Section A [64 marks]

Answer all the questions in this section.

1   (a) Factorise the following expressions completely

   (i) $9t^2 + 6t$,

   (ii) $mn - 4n + mr - 4r$.
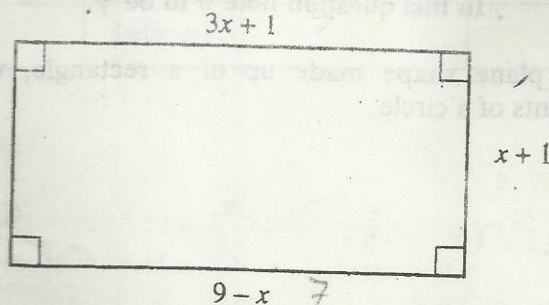
[4]

(b) Make u the subject of the formula

   $100 + nu = 40u$.

[2]

(c)

The diagram represents a rectangle and the lengths, in centimetres, of three of the sides have been given in terms of x.

Find

   (i) x,

   (ii) the numerical value of the perimeter of the rectangle.

[4]

2   Given the matrices

$A = \begin{pmatrix} \frac{1}{2} & -\frac{2}{3} \\ 9 & -6 \end{pmatrix}$ and $B = \begin{pmatrix} 6 & -1 \\ 12 & 3 \end{pmatrix}$,

find

(a) $-6A$,

[2]

(b) the determinant of A,

[2]

(c) the inverse of A,

[2]

(d) BA,

[2]

(e) B^2.
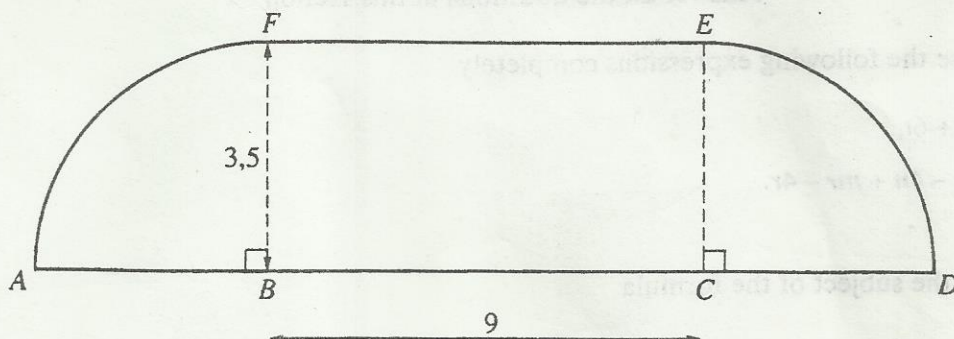
[2]

3

. In this question take π to be $\frac{22}{7}$.

The diagram represents a plane shape made up of a rectangle, with sides $BC = 9$ cm and $BF = 3,5$ cm, and two quadrants of a circle.

Calculate

(a) the length of the arc AF, [2]

(b) the perimeter of the shape, [3]

(c) the area of the quadrant ABF, [2]

(d) the total area of the shape, [3]

(e) the length of the side of a square which has the same area as the shape. [2]

4   **Answer the whole of this question on a sheet of plain paper.**

Use ruler and compasses only.

All the construction lines must be clearly shown.

(a) Construct, on a single diagram,

   (i) triangle ABC in which $AB = 6,8$ cm, $BC = 10$ cm and $A\hat{B}C = 120°$, [2]

   (ii) the perpendicular from A on to CB produced, [2]

   (iii) the locus of points which are 3 cm from BC, [2]

   (iv) the bisector of angle ABC. [2]

(b)   (i) Measure and write down the length of AC. [1]

   (ii) Mark two points X and Y which are 3 cm from BC and are equidistant from AB and BC. [2]

5 (a) $5000 earned interest of $530 in 6 months. Find the rate of simple interest per annum. [3]

(b) A salesman was paid commission at the rate of 12% of the value of the goods he sold. He received a commission of $1320. What was the value of the goods he sold? [3]

(c) The following extract shows an incomplete savings account statement.

Transaction date	Type of transaction	Debit	Credit	Balance
	Balance brought forward			$6508
5/3/95	Cash withdrawal	$600		$X
27/3/95	Salary deposit		$Y	$7248
31/3/95	Interest		$530	$Z

Find the value of

(i) X,

(ii) Y,

(iii) Z.

[6]

6
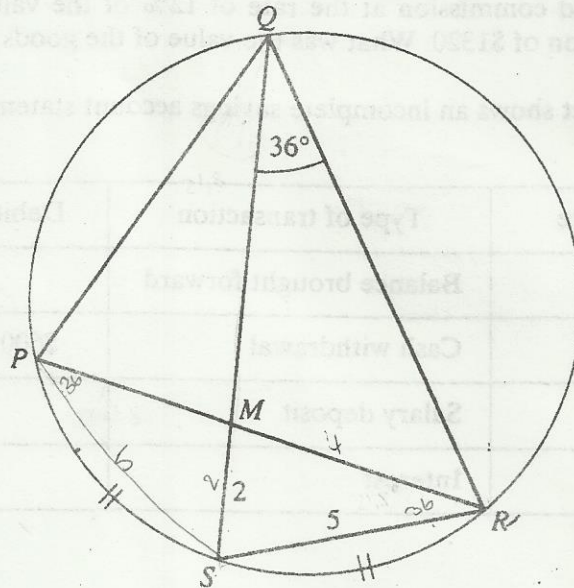
PQRS is a circle in which S is the mid-point of arc PR and M is the point of intersection of the chords SQ and PR.

$S\hat{Q}R = 36°$, MS = 2 cm and SR = 5 cm.

(a) Find

(i) $P\hat{Q}S$,

(ii) $P\hat{R}S$.

[3]

(b) (i) Name two triangles, with the letters in the correct order, which are similar to triangle MRS.   MQR   MPS

[2]

(ii) Hence find the length of the chord QS.

[4]

Section B [36 marks]

Answer **three** questions in this section.

Each question in this section carries 12 marks.

7 **Answer the whole of this question on a sheet of graph paper.**

The velocity, v m/s, of a particle after t seconds is given by

$$v = 2t^2 - 7t + 4.$$

The table below gives some corresponding values of v and t.

t	0	1	2	2,5	3	4
v	4	n	−2	−1	1	8

(a) Calculate the value of n. [1]

(b) Taking 2 cm to represent 1 unit on each axis draw the graph of $v = 2t^2 - 7t + 4$ for $0 \leqslant t \leqslant 4$. [4]

(c) Use your graph to estimate

   (i) the acceleration of the particle when $t = 1$, [3]

   (ii) the speed and time when the acceleration is zero, [2]

   (iii) the distance covered during the time interval from $t = 1$ to $t = 2$, giving your answer correct to 1 decimal place. [2]

8
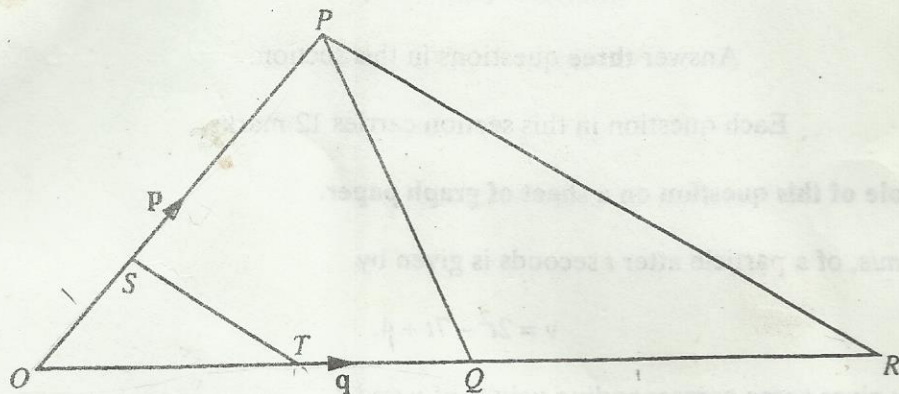
In the diagram $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

S is a point on OP such that $OS:SP = 1:3$ and T is a point on OQ such that $OT:TQ = 3:1$.

(a) Express the following vectors in terms of **p** and/or **q**.

    (i) $\overrightarrow{OS}$,

    (ii) $\overrightarrow{OT}$,

    (iii) $\overrightarrow{ST}$,

    (iv) $\overrightarrow{PQ}$.

        [4]

(b) R is a point on OQ produced such that $\overrightarrow{OR} = h\,\overrightarrow{OQ}$.

    (i) Express $\overrightarrow{OR}$ in terms of **q** and h.   [1]

    (ii) Express $\overrightarrow{PR}$ in terms of **p**, **q** and h.   [1]

    (iii) Given that PR is parallel to ST, find the value of h.   [2]

(c) Given that O is the origin, P is the point $(6,5)$ and T is the point $(5,0)$ find

    (i) $\overrightarrow{PT}$ in column form,   [2]

    (ii) $|\overrightarrow{PT}|$.   [2]