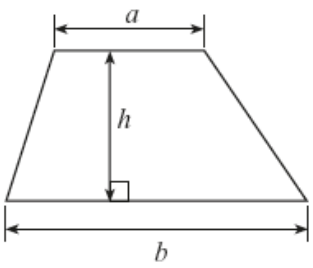
MATHEMATICS PRACTICE PAPER
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER
1 hour 45 minutes

(Linear paper - November 2015)

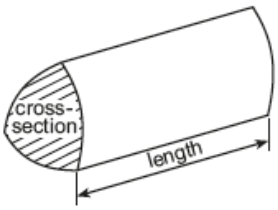
Question	Topic	Mark	Out of
1	Straight line graphs		4
2	Estimating the mean		7
3	Factorise, expand and simplify		6
4	Depreciation %		10
5	Pythagoras and trigonometry		6
6	Cumulative frequency		6
7	Area of a circle and a problem involving volume		8
8	Histogram		6
9	Solving quadratic equations		6
10	Probability		5
11	Volume of similar shapes		3
12	Trig graphs		3
13	Sin and Cos rule & area of a triangle		10
Total			100

Formula List - Higher Tier

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



Volume of prism = area of cross-section × length

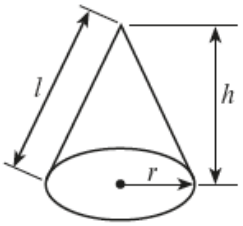


Volume of sphere = $\frac{4}{3}\pi r^3$

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

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

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

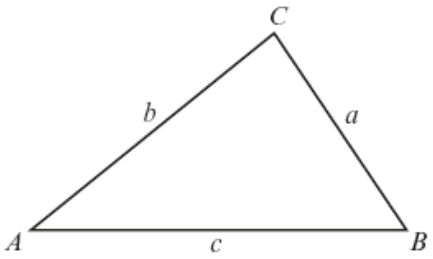


In any triangle ABC

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

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

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

1.

(a) Does the point (4, –2) lie on the straight line $2x - 3y = 14$?
Put a tick (✓) in the appropriate box.
You **must** show working to justify your answer. [1]

Yes ☐ No ☐

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(b) Does the point (4, 4) lie on the curve $2y = x^2$?
Put a tick (✓) in the appropriate box.
You **must** show working to justify your answer. [1]

Yes ☐ No ☐

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(c) Write down the coordinates of any **two** points that lie on the straight line $x + y = -4$. [2]

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(.....) and (.....)

2.

(a) In the mountains of Aplengrub, the snowfall on each of 28 days was measured. The results are summarised in the table below.

Daily snowfall, s (cm)	Number of days
$5 \leqslant s < 15$	5
$15 \leqslant s < 25$	10
$25 \leqslant s < 35$	12
$35 \leqslant s < 45$	1

(i) Calculate an estimate for the mean daily snowfall for the 28 days. [4]

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(ii) State the modal class. [1]

Modal class .....

(iii) Write down the class in which the median lies. [1]

Median class .....

(b) In the mountains of Terragal, the data collected on snowfall, over the same 28 days, was as follows.

Terragal 

Mean daily snowfall 20 cm
Median daily snowfall 9 cm

Ralph was on holiday in Terragal for these 28 days.
He does not understand how the mean snowfall could be as high as 20 cm.
Ralph says,
'On about half of the days there was less than 10 cm of snowfall each day.'
Write a brief explanation to help Ralph understand how it is possible to have a mean of 20 cm with a median of 9 cm. [1]

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3.

(a) Factorise $8x^2 - 16x$. [2]

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(b) Expand $5y(2y^2 - 3)$. [2]

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(c) Simplify $4h^3 \times 5h^2$. [1]

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(d) Simplify $\frac{76f^{10}}{38f^5}$. [1]

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4.

Rowena owns a car that Dafydd is planning to buy in 3 years' time.

Rowena's car is currently worth £3500.
Rowena estimates that her car will repeatedly depreciate by 24% of its value each year.

Dafydd has already saved £100.
Dafydd wants to set up a savings account to save a fixed amount of money each month to buy Rowena's car in 3 years' time.

(a) *You will be assessed on the quality of your written communication in this part of the question.*

What would be the minimum amount of money, to the nearest pound, that Dafydd should pay into his savings account each month?
You must show all your working. [9]

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(b) Do you think that this amount saved each month will guarantee that Dafydd will have enough money to buy Rowena's car?
You must give a reason for your answer. [1]

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5.

Calculate the lengths of the sides x and y in the right-angled triangles shown below.

(a) [3]

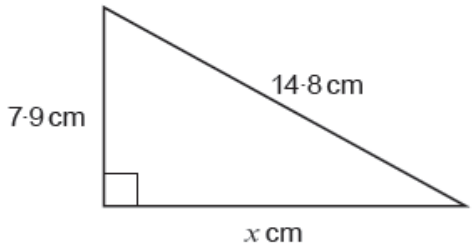

Diagram not drawn to scale

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x = ... cm

(b) [3]

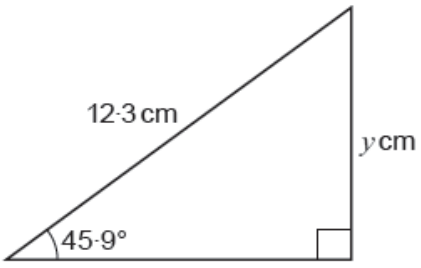

Diagram not drawn to scale

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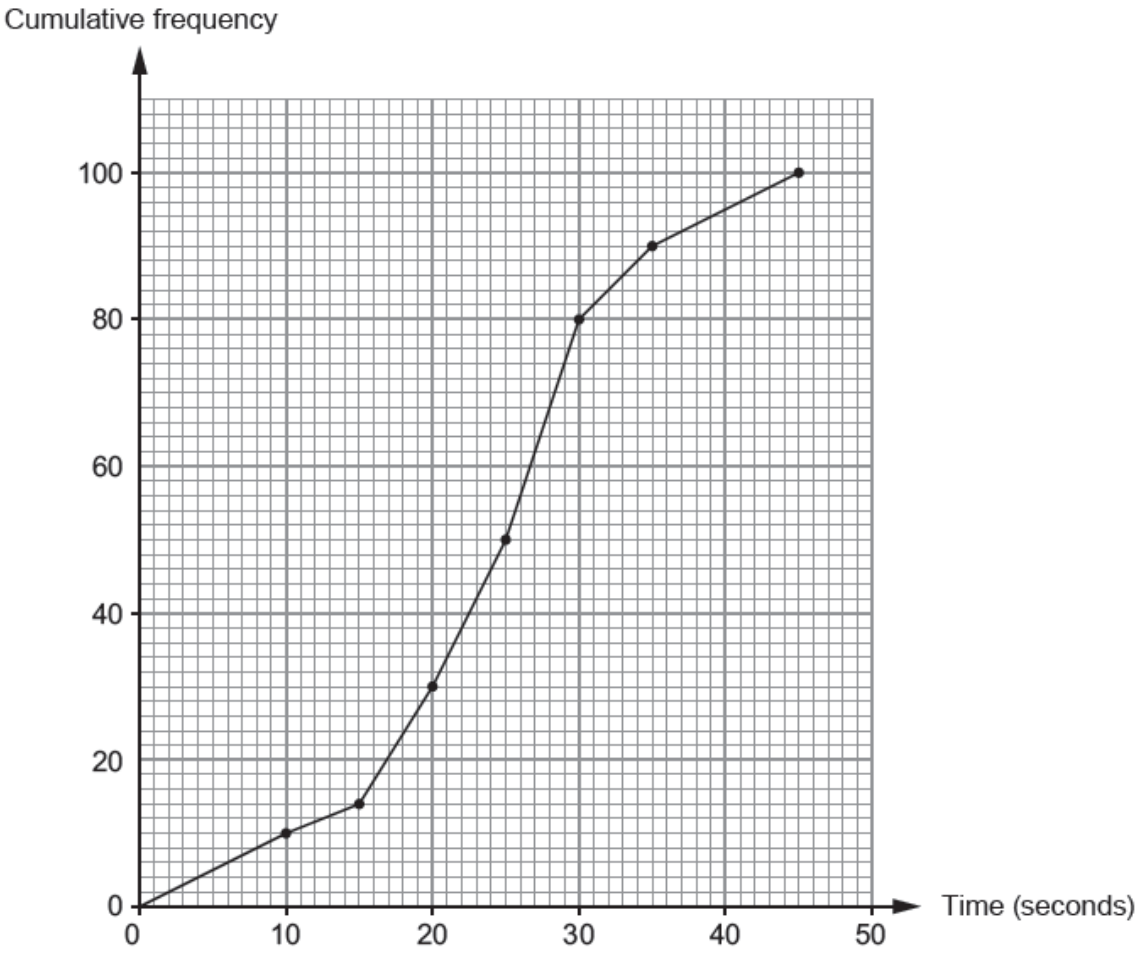
y = ... cm

6.

An exercise was carried out to time a group of 100 passengers leaving an aeroplane using the emergency exits.
The results are illustrated in the cumulative frequency diagram shown below.



(a) How many passengers took between 20 seconds and 35 seconds to leave the plane? [2]

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(b) How many passengers took more than 40 seconds to leave the plane? [2]

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(c) The regulations state that 85% of the passengers should be able to leave the plane in less than 30 seconds.
Complete the following statement. You must show your working. [2]

'In this exercise, the target time for passengers leaving the plane in an emergency was missed by ..... seconds.'

7.

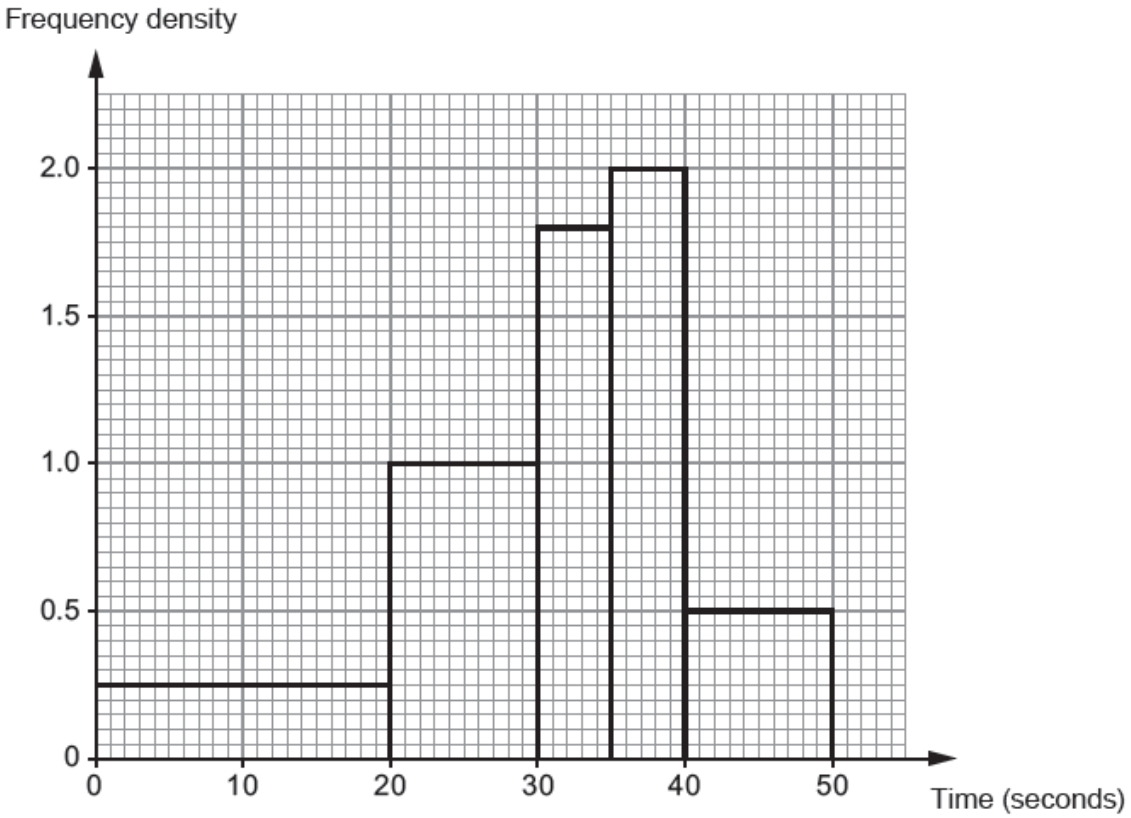
(a) The surface area of a circular pond is $35\,m^2$.
Calculate the diameter of the pond. [4]

(b) Water flows into the pond at a rate of 50 litres per minute.
Complete the following statement by inserting a value written in standard form, correct to 3 significant figures. [4]

'Water flows into the pond at a rate of ..... m^3 per second.'

8.

The histogram shows the times taken by people in a group to get off a train.



(a) Calculate the number of people in the group. [3]

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(b) Calculate an estimate for the number of people who took more than 37 seconds to get off the train. [2]

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(c) In fact, no one got off the train in less than 10 seconds.
Explain how the histogram should be changed to take this information into account. [1]

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9.

(a) Factorise $x^2 - 5x - 24$ and hence solve $x^2 - 5x - 24 = 0$. [3]

(b) Solve the following quadratic equation.
Give your answers correct to two decimal places.
You must show all your working. [3]

$$5x^2 + 2x - 9 = 0$$

10.

Osian owns 20 ties.
He has 2 plain red ties, 3 plain blue ties and 15 mixed-colour patterned ties.

Osian selects 2 ties at random to take on holiday.

(a) Calculate the probability that the 2 ties Osian takes on holiday are both plain ties. [2]

(b) Calculate the probability that **at most** one of the ties Osian takes is a plain red tie. [3]

11.

Two **similar** rugby balls are shown below.

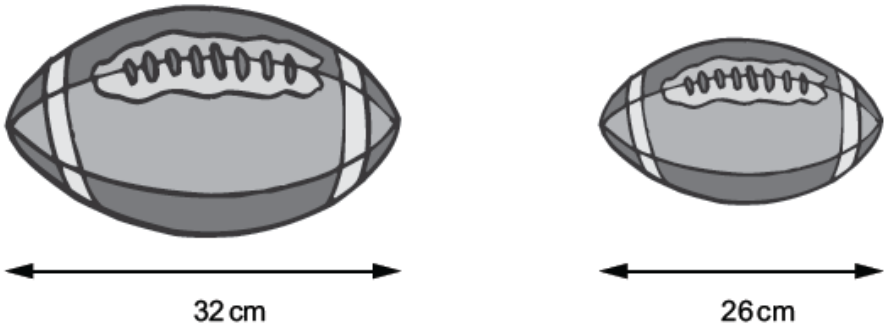

Diagram not drawn to scale

The volume of the larger rugby ball is 500 cm^3.
Calculate the volume of the smaller rugby ball. [3]

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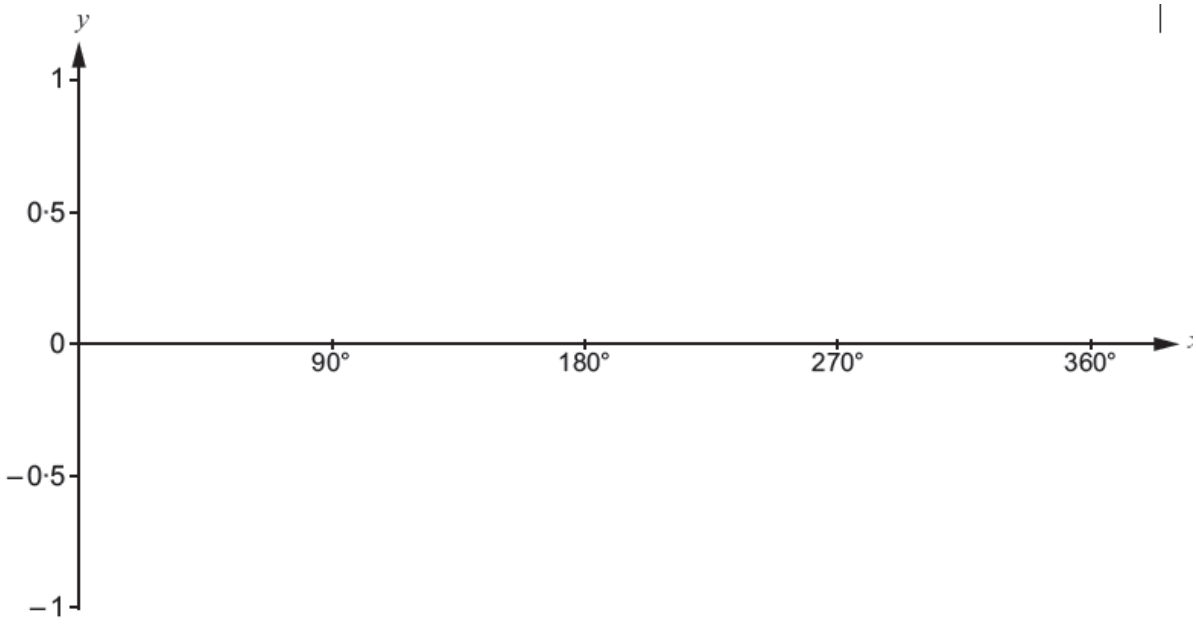
12.

(a) Use the axes shown below to sketch the graph of $y = \cos x$ between $x = 0°$ and $x = 360°$. [1]



(b) Find all the solutions of the equation $\cos x = -0{\cdot}616$ in the range 0° to 360°.
Give your solutions correct to the nearest degree. [2]

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13.

The diagram shows a quadrilateral $ABCD$. Angle $D\hat{A}B$ is acute.

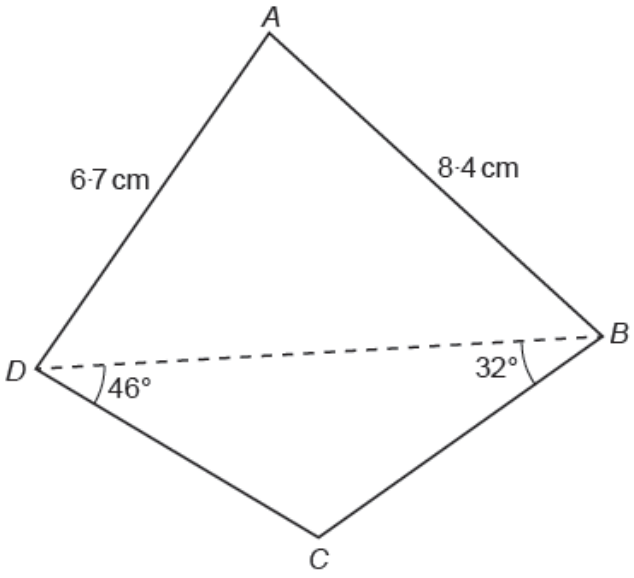

Diagram not drawn to scale

The area of triangle ABD is 22·8 cm^2.
Calculate the perimeter of the quadrilateral $ABCD$. [10]