KILLARA HIGH SCHOOL

YEAR 11 - 2 UNIT MATHEMATICS

YEARLY EXAMINATION.

Time allowed : 3 hours.
All Questions may be attempted.
All Questions are of equal value.

In every question, all necessary working should be shown.
Marks will be deducted for careless or badly arranged work.
Approved calculators may be used.
Each question should be started on a new page, and answers returned in order of questions.

YEAR 11 2 UNIT YEARLY

QUESTION 1. (10 marks)

(a) Find, correct to 2 decimal places:

(i) $(2{\cdot}7)^5$, (ii) $\dfrac{4{\cdot}6 - 5{\cdot}9}{4{\cdot}6 \times 2{\cdot}3}$

(b) (i) Simplify $6\sqrt{2} + \sqrt{12} - 2\sqrt{3} - 3\sqrt{8}$

(ii) Simplify, expressing the result in simplest surd form:

$4\sqrt{5} \times \sqrt{10}$

(c) Express in simplest surd form with a rational denominator:

(i) $\sqrt{\dfrac{5}{6}}$, (ii) $\dfrac{\sqrt{3}}{\sqrt{7} - \sqrt{3}}$

(d) Solve the equation $4(x - 5) = 3 - 2(x - 1)$

QUESTION 2. (10 marks)

(a) At a shoe sale, all shoes are to be sold at a discount of 15% off the marked price. What is the cost of a pair of shoes with a marked price of \$79.95?

(b) If $P = \sqrt{\dfrac{2R - V}{5}}$, find V when P = 0·2 and R = 20.

(c) Expand and simplify $x(5x - 3)(7x + 2)$

(d) Factorise completely :

(i) $x^3 - x^2y - 4x + 4y$

(ii) $3y^2 + 7y - 6$

(iii) $2x^3 - 16$

QUESTION 3. (10 marks)

(a) Draw and clearly label, on the same number plane the lines:

(i) $y = x$

(ii) $y = x + 1$

(iii) $x = 1$

(iv) $x = -1$

Indicate on your diagram, by shading, the region of the (x,y) plane determined by all those points which satisfy all the inequalities :

$|x| \leq 1$ and $y \geq x$ and $y \leq x - 1$

(b) In the above area find the area of the shading.

(c) Solve the simultaneous equations : $3x - y = 5$

$5x + 3y = -8$

QUESTION 4. (10 MARKS)

(a) If the co-ordinates of the midpoint of the interval joining AB is $(\frac{1}{2}, -2\frac{1}{2})$ and the coordinates of A are $(-4,2)$, find the coordinates of B.

(b) A(2,1), B(1,4) and C(-4,-1) are three points.

(i) If A, B, C form the vertices of a triangle, find the length of the side BC.

(ii) Show that the angle BAC is a right angle.

(c) Given the line $3x + 2y = 6$,

(i) Find the x and y intercept.

(ii) Sketch the line showing the intercepts.

(iii) If this line is reflected in the y axis, find the equation of the reflected line.

(iv) Find the perpendicular distance from the origin to the given line.

QUESTION 5. (10 marks)

(a) Given that $\tan \alpha = -\frac{3}{4}$ when $\sin \alpha > 0$, find $\cos \alpha$

(b) Simplify $\sec^2 ß(1 - \cos^2 ß)$

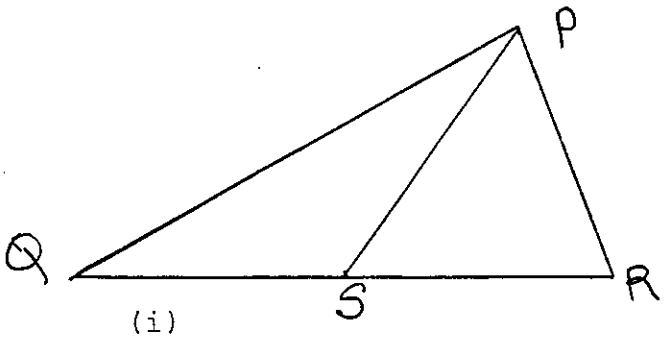
(c) The sides of a triangle are 7 cm, 5 cm, and 4 cm. Find the size of the angle opposite the largest side.

(d) What is the exact value of $\sin 240°$?

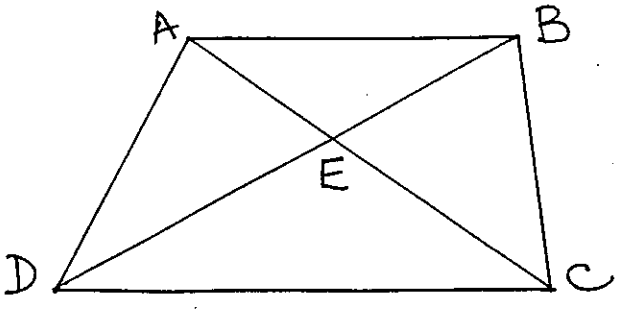
QUESTION 6. (10 marks)

(a) Sketch the curve $y = \cos x$ for $0° \leq x° \leq 360°$.
What is the period of the function?

(b) Copy the diagrams onto your answer paper and transfer all the information onto your diagram.



(i)



(ii)

In sketch (i) SQ = SP = SR and $\angle SPQ = 35°$. Find $\angle SRP$, giving reasons for each statement made.

In sketch (ii) AB || DC. Prove that two triangles are similar.

If AB = 8 cm, DC = 12cm, AC = 10 cm, find AE (giving reasons)

QUESTION 7. (10 marks)

(a) Find $\sum_{k=1}^{4} k^2$

(b) Determine if the followingsequences are arithmetic, geometric or neither. Give reasons.

(i) 5, 2, -1, -4.

(ii) $\frac{1}{2}, \frac{1}{3}, \frac{2}{9}, \frac{4}{27}$.

(c) For the sequence 14, 11, 8,.. find :

(i) the n th term .

(ii) which term of the sequence is -61.

(d) Find the sum of the first fifty positive odd integers.

QUESTION 8.

(a) A function is defined by the following rule:

$$f(x) = \begin{cases} 0 \text{ if } x \leq -2 \\ -1 \text{ if } -2 < x < 0 \\ x \text{ if } x \geq 0. \end{cases}$$

Find (i) $f(-2) + f(-1) + f(0)$;

(ii) $f(a^2)$

(b) A is a town due North of B and 6 km. from B; C is a town due East of B and 7 km. from A. Draw a diagram to illustrate these facts.

(i) What is the bearing of C from A ?

(ii) How far is C from B in km.? (correct to 2 decimal places)

(c) In triangle PQR, angle Q = 100°, r = 25·4cm. and q = 33·7cm. Find the size of angle R.

QUESTION 9. (10 marks)

(a) Solve $\frac{1}{x+2} + \frac{1}{x-3} = \frac{1}{(x+2)(x-3)}$

(b) Solve $|3 + 2x| < 2$ and plot the solution on a number line.

(c) Solve $2x^2 - 3x - 1 = 0$ (Leave answer in exact form)

(d) For the points (3,1) and (7,4) find the equation of the line which contains them.

QUESTION 10 (10 marks)

(a) A man invests $1 000 for 10 years. For the first six years interest compounds annually at 14% p.a. For the next four years interest compounds quarterly at 12% p.a.

(i) What is the value of the investment at the end of six years?

(ii) What is the value of the investment at the end of ten years?

(b) P and Q are points on the parabola $y = x^2$, with x co-ordinates 3 and $3+h$, respectively.

(i) Find the y co-ordinate when $x = 3+h$.

(ii) Find the gradient of the line PQ in simplest form.

(c) Sketch $y = \frac{1}{x + 2}$ showing significant features.