IB Math Studies

Summer Assignment

This is to be turned on the first full day of class. We will go over any questions. This will count as a homework grade.

You are to log on to my moodle page with your school login. The enrollment key for IB Math Studies is IBMathStudies. I will be checking to see that you are enrolled. Go to the IB Math Resources and the Internal Assessment Information links and investigate your Math IA. You are to have 3 possible topics of interest and reasoning as to why you would want to research each of these topics.

1. The cost *c*, in Australian dollars (AUD), of renting a bungalow for *n* weeks is given by the linear relationship *c* = *nr* + *s*, where *s* is the security deposit and *r* is the amount of rent per week.

Ana rented the bungalow for 12 weeks and paid a total of 2925 AUD.

Raquel rented the same bungalow for 20 weeks and paid a total of 4525 AUD.

Find the value of

(a) *r*, the rent per week;

(b) *s*, the security deposit.

2. The total weight of 256 identical pencils is 4.24 kg. Calculate the weight of one pencil, in kg.

(a) Give your answer exactly.

(b) Give your answer correct to three significant figures.

(c) Write your answer to part (b) in the form *a* × 10*k* where 1 ≤ *a* < 10 and *k* ∈ ℤ .

3. The fourth term of an arithmetic sequence is 12 and the tenth term is 42.

(a) Given that the first term is *u*1 and the common difference is *d*, write down two equations in *u*1 and *d* that satisfy this information.

(b) Solve the equations to find the values of *u*1 and *d*.

4. A geometric sequence has all its terms positive. The first term is 7 and the third term is 28.

(a) Find the common ratio.

(b) Find the sum of the first 14 terms.

5. Consider the numbers 5, 0.5,  and –5. Create a table showing which of the number sets,  and  these numbers belong to.

6. (a) Find the solution of the equation *x²*– 5*x* – 24 = 0.

(b) The equation *ax²* – 9*x* – 30 = 0 has solution *x* = 5 and *x* = –2. Find the value of *a*.

7. The universal set *U* is defined as the set of positive integers less than 10. The subsets *A* and *B* are defined as:

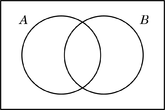
*A* = {integers that are multiples of 3} *B* = {integers that are factors of 30}

(a) List the elements of

(i) *A*;

(ii) *B*.

(b) Place the elements of *A* and *B* in the appropriate region in the Venn diagram below.

*U* 

8. Consider the statement *“If a figure is a square, then it is a rhombus”*.

(a) For this statement, write in words

(i) its converse;

(ii) its inverse;

(iii) its contrapositive.

(b) Only one of the statements in part(a) is true. Which one is it?

9. A bag contains 2 red, 3 yellow and 5 green sweets. Without looking, Mary takes one sweet out of the bag and eats it. She then takes out a second sweet.

(a) If the first sweet is green, what is the probability that the second sweet is also green?

(b) If the first sweet is not red, what is the probability that the second sweet is red?

10. A swimming pool is to be built in the shape of a letter L. The shape is formed from two squares

*x*

with side dimensions *x* and

as shown.

*x*

Diagram not to scale

*x x*

*x*

* 1. Write down an expression for the area of the swimming pool surface.
  2. The area *A* is to be 30 m2. Write a quadratic equation that expresses this information.
  3. Find both the solutions of your equation in part (b).

11. The gradients (slopes) of several lines are as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Line | *a* | *b* | *c* | *d* | *e* | *f* | *g* | *h* |
| Gradient | -3 | -5/2 | 1/3 | 0.5 | 3/6 | -2/5 | 5/-2 | 0.4 |

1. Find two pairs of lines that are parallel to each other.
2. Find any two pairs of lines that are at right angles to each other.

12. (a) Represent the function where  by a mapping diagram.

*x* *y*

1. List the elements of the domain of this function.
2. List the elements of the range of this function.

13. In an experiment researchers found that a specific culture of bacteria increases in number according to the formula



Where *N* is the number of bacteria present and *t* is the number of hours since the experiment began.

Use the formula to calculate

1. The number of bacteria present at the start of the experiment;
2. The number of bacteria present after 3 hours;
3. The number of hours it would take for the number of bacteria to reach 19,200.
4. A swimming pool is to be built in the shape of a letter L. The shape is formed from two squares

*x*

with side dimensions *x* and

as shown.

*x*

Diagram not to scale

*x x*

*x*

1. Write down an expression for the area of the swimming pool surface.
2. The area *A* is to be 30 m2. Write a quadratic equation that expresses this information.
3. Find both the solutions of your equation in part (b).
4. Which of the solutions in part (c) is the correct value of *x* for the pool? State briefly why you made this choice.
5. The graphs of three trigonometric functions are drawn below. The *x* variable is measured in degrees, with –360° ≤ *x* ≤ 360°. The amplitude '*a*' is a positive constant with 0 < *a* ≤ 1.

Graph A

a Graph B

2

*y* 0

90 180

*x*

270

360

90 180

*x*

270

–a

360

Graph C

a

90

180

270

360

0

–a

Write the letter of the graph next to the function representing that graph in the box below.

|  |  |
| --- | --- |
| FUNCTION | GRAPH |
| *y* = *a*cos(*x*) |  |
| *y* = *a*sin(2*x*) |  |
| *y* = 2 + *a*sin(*x*) |  |

1. State the period of the function shown in graph B.
2. State the range of the function 2 + *a*sin(*x*) in terms of the constant *a*.

16. A farmer wants to construct a new fence across a field. The plan is shown below. The new fence is indicated by a dotted line.

75°

Diagram not to scale

40° 410 m

1. Calculate the length of the fence.
2. The fence creates two sections of land. Find the area of the smaller section of land ABC, given the additional information shown below.

A B

Diagram not to scale

245 m

24°

C

1. Find the volume of the following prism.

8 cm

Diagram not to scale

5.7 cm

42°