Firrhill High School

Mathematics Department

Level 5
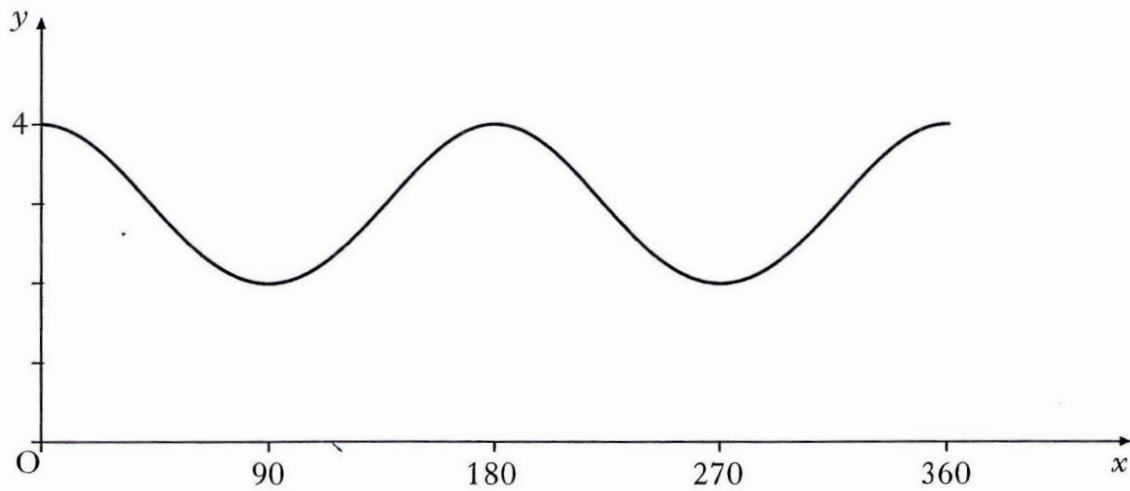
Assessment Questions

Trig Graphs & Equations

(1) 2010 Paper 2 Q.13

The depth of water, D metres, in a harbour is given by the formula

$$D = 3 + 1 \cdot 75 \sin 30 h°$$

where h is the number of hours after midnight.

(a) Calculate the depth of water at 5 am.

2

(b) Calculate the maximum difference in depth of the water in the harbour.

Do not use a trial and improvement method.

2

(2)   2008 Paper 2 Q.12

KU	RE

The diagram shows part of the graph of $y = \tan x°$.

The line $y = 5$ is drawn and intersects the graph of $y = \tan x°$ at P and Q.

(a) Find the x-coordinates of P and Q.

3

(b) Write down the x-coordinate of the point R, where the line $y = 5$ next intersects the graph of $y = \tan x°$.

1

(3)   2007 Paper 1 Q.13

Part of the graph of $y = \cos bx° + c$ is shown below.
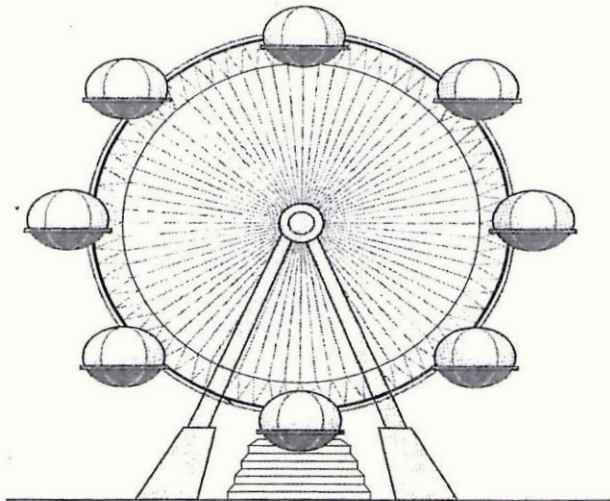

Write down the values of b and c.

2

(4)   2006 Paper 2 Q.10

Solve **algebraically** the equation

Emma goes on the "Big Eye".

Her height, h metres, above the ground is given by the formula

$$h = -31 \cos t° + 33$$

where t is the number of seconds after the start.

(a) Calculate Emma's height above the ground 20 seconds after the start.   2

(b) When will Emma first reach a height of 60 metres above the ground?   3

(c) When will she next be at a height of 60 metres above the ground?   1

(5)   2005 Paper 2 Q.11

   (a) Solve algebraically the equation
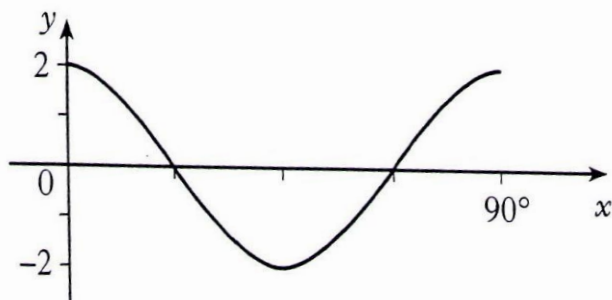
      $\sqrt{3}\sin x° -1 = 0$ $0 \le x < 360$.

                                                              3

   (b) Hence write down the solution of the equation

      $\sqrt{3}\sin 2x° -1 = 0$ $0 \le x < 90$.

                                                                            1

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(6)   2004 Paper 1 Q.9

The graph of $y = a \cos bx°$, $0 \le x \le 90$, is shown below.

Write down the values of a and b.

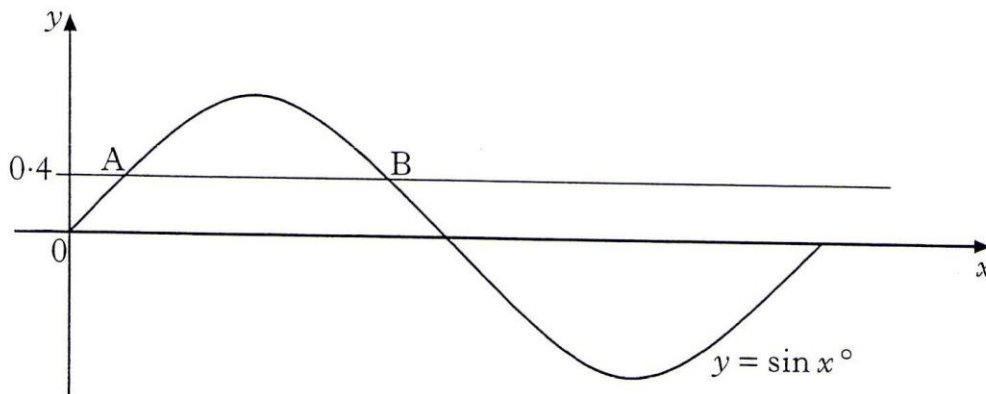   2

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(7)   2004 Paper 2 Q.10

Solve **algebraically** the equation

      $4\sin x° + 1 = -2$ $0 \le x < 360$.

                                                                     3

(8)   2002 Paper 2 Q.8

The diagram shows part of the graph of $y = \sin x°$.

The line $y = 0·4$ is drawn and cuts the graph of $y = \sin x°$ at A and B.

Find the x-coordinates of A and B.

3

(9)   2001 Paper 2 Q.7

Solve **algebraically** the equation

$$\tan 40° = 2\sin x° + 1 \qquad 0 \le x < 360.$$

3

(10)   2000 Paper 2 Q.9

The height, H metres, of the tide-mark in a harbour is given by the formula

$$H = 14 + 3\cos(30n)°$$

where n is the number of hours after midnight.

(a) Find the height of the tide-mark at 2 am.

2

(b) When, after midnight, is the first time that the height of the tide-mark is 12·5 metres?

3

(11) 1999 Paper 2 Q.5

Solve **algebraically** the equation

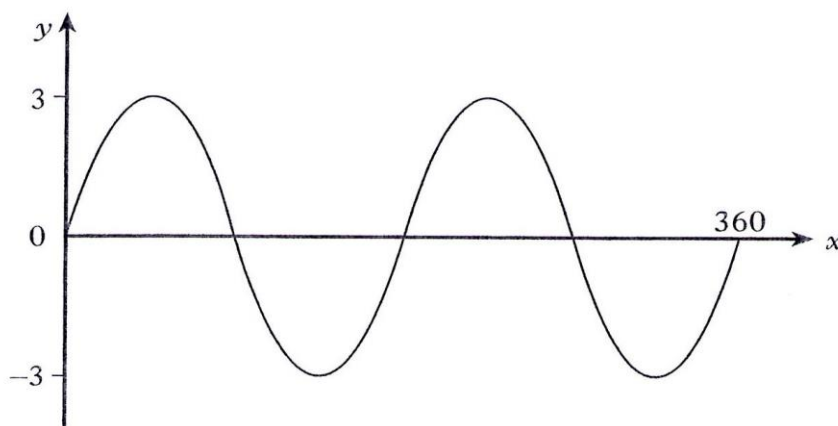$$2 + 3\sin x° = 0 \quad \text{for } 0 \le x < 360.$$

3

(12) 1998 Paper 2 Q.7

KU | RE

Solve, **algebraically**, the equation

$$7\cos x° - 2 = 0, \quad \text{for } 0 \le x < 360.$$

3

(13) 1997 Q.13

The diagram shows the graph of $y = k\sin ax°$, $0 \le x < 360$.

Find the values of a and k.

2

(14) 1996 Q.13

Solve **algebraically** the equation

$$5\tan x° - 9 = 0, \text{ for } 0 \le x < 360.$$
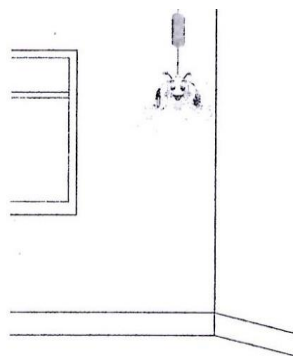
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3

(15)   1997 Q.16

A toy is hanging by a spring from the ceiling.

Once the toy is set moving, the height, H metres, of the toy above the floor is given by the formula

$$H = 1 \cdot 9 + 0 \cdot 3\cos (30t)°$$

t seconds after starting to move.

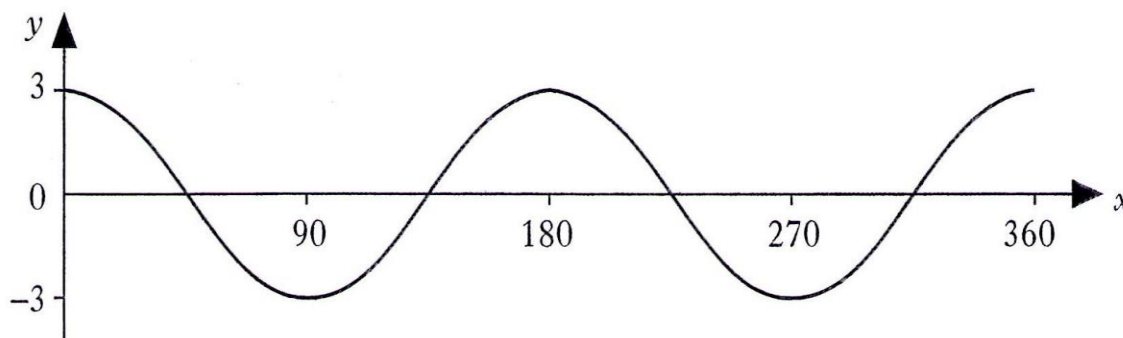(a)   State the maximum value of H.   **1**

(b)   Calculate the height of the toy above the floor after 8 seconds.   **3**

(c)   When is the height of the toy **first** 2·05 metres above the floor?   **3**

(16)   1995 Q.17

The diagram shows the graph of $y = a\cos bx°$, $0 \le x < 360$.

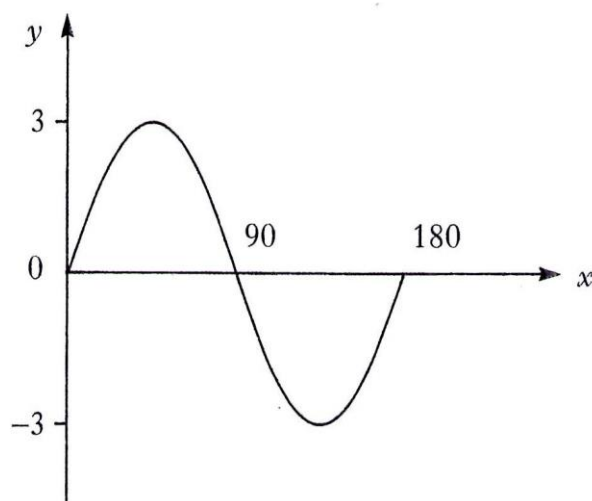Find the values of a and b.   **2**

(17)   1994 Q.17

Solve the equation

$$5 \sin x° + 2 = 0, \quad \text{for } 0 \le x < 360.$$

                                                                                                                                       3

(18) 1992 Paper 1 Q.13

The diagram shows the graph of $y = a\sin bx°$, $0 \leqslant x \leqslant 180$.

Find the values of a and b.

(19) 1991 Paper 2 Q.7

Due to tidal variations, the depth of water in a harbour is given by the formula

$$D = 6 + 4\cos(32t + 108)°,$$

where D is the depth of water in metres and t is the time in hours after midnight on Monday night.

(a) What were the greatest and least depths of water in the harbour? **(2)**

(b) At what time was low tide on Tuesday morning? **(3)**

(c) A boat needs at least 4 metres of water to leave the harbour.

Can the boat leave the harbour at 3.00 p.m. on Tuesday?

Justify your answer. **(3)**