14+ ENTRANCE EXAMINATION

For entry in

September 2016

Mathematics

Time: 1 hour

Candidate’s Name: .................................................................

Instructions to Candidates

• 60 Marks
• Time allowed 1 Hour
• Calculators are allowed
• Write all answers, including your workings, in this booklet
IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER

Pythagoras' Theorem
\[ a^2 + b^2 = c^2 \]

Volume of cone = \( \frac{1}{3} \pi r^2 h \)
Curved surface area of cone = \( \pi rl \)

Volume of sphere = \( \frac{4}{3} \pi r^3 \)
Surface area of sphere = \( 4\pi r^2 \)

\begin{align*}
\text{adj} &= \text{hyp} \times \cos \theta \\
\text{opp} &= \text{hyp} \times \sin \theta \\
\text{opp} &= \text{adj} \times \tan \theta \\
\text{or} \quad \sin \theta &= \frac{\text{opp}}{\text{hyp}} \\
\cos \theta &= \frac{\text{adj}}{\text{hyp}} \\
\tan \theta &= \frac{\text{opp}}{\text{adj}}
\end{align*}

In any triangle \( ABC \)

Sine rule \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)

Cosine rule \( a^2 = b^2 + c^2 - 2bc \cos A \)

Area of triangle = \( \frac{1}{2} \ ab \sin C \)

Volume of prism = area of cross section \( \times \) length

Circumference of circle = \( 2\pi r \)
Area of circle = \( \pi r^2 \)

Volume of cylinder = \( \pi r^2 h \)
Curved surface area of cylinder = \( 2\pi rh \)

Area of a trapezium = \( \frac{1}{2} (a + b)h \)

The Quadratic Equation
The solutions of \( ax^2 + bx + c = 0 \)
where \( a \neq 0 \), are given by
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
1. William’s salary is £24 000
   His salary increases by 4%.

   Work out William’s new salary.

   £ ............................
   (Total 2 marks)

   The normal price of the dress is reduced by 20%.
   The normal price is £36.80

   Work out the sale price of the dress.

   £ ..........................
   (Total 3 marks)

3. (a) Find the Highest Common Factor of 75 and 90.

   ………………………………
   (2)

   (b) Find the Lowest Common Multiple of 75 and 90.

   ………………………………
   (2)
   (Total 4 marks)
4. Ann and Bob shared £240 in the ratio 3 : 5

Ann gave a half of her share to Colin.
Bob gave a tenth of his share to Colin.

What fraction of the £240 did Colin receive?

5. (a) Solve \(7p + 2 = 5p + 8\)

\[ p = \ldots \] (2 marks)

(b) Solve \(7r + 2 = 5(r - 4)\)

\[ r = \ldots \] (2 marks)
6. 

$PQ$ is a straight line.

(a) Work out the size of the angle marked $x^\circ$.

..............................°

(1)

(b) (i) Work out the size of the angle marked $y^\circ$.

..............................°

(ii) Give reasons for your answer.

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........................................................................................................................................
........................................................................................................................................

(3)

(Total 4 marks)
7. The diagram shows a shape. Work out the area of the shape.

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Diagram NOT accurately drawn
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Area = ................cm^2  (3 marks)
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8. Find the missing Angles

a)

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\[ g = \ldots \]
\[ h = \ldots \]
\[ i = \ldots \]
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(6 marks)

b)

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\[ a = \ldots \]
\[ b = \ldots \]
\[ c = \ldots \]
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(6 marks)
9. A straight line has equation \( y = 5 - 3x \)

(a) Write down the gradient of the line.

\[ \text{\ldots} \] (1)

(b) Write down the coordinates of the point where the line crosses the \( y \) axis.

\[ \ldots \ (\ldots, \ldots) \] (1)

(Total 2 marks)

10. Solve the simultaneous equations

\[
\begin{align*}
2x + y &= 4 \\
5x - y &= 17
\end{align*}
\]

\[ x = \ldots \ldots \]  
\[ y = \ldots \ldots \]  

(Total 2 marks)

11. (a) Solve \( 20y - 16 = 18y - 9 \)

\[ y = \ldots \ldots \] (3)

(b) Solve \( \frac{40 - x}{3} = 4 + x \)

\[ x = \ldots \ldots \] (3)

(Total 6 marks)
The diagram shows two straight lines intersecting at point $A$. The equations of the lines are:

\[
\begin{align*}
y &= 4x - 8 \\
y &= 2x + 3
\end{align*}
\]

Work out the coordinates of $A$.

$\left( \ldots, \ldots \right)$

(Total 3 marks)
13. (i) Factorise \( x^2 - 7x + 12 \)

\( ... \) 

(ii) Solve the equation \( x^2 - 7x + 12 = 0 \)

\( ... \) 

(Total 3 marks)

14. Solve \( \frac{x}{3} - 5 = 3(x - 2) \)

\( x = \) 

(Total 4 marks)
15. a) Factorise

i) \(2x^2 - 7x + 3\)

ii) \(4x^2 - 9\)

16. Ben fills a container with boxes. Each box is a cube of side 0.5 m.

The container is a cuboid of
length 9 m,
width 4 m and
height 3 m.

Work out how many boxes will fit exactly into the container.

17. I bought a cat and a dog, and then sold them for £60 each. I made a 20% profit on the dog and a 20% loss on the sale of the cat. How much money did I make (or lose)?