

SECTION A (60 Marks)

Answer ALL questions in this section

1. (a) Find the value of the expression

$$\left(\frac{4.75 + 1.31}{3.13} \right)^2$$

giving your answer in three decimal places.

- (b) By rounding each term of the expression in (a) above to one significant figure, obtain a rough estimate of the expression.
- (c) Express $1.\dot{2}1\dot{3}$ as a rational number.
2. (a) How many even numbers greater than 2000 can be formed with digits 1, 2, 4 and 8 if each digit may be used only once?
- (b) If $n(A) = 8$, $n(B) = 12$ and $(A \cap B) = 5$, find $n(A \cup B)$.

3. (a) Solve the equation $\tan \theta = 2 \sin \theta$ for values of θ from 0° to 180° .

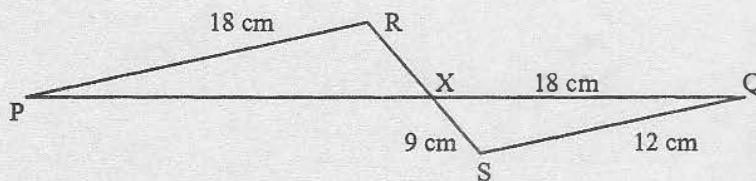
- (b) If $\underline{a} = 4\mathbf{i} + 5\mathbf{j}$, $\underline{b} = 6\mathbf{i} + 9\mathbf{j}$ determine the magnitude and direction of the vector $\underline{v} = \frac{1}{2}\underline{a} + \frac{1}{6}\underline{b}$.

4. (a) Solve for x if $\sqrt[3]{(x-1)} + 3 = 0$.

- (b) Using mathematical tables, evaluate

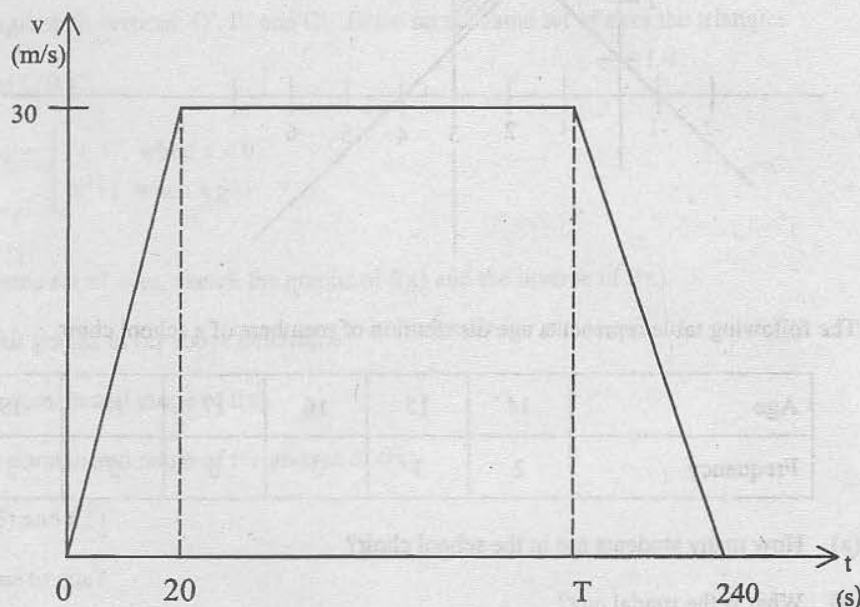
$$\frac{(36.12)^3 \times 750.9}{(113.2)^2 \times \sqrt{92.5}}$$

5. (a) PXQ and RXS are straight lines and PR is parallel to SQ. Calculate PX and RX if $PR = XQ = 18$ cm, $XS = 9$ cm and $SQ = 12$ cm.



- (b) An exterior angle of a regular polygon has degree measure of $22\frac{1}{2}$. Find the sum of degree measure of all the interior angles.
6. (a) A variable a varies directly as b and inversely as the square root of c . If $a = 0.2$ when $b = 4$ and $c = 100$, find the value of a when $b = 16$ and $c = 64$.
- (b) John wants to invest a certain sum of money so that its value after 3 years will be sh. 100,000/=. How much should he invest at 5 % p.a. compound interest?

7. Both lines r and s pass through point $(k, 9)$. Line r has a gradient of $-\frac{4}{3}$ and passes through point $(5, -3)$. Find
- the value of k
 - the equation of line s if it crosses the x axis at $(-14, 0)$
 - the equation of a line t perpendicular to line r and passes through point $(k, 9)$.
8. (a) Find the perimeter of a sector of a circle of radius 3.5 cm if the angle of the sector is 144° .
- (b) Find the area of triangle ABC if $\overline{AB} = 4$ cm, $\overline{BC} = 7$ cm and $m(\angle B) = 30^\circ$.
9. (a) Make t the subject of the expression $3t^2x - 2xy = 3t^2y$.
- (b) Find the remainder when $2x^3 + 3x^2 - 5x - 6$ is divided by $x + 1$ and hence solve the equation $2x^3 + 3x^2 - 5x - 6 = 0$.
10. Below is the velocity – time graph for a certain car journey.

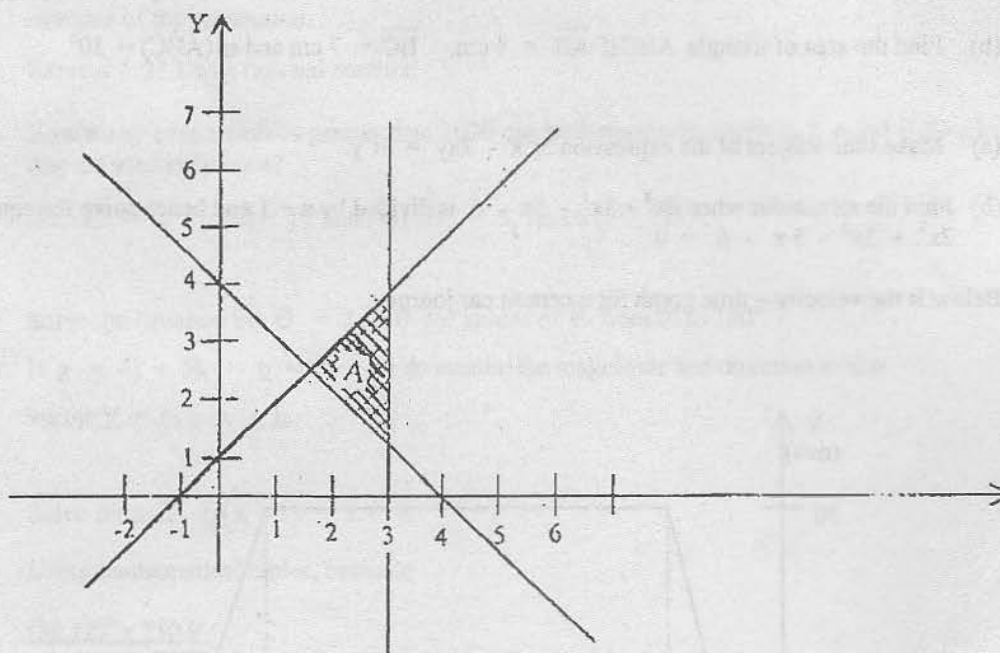


- Calculate the acceleration of the car during the first 20 seconds.
- Find the value of T if the final retardation is 0.5 m/s^2 .
- Calculate the total distance travelled by the car.

SECTION B (40 marks)

Answer FOUR (4) questions from this section.

11. (a) If $B_1 = \{(x, y): x + y < 6, \quad x, y \in \mathbb{R}\}$ and $B_2 = \{(x, y): x - y < 2, \quad x, y \in \mathbb{R}\}$ draw the graphs of B_1 and B_2 and shade the area represented by $B_1 \cap B_2$.
- (b) Write down three inequalities which define the shaded area labelled A in the diagram below.



12. The following table represents age distribution of members of a school choir.

Age	14	15	16	17	18	19
Frequency	2	1	3	6	5	3

- (a) How many students are in the school choir?
- (b) What is the modal age?
- (c) Calculate the mean age of the members of the school choir.
- (d) What is the probability that a member chosen at random from the choir is
- (i) 17 years old?
- (ii) over or equal to 17 years?
- (e) Draw a pie chart to show the age distribution of the members of the school choir.

13. (a) Find the capacity in litres of a bucket 24 cm in diameter at the top, 16 cm in diameter at the bottom and 18 cm deep.
- (b) Given that the radius of the earth is 6400 km, find
- (i) the length of the parallel latitude 30°N
 - (ii) the shortest distance along the surface of the earth from town Q whose position is $(30^\circ \text{N}, 10^\circ \text{E})$ to town P whose position is $(30^\circ \text{N}, 50^\circ \text{W})$.

14. (a) Find the image of the point (2, 4) when it is

- (i) reflected about the line $y + x = 0$
- (ii) rotated through 180° about the origin
- (iii) translated by the vector $\underline{a} = (2, 4)$.

- (b) A triangle with vertices O(0, 0), B(2, 0) and C(2, 3) is enlarged by the matrix

$$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$$

to a triangle with vertices O', B' and C'. Draw on the same set of axes the triangles OBC and O'B'C'.

15. Given that $f(x) = \begin{cases} 1 & \text{when } x < 0 \\ x^2 + 1 & \text{when } x \geq 0 \end{cases}$

- (a) On the same set of axes, sketch the graphs of $f(x)$ and the inverse of $f(x)$.
- (b) From your graphs in (a) above determine
 - (i) the domain and range of $f(x)$
 - (ii) the domain and range of the inverse of $f(x)$.

- (c) Find $f(-5)$ and $f(5)$

- (d) Is $f(x)$ one to one?

- (e) Is the inverse of $f(x)$ a function?

16. (a) Find the probability that a number chosen at random from a set of integers between 10 and 20 inclusive is either a prime number or a multiple of five.

- (b) Three defective transistors and two good transistors are mixed in a box. Two transistors are randomly selected. Find the probability that they are both defective if the selections are made

- (i) with replacement
- (ii) without replacement.