



# PRE-IB / IB ENTRANCE EXAMINATION YEAR 11 AND 12

## MATHEMATICS

SURNAME \_\_\_\_\_

FIRST NAME \_\_\_\_\_

DATE OF BIRTH \_\_\_\_\_

**Please read this information carefully before the examination starts.**

- This examination is **60 minutes** long
- Calculators are NOT allowed for this paper
- A completely correct answer may receive no marks until you show all your working.
- At the end of the assessment, make sure you hand all your work to the supervisor.
- Please ask the supervisor if you do not understand what a question requires.
- Use of a dictionary is permitted
- Some important definitions are on the last page



1. Expand and simplify  $(3x + y)(2x - 5y)$

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2. Solve  $\frac{18 + 5x}{3} = 10 - x$

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3a Factorise  $2x^2 - x - 3$

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3b Hence, simplify  $\frac{2x^2 - x - 3}{4x^2 - 9}$

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4. Put these in order starting with the smallest.  
You **must** show the value of each number in your working.

$$9^{\frac{1}{2}} \qquad (-7)^0 \qquad \left(\frac{1}{8}\right)^{-\frac{1}{3}}$$

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5a. Solve  $\frac{y+1}{3} + \frac{y-2}{2} = 2$

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5b. Work out  $2\frac{1}{8} - \frac{2}{3}$

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6. Circle the **two** equations that are equivalent to  $2y = 3x + 4$

A  $2x = 3y + 4$

B  $y - \frac{3}{2}x = 2$

C  $y = \frac{3}{2}x + 4$

D  $3x - 2y + 4 = 0$

7. The clues below describe a straight line.

The straight line:

- is perpendicular to  $x + 4y - 3 = 0$ ,
- passes through the mid-point of the line joining (2, 2) and (6, 6).

Find the coordinates of the point where the straight line described intersects the  $x$ -axis.



8. Solve the simultaneous equations

$$\begin{aligned}2x + 4y &= 1 \\3x - 5y &= 7\end{aligned}$$

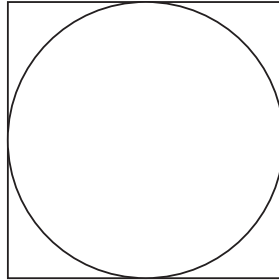
Do **not** use trial and improvement.  
You **must** show your working.

9. The square number sequence is

1            4            9            16            25            .....

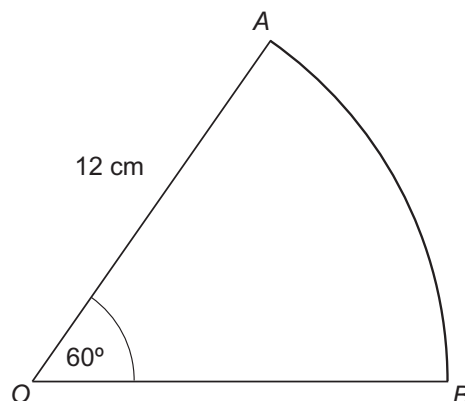
Prove algebraically that the difference of two consecutive square numbers is an odd number.

10. A circle is drawn inside a square as shown.



Show that the area of the circle is more than 75% of the area of the square.

11.  $OAB$  is a sector of a circle of radius 12 cm  
Angle  $AOB = 60^\circ$



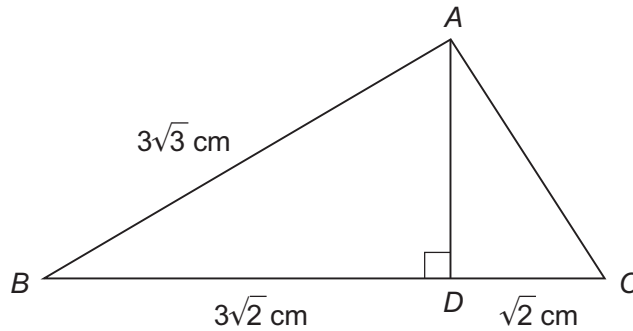
Not drawn  
accurately

Work out the length of the arc  $AB$ .  
Give your answer in terms of  $\pi$ .



12.  $ABC$  is a triangle.  
 $AD$  is perpendicular to  $BC$ .

$$AB = 3\sqrt{3} \text{ cm}, BD = 3\sqrt{2} \text{ cm}, DC = \sqrt{2} \text{ cm}$$



Not drawn accurately

Work out the area of triangle  $ABC$ .

Give your answer in the form  $a\sqrt{2}$  where  $a$  is an integer.

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13. A shopkeeper pays £120 for an mp3 player.  
He wishes to put a marked price on the mp3 player so that, in the forthcoming sale when he gives a discount of 25% on the marked price, he will still make a profit of 20% on the price paid for the mp3 player.  
Find the marked price.

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14.

The members of a rock band think that they can perform live on stage at two concerts, both held on the same date.

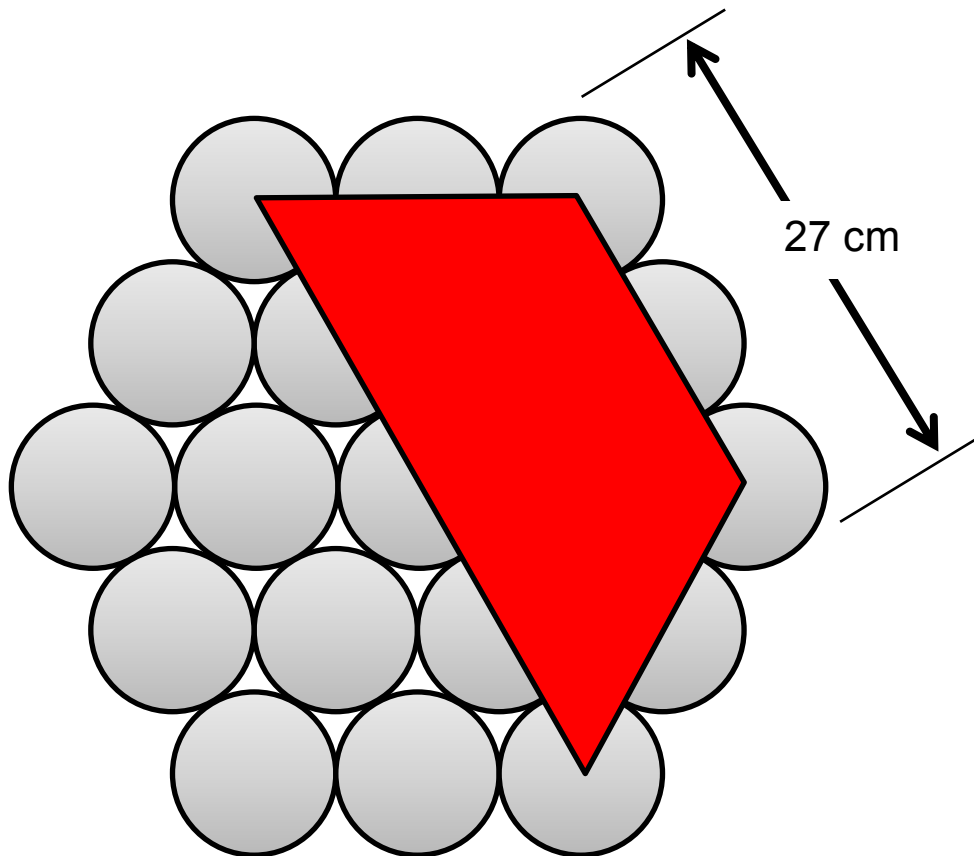
The first concert is held in London and the second in New York.

Use the following information to decide if it is possible.

- The time in London is 5 hours ahead of the time in New York.
- Both concerts start at 6 p.m. and end at 11 p.m. local time.
- The band will perform on stage for 20 minutes at each concert.
- The flight time between London and New York is 7 hours 20 minutes.
- As it is a charity event, the two cities, airports and airline have all guaranteed that
  - (i) the time from leaving the stage in London to the plane taking off will be 1 hour,
  - (ii) the time between the plane landing and the band reaching the stage in New York will be 40 minutes.

15.

## Hexabubble



This diagram shows 19 identical circles arranged in a hexagon.

All of the vertices of the trapezium are in the centre of a circle.

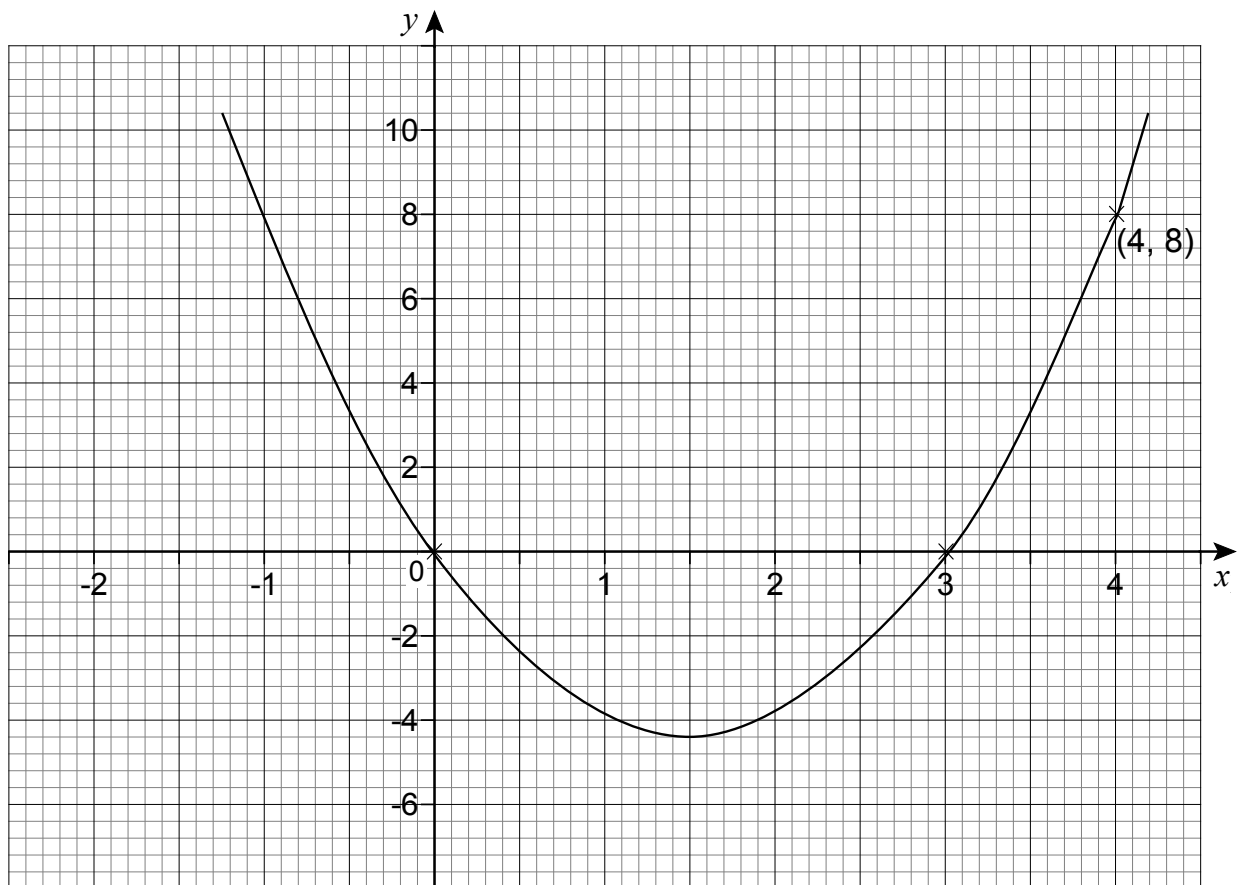
Find the area of the trapezium.





16.

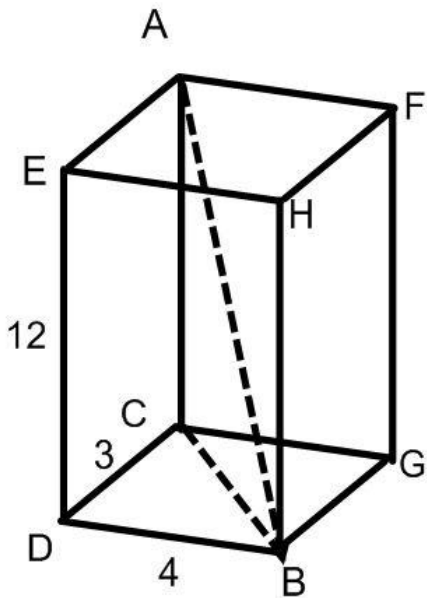
Here is part of the graph for a quadratic function.



Find the equation of the graph.



17.



What is the length of the shortest line that can be drawn on the outside of the prism from A to B? (leave answer as a radical)

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