ST EDWARD'S
OXFORD

Lower Sixth Entrance Assessment

November 2011

Mathematics

1 hour
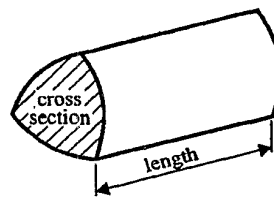
Candidate Name: ………………………………….

Instructions
- There are 80 marks available
- Attempt all questions
- Write all answers, including your workings, in this booklet
- Calculators are NOT permitted
- Where answers are not exact, they should be given to three significant figures unless otherwise specified
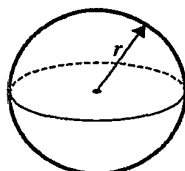
You may use the following formulae:

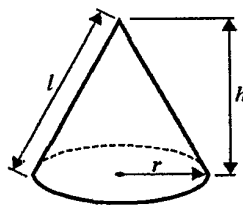**Volume of prism** = area of cross section × length

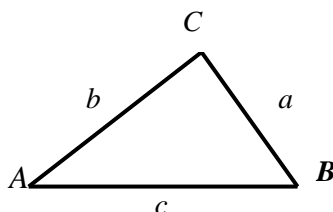**Volume of sphere** = $\frac{4}{3}\pi r^3$

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 $7r + 2 = 5(r - 4)$

r = ...
[2]

(b) Solve $4 = \dfrac{22}{p}$

p = ...
[2]

2. Convert 1.35 cubic metres to cubic centimetres. Give your answer in standard form.

....
[2]

3. Solve $x^2 - 2x - 15 = 0$

$x =$ ………… or $x =$ ………..
[1]

4. a)   Simplify fully

(i) $(p^3)^3$

....
[1]

(ii) $\dfrac{3q^4 \times 2q^5}{q^3}$

....
[1]

b)   Write down the integer values that satisfy the inequality

$$-6 \leq 2x < 7$$

....
[2]

---

5.   A straight line has equation $2y + 3x = 5$

(a)   Write down the gradient of the line.

………………………..
[1]

(b)   What is the equation of the line that goes through (1,3) and (3,6)

………………………..
[2]

(c)   What is the equation of the line that is perpendicular to the line y = 4x - 9, which passes through the point (0,-3)

…………………………..

[2]

6.   Make *m* the subject of the formula 2(2*p* + *m*) = 3 – 5*m*
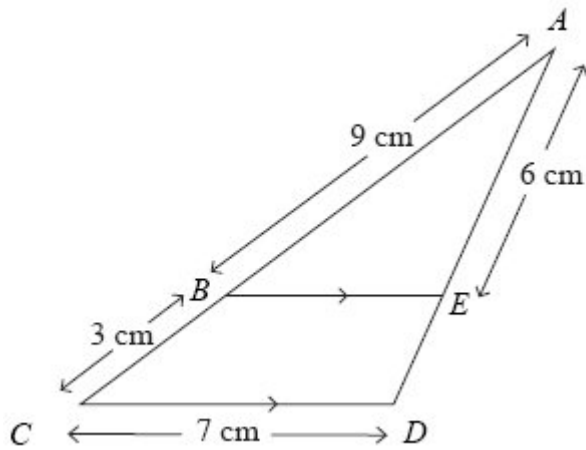
m = ……………………………

[3]

7.

Diagram **NOT** accurately drawn

BE is parallel to *CD*.

AB = 9 cm, *BC* = 3 cm, *CD* = 7 cm, *AE* = 6 cm.

(a)   Calculate the length of *ED*.

………………… cm

[2]

(b)   Calculate the length of *BE*.
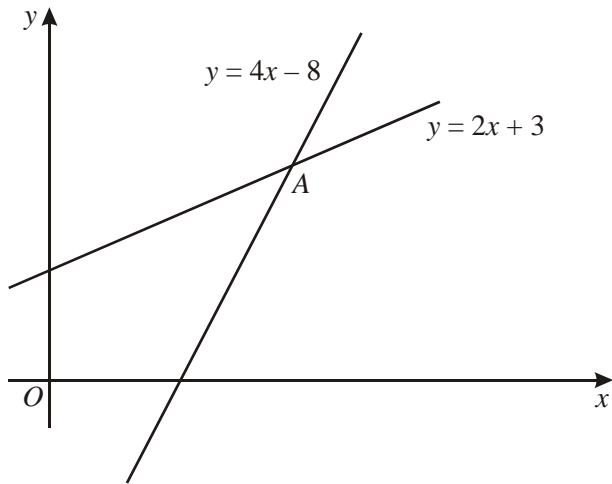
………………… cm

[2]

8.

Diagram **NOT** accurately drawn

The diagram shows two straight lines intersecting at point *A*.
The equations of the lines are

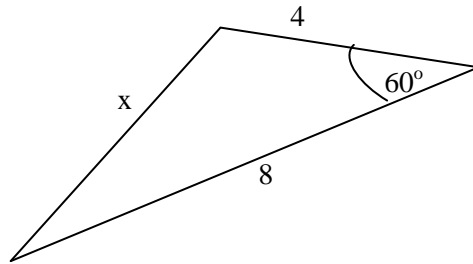$$y = 4x - 8$$
$$y = 2x + 3$$

Work out the coordinates of *A*.

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

[3]

9. Given that cos (60) is 0.5, calculate the length of the side marked x.

Give your answer in exact form.

x = ……………………………

[3]

10. There are nine girls and seven boys in a class. Two students are chosen without replacement.

a) What is the probability that two girls are chosen?

…………………………

[2]

b) What is the probability that at least one girl is selected?

…………………………

[2]

11. (a) Complete the table of values for $y = x^2 - 3x - 1$.

x	-2	-1	0	1	2	3	4
y		3	-1	-3			3

[2]
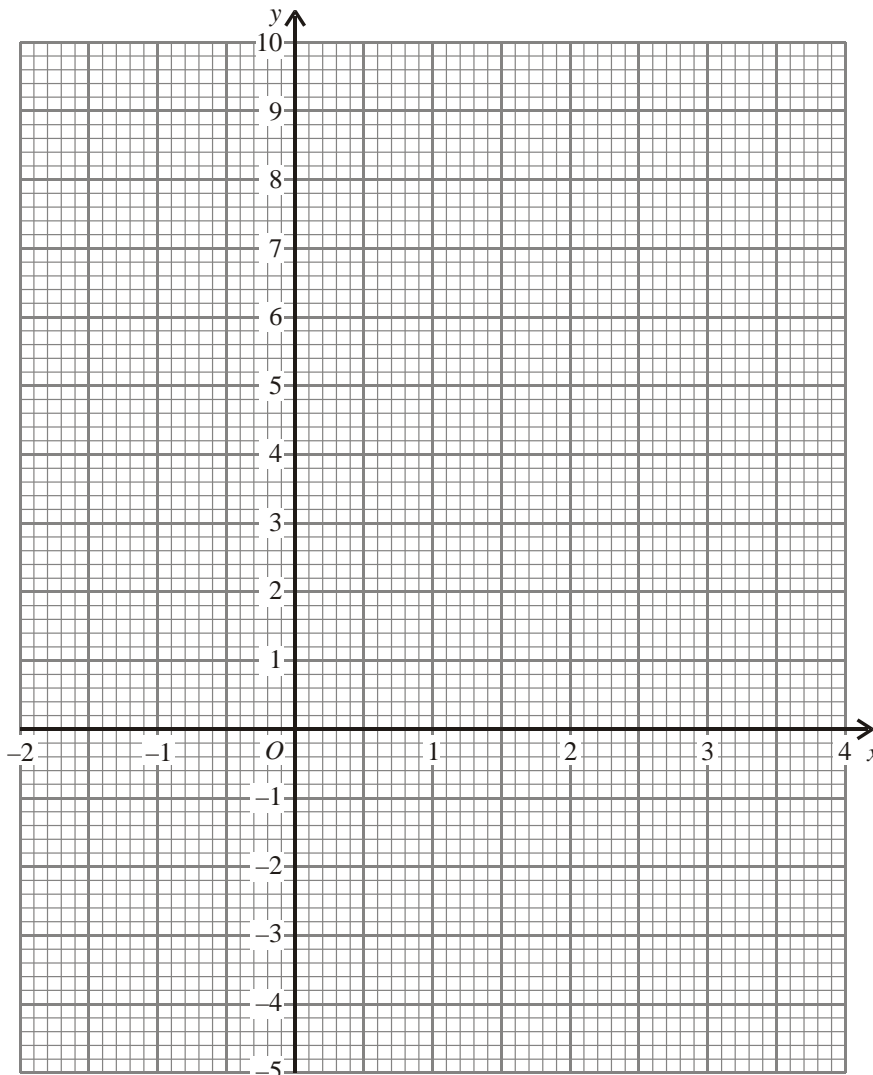
(b) On the grid below, draw the graph of $y = x^2 - 3x - 1$.

[2]

(c) Use your graph to find an estimate for the minimum value of y.

………………………………

[1]

(d) By drawing a suitable line on your graph, estimate the solutions to the equation:

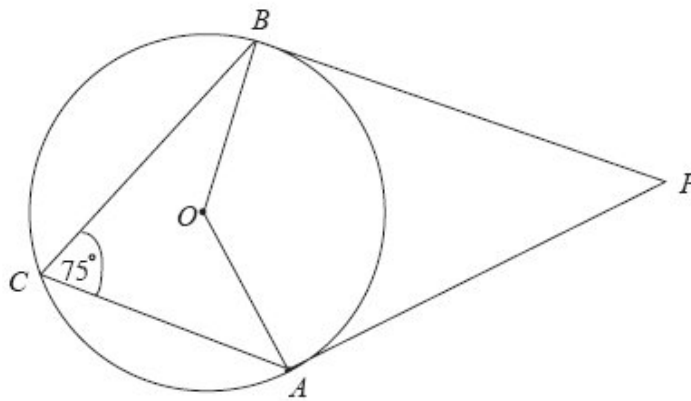$$x^2 - 3x - 5 = 0.$$

……………………………

[2]

12.

Diagram **NOT** accurately drawn

In the diagram, A, B and C are points on the circumference of a circle, centre O.

PA and PB are tangents.   Angle ACB = 75°.

a)   What is the size of angle AOB. You must give a reason for your answer.
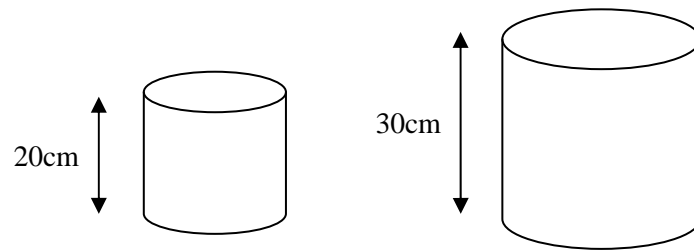
…………………..°

Because: …………………………………………………………………………

……………………………………………………………………………………

[2]

(b)   Work out the size of angle *APB*.

…………………..°

[3]

13. Two solid cylinders are mathematically similar.

    a)   The diameter of the larger cylinder is 18cm. What is the radius of the smaller cylinder?

…………………………

[2]

    b)   The cylinders are both made of the same material. The small one weighs 160g. How much does the large one weigh?

…………………………

[2]

14. Solve the simultaneous equations

$$x^2 + y^2 = 29$$

$$y - x = 3$$

………………………………………………………

[7]

15. (a) Evaluate

(i) 3^{-2}

....
[1]

(ii) $27^{\frac{2}{3}}$

....
[1]

(iii) $\left(\dfrac{16}{81}\right)^{-\frac{3}{4}}$

....
[2]

(b) Simplify:

(i) $3\sqrt{2} + 2\sqrt{8}$

....
[1]

(ii) $\dfrac{21}{\sqrt{7}}$

....
[2]

(iii) $\left(\sqrt{5} + 2\sqrt{3}\right)\left(\sqrt{5} - 2\sqrt{3}\right)$

....
[2]

16. The diagram shows a sector of a circle with a radius of x cm and centre O.
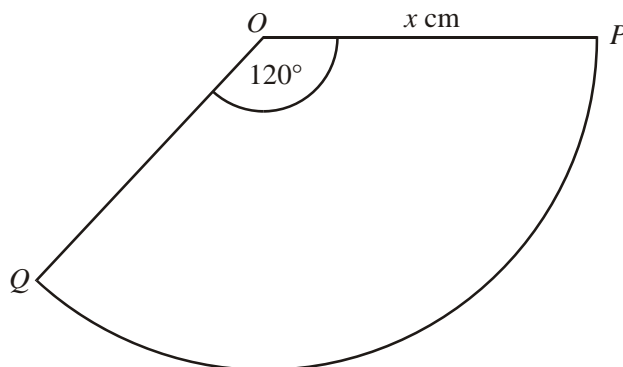PQ is an arc of the circle.
Angle $POQ = 120°$.

Diagram **NOT** accurately drawn

(a)   Write down an expression in terms of π and x for

(i)   the area of this sector,

....

(ii)   the perimeter of this sector.

....

[3]

17.   (a)   Factorise $9x^2 - 6x + 1$

....

[2]

(b)   Simplify $\dfrac{6x^2 + 7x - 3}{9x^2 - 6x + 1}$

....

[3]

18. Show that $25 - \dfrac{(x-8)^2}{4} = \dfrac{(2+x)(18-x)}{4}$

………………………………

[3]

19. Prove algebraically that the sum of the squares of any two consecutive even integers is never a multiple of 8.

[4]

END OF TEST