculate the height, *AB*, of triangle *ABC*.

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

(b) Calculate the **total surface area** of the prism.

Answer(b) .... cm^2 [5]

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K is the point (3, 2) and *L* is the point (7, 5).

(a) Calculate the distance *KL*.

Answer(a) .... [2]

(b) The circle in the diagram has centre *K* and passes through *L*.
Calculate its area, giving your answer correct to 2 decimal places.

Answer(b) .... [3]

(c) The points *M*, *N* and *P* lie on the circle. *LMNP* is a rectangle with its sides parallel to the axes.

  (i) Write down the co-ordinates of *M*, *N* and *P*.

  Answer(c)(i)   (.......... , ...) (.......... , ...) (.......... , ...)   [2]

  (ii) Calculate the area of the rectangle *LMNP*.

Answer(c)(ii) .... [2]

9 **(a)** In the space below and on the same set of axes, **sketch** the graphs of

$$y = \left| x^2 - 4 \right| \quad \text{and} \quad y = x^3 - 2x - 1.5 \quad \text{for} \quad -3 \leqslant x \leqslant 3.$$

Answer(a)

[4]

(b) Write down the co-ordinates of the points where the graph of $y = \left| x^2 - 4 \right|$ meets the axes.

Answer(b) .... [3]

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(c) Write down the co-ordinates of the point where the graph of $y = x^3 - 2x - 1.5$ crosses the y-axis.

Answer(c) .... [1]

(d) Write down the co-ordinates of the local minimum point on the graph of $y = x^3 - 2x - 1.5$.

Answer(d) .... [2]

(e) Solve the equations

  (i) $x^3 - 2x - 1.5 = 0$,

Answer(e)(i) .... [1]

  (ii) $|x^2 - 4| = x^3 - 2x - 1.5$,

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

  (iii) $|x^2 - 4| = 2$.

Answer(e)(iii) .... [4]

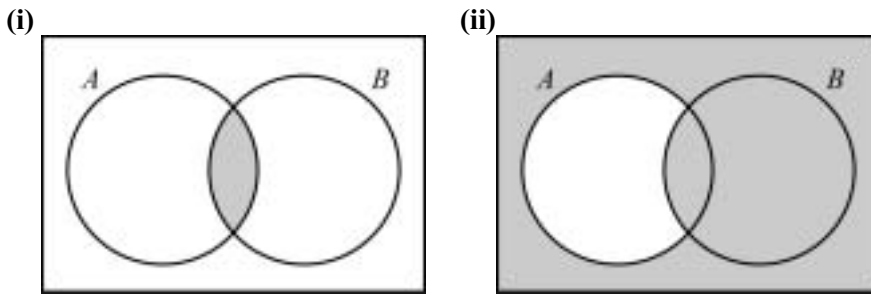**(f)** For a particular value of k, the equation $|x^2 - 4| = k$ has three different solutions.

Write down this value of k.

Answer(f) k = ... [1]

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10 (a) For each Venn diagram, write down the shaded region in **set notation**.

(i)

(ii)

Answer(a)(i) ....   *Answer(a)*(ii) .... [2]

(b) In a school class, some students study Chemistry (*C*) and some study Economics (*E*) but it is not possible to study these two subjects together.
Some students study Physics (*P*) and it is possible to study Physics with either Chemistry or Economics.

This is shown in the Venn diagram below.
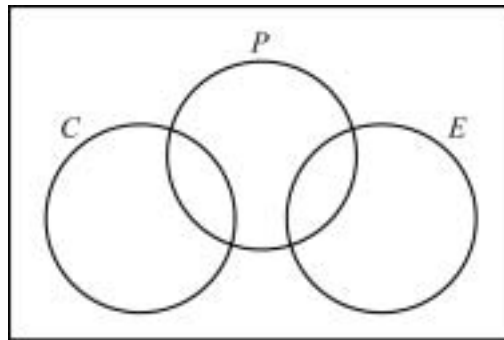
There are 24 students in the class.
8 study both Physics and Chemistry.
4 study both Physics and Economics.
18 study Physics, 10 study Chemistry and 7 study Economics.

(i) How many students study Physics but neither Chemistry nor Economics?

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

(ii) How many students study none of the three subjects?

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

(iii) A student is chosen at random from the class of 24.

What is the probability that the student studies both Physics and Chemistry?

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

(iv) Two students are chosen at random from the class of 24.

Find the probability that both students study Economics but not Physics.

Answer(b)(iv) .... [3]

(v) Two students are chosen at random from those students who do not study Physics.

Find the probability that both students study Economics.

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

(vi) Find n($(C \cup E) \cap P'$).

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

11 The table shows the Mathematics marks and the History marks of 10 students.

Student	A	B	C	D	E	F	G	H	I	J
Mathematics	85	40	55	55	70	65	70	45	80	90
History	45	70	60	55	45	50	50	60	40	40

(a) Write down the mean mark for

  (i) Mathematics,

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

  (ii) History.

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

(b) Write down the median mark for

  (i) Mathematics,

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

  (ii) History.

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

(c) Write down the inter-quartile range for

  (i) Mathematics,

Answer(c)(i) .... [1]

  (ii) History.

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

(d) Describe briefly how the two sets of marks differ.

Answer(d) ....

....

.... [2]
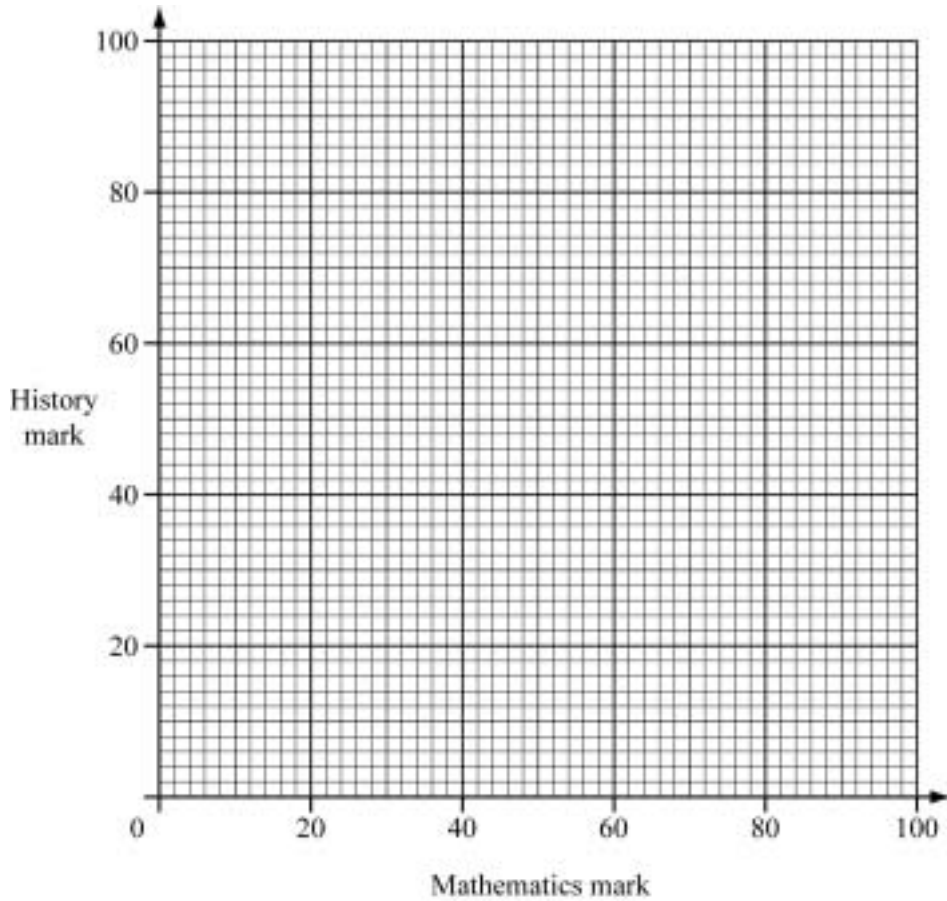
(e) On the grid above,

(i) draw a scatter diagram to show the Mathematics marks and the History marks of the
10 students, [3]

(ii) draw the line of best fit. [2]

(f) Describe any correlation between the two sets of marks.

Answer(f) ....

....

.... [2]

(g) (i) Use your calculator to find the equation of the line of regression.

Answer(g)(i) .... [2]

(ii) Student K scored 63 marks in Mathematics.
Use your answer to **part (g) (i)** to predict student K's History mark.

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

12

North

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A

11 km

13 km

70°

P

21 km

B
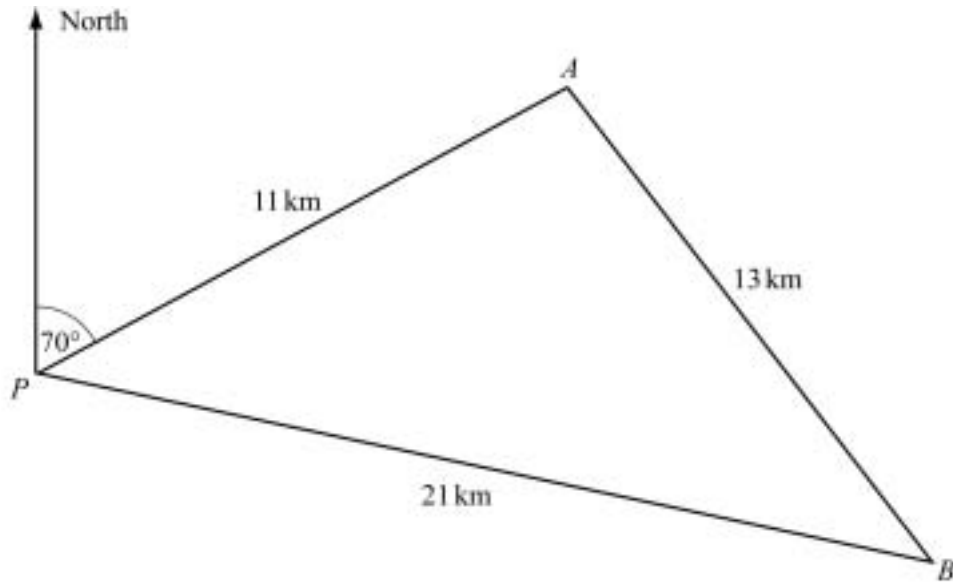
Two ships, *A* and *B*, set out from port *P*.
Ship *A* travels on a bearing of 070°
At noon, *PA* = 11 km, *PB* = 21 km and *AB* = 13 km, as shown in the diagram.

(a) Show, by calculation, that the bearing of *B* from *P* is 101.7°, to one decimal place.

Answer (a)

[4]

(b) Ship *A* continues to travel on a bearing of 070° and ship *B* continues to travel on a bearing of 101.7°.
Ship *A* travels at 20 km/h and ship *B* travels at 15 km/h.
Calculate the distance between the ships at 13 30.

Answer(b) .... [4]

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