**IB Math SL Year 1 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Exam Review #2**

**PART I: NO CALCULATOR**

**1.** The diagram shows three graphs.



 *A* is part of the graph of *y = x.*

 *B* is part of the graph of *y* = 2*x*.

 *C* is the reflection of graph *B* in line *A.*

 Write down

(a) the equation of *C* in the form *y =f* (*x*);

(b) the coordinates of the point where *C* cuts the *x*-axis.

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| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 4 marks)

**2.** The diagram below shows a circle centre O, with radius *r*. The length of arc ABC is 3 cm and  = 



(a) Find the value of *r*.

(2)

(b) Find the perimeter of sector OABC.

(2)

(c) Find the area of sector OABC.

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(2)

(Total 6 marks)

**3.** Three of the following diagrams I, II, III, IV represent the graphs of

(a) *y* = 3 + cos 2*x*

(b) *y* = 3 cos (*x* + 2)

(c) *y* = 2 cos *x* + 3.

 Identify which diagram represents which graph.



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| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) ..................................................................(c) .................................................................. |

(Total 4 marks)

**4.** Two functions *f* and *g* are defined as follows:

*f* (*x*) = cos *x*, 0  *x*  2;

*g* (*x*) = 2*x* + 1, *x*  .

 Solve the equation (*g*  *f*)(*x*) = 0.

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| *Working:* |  |
|  | *Answer:*...................................................................... |

(Total 4 marks)

**5.** The diagram shows the parabola *y* = (7 – *x*)(l + *x*). The points *A* and *C* are the *x*-intercepts and the point *B* is the maximum point.

 Find the coordinates of *A*, *B* and *C*.

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| *Working:* |  |
|  | *Answer:*...................................................................... |

(Total 4 marks)

 **6.** Find the cosine of the angle between the two vectors  and .

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| *Working:* |  |
|  | *Answer*:....…………………………………….......... |

(Total 6 marks)

**7.** The diagram below shows a circle of radius *r* and centre O. The angle  = **.



The length of the arc AB is 24 cm. The area of the sector OAB is 180 cm2.

Find the value of *r* and of **.

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(Total 6 marks)

**8.** The quadratic equation 4*x2 +* 4*kx +* 9 *=* 0, *k >* 0 has exactly one solution for *x.*Find the value of *k.*

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| *Working:* |  |
|  | *Answer:*...................................................................... |

(Total 4 marks)

**9.** The following diagram shows a triangle ABC, where  is 90, AB = 3, AC = 2 and  is **.



(a) Show that sin ** = .

(b) Show that sin 2** = .

(c) Find the **exact** value of cos 2*.*

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 (Total 6 marks)

**10.** Let ln *a* = *p*, ln *b* = *q*. Write the following expressions in terms of *p* and *q*.

(a) ln *a*3*b*

(b) ln 

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(Total 6 marks)

**11.** A population of bacteria is growing at the rate of 2.3% per minute. How long will it take for the size of the population to double? Give your answer to the nearest minute.

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| *Working:* |  |
|  | *Answer:*...................................................................... |

(Total 4 marks)

**12.** Consider *g* (*x*) = 3 sin 2*x*.

(a) Write down the period of *g*.

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(1)

(b) On the diagram below, sketch the curve of *g*, for 0  *x*  2.



(3)

(c) Write down the number of solutions to the equation *g* (*x*) = 2, for 0  *x*  2.

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(Total 6 marks)

**13.** The following graph shows the depth of water, *y* metres, at a point P, during one day.

The time *t* is given in hours, from midnight to noon.



(a) Use the graph to write down an estimate of the value of *t* when

(i) the depth of water is minimum;

(ii) the depth of water is maximum;

(iii) the depth of the water is increasing most rapidly.

(3)

(b) The depth of water can be modelled by the function *y* = *A* cos (*B* (*t* – 1)) + *C*.

(i) Show that *A* = 8.

(ii) Write down the value of *C*.

(iii) Find the value of *B*.

(6)

(c) A sailor knows that he cannot sail past P when the depth of the water is less than 12 m. Calculate the values of *t* between which he cannot sail past P.

(2)

(Total 11 marks)

**PART II: CALCULATOR OK**

**14.** One of the terms of the expansion of (*x* + 2*y*)10 is *ax*8 *y*2. Find the value of *a*.

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(Total 6 marks)

**15.** Consider the infinite geometric sequence 3000, – 1800, 1080, – 648, … .

(a) Find the common ratio.

(2)

(b) Find the 10th term.

(2)

(c) Find the **exact** sum of the infinite sequence.

(2)

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(Total 6 marks)

**16.** (a) Expand  in terms of e.

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(b) Express  +  as the sum of three terms.

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(Total 6 marks)

**17.** The vectors  and  are perpendicular for two values of *x*.

(a) Write down the quadratic equation which the two values of *x* must satisfy.

(b) Find the two values of *x*.

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| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 4 marks)

**18.** (a) Write down the first three terms of the sequence *un* = 3*n*, for *n* 1.

(1)

(b) Find

(i) 

(ii) .

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(Total 6 marks)

**19.** A triangle has its vertices at A(–1, 3), B(3, 6) and C(–4, 4).

(a) Show that 

(b) Show that, to three significant figures, cos

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(Total 6 marks)

**20.** Michele invested 1500 francs at an annual rate of interest of 5.25 percent,
compounded annually.

(a) Find the value of Michele’s investment after 3 years. Give your answer to the nearest franc.

(3)

(b) How many complete years will it take for Michele’s initial investment to double in value?

(3)

(c) What should the interest rate be if Michele’s initial investment were to double in value in 10 years?

(4)

(Total 10 marks)

**21.** In the triangle PQR, PR = 5 cm, QR = 4 cm and PQ = 6 cm.

Calculate

(a) the size of ;

(b) the area of triangle PQR.

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(Total 6 marks)

**22.** A group of ten leopards is introduced into a game park. After *t* years the number of leopards, *N*, is modelled by *N* = 10 e0.4t.

(a) How many leopards are there after 2 years?

(b) How long will it take for the number of leopards to reach 100? Give your answers to an appropriate degree of accuracy.

Give your answers to an appropriate degree of accuracy.

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| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 4 marks)