ST EDWARD'S

OXFORD

16+ ENTRANCE EXAMINATION

For entry in

September 2018

Mathematics

Time: 1 hour

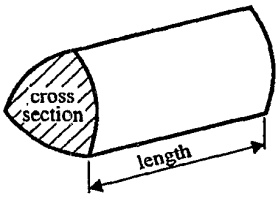
Candidates Name: ……

Instructions to Candidates

- 65 Marks
- Time allowed 1 Hour
- Calculators are allowed
- Write all answers, including your workings, in this booklet

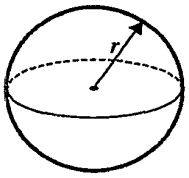
You may use the following formulae:

Volume of prism = area of cross section × length



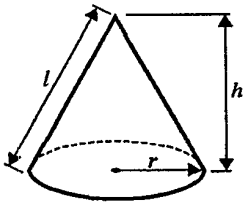
Volume of sphere = $\frac{4}{3}\pi r^3$

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



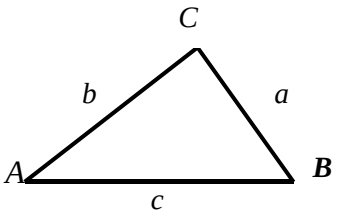
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle ABC

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



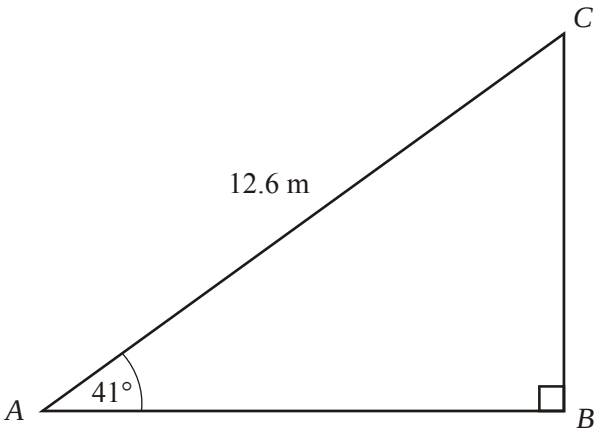
Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

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

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.



The diagram shows a right-angled triangle *ABC*.
AC = 12.6 m.
Angle *CAB* = 41°
Angle *ABC* = 90°

Find the length of the side *AB*. Give your answer correct to 3 significant figures.

…… m

(Total 3 marks)

2. A spaceship travelled for 6×10^2 hours at a speed of 8×10^4 km/h.

(a) Calculate the distance travelled by the spaceship.
Give your answer in standard form.

..... km

(3)

One month an aircraft travelled 2×10^5 km.
The next month the aircraft travelled 3×10^4 km.

(b) Calculate the total distance travelled by the aircraft in the two months.
Give your answer as an ordinary number.

..... km

(2)

(Total 5 marks)

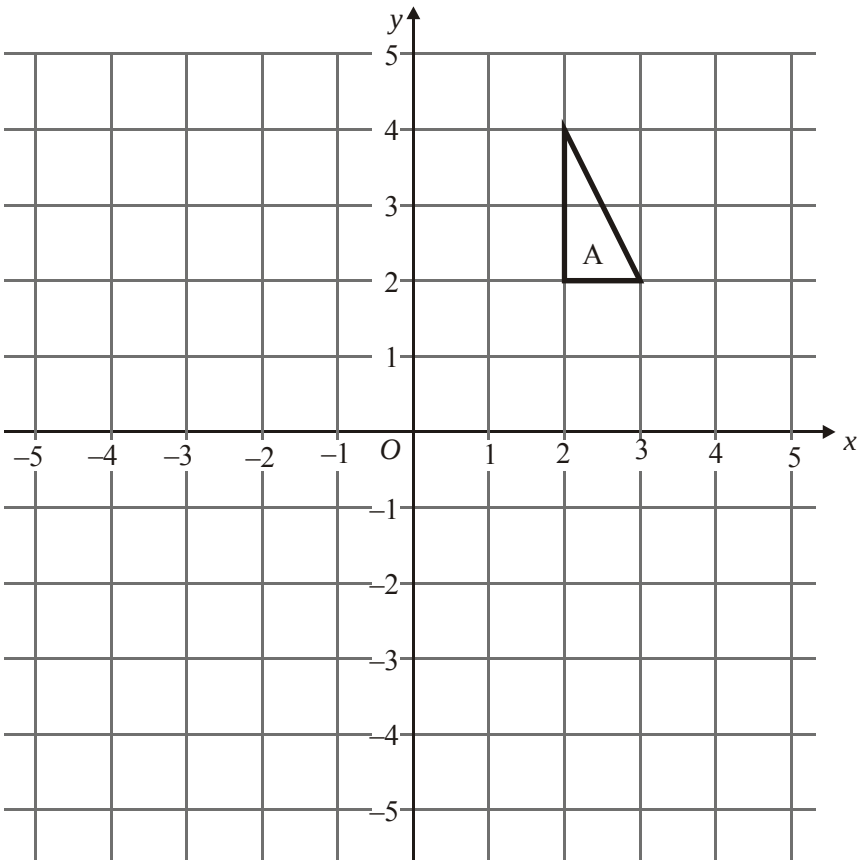
3. This table shows some expressions.
The letters a, b, c, and d represent lengths.
π and 4 are numbers that have no dimensions.
Three of the expressions could represent volumes.

Tick the boxes underneath the three expressions which could represent volumes.

$\frac{abc}{d}$	$4\pi a^3$	$4a^2$	$\pi a^3 + bd$	$(a + b)cd$	$\pi(c^2 + d^2)$	$4ad^2$

(Total 3 marks)

4.



(a) On the grid, rotate triangle **A** 180° about O.
Label your new triangle **B**.

(2)

(b) On the grid, enlarge triangle **A** by scale factor $\frac{1}{2}$, centre O.
Label your new triangle **C**.

(3)
(Total 5 marks)

5. Convert the recurring decimal $0.\dot{2}\dot{9}$ to a fraction.

.....

(Total 2 marks)

6. (a) $-2 < x \leq 1$

x is an integer.

Write down all the possible values of x.

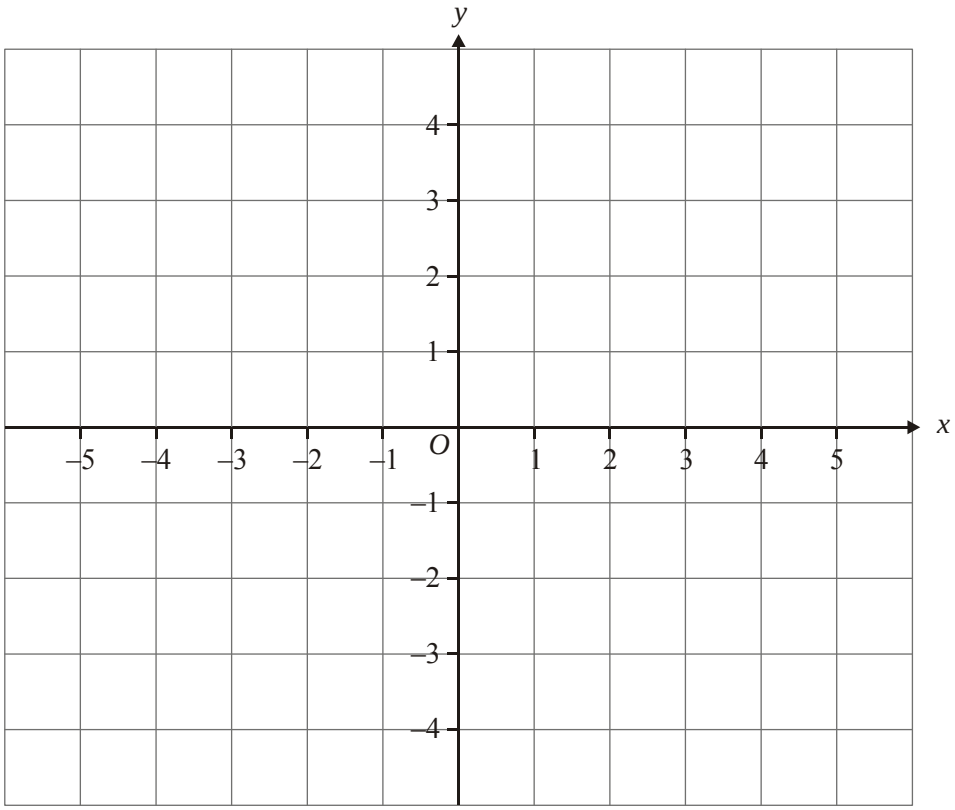
.....

(2)

(b) $-2 < x \leq 1$ $y > -2$ $y < x + 1$

x and y are integers.

On the grid, mark with a cross (✖), each of the six points which satisfies **all** these 3 inequalities.



(3)

(Total 5 marks)

7. (a) Solve $6x + 2 = 4(x - 7)$

$x =$ ……..

(2)

(b) (i) Factorise $x^2 - 23x + 42$

..……..

(ii) Hence solve $x^2 - 23x + 42 = 0$

……

(3)

(c) Factorise $(x + y)^2 - 3(x + y)$

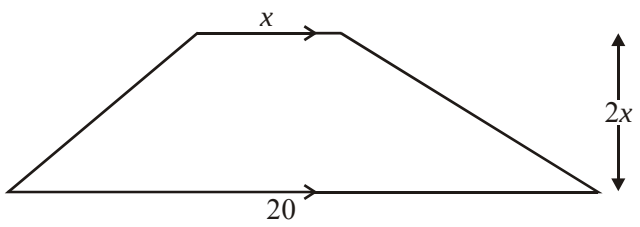
..……..

(1)

(Total 9 marks)

8.

Diagram **NOT** accurately drawn



The diagram shows a trapezium.
The measurements on the diagram are in centimetres.
The lengths of the parallel sides are x cm and 20 cm.
The height of the trapezium is $2x$ cm.

The area of the trapezium is 400 cm^2.

(a) Show that

$$x^2 + 20x = 400$$

(2)

(b) Find the value of x.
Give your answer correct to 3 decimal places.

.....

(3)
(Total 5 marks)

9. The fraction, p, of an adult's dose of medicine which should be given to a child who weighs w kg is given by the formula

$$p = \frac{3w + 20}{200}$$

(a) Use the formula $p = \frac{3w + 20}{200}$ to find the weight of a child whose dose is the same as an adult's dose.

…… kg

(3)

(b) Make w the subject of the formula $p = \frac{3w + 20}{200}$

w = ……

(3)

$$\frac{3w + 20}{200} = \frac{A}{A + 12}$$

(c) Express A in terms of w.

A = ……

(4)

(Total 10 marks)

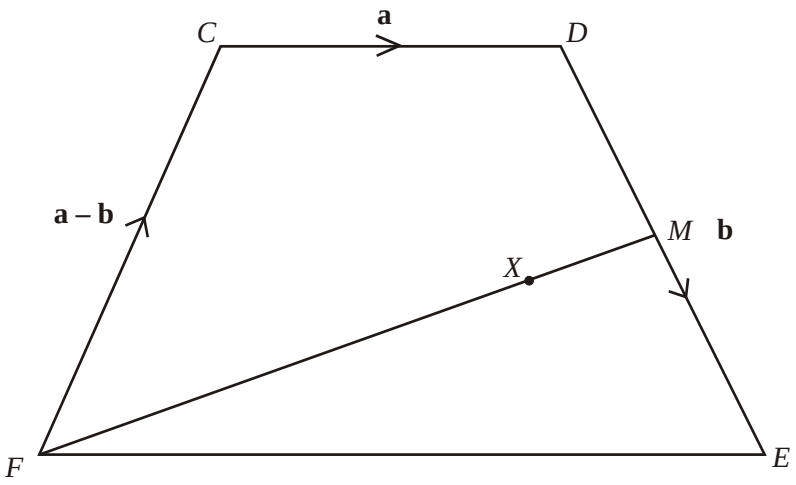
10. Solve the equation

$$\frac{7}{x+2}+\frac{1}{x-1}=4$$

.....

(Total 7 marks)

11.



CDEF is a quadrilateral with $\overrightarrow{CD} = \mathbf{a}$, $\overrightarrow{DE} = \mathbf{b}$ and $\overrightarrow{FC} = \mathbf{a} - \mathbf{b}$.

(a) Express $\overline{CE}$ in terms of **a** and **b**.

……..

(1)

(b) Prove that *FE* is parallel to *CD*.

……...

……

(2)

M is the midpoint of *DE*.

(c) Express $\overrightarrow{FM}$ in terms of **a** and **b**.

…….

(1)

X is the point on FM such that $FX : XM = 4 : 1$.

(d) Prove that C, X and E lie on the same straight line.

(3)
(Total 7 marks)

12. The depth, D metres, of the water at the end of a jetty in the afternoon can be modelled by this formula

$$D = 5.5 + A \sin 30(t - k)°$$

Where t hours is the number of hours after midday, A and k are constants.

Yesterday the low tide was at 3 p.m.
The depth of water at low tide was 3.5 m.

Find the value of A and k.

$A =$ ……

$k =$ ……

(Total 4 marks)

END OF TEST