You will be supplied with a sheet of formulae by your Superintendent to help in answering this paper.

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1996

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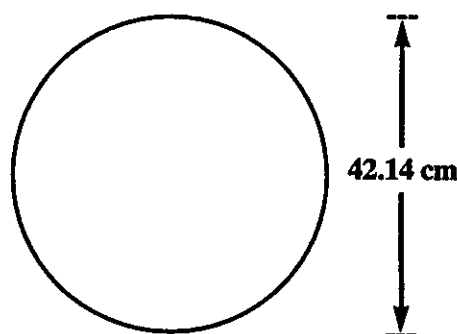# MATHEMATICS — ALTERNATIVE — ORDINARY LEVEL

PAPER 2 (300 marks)

FRIDAY, 7 JUNE — MORNING, 9.30 to 12.00

Attempt **SIX QUESTIONS** (50 marks each)

Marks may be lost if necessary work is not clearly shown.

1. (a) A disc has diameter of length 42.14 cm.

   Calculate its area, correct to two places of decimals. Take 3.14 as an approximation of π.

42.14 cm

   (b) The area of a square is 24.01 m².
   Calculate the length of the side of the square.

   Then, find the length of the perimeter of the square.
   Give this answer correct to the nearest metre.

   (c) Five identical small parallelograms are joined to make the shape shown in the diagram.

   The perpendicular height of each parallelogram is 12 cm.

   If the total area of the shape is 795 cm², find the length a.

12 cm

a

OVER→
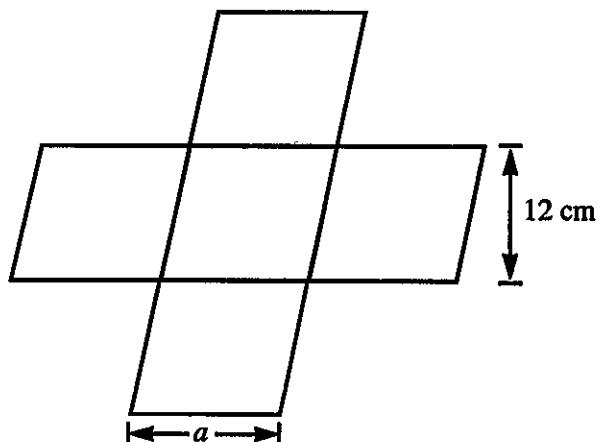
2. **(a)** Calculate the volume of a cylinder of height 26.4 mm and diameter length 15.4 mm, taking 3.14 as an approximation of π.
Give your answer correct to the nearest mm³.

26.4 mm

15.4 mm
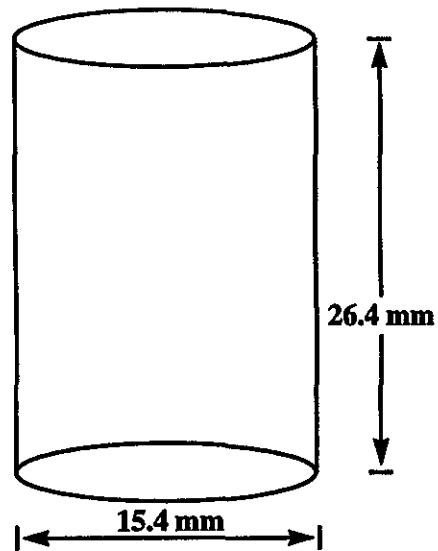
(b) A sphere has surface area of 1000 cm².

Find the length of the radius of the sphere, taking 3.14 as an approximation of π.
Give your answer correct of two places of decimals.

(c) A rectangular block of wax (56 x 31 x 40) cm³ is melted down and most of it is reshaped as a cylinder of height 40 cm.

If 50 cm³ of wax is not used, calculate the length of the diameter of the cylinder. Take 3.14 as an approximation of π. Give your answer correct to the nearest cm.

3. **(a)** A student is planning to travel to Dublin and home again by train on a certain day.
The student can travel to Dublin on a train at 0800 hours, at 0830 hours or at 0900 hours.
The student can return from Dublin on a train at 1700 hours, at 1730 hours, at 1800 hours or at 1830 hours.
In how many different ways can the journey be planned?

(b) The results of a survey of 500 people who each bought a bicycle are as follows:

	Type of bicycle		
	Regular	Racer	Mountain Bike
Number of people who paid by cash	63	58	115
Number of people who paid by cheque	48	32	43
Number of people who paid by credit card	40	47	54

If a person is picked at random, what is the probability that he or she
(i) paid by cheque for a mountain bike?
(ii) bought a racing bike?
(iii) did not pay by credit card?

(c) The place-name B A L L Y N A H I N C H is printed on a card. The first 6 letters are printed in red and the rest are printed in green. The card is cut so that each letter is on a separate piece. The pieces are put in a bag.

When one piece is taken out at random, what is the probability that it is
(i) a green letter?
(ii) the letter A in red?
(iii) the letter N or a red letter?

4. **(a)** Use the theorem of Pythagoras to find the length x in the right-angled triangle shown.
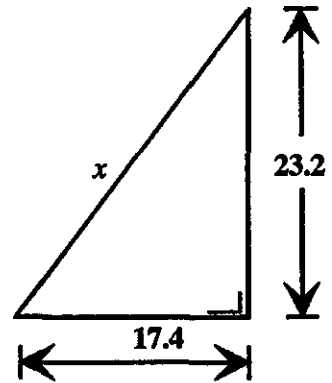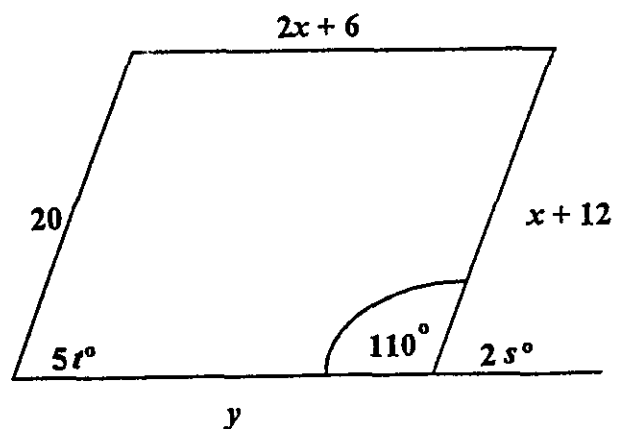

(b) In the diagram, the lengths $| pr |$ and $| qr |$ are equal.

Find the value of x and the value of y.
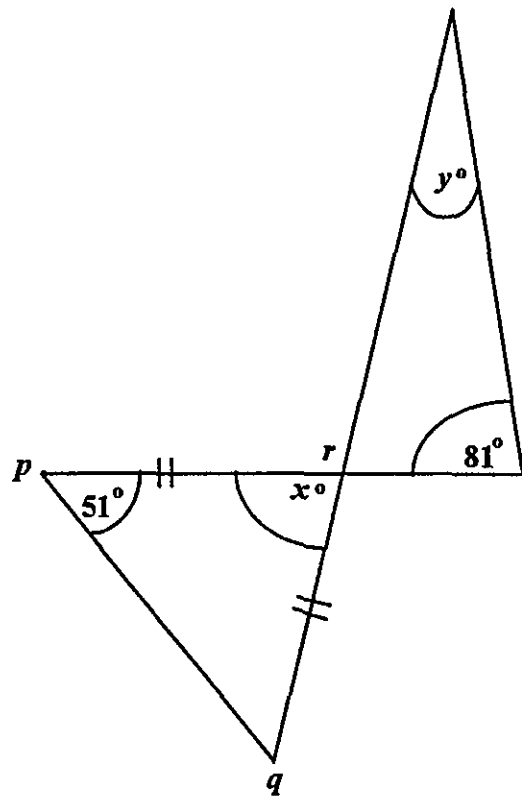
(c) From the parallelogram shown, find the value of

   (i) x

   (ii) y

   (iii) s

   (iv) t.

5. **(a)** $p\ (-5,2)$ and $q\ (-1,5)$ are points.

  (i) Calculate the slope of pq.

 **(ii)** Write down the slope of a line perpendicular to pq.

(b) In an experiment, the height of a plant was measured on 6 consecutive days. The results were as follows:

Time, x, in days	1	2	3	4	5	6
Height, y, in mm	50	57	59	63	70	74

  (i) Plot these points (x, y) on graph paper.

  (ii) Join points $(1,50)$ and $(5,70)$ by a line.

  (iii) Find the slope of this line.
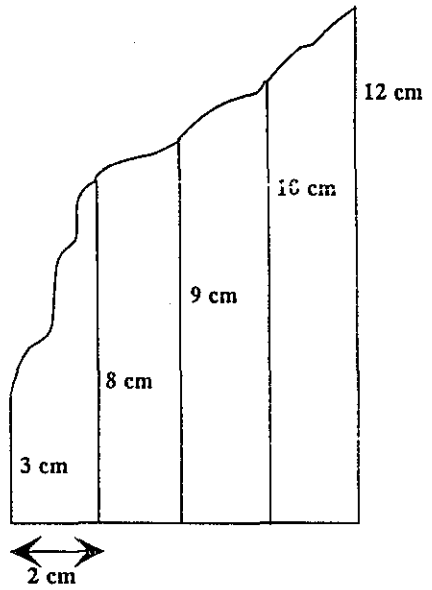
  (iv) Write down the equation of this line.

  Use your equation to estimate the height, y, when the time, x, is 20 days.

6. **(a)** Sketch the net of the closed box in the diagram.
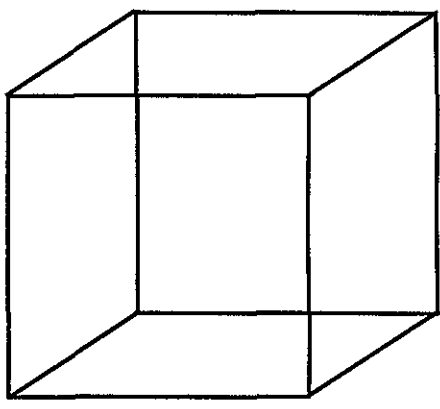
(b) A piece of paper with a straight bottom edge is measured using offsets at intervals of 2 cm.
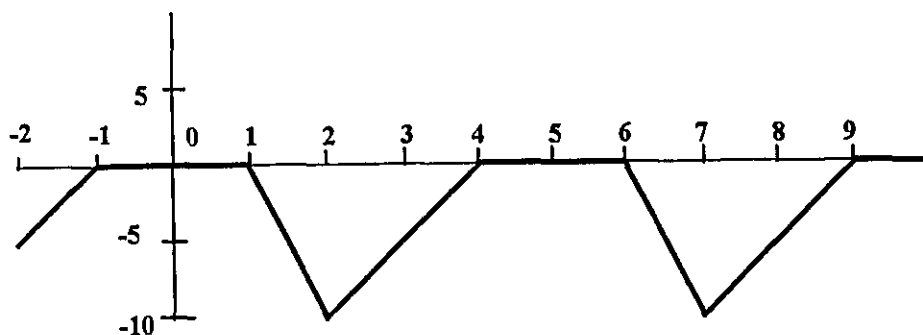
 Use Simpson's Rule to estimate the area of the piece of paper.

(c) A lawn in the shape of a square of side of length 11 m is bordered on all four sides by a path. The width of the path is 1 m.

  What is the area of the path?

OVER→

7. (a) The diagram shows part of the graph of a periodic function.
What is the period and the range of the function?

(b) Use the measurements in the diagram to write down

    (i) the value of cos A

    (ii) the measure of angle A, to the nearest degree

    (iii) the measure of angle B, to the nearest degree.
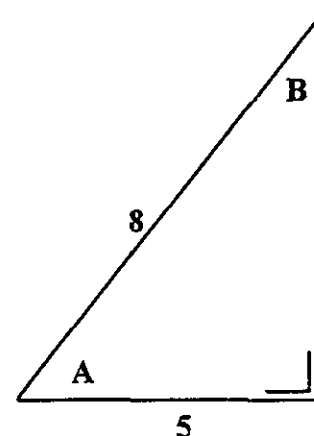
(c) When a person stands on level ground at a point 100 m from the foot of a vertical cliff, the angle of elevation of the top of the cliff is 40°.

Calculate the height of the cliff, correct to the nearest metre.

If the person moves to a different point on level ground, 300 m from the foot of the cliff, what will then be the measure of the angle of elevation? Give your answer correct to the nearest degree.
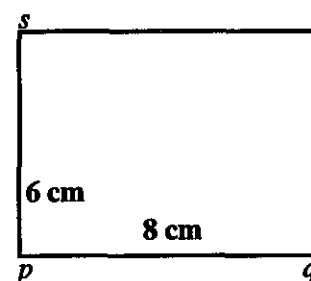
8. (a) Draw accurately a parallelogram *abcd* which has measurements as follows:

| *ab* | = 7 cm; | *bc* | = 5 cm; | *ac* | = 11 cm.

(b) Draw accurately the rectangle *pqrs* with
| *pq* | = 8 cm and | *ps* | = 6 cm.

On the same diagram, construct the image of the rectangle under the enlargement, centre *p*, of scale factor 0.4.
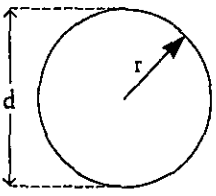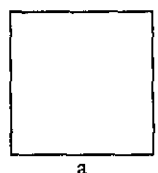
Write down the area of the image rectangle.

(c) A photograph has area 80 cm².
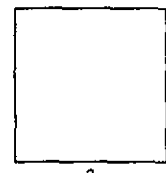
This photograph is enlarged to give a photograph of area 288.8 cm².
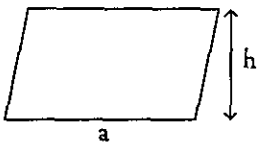Find the scale factor of the enlargement.

In the original photograph, a door was 2.4 cm wide.
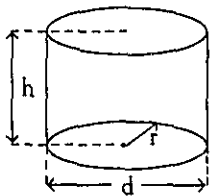How wide will the door measure in the enlarged photograph?

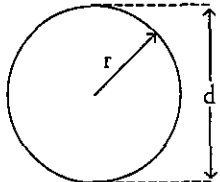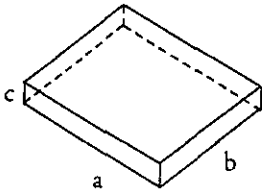| DISC	AREA	FORMULAE
	$\text{Area} = \pi r^2$ $\text{Area} = \dfrac{\pi d^2}{4}$	$r = \sqrt{\dfrac{\text{Area}}{\pi}}$ $d = \sqrt{\dfrac{4(\text{Area})}{\pi}}$

SQUARE	AREA	FORMULAE
	$\text{Area} = a^2$	$a = \sqrt{\text{Area}}$

SQUARE	LENGTH(L)	FORMULAE
	$L = 4a$	$a = \dfrac{L}{4}$

PARALLELOGRAM	AREA	FORMULAE
	$\text{Area} = ah$	$a = \dfrac{\text{Area}}{h}$ $h = \dfrac{\text{Area}}{a}$

CYLINDER	VOLUME(V)	FORMULAE
	$V = \pi r^2 h$ $V = \dfrac{\pi h d^2}{4}$	$h = \dfrac{V}{\pi r^2}$ $h = \dfrac{4V}{\pi d^2}$ $r = \sqrt{\dfrac{V}{\pi h}}$ $d = \sqrt{\dfrac{4V}{\pi h}}$

SPHERE	AREA	FORMULAE
	$\text{Area} = 4\pi r^2$ $\text{Area} = \pi d^2$	$r = \sqrt{\dfrac{\text{Area}}{4\pi}}$ $d = \sqrt{\dfrac{\text{Area}}{\pi}}$

RECTANGULAR BLOCK	VOLUME(V)	FORMULAE
	$V = abc$	$a = \dfrac{V}{bc}$ $b = \dfrac{V}{ac}$ $c = \dfrac{V}{ab}$

Slope Formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Equation of a line:

$$y = mx + c \qquad \text{or} \qquad y - y_1 = m(x - x_1)$$

Simpson's Rule:

$$\text{Approximate Area} = \frac{h}{3}(\text{First} + \text{Last} + \text{T.O.F.E.})$$

where

First	=	First ordinate
Last	=	Last ordinate
T.O.F.E.	=	Twice the sum of the Odd ordinates + Four times the sum of the Even ordinates
h	=	interval