LEAVING CERTIFICATE EXAMINATION, 1993

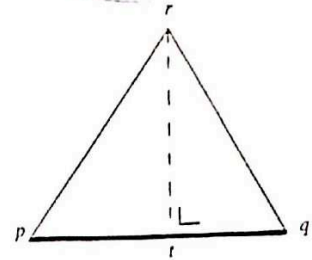# MATHEMATICS – ALTERNATIVE – ORDINARY LEVEL

### PAPER 2 (300 marks)

FRIDAY, 11 JUNE – MORNING 9.30 – 12.00
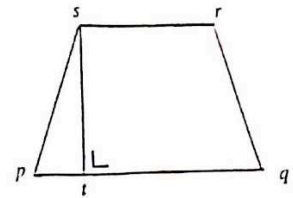
Attempt **SIX QUESTIONS** (50 marks each)

**Marks may be lost if all your work is not clearly shown.**

1. (a) Calculate, correct to one place of decimals,
the area of the triangle *pqr*
if  | *pq* | = 6·7 cm
| *rt* | = 8·24 cm and *rt* ⊥ *pq*.



(b) The area of the trapezium *pqrs* is 94·8 cm².
Calculate | *st* | if
| *pq* | = 12 cm
| *sr* | = 7·2 cm.



(c) Four identical discs each of diameter 5 cm
fit exactly on a square of side 10 cm.
Take 3·14 as an approximation of π.

What is the area of that part of the square
which is not covered by the discs?

What percentage of the area of the square
is covered by the discs? Give the answer to
the nearest unit.
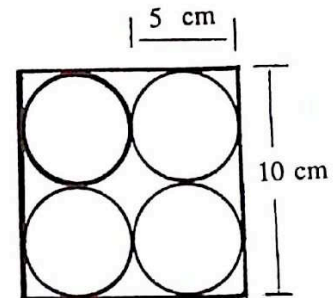


2. (a) A solid sphere has a diameter of 30 cm.
What is its volume in cm³ ? Take 3·14 as an approximation of π.

(b) A cement pathway 1 m wide surrounds a rectangular lawn,
18·8 m by 12 m, see diagram.  Find the area of the pathway.
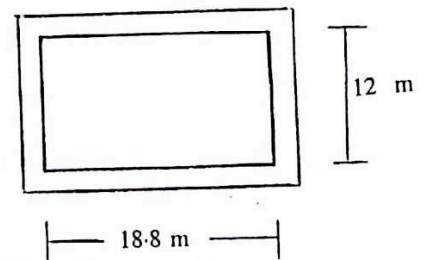


(c) A solid metal right cone (radius length = 22 cm, vertical height 15 cm) was melted
and recast as a solid cylinder.  The cylinder was 30 cm in height.  What to the nearest
millimetre, was its radius length?

OVER →

**3.** **(a)** Of the 28 pupils in a class, 21 are in their 18th year of age.

What is the probability, on picking a pupil at random, that he/she is

(i) in his/her 18th year?
(ii) not in his/her 18th year?

**(b)** 100 candidates in an examination were classified as follows:

|  | Age 16 | Age 17 | Age 18 |
|---|---|---|---|
| Girls | 4 | 17 | 33 |
| Boys | 3 | 12 | 31 |

One candidate's answerbook was lost. What was the probability that it was

(i) that of a boy in his 17th year?
(ii) that of a girl?
(iii) neither (i) nor (ii)?

**(c)** There are three balls in a bag, one green, one red, one blue. When a fair die is rolled a ball is also taken from the bag at random. What is the probability of

(i) a red ball and a six?
(ii) a green ball and an even number?

**4.** **(a)** As in the diagram, $|\angle pqr| = 90°$
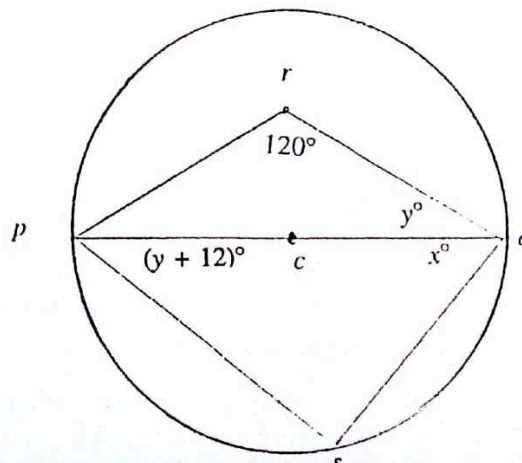Calculate $|pr|$.



10 cm

$p$    24 cm    $q$
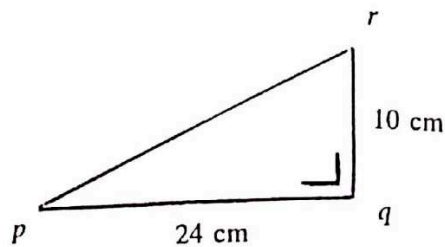
**(b)** $pqr$ is a triangle and $ts$ is a line parallel to $qr$. $|\angle tpq| = 56°$, $|\angle spr| = 33°$.
Write down the measure of
(i) $\angle pqr$   (ii) $\angle rpq$.
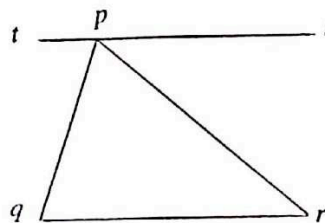


**(c)** [ $pq$ ] is a diameter of the circle, centre c, and $|pr| = |rq|$.

Calculate the value   (i) of $y$
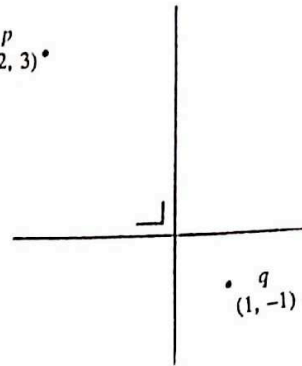             (ii) of $x$.

Give reasons for your answers.



120°

$(y + 12)°$

5. (a) $p$ (–2, 3) and $q$ (1, –1) are points on the plane.

Evaluate $|pq|$.

Find the coordinates of the mid-point of [ $pq$ ].

$p$
(–2, 3) •

•  $q$
  (1, –1)

(b) Water was heated in a kettle.
Its temperature was noted at 10 second intervals after the start.

| Time in seconds (x) | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| Temperature °C (y) | | 7 | 10 | 11 | 15 | 17 | 19 |

Draw a graph using these results and fit a straight line by joining (10, 7) and (50, 17).

Use the graph to estimate the temperature at the start.

Find (i) the slope of your line.
   (ii) the equation of your line.

Use the equation to estimate the least number of seconds to bring the water to 100° C.

6. (a) In a hollow pyramid all edges
are the same length.

Sketch the net of the pyramid.
Shade the part of the net which indicates the base.
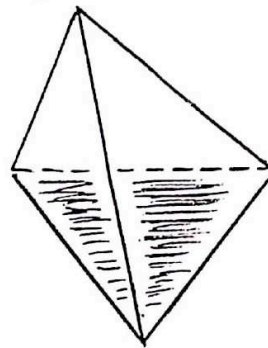
(b) If L is the line $3x - y + 4 = 0$, find the slope of a line perpendicular to L.

Find the equation of the line perpendicular to L through the point (6, –2).

(c) The diagram shows the outline of a level building site. Intervals of 10 m are marked along [fg]. The offsets from [fg] are measured and noted.
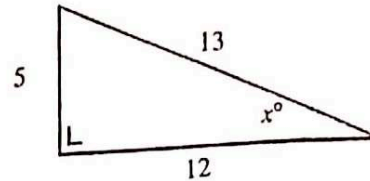


f    18 m    21 m    19 m    20 m    16 m    17 m    20 m    g

|— 10 m —|
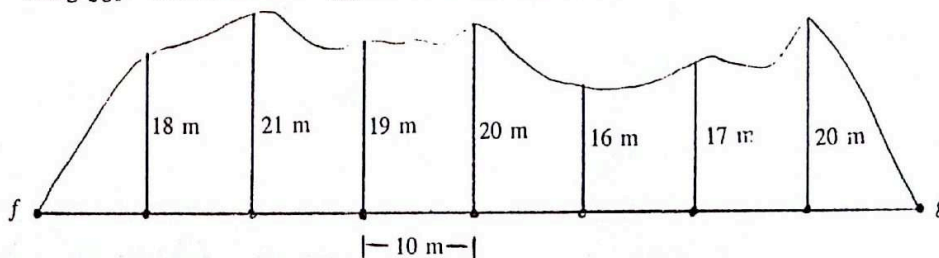
Estimate the area of the site using Simpson's rule.

**7.** **(a)** The graph of a function is shown in the diagram. What is the period of the function?
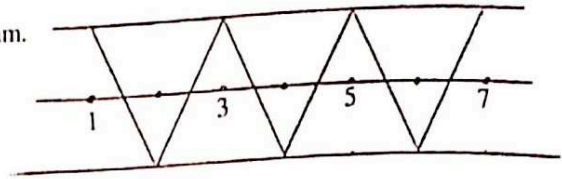
**(b)** Using the diagram write down the value of

(i) sin $x°$ (ii) cos $x°$.

Find the value of $(\sin x°)^2 + (\cos x°)^2$.

**(c)** The angle of elevation of the sun being 60°, a shadow cast by a vertical pole measures 7·2 m on level ground.

Find, correct to one place of decimals, the height of the pole.

**8.** **(a)** Draw a triangle. Construct a circle which passes through each of its vertices.
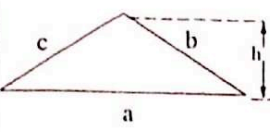
**(b)** Draw the diagram below on your page.

3 cm

$p$

4 cm

5 cm
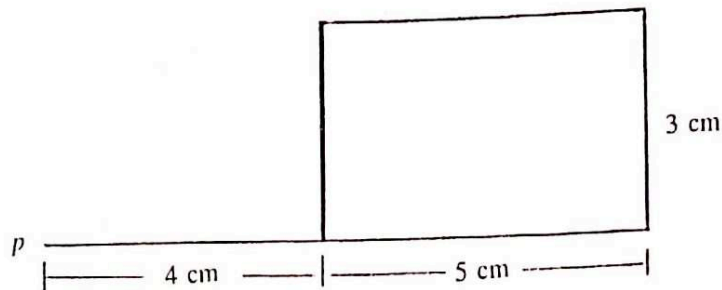
Construct the image of the rectangle under an enlargement, centre $p$, of scale factor $1\frac{1}{2}$.
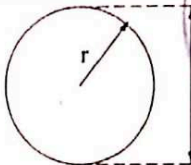
Find the ratio

the area of the image rectangle
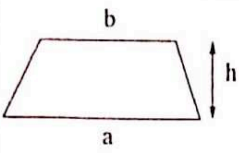the area of the original rectangle

**(c)** The triangle *pst* is the image under an enlargement of the triangle *pqr*, *p* being the centre of enlargement.
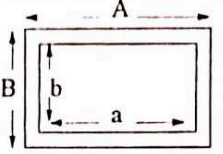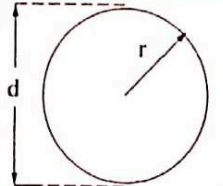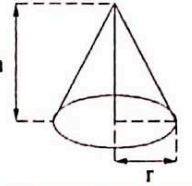
Calculate l *rt* l.
(The diagram is not to scale)

5 cm

$t$

$r$

$q$

$s$

$p$

13·5 cm

8·1 cm

15994
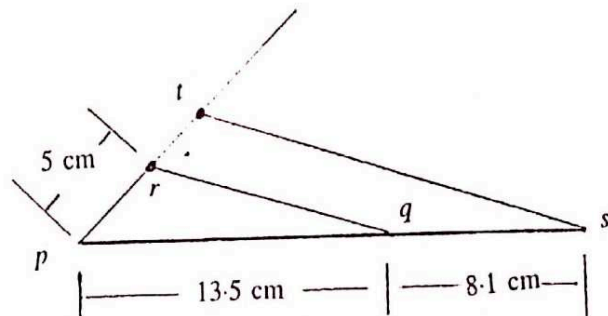
| TRIANGLE | AREA | FORMULAE |
|---|---|---|
|  | $\text{Area} = \dfrac{ah}{2}$ | $a = \dfrac{2(\text{area})}{h}$ <br><br> $h = \dfrac{2(\text{Area})}{a}$ |

| TRAPEZIUM | AREA | FORMULAE |
|---|---|---|
|  | $\text{Area} = \dfrac{h(a+b)}{2}$ | $a = \dfrac{2(\text{Area})}{h} - b$ <br> $b = \dfrac{2(\text{Area})}{h} - a$ <br> $h = \dfrac{2(\text{Area})}{(a+b)}$ |

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

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

| SPHERE | AREA | FORMULAE |
|---|---|---|
|  | $\text{Area} = 4\pi r^2$ <br> $\text{Area} = \pi d^2$ | $r = \sqrt{\dfrac{\text{Area}}{4\pi}}$ <br><br> $d = \sqrt{\dfrac{\text{Area}}{\pi}}$ |

| HOLLOW RECTANGLE | AREA | FORMULAE |
|---|---|---|
|  | $\text{Area} = AB - ab$ | $A = \dfrac{(\text{Area} + ab)}{B}$ <br> $B = \dfrac{(\text{Area} + ab)}{A}$ <br> $a = \dfrac{(AB - \text{Area})}{b}$ <br> $b = \dfrac{(AB - \text{Area})}{a}$ |

| RIGHT CONE | VOLUME (V) | FORMULAE |
|---|---|---|
|  | $V = \dfrac{\pi r^2 h}{3}$ | $r = \sqrt{\dfrac{3V}{\pi h}}$ <br><br> $h = \dfrac{3V}{\pi r^2}$ |

| CYLINDER | VOLUME (V) | FORMULAE |
|---|---|---|
|  | $V = \pi r^2 h$ <br><br> $V = \dfrac{\pi h d^2}{4}$ | $h = \dfrac{V}{\pi r^2}, \quad h = \dfrac{4V}{\pi d^2}$ <br> $r = \sqrt{\dfrac{V}{\pi h}}$ <br> $d = \sqrt{\dfrac{4V}{\pi h}}$ |

Distance Formula:   $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Midpoint formula:   $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Slope Formula:   $\dfrac{y_2 - y_1}{x_2 - x_1}$

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

Simpsons's Rule:   Approximate  $\text{Area} = \dfrac{h}{3}$ (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