

## SECTION 1

### Question 1 (2, 2 marks)

Solve the following equations to determine  $x$ .

(a)  $3^{-8x} = \frac{1}{81}$

(b)  $9^{x-3} = 27^{x+2}$

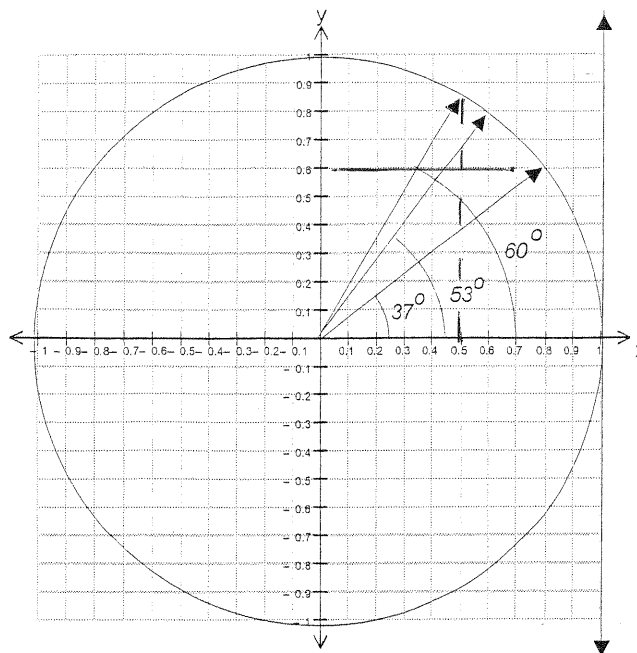
### Question 2 (2, 2 marks)

Simplify the following, expressing with positive indices where appropriate.

(a)  $\frac{2^{2n} + 2^n}{2^{n+1} + 2}$

(b)  $(3ab^{-2})^2 \left( \frac{9a^2}{b^3} \right)^{-2}$

**Question 3** (2 marks)



Using the unit circle above, find correct to one decimal place;

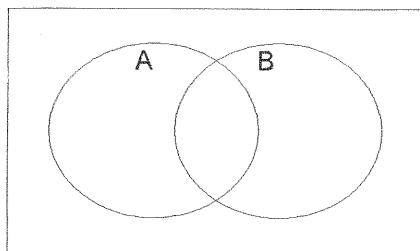
(a)  $\sin 37^\circ$  \_\_\_

(b)  $\cos 60^\circ$  \_\_\_

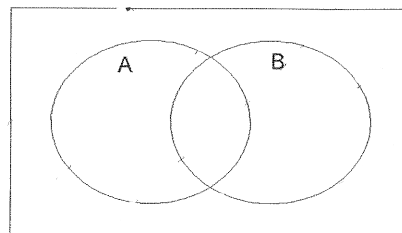
**Question 4** (1, 2 marks)

Shade the following descriptions on the Venn Diagrams provided.

(a)  $A \cap \bar{B}$



(b)  $(\bar{A} \cup \bar{B}) \cup (A \cap B)$



Question 5 (5 marks)

If  $X$  is the set of letters in the word **PENCIL** and  $Y$  is the set of letters in the word **PAINFUL** and  $Z$  is the set of letters in the word **MATHS**,

- (a) List the set  $X \cap Y$  \_\_\_\_\_
- (b) Determine  $n(X \cup Y)$  \_\_\_\_\_
- (c) Describe this set  $\{ \mathbf{P, A, I, N, F, U, L, M, T, H, S} \}$  \_\_\_\_\_
- (d) List the set  $X \cap Z$  \_\_\_\_\_
- (e) Is the word **FAINT** a subset of  $Y$ ? \_\_\_\_\_

Question 6 (2, 2, 2, 1 marks)

(a) List the first 5 terms for each sequence defined below

(i)  $T_n = T_{n-1} - 3$  with  $T_5 = 5$

(ii)  $T_{n+1} = (-1)^n T_n$  with  $T_2 = 4$

(iii)  $a_{n+1} = a_n - 2a_{n-1}$  with  $a_1 = 2, a_2 = 3$

(b) Which of the sequences is an arithmetic sequence? \_\_\_\_\_

**Question 7** (3 marks)

Mingi scored 65% in her Mathematics exam where the class mean was 55% and the standard deviation was 5%, whilst in her in English she scored 85% in the exam where the class average was 79% and the standard deviation was 3%. She went home and told her mother, "I've scored brilliantly in English compared to everyone else in the class whilst just OK in Mathematics!" Comment on this statement and calculate the Standardised Scores to support your reasoning.

**Question 8** (5 marks)

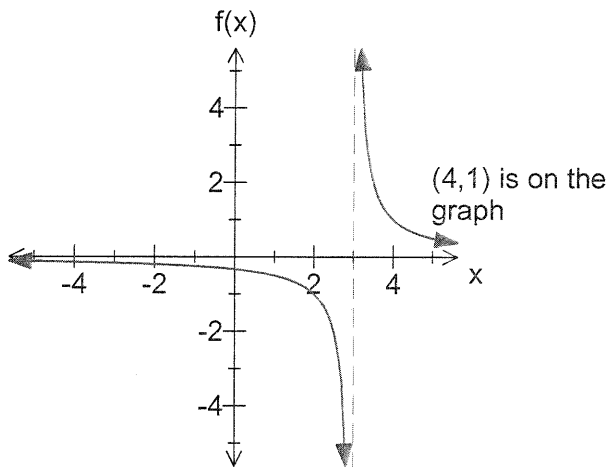
Five letter words are to be formed using the letters from the word **MATHS**.

- (a) How many five letter words can be formed?
- (b) How many of these have the S and the M next to each other?
- (c) Find the probability that a five letter word has the S and M separated.
- (d) Find the probability that a five letter word starts with the letter M given that the S and the M are next to each other.

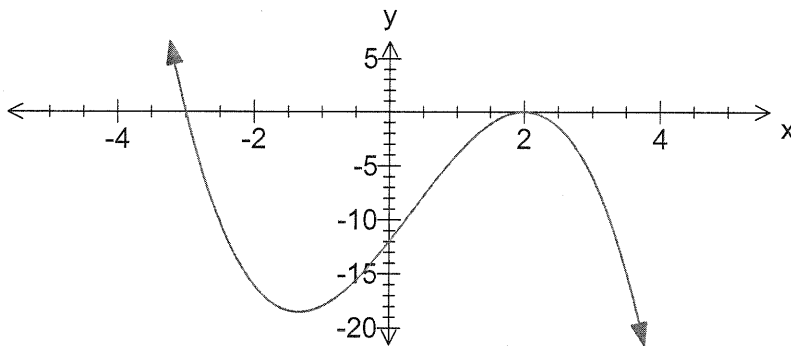
Question 9. (2, 2 marks)

Determine the value of  $a$ ,  $b$ ,  $c$ ,  $d$  in the equations of the following graphs.

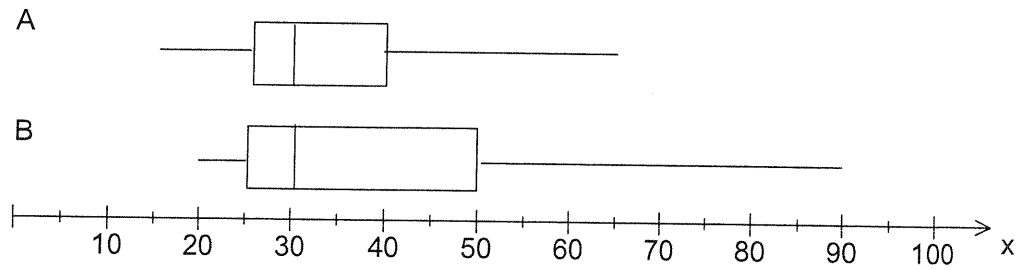
(a)  $f(x) = \frac{a}{x-b}$



(b)  $y = -(x-c)^2(x+d)$



**Question 10** (3 marks)



Box plot A above shows the number of apples obtained from 25 apple trees which were treated with a special spray to improve the yield, whilst box plot B shows the number of apples from 25 other apple trees which were kept as a control group (i.e. not treated with the special spray). All apple trees were of the same variety.

By comparing the distributions in the box plots above comment on whether the spray has been effective.