AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION, 1999

MATHEMATICS - FOUNDATION LEVEL

PAPER 2 (300 marks)

FRIDAY, 11 JUNE - MORNING, 9.30 - 12.00

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

Marks may be lost if necessary work is not clearly shown.
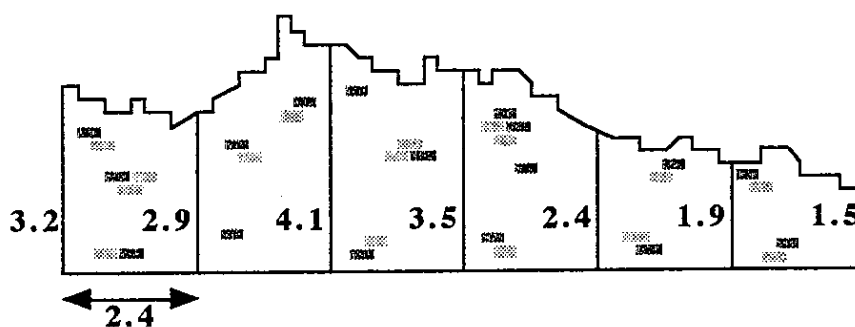**A sheet of formulae will be given to you by the Superintendent.**

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1. **(a)**   A rectangular block has volume 720 cm³.
The width and length of the block are
9 cm and 20 cm, respectively. Its height is *h* cm.

Calculate

(i)   the value of *h*

(ii)   the sum of the areas of the four
vertical sides.

9 cm   20 cm   *h*
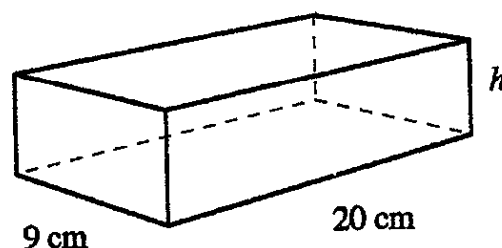
(b)   The front face of a stone wall of a ruined castle is shown in the diagram.

3.2   2.9   4.1   3.5   2.4   1.9   1.5

2.4

All distances are measured in metres. The heights are measured at intervals of 2.4 m along the
base line.
Use Simpson's Rule to calculate the area of the front face of the stone wall.

2. **(a)** The volume of a right circular cone is 14 130 cm³. The height of the cone is 20 cm. Find the length of its base radius correct to one place of decimals.
Take $\pi = 3.14$.

(b) A mirror has the shape of a rectangle with semi-circular top. The rectangular section has width 0.6 m and height 1.2 m.
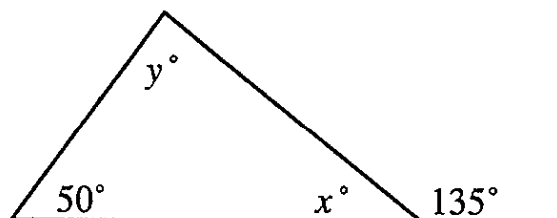The semi-circular part has radius length 0.2 m.

Find

(i) the area of the rectangular section

(ii) the area of the semi-circular part, taking $\pi = 3.14$

(iii) the total area

(iv) the length of the perimeter of the mirror, taking $\pi = 3.14$.
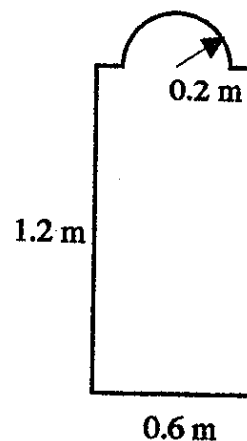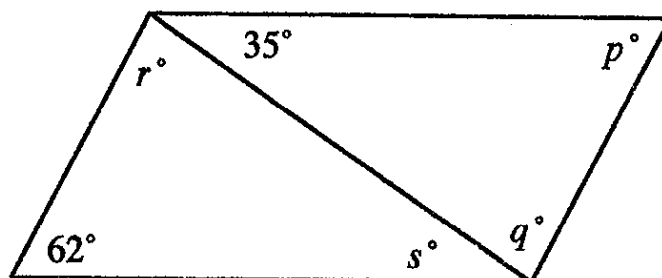
3. **(a)** The diagram shows a triangle.

Find the value of x and the value of y.

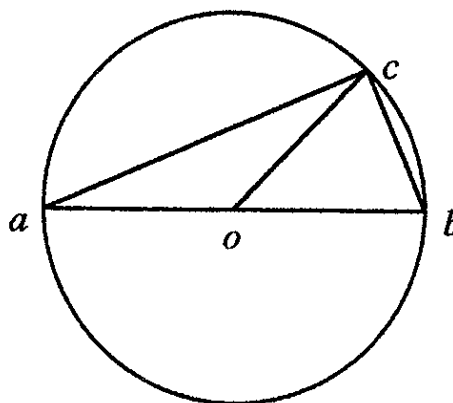**(b)** The diagram shows a parallelogram.

Find the value of

(i) p

(ii) q

(iii) r

(iv) s.

(c) A circle, centre o, is drawn around the triangle abc so as to touch the points a, b and c.

$[ab]$ is a diameter of the circle.

(i) Write down the measure of $\angle acb$.

(ii) Name two isosceles triangles.

(iii) Given that the radius length is 6.5 cm and $|ac| = 12$ cm, calculate $|cb|$.

4. **(a)** $p(5, 4)$ and $q(-3, -2)$ are points.

Find the co-ordinates of the midpoint of $[pq]$.

(b) r is the point $(1, 2)$ and s is the point $(-2, 6)$.

(i) Plot the points r and s on graph paper.

(ii) Find the length of $[rs]$.

(iii) Find the slope of rs.

(c) The line L has equation $y = 2x + 3$.

The point k has co-ordinates $(0, 3)$.

(i) Show that k lies on the line L.
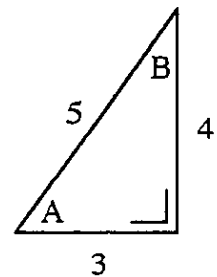
(ii) Write down the value of the slope of L.

(iii) Find the equation of the line which passes through k and is perpendicular to L.

5. **(a)** Given that $\sin A = \dfrac{4}{5}$,
write down the value of

(i) $\cos A$

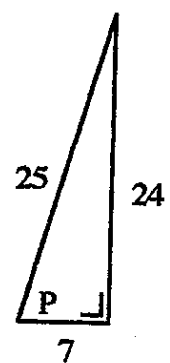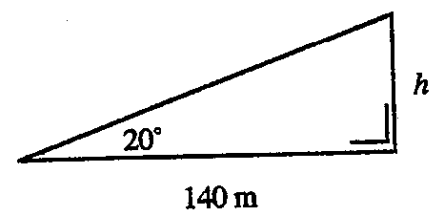*(ii)* $\tan A$

(iii) $\sin B$.

(b) Find cos P and write your answer as a decimal.

Hence find the measure of the angle P, correct to the nearest degree.

(c) The angle of elevation of the top of a television mast from a point on the level ground 140 m from the foot of the mast is 20°.

Find the height h of the mast, correct to two places of decimals.

6. **(a)** A pupil must choose one subject out of each of the following subject groups:

> Group A has 3 modern language subjects
> Group B has 2 science subjects
> Group C has 2 business subjects.

How many different subject selections are possible?

(b) A bag contains 8 red balls, 7 yellow balls and 5 white balls. A ball is picked at random from the bag.

What is the probability that

(i) the ball is yellow

(ii) the ball is <u>not</u> red?

(c) The number of houses of various types in an estate of 80 houses is shown in the table.

House type	Two-bedroomed	Three-bedroomed	Four-bedroomed
Detached	0	9	5
Semi-detached	0	24	12
Terraced	10	20	0

For example, there are 24 three-bedroomed semi-detached houses in the estate.

A house is selected at random.

What is the probability that it is

(i) a four-bedroomed detached house

(ii) a semi-detached house

(iii) a terraced house

(iv) a three-bedroomed or four-bedroomed house?

7. **(a)** The time spent studying by each of 60 students was recorded on one day and the results are shown in the following table:

Study time (in minutes)	0 - 50	50 - 100	100 - 150	150 - 200	200 - 250
Number of students	8	14	17	13	8

[Note: 50 - 100 means 50 minutes or more but less than 100 minutes studying.]

Copy and complete the following cumulative frequency table:

Study time (in minutes)	<50	<100	<150	<200	<250
Number of students					

Draw the cumulative frequency curve. Put the number of students on the vertical axis.

Use this curve to estimate

(i)   the median study time

(ii)   the number of students who spent 90 minutes or more but less than 180 minutes studying.

(b) Find the mean and calculate the standard deviation of the numbers

$$2, \quad 6, \quad 10, \quad 14$$

correct to two places of decimals.

8. **(a)** Show how to draw the tangent to a circle at a given point on the circle.

(b) The right-angled triangle $p'q'r'$ is the enlargement of the right-angled triangle pqr.
The centre of enlargement is o.
$|rp| = 4$, $|r'p'| = 8$ and $|p'q'| = 6.4$.
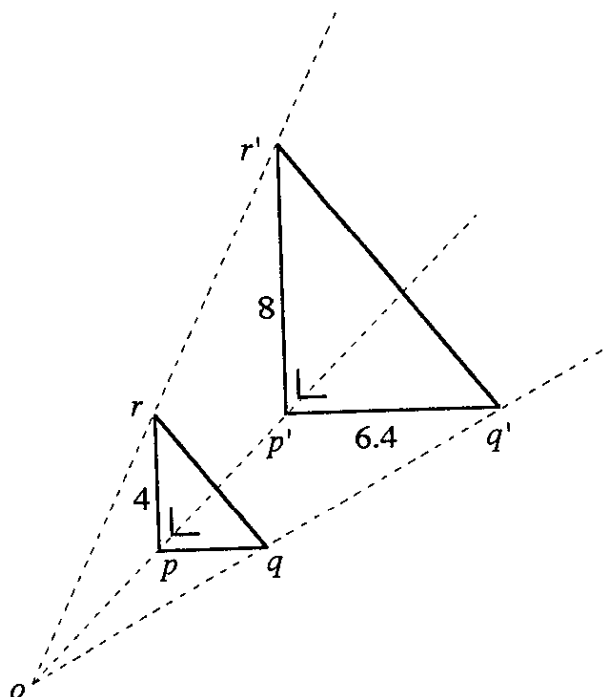
(i) Calculate the scale factor of the enlargement.

(ii) Find the length of $[pq]$.

(iii) Find the area of triangle pqr.

(c) Construct a rectangle $abcd$ with $|ab| = 2.5$ cm and $|bc| = 1.5$ cm.

Construct the image of the rectangle $abcd$ under the enlargement with centre a and scale factor 2.4 .

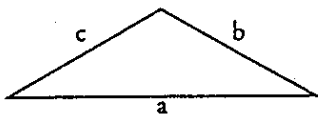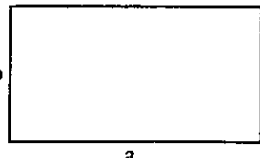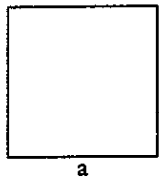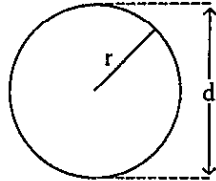Calculate the area enclosed by the image.
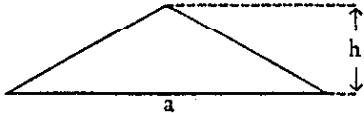
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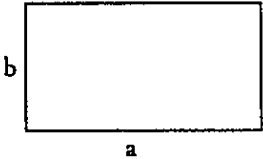
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FORMULAE FOR PAPER 2
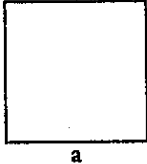
FAD			LENGTH		

FAD	FOIRMLÍ	TRIANTÁN TRIANGLE	LENGTH	FORMULAE
Fad = a + b + c	$a = Fad - b - c$ $b = Fad - a - c$ $c = Fad - a - b$		Length = a + b + c	$a = Length - b - c$ $b = Length - a - c$ $c = Length - a - b$

FAD	FOIRMLÍ	DRONUILLEOG RECTANGLE	LENGTH	FORMULAE
Fad = 2(a + b) = 2a + 2b	$a = \dfrac{(Fad - 2b)}{2}$ $b = \dfrac{(Fad - 2a)}{2}$		Length = 2(a + b) = 2a + 2b	$a = \dfrac{(Length - 2b)}{2}$ $b = \dfrac{(Length - 2a)}{2}$

FAD	FOIRMLÍ	CEARNÓG SQUARE	LENGTH	FORMULAE
Fad = 4a	$a = \dfrac{Fad}{4}$		Length = 4a	$a = \dfrac{Length}{4}$

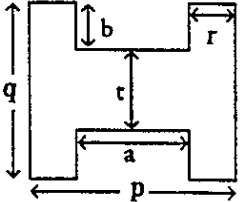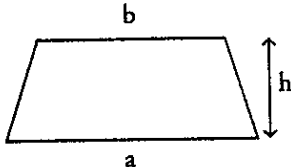| FAD	FOIRMLÍ	CIORCAL CIRCLE	LENGTH	FORMULAE
Fad = 2πr Fad = πd	$d = 2r, \quad r = \dfrac{d}{2}$ $r = \dfrac{Fad}{2\pi}$ $d = \dfrac{Fad}{\pi}$		Length = 2πr Length = πd	$d = 2r, \quad r = \dfrac{d}{2}$ $r = \dfrac{Length}{2\pi}$ $d = \dfrac{Length}{\pi}$

ACHAR	FOIRMLÍ	TRIANTÁN TRIANGLE	AREA	FORMULAE
$Achar = \dfrac{ah}{2}$	$a = \dfrac{2(Achar)}{h}$ $h = \dfrac{2(Achar)}{a}$		$Area = \dfrac{ah}{2}$	$a = \dfrac{2(Area)}{h}$ $h = \dfrac{2(Area)}{a}$

ACHAR	FOIRMLÍ	DRONUILLEOG RECTANGLE	AREA	FORMULAE
$Achar = ab$	$a = \dfrac{Achar}{b}$ $b = \dfrac{Achar}{a}$		$Area = ab$	$a = \dfrac{Area}{b}$ $b = \dfrac{Area}{a}$
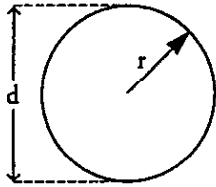
ACHAR	FOIRMLÍ	CEARNÓG SQUARE	AREA	FORMULAE
$Achar = a^2$	$a = \sqrt{Achar}$		$Area = a^2$	$a = \sqrt{Area}$
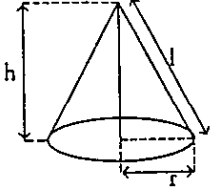
ACHAR	FOIRMLÍ	FÍOR - H H - FIGURE	AREA	FORMULAE
$Achar = pq - 2ab$ $Achar = at + 2qr$ Nóta: $p = a + 2r$ $q = 2b + t$	$p = \dfrac{(Achar + 2ab)}{q}$ $q = \dfrac{(Achar + 2ab)}{p}$ $a = \dfrac{(pq - Achar)}{2b}$ $b = \dfrac{(pq - Achar)}{2a}$		$Area = pq - 2ab$ $Area = at + 2qr$ Note: $p = a + 2r$ $q = 2b + t$	$p = \dfrac{(Area + 2ab)}{q}$ $q = \dfrac{(Area + 2ab)}{p}$ $a = \dfrac{(pq - Area)}{2b}$ $b = \dfrac{(pq - Area)}{2a}$
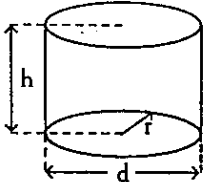
ACHAR	FOIRMLÍ	TRAIPÉISIAM TRAPEZIUM	AREA	FORMULAE
$Achar = \dfrac{h(a + b)}{2}$	$a = \dfrac{2(Achar)}{h} - b$ $b = \dfrac{2(Achar)}{h} - a$ $h = \dfrac{2(Achar)}{(a + b)}$		$Area = \dfrac{h(a + b)}{2}$	$a = \dfrac{2(Area)}{h} - b$ $b = \dfrac{2(Area)}{h} - a$ $h = \dfrac{2(Area)}{(a + b)}$
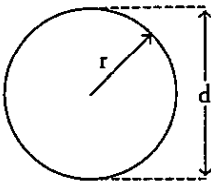
ACHAR	FOIRMLÍ	COMHTHREOMHARÁN PARALLELOGRAM	AREA	FORMULAE
$Achar = ah$	$a = \dfrac{Achar}{h}$ $h = \dfrac{Achar}{a}$		$Area = ah$	$a = \dfrac{Area}{h}$ $h = \dfrac{Area}{a}$

ACHAR	FOIRMLÍ	DIOSCA DISC	AREA	FORMULAE
$\text{Achar} = \pi r^2$ $\text{Achar} = \dfrac{\pi d^2}{4}$	$r = \sqrt{\dfrac{\text{Achar}}{\pi}}$ $d = \sqrt{\dfrac{4(\text{Achar})}{\pi}}$		$\text{Area} = \pi r^2$ $\text{Area} = \dfrac{\pi d^2}{4}$	$r = \sqrt{\dfrac{\text{Area}}{\pi}}$ $d = \sqrt{\dfrac{4(\text{Area})}{\pi}}$
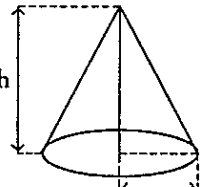
ACHAR	FOIRMLÍ	DRONCHÓN RIGHT CONE	AREA	FORMULAE
$\text{Achar} = \pi r l$ Nóta: $l^2 = r^2 + h^2$	$r = \dfrac{\text{Achar}}{\pi l}$ $l = \dfrac{\text{Achar}}{\pi r}$		$\text{Area} = \pi r l$ Note: $l^2 = r^2 + h^2$	$r = \dfrac{\text{Area}}{\pi l}$ $l = \dfrac{\text{Area}}{\pi r}$
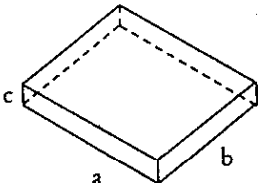
ACHAR	FOIRMLÍ	SORCÓIR CYLINDER	AREA	FORMULAE
$\text{Achar} = 2\pi r h$ $\text{Achar} = \pi d h$	$r = \dfrac{\text{Achar}}{2\pi h}$ $h = \dfrac{\text{Achar}}{2\pi r}$ $d = \dfrac{\text{Achar}}{\pi h}$ $h = \dfrac{\text{Achar}}{\pi d}$		$\text{Area} = 2\pi r h$ $\text{Area} = \pi d h$	$r = \dfrac{\text{Area}}{2\pi h}$ $h = \dfrac{\text{Area}}{2\pi r}$ $d = \dfrac{\text{Area}}{\pi h}$ $h = \dfrac{\text{Area}}{\pi d}$
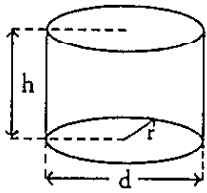
ACHAR	FOIRMLÍ	SFÉAR SPHERE	AREA	FORMULAE
$\text{Achar} = 4\pi r^2$ $\text{Achar} = \pi d^2$	$r = \sqrt{\dfrac{\text{Achar}}{4\pi}}$ $d = \sqrt{\dfrac{\text{Achar}}{\pi}}$		$\text{Area} = 4\pi r^2$ $\text{Area} = \pi d^2$	$r = \sqrt{\dfrac{\text{Area}}{4\pi}}$ $d = \sqrt{\dfrac{\text{Area}}{\pi}}$
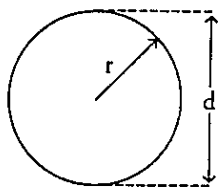
TOIRT   VOLUME
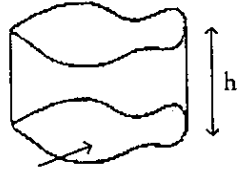
TOIRT	FOIRMLÍ	DRONCHÓN RIGHT CONE	VOLUME	FORMULAE
$\text{Toirt} = \dfrac{\pi r^2 h}{3}$	$r = \sqrt{\dfrac{3(\text{Toirt})}{\pi h}}$ $h = \dfrac{3(\text{Toirt})}{\pi r^2}$		$\text{Volume} = \dfrac{\pi r^2 h}{3}$	$r = \sqrt{\dfrac{3(\text{Volume})}{\pi h}}$ $h = \dfrac{3(\text{Volume})}{\pi r^2}$

TOIRT	FOIRMLÍ	BLOC DRONUILLEOGACH RECTANGULAR BLOCK	VOLUME	FORMULAE
$\text{Toirt} = abc$	$a = \dfrac{\text{Toirt}}{bc}$ $b = \dfrac{\text{Toirt}}{ac}$ $c = \dfrac{\text{Toirt}}{ab}$		$\text{Volume} = abc$	$a = \dfrac{\text{Volume}}{bc}$ $b = \dfrac{\text{Volume}}{ac}$ $c = \dfrac{\text{Volume}}{ab}$

TOIRT	FOIRMLÍ	SORCÓIR CYLINDER	VOLUME	FORMULAE
Toirt = $\pi r^2 h$ Toirt = $\dfrac{\pi d^2 h}{4}$	$h = \dfrac{Toirt}{\pi r^2}$ $h = \dfrac{4(Toirt)}{\pi d^2}$ $r = \sqrt{\dfrac{Toirt}{\pi h}}$ $d = \sqrt{\dfrac{4(Toirt)}{\pi h}}$		Volume = $\pi r^2 h$ Volume = $\dfrac{\pi d^2 h}{4}$	$h = \dfrac{Volume}{\pi r^2}$ $h = \dfrac{4(Volume)}{\pi d^2}$ $r = \sqrt{\dfrac{Volume}{\pi h}}$ $d = \sqrt{\dfrac{4(Volume)}{\pi h}}$

TOIRT	FOIRMLÍ	SFÉAR SPHERE	VOLUME	FORMULAE
Toirt = $\dfrac{4\pi r^3}{3}$ Toirt = $\dfrac{\pi d^3}{6}$	$r = \sqrt[3]{\dfrac{3(Toirt)}{4\pi}}$ $d = \sqrt[3]{\dfrac{6(Toirt)}{\pi}}$		Volume = $\dfrac{4\pi r^3}{3}$ $V = \dfrac{\pi d^3}{6}$	$r = \sqrt[3]{\dfrac{3(Volume)}{4\pi}}$ $d = \sqrt[3]{\dfrac{6(Volume)}{\pi}}$

TOIRT	FOIRMLÍ	DRONPHRIOSMA RIGHT PRISM	VOLUME	FORMULAE
Toirt = (Achar)h	Achar = $\dfrac{Toirt}{h}$ $h = \dfrac{Toirt}{Achar}$	 Achar = Achar an Bhoinn Area = Area of Base	Volume = (Area)h	Area = $\dfrac{Volume}{h}$ $h = \dfrac{Volume}{Area}$

Foirmle don fad:
Distance formula:
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Foirmle don fána:
Slope formula:
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Foirmle don lárphointe:
Midpoint formula:
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Cóthromóid líne:
Equation of a line:
$$y = mx + c$$
$$y - y_1 = m(x - x_1)$$

Riail Simpson: Garachar = $\dfrac{h}{3}$ (Ceád + Deireadh + C.D.R.C.) áit gur Céad = an Cheád ordanáid, Deireadh = an ordanáid Deireanach, C.D.R.C. = Corr ordanáidí faoi Dó + Réidh ordanáidí faoi Ceathair, h = an t-eatramh.

Simpson's Rule: Approximate Area = $\dfrac{h}{3}$ (First + Last + 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 = the interval.