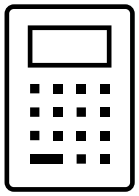
Surname:	Forename(s):

GCSE Mathematics – Higher Tier

Paper 2 – Calculator



Practice Set C

ANSWERS

/40

Materials

- **Formulae Sheet** (on the next page)
- **Black** ink or ball-point pen
- Pencil
- Eraser
- Protractor
- Compass
- Tracing Paper
- **Calculator allowed**

Instructions

- Time allowed: **45 minutes.**
- The total mark for this paper is **40**.
- Show **all** of your working.
- Draw diagrams in pencil.
- Plot graphs in pencil.
- Diagrams are **not** accurately drawn, unless otherwise indicated.
- Cross through any work you don't want to be marked

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h Is their perpendicular separation:

Area of a trapezium = ½ (a + b) h

Volume of a prism = area of cross section x length

Where r is the radius and d is the diameter:

Circumference of a circle = 2πr = πd

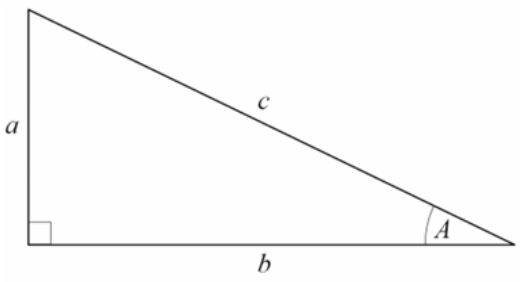
Area of a circle = πr^2

Quadratic Formula

The solution of $ax^2 + bx + c = 0$ where $a \neq 0$

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

Pythagoras' Theorem and Trigonometry

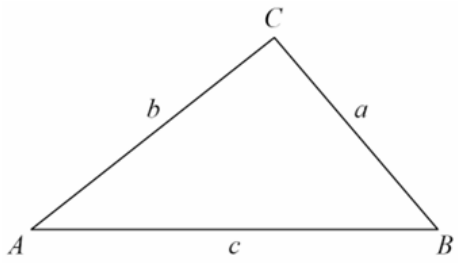


In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$



In any triangle ABC where a, b and c are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

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

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

$$\text{Total accrued} = P\left(1 + \frac{r}{100}\right)^n$$

Probability

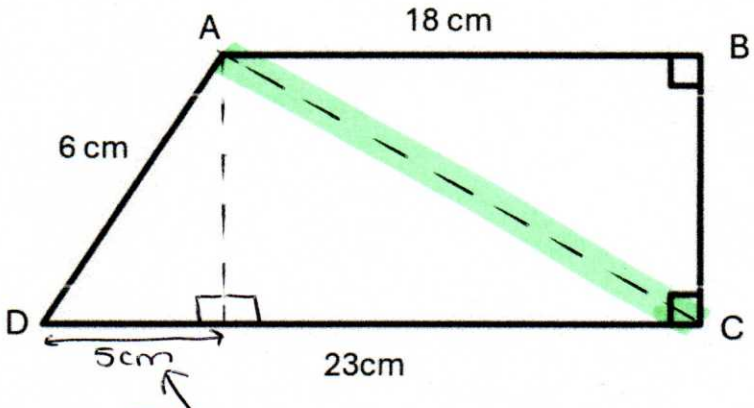
Where P (A) is the probability of outcome A

and P (B) is the probability of outcome B:

P (A or B) = P (A) + P (B) – P (A and B)

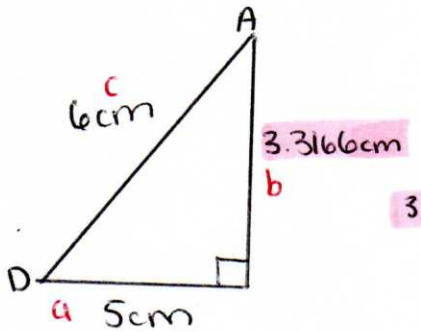
P (A and B) = P (A given B) P(B)

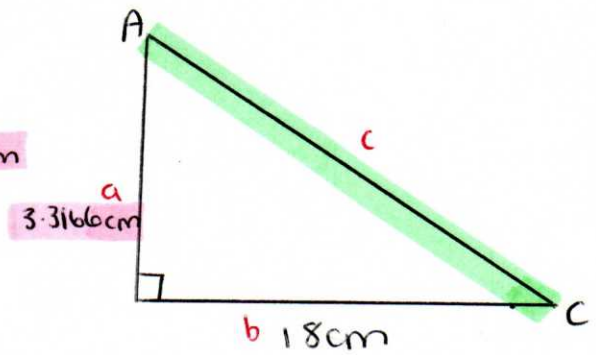
1 ABCD is a trapezium.



Calculate the length of AC. 23 − 18

Give your answer correct to 3 significant figures





$a^2 + b^2 = c^2$

$5^2 + b^2 = 6^2$

$25 + b^2 = 36$

(−25) (−25)

$b^2 = 11$

(√) (√)

$b = 3.3166...$

$a^2 + b^2 = c^2$

$3.3166^2 + 18^2 = c^2$

$335 = c^2$

(√) (√)

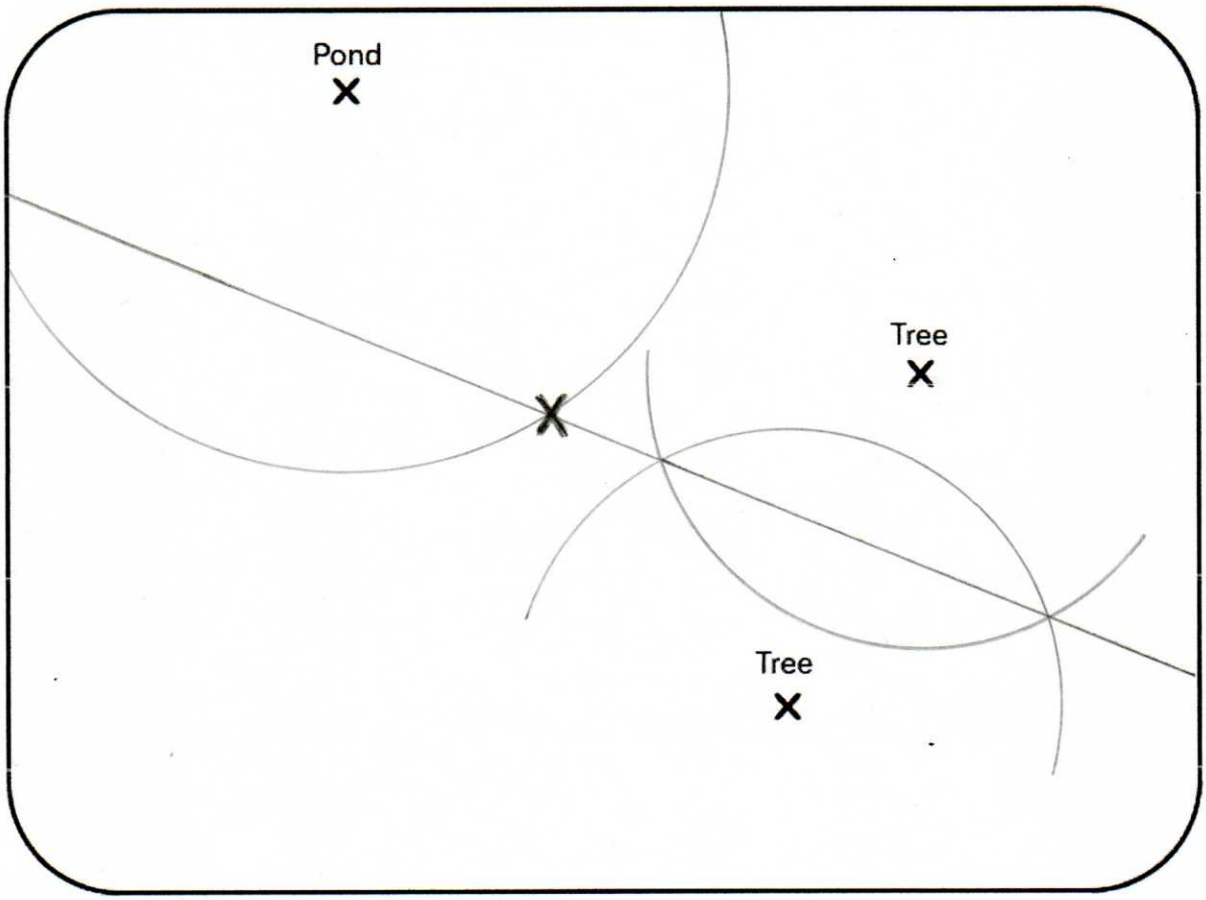
$c = 18.303...$

18.3 cm

(Total for question 1 is 4 marks)

2 Here is a scale drawing of Andy's garden.

1 centimetre represents 4 metres



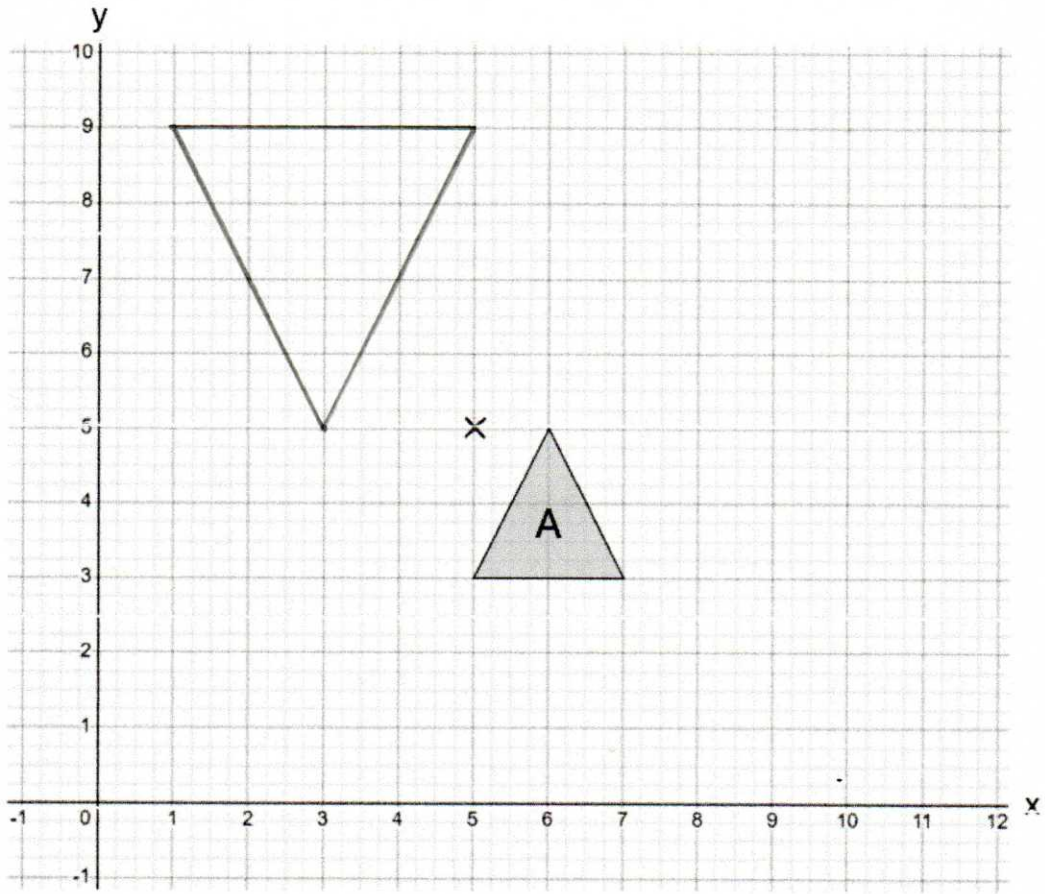
Andy is planning to build a barbecue station in his garden.
He wants the barbecue to be equidistant from both trees.
He also wants the barbecue to be exactly 20 meters away from the pond.

Show, by marking with an X, the position that the barbecue can be built.

×5 ↓ 1cm : 4m
5cm : 20m ↓ ×5

(Total for question 2 is 3 marks)

3 Enlarge triangle A by scale factor – 2 with centre (5 , 5)



(Total for question 3 is 2 marks)

4 'A' is an arithmetic progression.
Here are the first 4 terms of 'A'

-5 3 11 19

'G' is a geometric progression.
Here are the first 4 terms of 'G'

3 (×3) 9 (×3) 27 (×3) 81 (×3) 243 (×3) 729 (×3) 2187

The n^{th} term of 'A' is equal to the 7^{th} term of 'G'
Work out the value of n.

-5 (-13) 3 (+8) 11 (+8) 19 (+8)

n^{th} term = $8n - 13$

$8n - 13 = 2187$
(+13) (+13)
$8n = 2200$
(÷8) (÷8)
$n = 275$

n = 275

(Total for question 4 is 4 marks)

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5 Simplify $\sqrt{2}x + \sqrt{2}x + \sqrt{8}x$

$\sqrt{8} = \sqrt{4} \times \sqrt{2} = 2\sqrt{2}$

$\sqrt{2}x + \sqrt{2}x + 2\sqrt{2}x = 4\sqrt{2}x$

$4\sqrt{2}x$

(Total for question 5 is 2 marks)

6 The table below gives information about the time, t minutes, that 80 people spend in the gym on a random Monday evening.

Time (t minutes)	Frequency
$0 \leq t < 30$	3
$30 \leq t < 45$	7
$45 \leq t < 60$	19
$60 \leq t < 80$	35
$80 \leq t < 100$	11
$100 \leq t < 120$	5

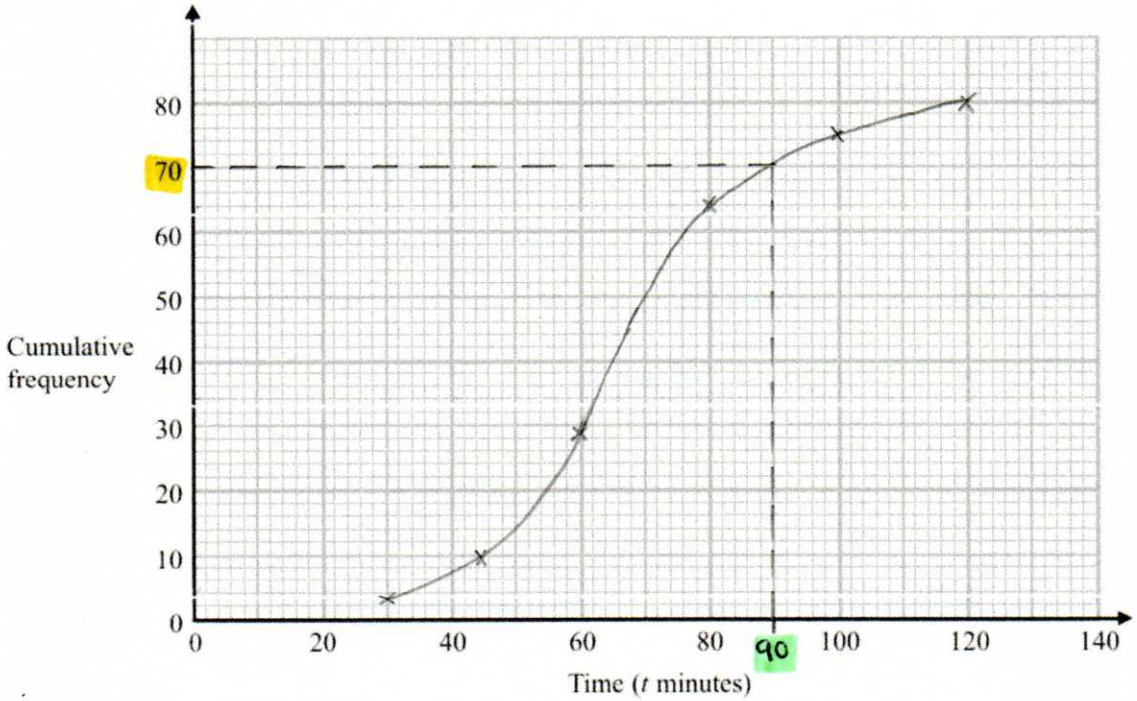
(a) Complete the cumulative frequency table.

Time (t minutes)	Cumulative Frequency
$0 \leq t < 30$	3
$0 \leq t < 45$	10
$0 \leq t < 60$	29
$0 \leq t < 80$	64
$0 \leq t < 100$	75
$0 \leq t < 120$	80

(1)

6 (continued)

(b) On the grid below, draw the cumulative frequency graph for this information.



(2)

(c) Use your graph to estimate the percentage of people who spend more than 1 hour and 30 minutes in the gym.

90 minutes

80 - 70 = 10

$\frac{10}{80} \times 100 = 12.5\%$

12.5 %

(3)

(Total for question 6 is 6 marks)

7 Debbie invests £600 into an account that pays compound interest.
She wants to have at least £680 in the account after 3 years.
Work out the minimum rate of annual interest that she will need.
Give your answer correct to 1 decimal place.

$$600\left(1+\frac{r}{100}\right)^3 > 680$$

$\div 600$ $\div 600$

$$\left(1+\frac{r}{100}\right)^3 > 1.1333\ldots$$

$\sqrt[3]{}$ $\sqrt[3]{}$

$$1+\frac{r}{100} > 1.042603\ldots$$

-1 -1

$$\frac{r}{100} > 0.042603\ldots$$

$\times 100$ $\times 100$

$$r > 4.2603\ldots$$

4.3 %

(Total for question 7 is 3 marks)

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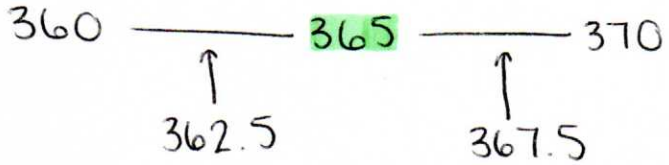
8 The number, N, is rounded to 365 to the nearest 5.
Write down the error interval for N



362.5 ≤ N < 367.5

(Total for 8 is 2 marks)

9 f is directly proportional to the square root of g.
When f = 5, g = 4

g is inversely proportional to square of h.
When h = 2, g = 3

Find f when h = 1
Give your answer in the form $a\sqrt{3}$

$f \propto \sqrt{g}$

$f = k\sqrt{g}$

$5 = k\sqrt{4}$

$5 = 2k$

$k = \frac{5}{2} \Rightarrow f = \frac{5}{2}\sqrt{g}$

$g \propto \frac{1}{h^2}$

$g = \frac{k}{h^2}$

$3 = \frac{k}{2^2}$

$3 = \frac{k}{4}$

$k = 12 \Rightarrow g = \frac{12}{h^2}$

when $h = 1$

↳ $g = \frac{12}{1^2} = 12$

↳ $f = \frac{5}{2}\sqrt{g}$

↳ $f = \frac{5}{2}\sqrt{12}$ ← $\sqrt{12} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$

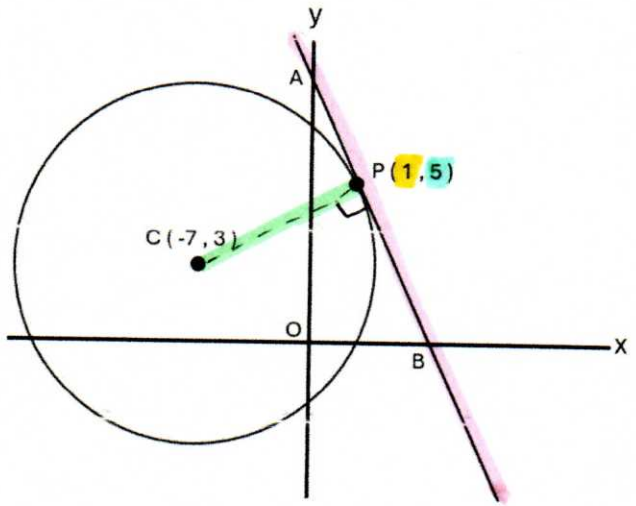
↳ $f = \frac{5}{2} \times 2\sqrt{3}$

↳ $f = 5\sqrt{3}$

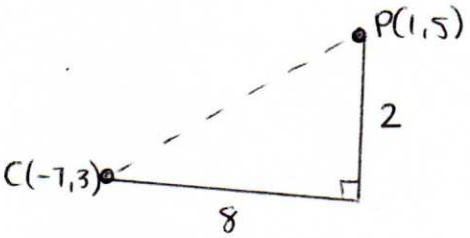
f = $5\sqrt{3}$

(Total for question 9 is 5 marks)

10 A circle has centre C (-7 , 3)
The point P (1 , 5) lies on the circumference of the circle.



(a) Show that the equation of the tangent to the circle at point P is y = -4x +9



gradient of radius $= \frac{2}{8} = \frac{1}{4}$

radius and tangent are perpendicular, so their gradients are the negative reciprocal of eachother.

gradient of tangent $= -4$

Equation of tangent: $y - y_1 = m(x - x_1)$

$y - 5 = -4(x - 1)$

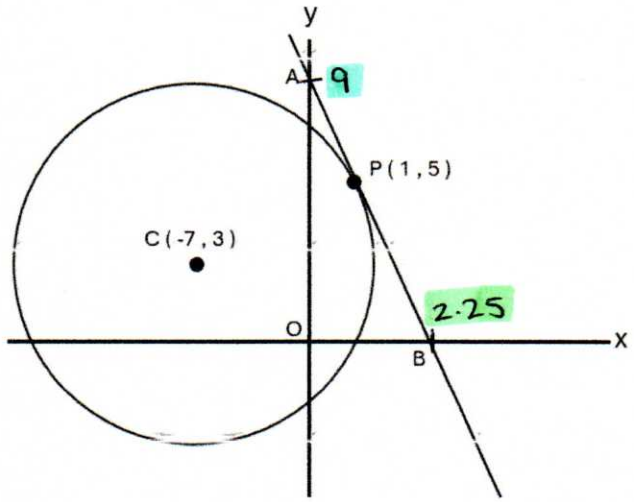
$y - 5 = -4x + 4$

$+5 \quad +5$

$y = -4x + 9$

(5)

10 (continued)



(b) The tangent meets the Y axis at point A, and meets the X axis at point B.

Calculate the area of the triangle OAB

Give your answer correct to 3 significant figures.

Equation of tangent: $y = -4x + 9$

when $x=0$, $y = -4(0) + 9 = 9$

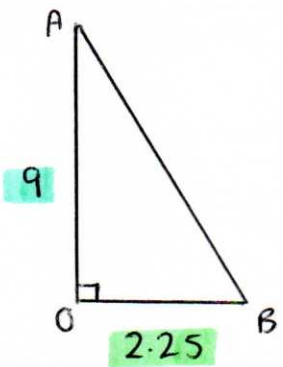
when $y=0$, $0 = -4x + 9$

$-9 \quad -9$

$-9 = -4x$

$\div -4 \quad \div -4$

$2.25 = x$



$$\text{Area} = \frac{b \times h}{2}$$

$$= \frac{2.25 \times 9}{2}$$

$$= 10.125$$

10.1 units²

(4)

(Total for question 10 is 9 marks)

END OF TEST

TOTAL FOR THIS PAPER IS 40 MARKS

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