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**IB Math SL**

*Functions and Equations*

Applying Quadratics

Solve each problem ALGEBRAICALLY!!!

1. Two integers differ by 12 and the sum of their squares is 74. Find the number.

2. The sum of a number and its reciprocal is 

3. The sum of a natural number and its square is 210. Find the number.

4. The product of two consecutive even numbers is 360. Find the numbers.

5. The product of two consecutive odd numbers is 255. Find the numbers.

6. The number of diagonals of an *n*-sided polygon is given by the formula . A polygon has 90

diagonals. How many sides does it have?

7. The length of a rectangle is 4 cm longer than its width. Find its width given that its area is 26 cm2.

8. A rectangular box has a square base, and its height is 1 cm longer than the length of each side of its base.

a. If each side of its base has length *x* cm, **show that** its total surface area is given by

 cm2.

b. If the total surface area is 240 cm2, find the dimensions of the box.

9. An open box can hold 80 cm3. It is made from a square piece of tinplate with 3 cm squares cut from

each of its 4 corners. Find the dimensions of the original piece of tinplate.

10. Is it possible to bend a 20 cm length of wire into the shape of a rectangle which has an area of 30 cm2.

11. The golden rectangle is the rectangle which can be divided into a square and a smaller rectangle by a

line which is parallel to its shorter sides. The smaller rectangle is similar to the original rectangle. Thus, if ABCD is the golden rectangle, ADXY is a square and BCXY is similar to ABCD. The ratio of  for the golden rectangle is called the golden ratio. **Show that** the golden ratio is . **HINT:** let AB = *x* and AD = 1 unit.

12. A triangular paddock has a road (AB) forming its longest side. [AB] is 3 km long. The fences [AC]

and [CB] are at right angles. If [BC] is 400 m longer than [AC], find the area of the paddock in hectares. **HINT:** The **hectare** is a unit of [area](http://en.wikipedia.org/wiki/Area), defined as 10,000 square [metres](http://en.wikipedia.org/wiki/Metre).

13. A uniform concrete path is paved around a 30 m by 40 m rectangular lawn. The concrete has area one

quarter of the lawn. Find the width of the path.

14. Chuong and Hassan both drive 40 km from home to work each day. One day Chuong said to Hassan,

“If you drive home at your usual speed, I will average 40 km h-1 faster than you and arrive home in 20 minutes less time.” Find Hassan’s speed.

15. If the average speed of a small aeroplane had been 120 km h-1 less, it would have taken a half an hour

longer to fly 1000 km. Find the speed of the plane.

16. Two trains travel a 160 km track each day. The express travels 10 km h-1 faster and takes 30 minutes

less time than the normal train. Find the speed of the express.

17. A group of elderly citizens charted a bus from $160. However, at the last minutes 8 of them fell ill and

had to miss the trip. As a consequence, the other citizens had to pay an extra $1 each. How many elderly citizens went on the trip?

18. A tunnel is parabolic in shape with dimensions shown. A truck carrying a wide load need to pass

through the tunnel. The truck is 4,8 m high and 3.9 m wide. Determine whether the truck will fit.