ST EDWARD'S

OXFORD

Lower Sixth Entrance Assessment

November 2013

Mathematics

1 hour

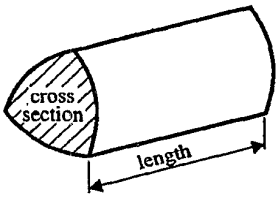
Candidate Name: …….

Instructions

- There are 80 marks available
- Write all answers, including your workings, in this booklet
- Calculators are allowed
- Where answers are not exact, they should be given to three significant figures unless otherwise specified

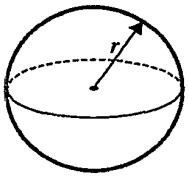
You may use the following formulae:

Volume of prism = area of cross section × length



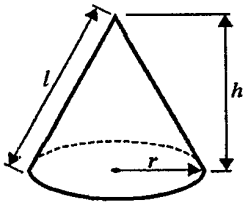
Volume of sphere = $\frac{4}{3}\pi r^3$

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



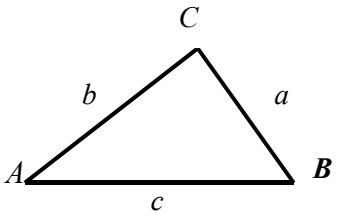
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



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) Expand and simplify

$$3(2x - 1) - 2(2x - 3)$$

.....

(2)

(b) Factorise

$$y^2 + y$$

.....

(1)

(c) Factorise $6x^2 - x - 2$

.....

(2)

(Total 5 marks)

2. (a) Simplify $a^3 \times a^4$

……

(1)

(b) Simplify $3x^2y \times 5xy^3$

……

(2)

(c) Factorise $a^2 - 9b^2$

……

(2)

(d) Factorise $x^2 + px + qx + pq$

……

(2)

(Total 7 marks)

3.

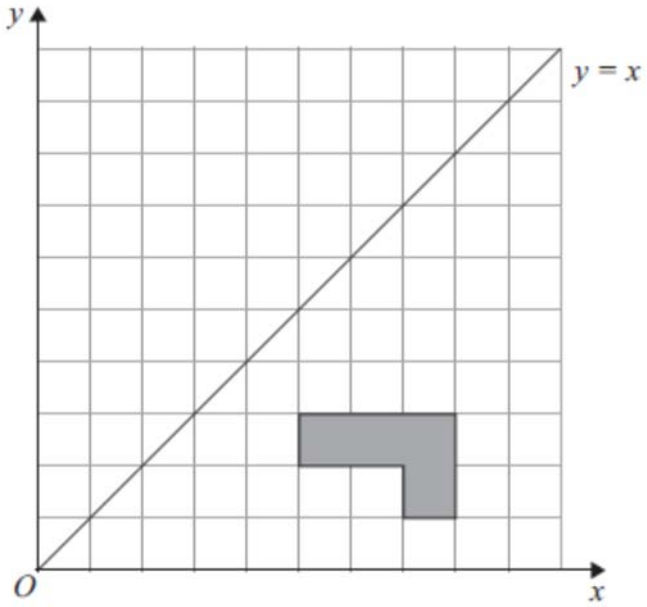
Make r the subject of the formula

$$P = \pi r + 2r + 2a$$

……

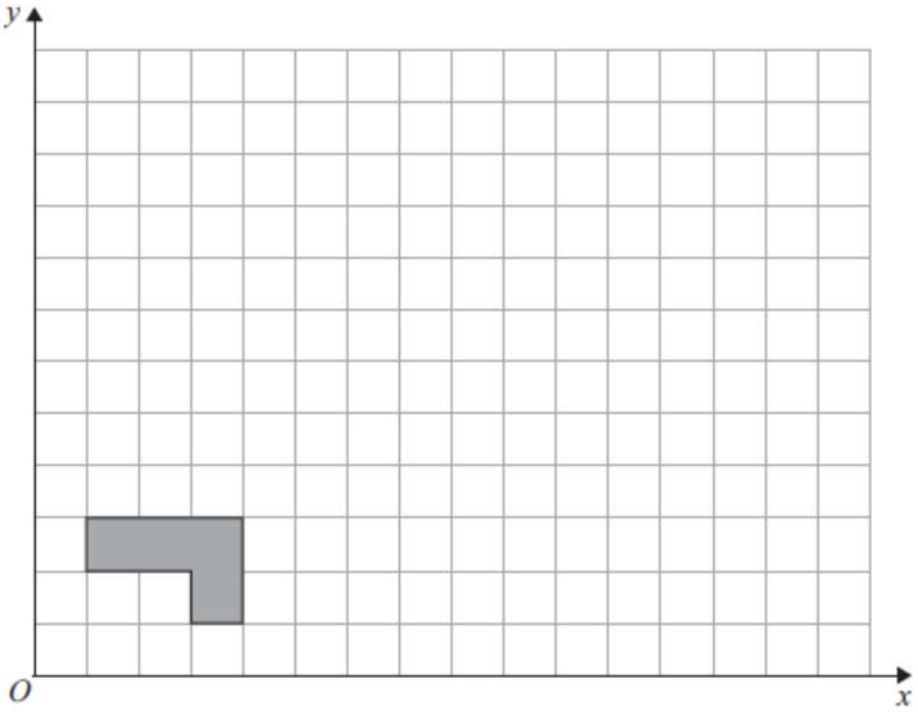
(Total marks 3)

4.



(a) Reflect the shaded shape in the line $y = x$.

(2)



(b) On the grid, enlarge the shaded shape by a scale factor of 3, centre O.

(3)

(Total 5 marks)

5. $-3 < k \leq 2$

k is an integer.

(a) Write down all the possible values of k.

.....

(2)

(b) Solve the inequality $\frac{2x}{3} < 10$

.....

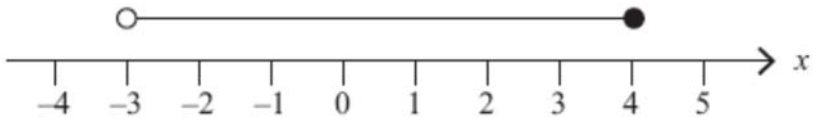
(2)

(d) On the number line below, show the inequality $-2 < y < 3$



(1)

(e) Here is an inequality, in x, shown on a number line.



Write down the inequality.

.....

(2)

(Total 7 marks)

6.

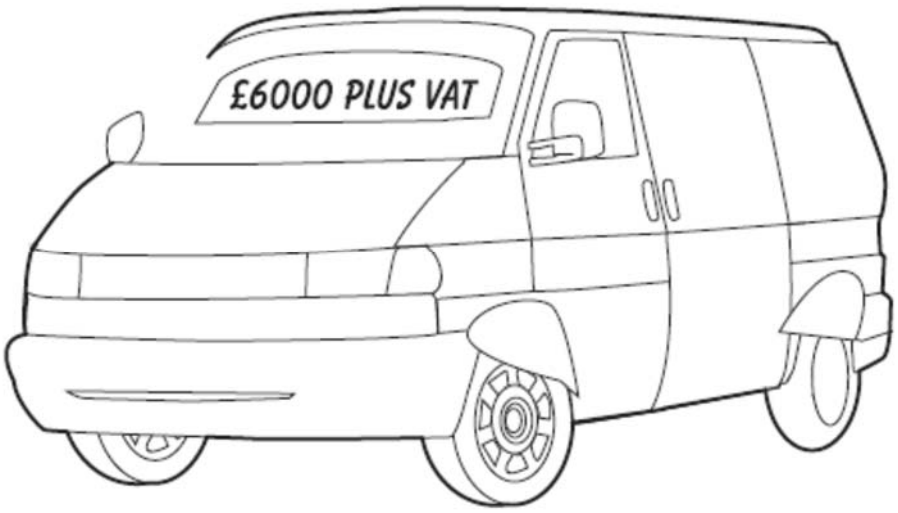
(a) In a sale the normal price of a book is reduced by 10%.
The sale price of the book is £4.86
Calculate the normal price of the book.

£.....

(3)

(b) Lizzie bought a van.

The total cost of the van was £6000 **plus** VAT at $17\frac{1}{2}$ %.



Lizzie paid £3000 when she got the van.

She paid the rest of the total cost of the van in 10 equal monthly payments.

Work out the amount of each monthly payment.

£ .....

(6)

(Total 9 marks)

7.

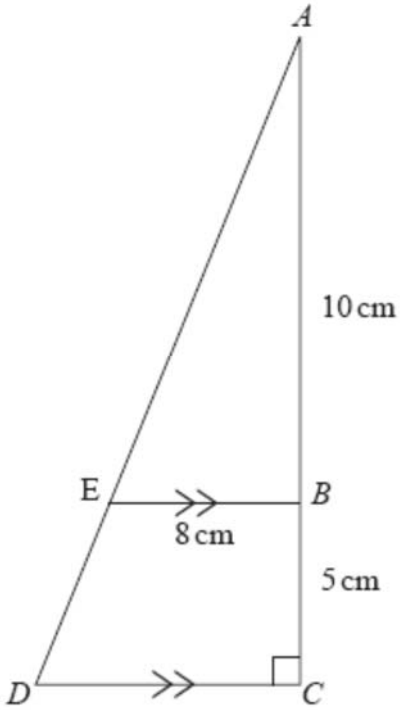


Diagram **NOT** accurately drawn

ABC and *AED* are straight lines. *EB* is parallel to *DC*. Angle *ACD* = 90°.

AB = 10 cm. *BC* = 5 cm. *EB* = 8 cm.

(a) Work out the length of *DC*.

.....cm

(2)

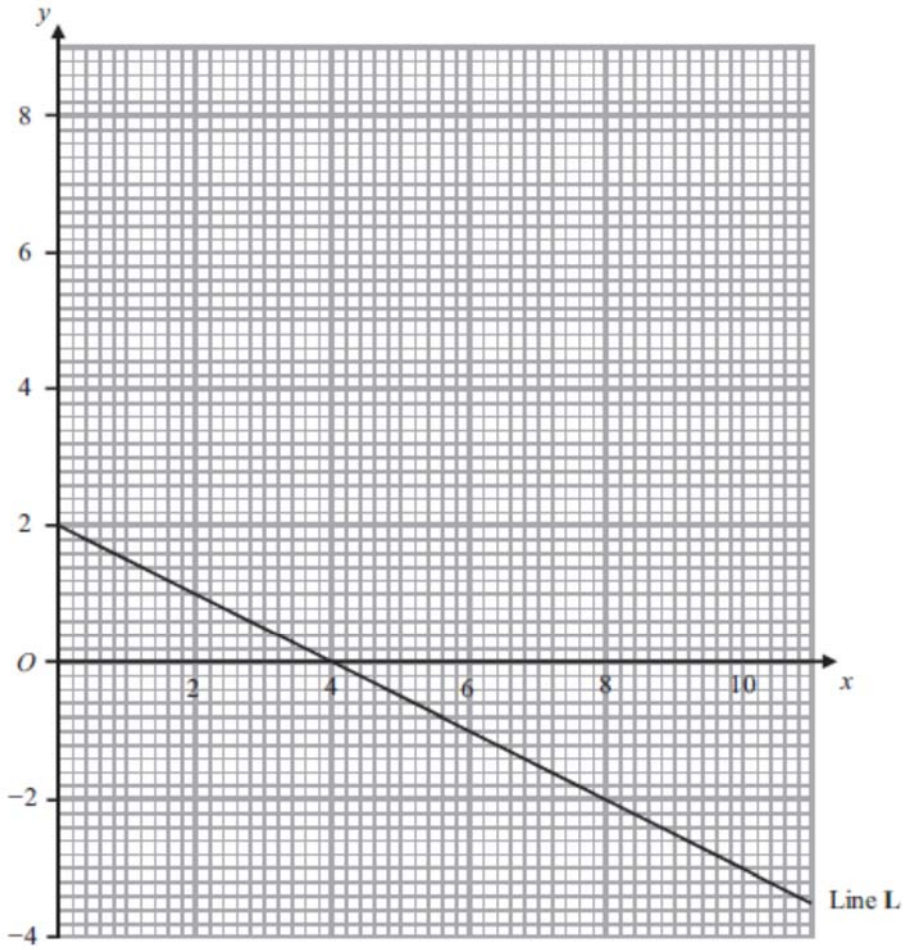
(b) Work out the area of the trapezium *EBCD*.

.....cm^2

(2)

(Total 4 marks)

8.



Line **L** is drawn on the grid.

(*a*) Work out the gradient of Line **L**.

.....

(2)

Another line, Line **M**, is parallel to Line **L** and passes through the point (6, 2).

(*b*) Find an equation for Line **M**.

.....

(2)

(Total 4 marks)

9. (*a*) Show that $27^{-\frac{2}{3}} = \frac{1}{9}$

(3)

(*b*) Given that $\frac{8-\sqrt{18}}{\sqrt{2}} = a + b\sqrt{2}$, where *a* and *b* are integers,

find the value of *a* and the value of *b*.

a = ...

b = ...

(3)

(c) Write as a single fraction in its simplest form $\frac{2}{x-4} - \frac{1}{x+3}$

……..……

(3)

(Total 8 marks)

10.

(a) Show that $\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$.

.....

(2)

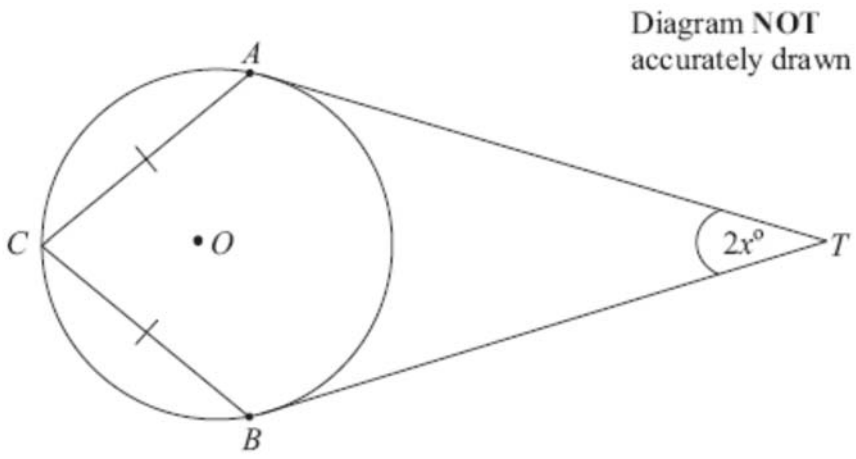
(b) Show that $\frac{2}{5} \div \frac{3}{10} = 1\frac{1}{3}$

.....

(3)

(Total 5 marks)

11.



A, *B* and *C* are points on the circumference of the circle, centre *O*.

TA and *TB* are tangents to the circle.
CA = *CB*.
Angle *ATB* = 2*x*°.
Show that angle *ACB* = (90 – *x*)°.

(Total 5 marks)

12. Solve the simultaneous equations

$$x + y = 2$$
$$4y^2 - x^2 = 11$$

……

[Total 7 marks]

13.

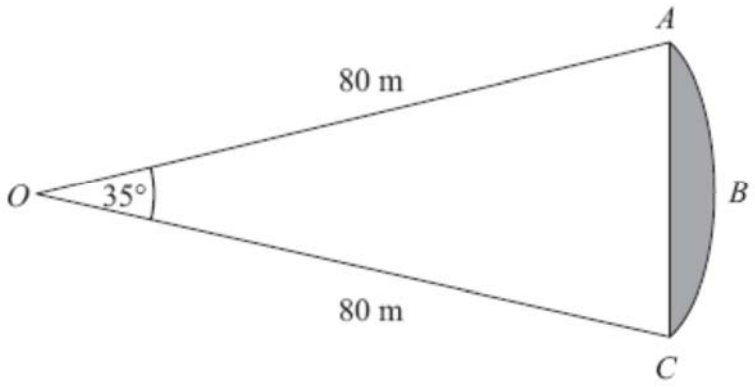


Diagram **NOT** accurately drawn

ABC is an arc of a circle centre *O* with radius 80 m.

AC is a chord of the circle.

Angle *AOC* = 35°.

Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

..... m^2

(Total 5 marks)

14.

Solve $\dfrac{5(2x+1)^2}{4x+5} = 5x - 1$

.....

(Total 5 marks)

This question is from a UKMT Challenge paper, and is intended to be difficult. Please only attempt it if you have finished questions 1 to 14.

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15. Two numbers x and y are such that $x + y = 20$ and $\frac{1}{x} + \frac{1}{y} = \frac{1}{2}$.
Showing full working, find the value of $x^2y + xy^2$.

……..

[4]

END OF TEST