



Mathematics Entrance Exam

Year 10

FULL NAME	
OTHER DETAILS	

You have 60 minutes to complete this assessment.

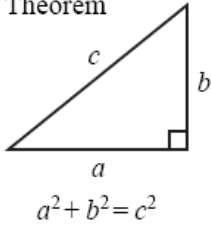
You may use a calculator but you **MUST** show your working.

The number of marks per question is indicated by brackets, (1).

MARK (OUT OF 60)	GRADE
%	

FORMULA SHEET – HIGHER TIER

Pythagoras' Theorem

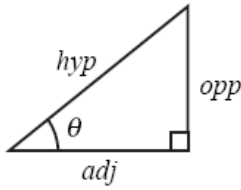
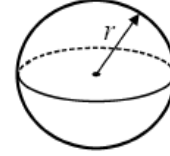
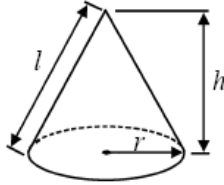


Volume of cone = $\frac{1}{3}\pi r^2 h$

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

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

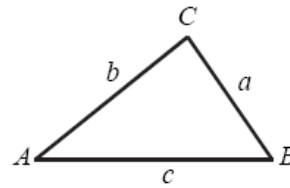
Surface area of sphere = $4\pi r^2$



adj = hyp \times cos θ
 opp = hyp \times sin θ
 opp = adj \times tan θ

In any triangle ABC

or $\sin \theta = \frac{\text{opp}}{\text{hyp}}$



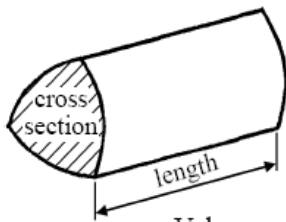
$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

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

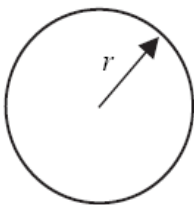
$\tan \theta = \frac{\text{opp}}{\text{adj}}$

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

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



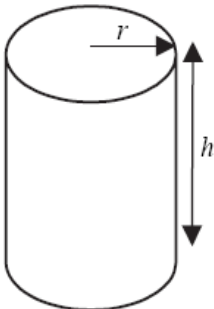
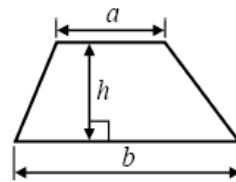
Volume of prism = area of cross section \times length



Circumference of circle = $2\pi r$

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

Area of circle = πr^2



Volume of cylinder = $\pi r^2 h$

The Quadratic Equation

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

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

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

1 Find the value of x in each of the following.

(a) $3x - 5 = 3$

[1 mark]

(b) $13 + 3x = 19$

[1 mark]

2 Find the value of x .

$$5(3x + 4) = 30$$

[2 marks]

3 Multiply out this expression: $3(x + 4) + 2(x - 3)$.

Write your answer as simply as possible.

[2 marks]

4 Multiply out this expression: $(x + 2)(x - 7)$.

Write your answer as simply as possible.

[2 marks]

5 Solve $\frac{3x+4}{5} = \frac{2x+1}{3}$

$x = \dots\dots\dots$

[3 marks]

6 Factorise fully $15x^2 + 3xy$

[2 marks]

7 (a) Fill in the missing numbers.

50% of £600 = £ _____

10% of £600 = £ _____

1% of £600 = £ _____

[2 marks]

(b) Work out 61% of £600. Use part (a) to help you.

[1 mark]

8 In Germany VAT is charged at 19%.

(a) Find 19% of €3500

€.....

(b) Increase €3500 by 19%

€.....

[2 marks]

9 a) Subtract $\frac{7}{9} - \frac{3}{8}$

b) Add $2\frac{1}{3} + 3\frac{1}{6}$

c) Multiply $3\frac{1}{2} \times \frac{3}{14}$

.....

[3 marks]

10 Round these numbers to one significant figure, then **estimate** the value of

$$\frac{68 \times 401}{198}$$

.....

[2 marks]

11 (a) Write 600 000 000 000 in standard form.

.....

(b) Write 5×10^{-4} as an ordinary number.

.....

[2 marks]

12 Factorise fully.

(a) $24x + 30y$

(b) $5s + 10t$

[2 marks]

13 60 British students each visited one foreign country last week.
The two-way table shows some information about these students.

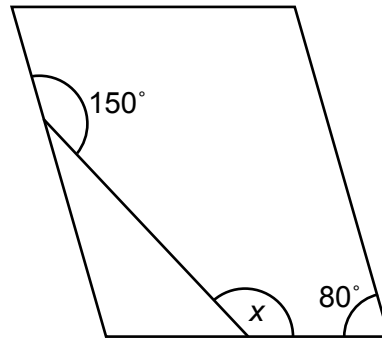
	France	Germany	Spain	Total
Female			9	34
Male	15			
Total		25	18	60

(a) Complete the two-way table.

(b) One of the girls was chosen at random. What is the probability that she visited Germany last week?

[3 marks]

- 14** Look at this parallelogram.
Work out the size of angle x .



[2 marks]

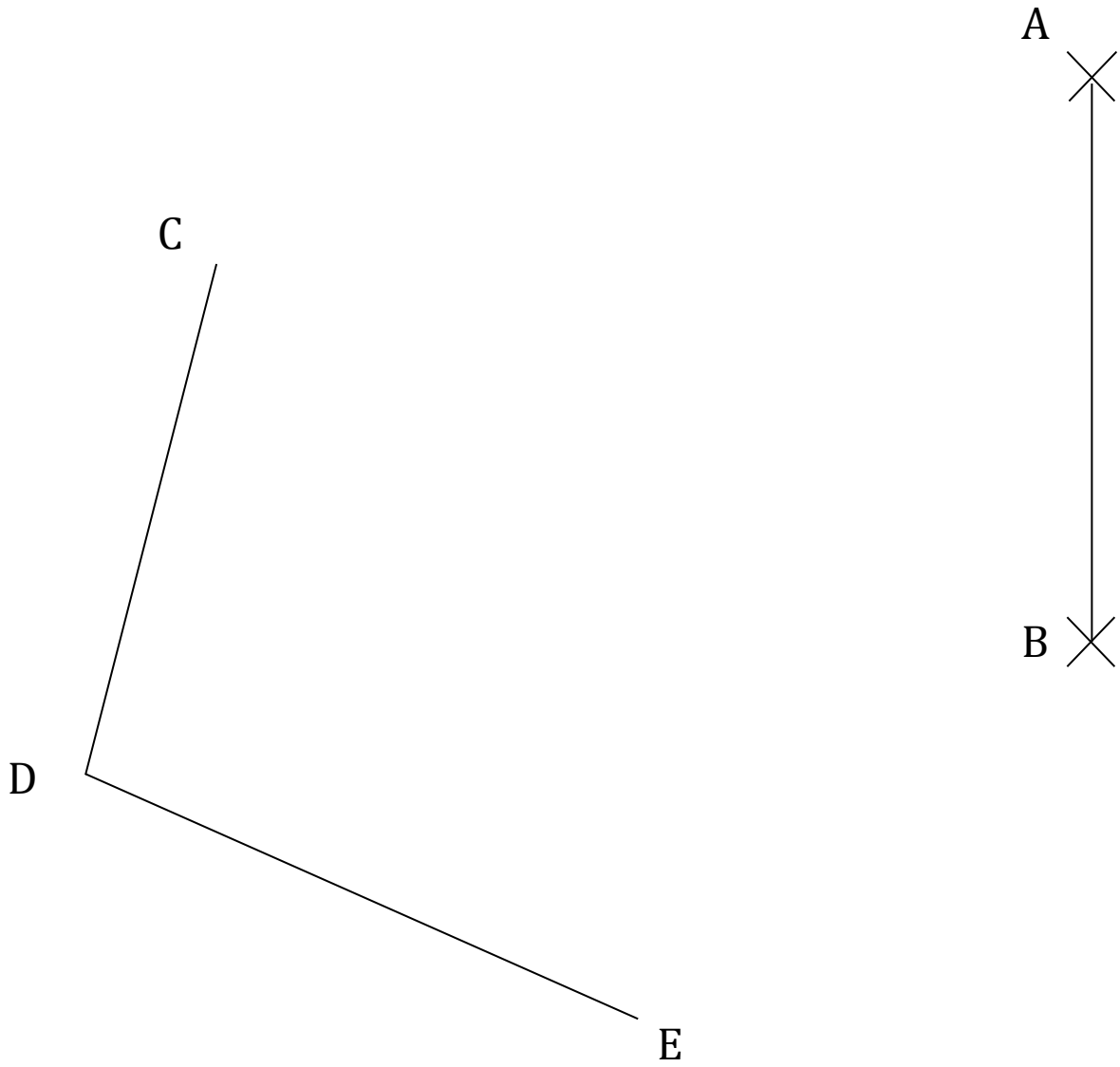
- 15** A calculator display is 15.25 cm^2
Write the area of the display in mm^2 .

[1 mark]

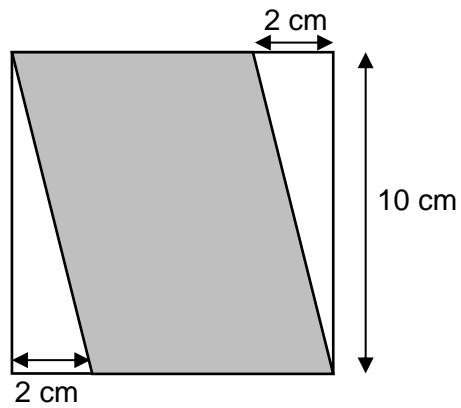
16 Find the point on the page where the perpendicular bisector of the line segment AB intersects with the bisector of the angle CDE. Label this point F.

[4 marks]

(Note: there is a second copy of this diagram at the end of the question booklet.)



17 The diagram shows a parallelogram drawn inside a square.



What is the area of the grey parallelogram?

Give the correct units with your answer.

[2 marks]

18 You can buy tins of the same fruit cocktail in two sizes.

A smaller 250 g tin costs £0.32

A larger 400 g tin costs £0.69

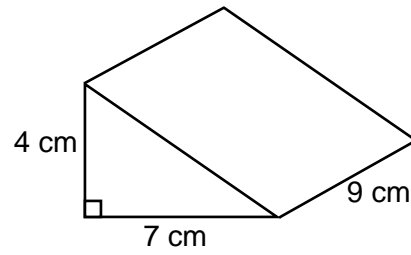
Which tin is better value for money?

You **must** show your working.

[2 marks]

19 Look at this triangular prism.

(a) Calculate its volume.



[2 marks]

(b) Use Pythagoras Theorem to calculate the length of the hypotenuse of the triangular ends. Give your answer to one decimal place.

[1 mark]

20 The diagram shows a cylinder with a height of 10 cm and a radius of 4 cm.

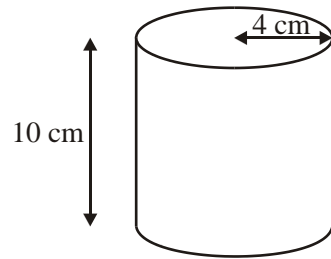


Diagram **NOT** accurately drawn

- (a) Calculate the volume of the cylinder.
Give your answer correct to 3 significant figures.

.....cm³

- (b) Convert your answer to litres.

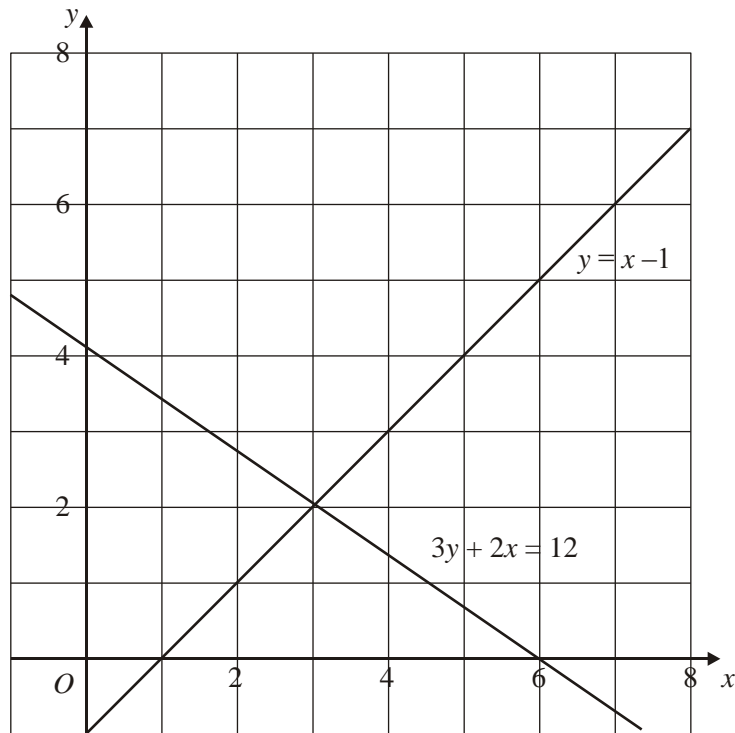
.....litres

- (c) Calculate the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

.....cm²

[5 marks]

21 The graphs of the straight lines with equations $3y + 2x = 12$ and $y = x - 1$ have been drawn on the grid.



Use the graphs to solve the simultaneous equations

$$\begin{aligned} 3y + 2x &= 12 \\ y &= x - 1 \end{aligned}$$

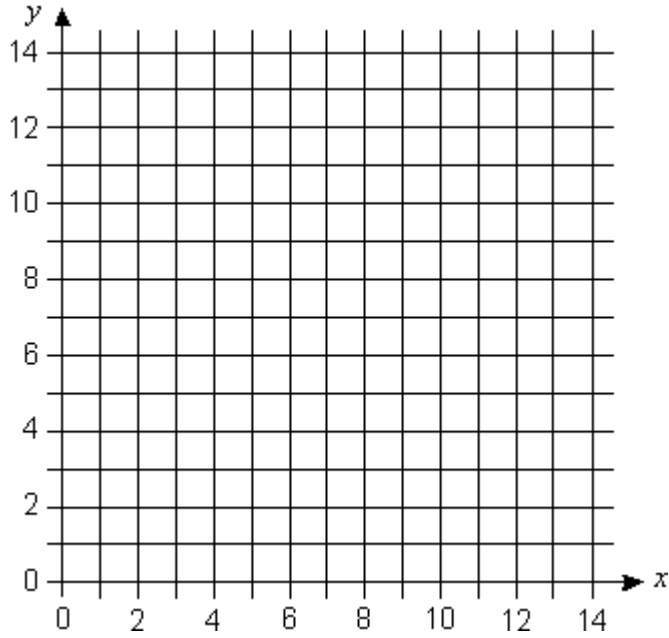
$x = \dots\dots\dots$

$y = \dots\dots\dots$

[1 mark]

22 Each point on the straight line $x + y = 12$ has an x coordinate and a y coordinate that add together to make 12

Draw the straight line $x + y = 12$



[1 mark]

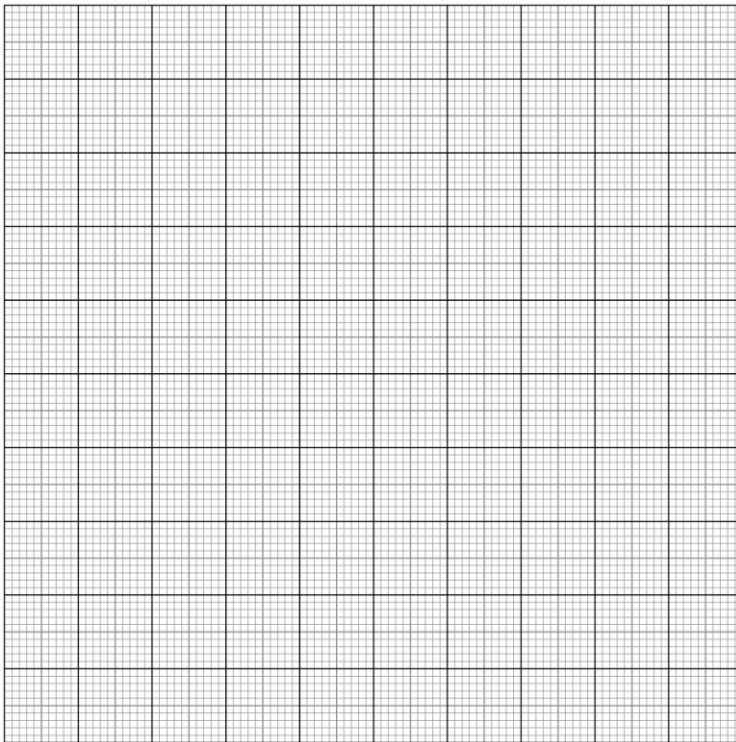
23 Graphs of quadratic equations

(a) Complete the table for the graph of $y = x^2 - 4x + 3$.

x	-1	0	1	2	3	4	5
x^2		0		4	9		25
$-4x$		0	-4				-20
+3		3		3			3
$y = x^2 - 4x + 3$		3					8

[3 marks]

(b) Using a scale for -1 to 5 on the x -axis and -2 to 8 on the y -axis, draw the graph of $y = x^2 - 4x + 3$.



[3 marks]

(More grids are printed at the end of the question booklet)

24 Lee works in a restaurant.

This time card shows the hours he works one week.

	Afternoon		Evening	
	In	Out	In	Out
Tuesday	12:00	17:00		
Wednesday			18:00	22:00
Thursday			18:00	22:00
Friday			18:00	22:00
Saturday	12:00	17:00	18:00	22:00
Sunday	12:00	17:00	18:00	22:00

This table shows Lee's hourly rate of pay:

	Pay per hour
Tuesday–Friday, 9:00–17:00	£4.80
Tuesday–Friday, 18:00–22:00	£7.20
Weekends, 9:00–22:00	£9.60

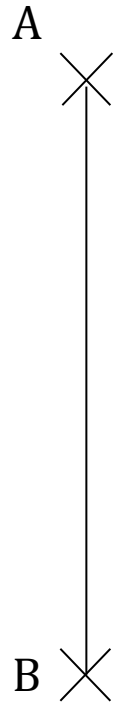
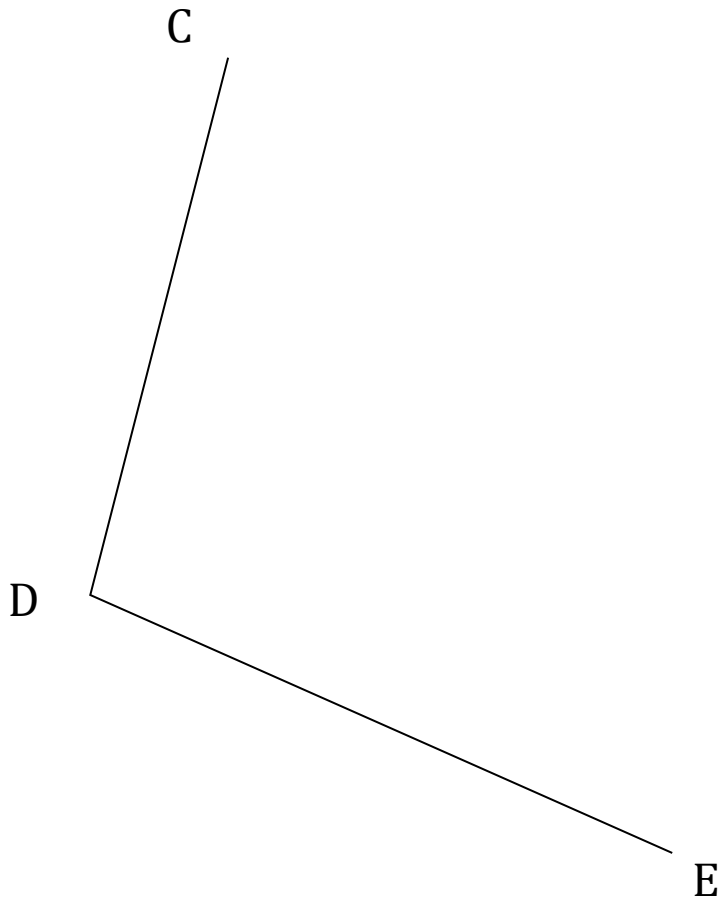
How much is Lee's total pay this week?

[2 marks]

25 James travels 8.5 miles on his bicycle in 25 minutes. He then returns by the same route in 35 minutes. What is his average speed for his trip?

[1 mark]

Here is a second copy of the diagram from question 16.



Spare grids

