# TONBRIDGE SCHOOL

Test for Entrance into Year 12 in September

## Sample Paper Maths

Name: …………………………………………

School: …………………………………………

Answer **ALL** questions.
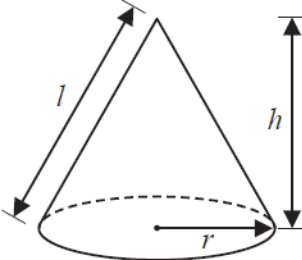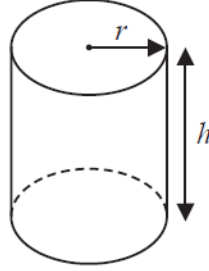
Do all your workings in the spaces provided.
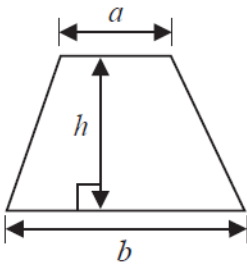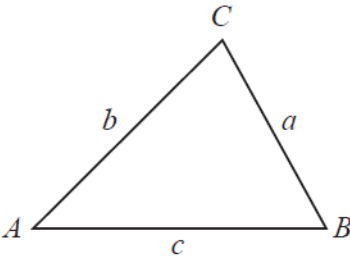
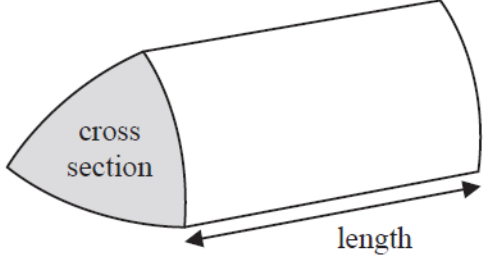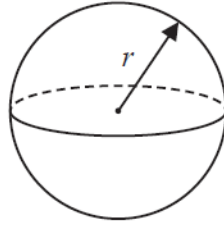Total marks: 60

**Time: 60 minutes.**

**You are allowed to use a calculator in this exam.**

**A list of useful formulae will be found on page 2.**

# Formulae sheet – Higher Tier

**Arithmetic series**

Sum to $n$ terms, $S_n = \dfrac{n}{2}\left[2a + (n-1)d\right]$

**The quadratic equation**

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Area of trapezium** $= \dfrac{1}{2}(a + b)h$



**Trigonometry**



**In any triangle $ABC$**

**Sine Rule** $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

**Cosine Rule** $\quad a^2 = b^2 + c^2 - 2bc\cos A$

**Area of triangle** $= \dfrac{1}{2}ab\sin C$

**Volume of cone** $= \dfrac{1}{3}\pi r^2 h$

**Curved surface area of cone** $= \pi r l$



**Volume of prism**
= area of cross section × length



**Volume of cylinder** $= \pi r^2 h$
**Curved surface area
of cylinder** $= 2\pi r h$



**Volume of sphere** $= \dfrac{4}{3}\pi r^3$

**Surface area of sphere** $= 4\pi r^2$

Q1)

Expand and simplify:

$$(2x + 1)^2 - (x + 1)(x - 2)$$

_____[3]

Q2)

Write as a single fraction in its simplest form:

$$\frac{4}{3x} + \frac{5}{2x}$$

_____[2]

Q3)

Solve:

$$\frac{3}{x + 7} = \frac{5}{x - 1}$$

_____[3]

Q4) Factorise fully:

a) $2x - 4x^2$

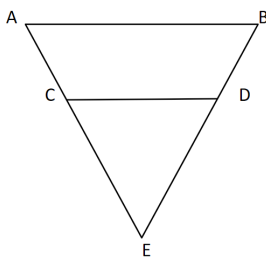_____[1]

b) $3x^2 - x - 2$

_____[2]

c) $50p^4 - 18q^2$

_____[2]

Q5)

In the diagram below, AB and CD are parallel. The ratio of the area of ABCD to the area of CDE is 9:16.

The length of ED is 6 cm. Calculate the length of DB.

Note the diagram is not to scale.



_____[4]

Q6)

Find the equation of the line perpendicular to $2y + 3x = 5$ that passes through $(6,1)$. Give your answer in the form $ax + by + c = 0$, where $a, b$ and $c$ are integers.

_____[5]

Q7)     a) Write the expression below in the form $\sqrt{k}$. You must show full working.

$$\frac{27}{\sqrt{3}} - \sqrt{75}$$

_____[4]

b) Solve $x^2 + 2x \geq 3$

_____[3]

Q8)

A die is biased so that the probability of getting a six is 1/5. I roll the die three times. Calculate the probability I get at least two sixes.

_____[4]

Q9)

Find the coordinates of the points of intersection of $y + 2x = 5$ and $x^2 - 3y^2 = 6$.

You must show full algebraic working!

_____[6]

Q10)

Find the coordinates of the point(s) on the curve $y = \frac{6}{x}$ where the gradient is $-\frac{3}{4}$.

_____[4]

Q11)

The values of $P$ and $Q$ are given below correct to one decimal place. The value of $R$ is correct to one significant figure. Find the greatest possible value of $S$. Give your answer to three decimal places.

$$P = 1.5, Q = 2.7, R = 20$$

$$S = \frac{2P}{R - Q}$$

_____[3]

Q12) I walk 300m on a bearing of 070 degrees. I then walk 500m on a bearing of 120 degrees. On what bearing must I walk to get back to where I started?

_____[6]

Q13)

Solve

$$\frac{3 \times 3^x}{9^{2x}} = \frac{1}{\sqrt{3}}$$

_____[4]

Q14)

The seventh term of an arithmetic sequence is 43. The 13$^{th}$ term of the sequences is 25.

Find the greatest possible value of $S_N$

_____[4]