ST EDWARD'S

OXFORD

16+ ENTRANCE EXAMINATION

For entry in

September 2017

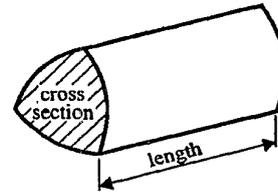## Mathematics

Time: 1 hour

Candidates Name: …………………………………………

Instructions to Candidates

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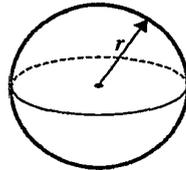- Write all answers, including your workings, in this booklet

You may use the following formulae:

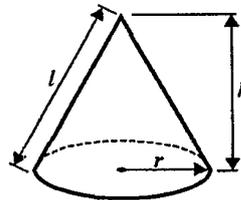**Volume of prism** = area of cross section × length

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

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

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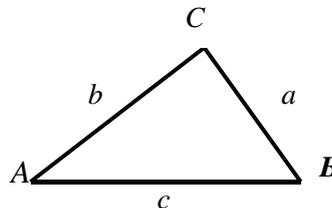
Curved surface area of cone = $\pi r l$

In any triangle ABC

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

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

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

$x =$ ……………………..
(2)

(b)   Solve $\dfrac{15 - 2x}{3} = 4$

$x =$ ……………………..
(3)

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

…………………………..

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

……………………………
(3)

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

…………………………..
(1)

(e)   Factorise

$$9x^2 - 6x + 1$$

……………………………
(2)

(f)   Simplify

$$\dfrac{6x^2 + 7x - 3}{9x^2 - 6x + 1}$$

……………………………
(3)
(Total 14 marks)

2)

$$\frac{1}{5^3} = 5^p \qquad 1 = 5^q \qquad \sqrt{5^3} = 5^r$$

(a) Write down the value of

(i) p

p = ...

(ii) q

q = ...

(iii) r

r = ...

(3)

(b) Show that

$$\frac{14}{\sqrt{245}} = \frac{2\sqrt{5}}{5}$$

You must write down each stage of your working.

(2)

$(e - 2\sqrt{3})^2 = f - 20\sqrt{3}$ where e and f are integers.

(c) Find the value of e and the value of f

e = ...

f = ...

(3)

(Total 8 marks)

3) A straight line, **L**, passes through the point with coordinates (4, 7) and is perpendicular to the line with equation $y = 2x + 3$.

Find an equation of the straight line **L**.

………………………………

(Total 3 marks)

4) Find the coordinates of the point of intersection of the line with equation $3x + 4y = 10$
and the line with equation $5x - 6y = 23$
Show your working clearly.

(.............................. , ...)

(Total 6 marks)

5)

a) $\dfrac{7x}{3} + \dfrac{3x}{4}$

....

b) $\dfrac{2x-5}{3} - \dfrac{4x+1}{7}$

....
(Total 5 marks)

6) Solve the equation

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

....
(Total 6 marks)

7) Solve the simultaneous equations

$$x^2 + y^2 = 26$$

$$y = 3 - 2x$$

Show clear algebraic working.

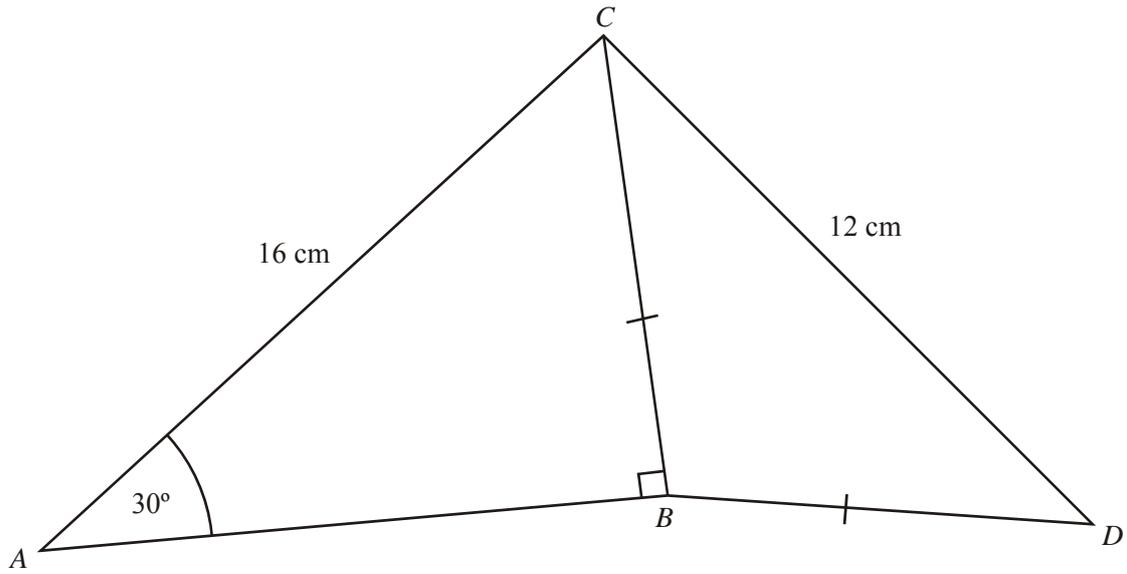...

8)

Diagram **NOT** accurately drawn

AC = 16 cm
Angle ABC = 90°
Angle CAB = 30°

$BC = BD$
CD = 12 cm

Calculate the area of triangle BCD.
Give your answer correct to 3 significant figures.
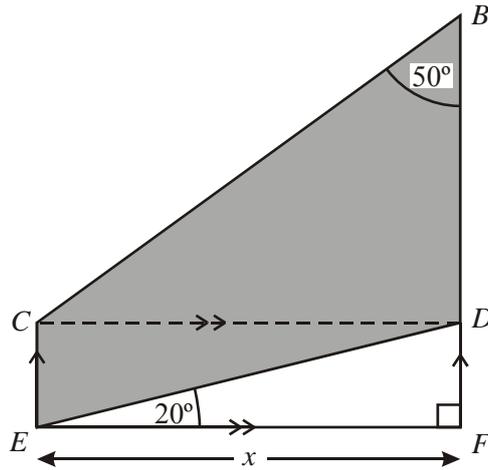
.……………. cm^2

(Total 5 marks)

9)

Diagram **NOT** accurately drawn

BCEF is a trapezium.
EC is parallel to *FDB*.
CD is parallel to *EF*.
Angle *CBD* = 50°.   Angle *DEF* = 20°.   Angle *EFD* = 90°.

EF = *x*.

(a)   Express, in terms of *x*,

    (i)   the length of *DF*,

                                                            …………….

    (ii)   the area of triangle *DEF*.

                                                            …………….

                                                                (3)

(b)   Work out the percentage of the trapezium *BCEF* that is **not** shaded.

                                                          …………… %

                                                                (4)
                                                             (Total 7 marks)

END OF TEST