

GCSE Mathematics
Practice Booklet 2024
Paper 1 (Non-Calculator)

Higher Tier



GCSE
Maths Tutor



How it all Works!

Work through the practice booklet,
scan the code, watch the live
tutorial and check your answers!

Try it out!

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages of your working.

1. James buys a television.

20% VAT is added to the price of the television.

James then has to pay a total of £600

What is the price of the television with **no** VAT added?

.....
(2 marks)

2. a) Work out $4\frac{1}{5} - 2\frac{2}{3}$

Give your answer as a mixed number.

.....
(3 marks)

b) Work out $3\frac{1}{2} \times 1\frac{3}{5}$

Give your answer as a mixed number in its simplest form.

.....
(3 marks)

3. Prove algebraically that $0.7\dot{3}$ can be written as $\frac{11}{15}$

.....
(2 marks)

4. a) Write 84 as a product of its prime factors.

.....
(2 marks)

b) Find the lowest common multiple (LCM) of 60 and 84.

.....
(2 marks)

5. a) Work out the value of $81^{-\frac{1}{2}}$

.....
(2 marks)

b) Work out the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

.....
(2 marks)

6. $\sqrt{5}(\sqrt{8} + \sqrt{18})$ can be written in the form $a\sqrt{10}$, where a is an integer.
Find the value of a .

.....
(3 marks)

7. a) Write 32,460,000 in standard form

.....
(1 mark)

b) Write 0.00562 in standard form

.....
(1 mark)

8. a) Write 1.452×10^3 as an ordinary number

.....
(1 mark)

b) Write 4.96×10^{-3} as an ordinary number

.....
(1 mark)

9. a) Work out $(4.2 \times 10^3) + (5.3 \times 10^2)$

Give your answer in standard form.

.....
(2 marks)

b) Work out $(2.52 \times 10^5) \div (4 \times 10^{-3})$

Give your answer in standard form.

.....
(2 marks)

10. a) Expand and Simplify $5(p + 3) - 2(1 - 2p)$

.....
(2 marks)

b) Expand and Simplify $(x - 3)(2x + 3)(4x + 5)$

.....
(3 marks)

11. a) Simplify fully $\frac{8(x-4)}{(x-4)^2}$

.....
(1 mark)

b) Factorise fully $50 - 2y^2$

.....
(2 marks)

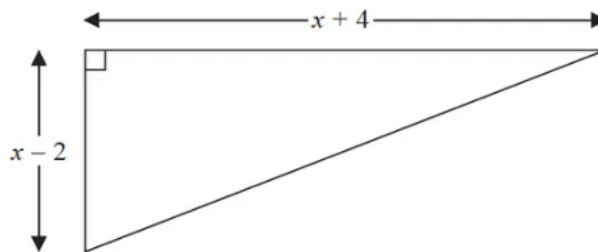
12. Simplify fully $\frac{x}{x+2} + \frac{2x}{x-4}$

.....
(3 marks)

13. Write $\frac{4x^2-9}{6x+9} \times \frac{2x}{x^2-3x}$ in the form $\frac{ax+b}{cx+d}$ where a, b, c and d are integers.

.....
(3 marks)

14. The diagram shows a right-angled triangle.



All measurements are in centimetres.

The area of the triangle is 27.5cm^2

Work out the length of the shortest side of the triangle.

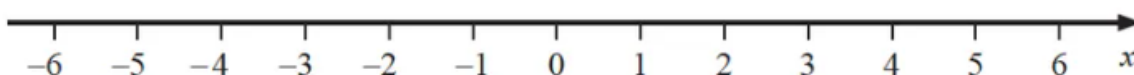
You must show all your working.

.....
(4 marks)

15. a) Solve $14n > 11n + 6$

.....
(2 marks)

b) On the number line, show the set of values of x for which $-2 < x + 3 \leq 4$

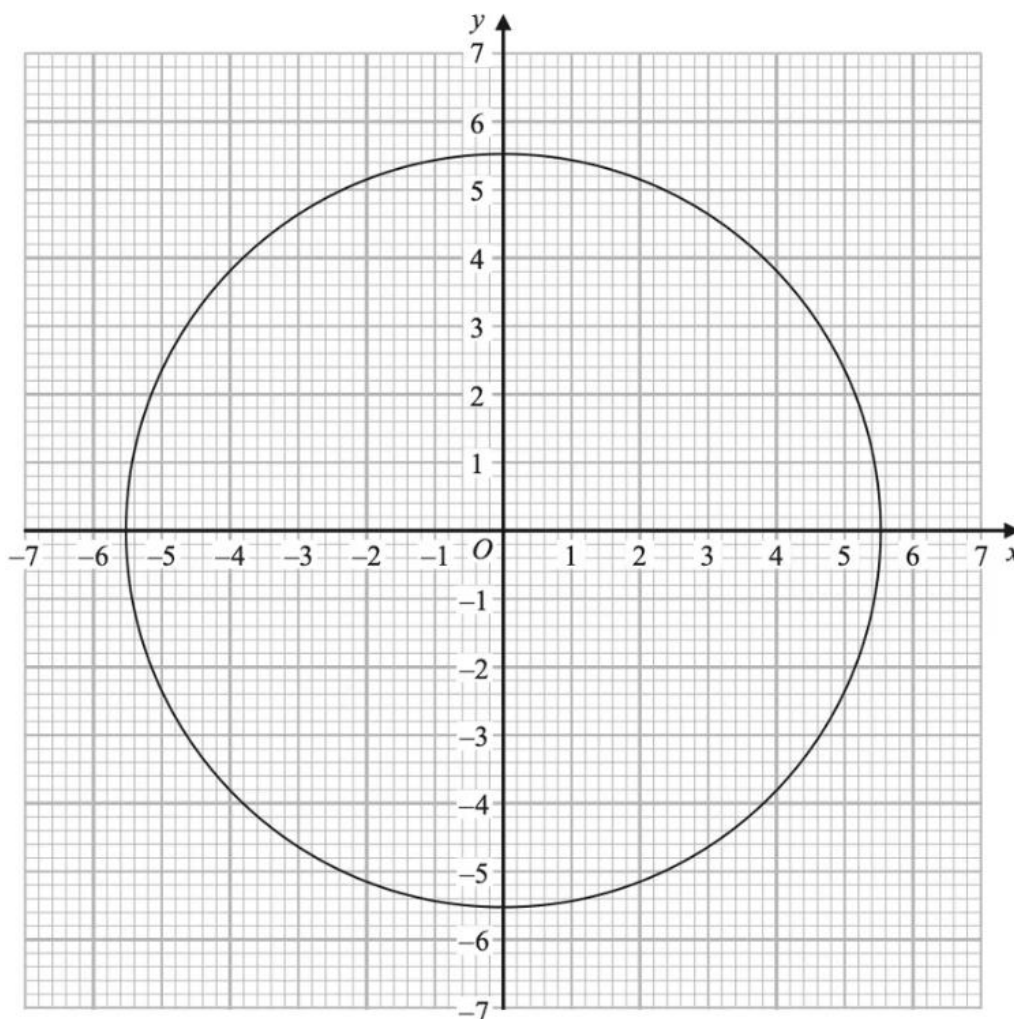


(3 marks)

16. Prove that the square of an odd number is always 1 more than a multiple of 4.

.....
(4 marks)

17. The diagram shows the graph of $x^2 + y^2 = 30.25$



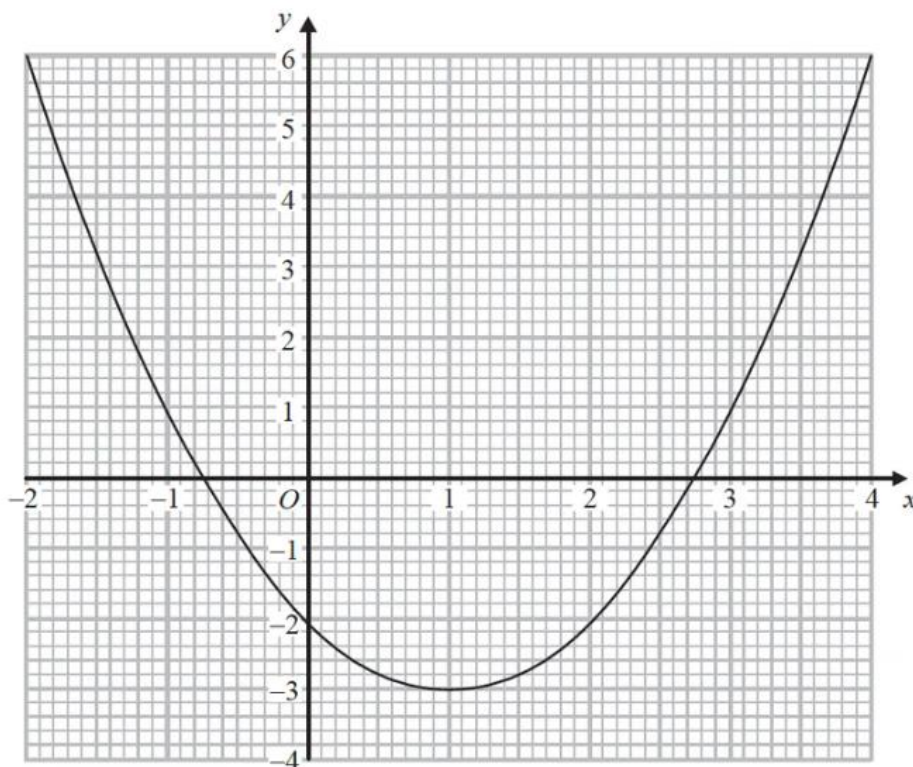
Use the graph to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 30.25$$

$$y - 2x = 1$$

.....
(3 marks)

18. The graph of $y = f(x)$ is drawn on the grid.



a) Write down the coordinates of the turning point of the graph.

.....
(1 mark)

b) Write down estimates for the roots of $f(x) = 0$

.....
(1 mark)

c) Use the graph to find an estimate for $f(1.5)$

.....
(1 mark)

19. The equation of the line L_1 is $y = 3x - 2$
The equation of the line L_2 is $3y - 9x + 5 = 0$

Show that these two lines are parallel.

.....
(2 marks)

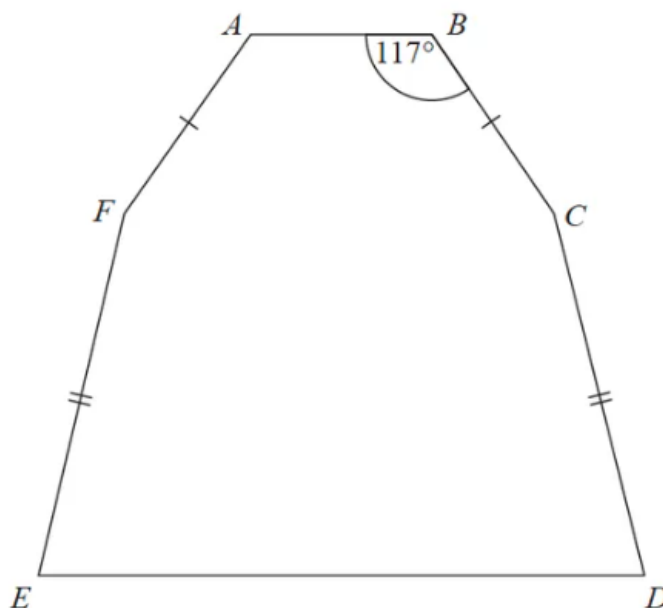
20. Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$

$$y - 3x = 13$$

.....
(5 marks)

21. The diagram shows a hexagon.
The hexagon has one line of symmetry.



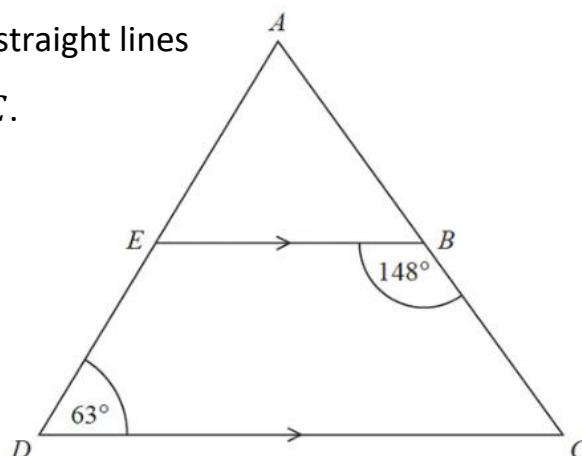
Angle $BCD = 2 \times$ angle CDE

Work out the size of angle AFE .

You must show all your working.

.....
(4 marks)

22. ADC is a triangle.
 AED and ABC are straight lines
 EB is parallel to DC .

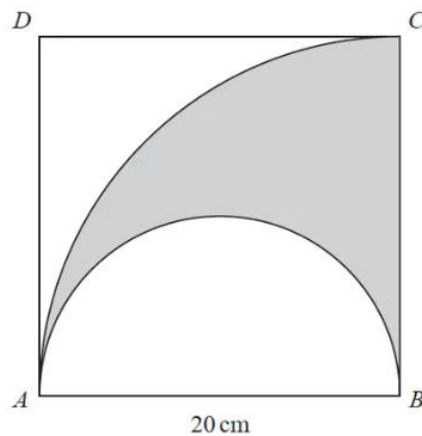


Work out the size of angle EAB .

You must give a reason for each stage of your working.

.....
(5 marks)

23. The diagram shows a square ABCD with sides of length 20cm.
It also shows a semicircle and an arc of a circle.



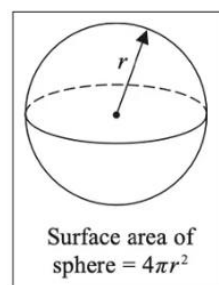
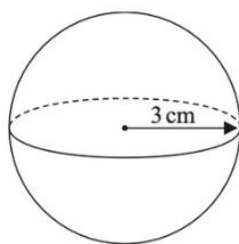
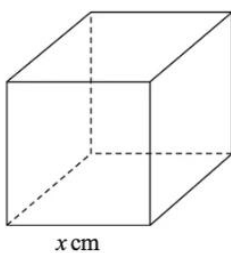
AB is the diameter of the semicircle.

AC is an arc of a circle with centre B.

Show that $\frac{\text{area of the shaded region}}{\text{area of the square}} = \frac{\pi}{8}$

.....
(4 marks)

24. The diagram shows a cube with edges of length x cm and a sphere of radius 3cm.

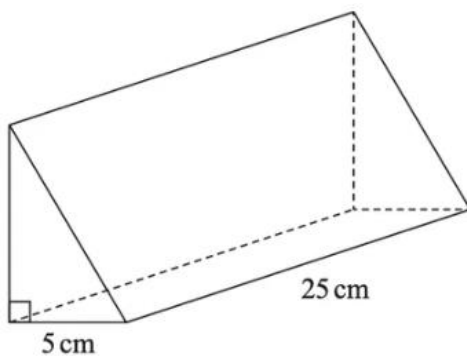


The surface area of the cube is equal to the surface area of the sphere.

Show that $x = \sqrt{k\pi}$ where k is an integer.

(4 marks)

25. The diagram shows a prism.



The prism has a length 25cm

The prism has a volume 750cm^3

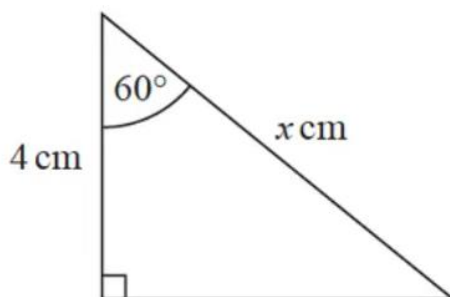
Work out the height of the prism.

.....
(3 marks)

26. a) Write down the exact value of $\tan 45^\circ$

.....
(1 mark)

Here is a right-angled triangle



$\cos 60^\circ = 0.5$

b) Work out the value of x

.....
(2 marks)

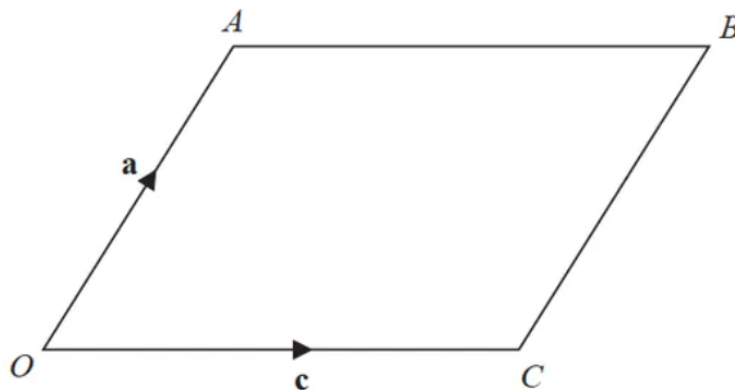
27. Triangle ABC has perimeter 20 cm.

$AB = 7$ cm and $BC = 4$ cm.

By calculation, deduce whether triangle ABC is a right-angled triangle.

.....
(3 marks)

28.



$OACB$ is a parallelogram

$\vec{OA} = \mathbf{a}$ and $\vec{OC} = \mathbf{c}$

X is the midpoint of the line AC .

OCD is a straight line so that $OC : CD = k : 1$

Given that $\vec{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$

Find the value of k .

$k =$
(4 marks)

29. A shop sells packs of black pens, packs of red pens and packs of green pens.

There are

2 pens in each pack of black pens

5 pens in each pack of red pens

6 pens in each pack of green pens

On Monday,

packs of black pens sold : packs of red pens sold : packs of green pens sold = 7 : 3 : 4

A total of 212 pens were sold.

Work out the number of green pens sold.

.....
(4 marks)

30. In a village
the number of houses and the number of flats are in the ratio 7 : 4
the number of flats and the number of bungalows are in the ratio 8 : 5

There are 50 bungalows in the village.

How many houses are there in the village?

.....
(3 marks)

31. Robin, Mary and Isabel collect stamps.

The amount of stamps they own are in the ratio

Robin's stamps : Mary's stamps : Isabel's stamps = 4 : 7 : 15

Isabel has 24 more stamps than Mary.

Isabel has more stamps than Robin.

How many more?

.....
(3 marks)

32. There are four types of cards in a game.

Each card has a black or white circle or a black or white triangle.

The number of cards with a black shape : number of cards with a white shape = 3 : 5

The number of cards with a circle : number of cards with a triangle = 2 : 7

Express the total number of cards with a black shape as a fraction of the total number of cards with a triangle.

.....
(3 marks)

33. h is inversely proportional to p
 p is directly proportional to \sqrt{t}

Given that $h = 10$ and $t = 144$ when $p = 6$
Find a formula for h in terms of t .

.....
(4 marks)

34. Liquid **A** and liquid **B** are mixed to make liquid **C**.

Liquid **A** has a density of 70kg/m^3
Liquid **A** has a mass of 1400kg

Liquid **B** has a density of 280kg/m^3
Liquid **B** has a volume of 30m^3

Work out the density of liquid **C**.

..... kg/m^3
(3 marks)

35. A car travels for 18 minutes at an average speed of 72km/h

How far will the car travel in these 18 minutes?

..... km
(2 marks)

36. There are only red counters, blue counters and yellow counters in a bag.
The ratio of the number of red counters to the number of blue counters is 3 : 17

Sian takes at random a counter from the bag.
The probability that the counter is yellow is 0.2

Work out the probability that Sian takes a red counter.

.....
(3 marks)

37. The functions f and g are such that

$$f(x) = 3x - 1 \text{ and } g(x) = x^2 + 4$$

(a) Find $f^{-1}(x)$

$f^{-1}(x)$
(2 marks)

Given that $fg(x) = 2gf(x)$,

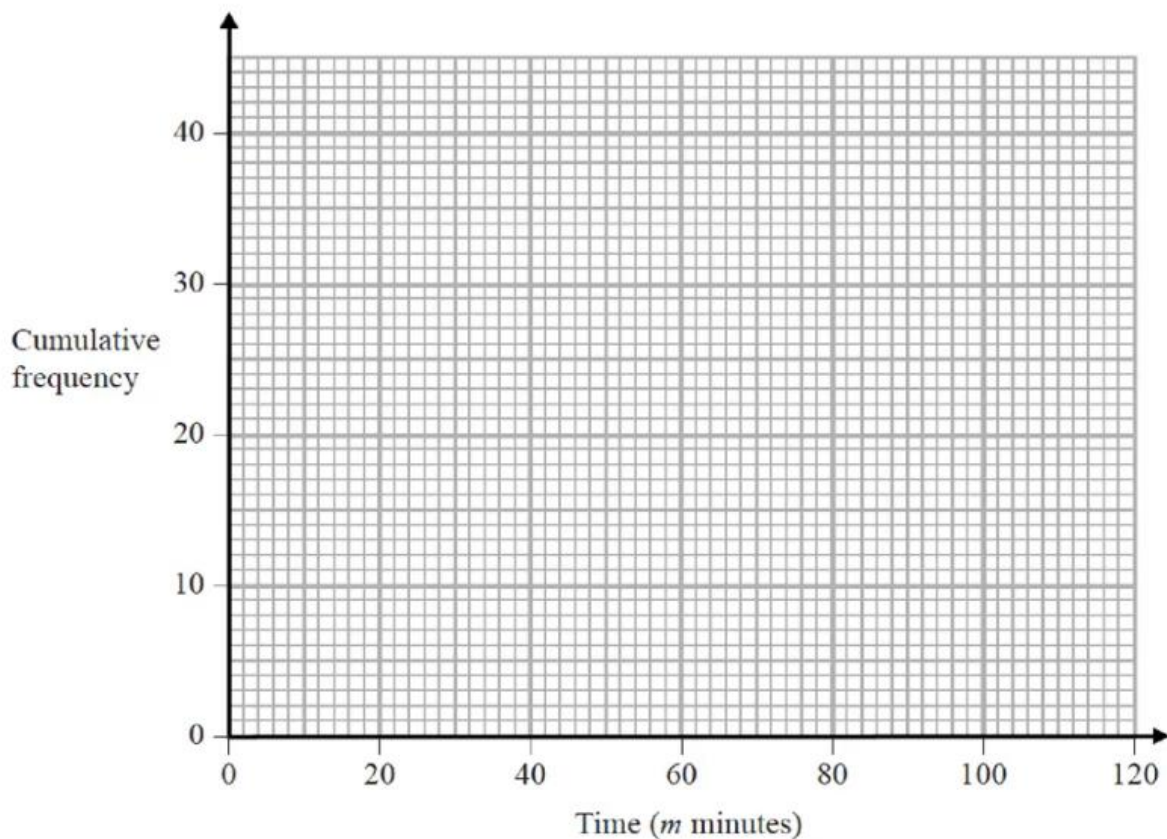
(b) show that $15x^2 - 12x - 1 = 0$

(5 marks)

38. The cumulative frequency table shows information about the times, in minutes, taken by 40 people to complete a test.

| Time (m minutes) | Cumulative frequency |
|---------------------|----------------------|
| $20 < m \leq 40$ | 5 |
| $20 < m \leq 60$ | 25 |
| $20 < m \leq 80$ | 35 |
| $20 < m \leq 100$ | 38 |
| $20 < m \leq 120$ | 40 |

- a) On the grid below, draw a cumulative frequency graph for this information.



- b) Use your graph to find an estimate for the interquartile range.

.....
(4 marks)

39. There are 15 children at a birthday party.
The mean age of the 15 children is 7 years.

9 of the 15 children are boys.
The mean age of the boys is 5 years.

Work out the mean age of the girls.

.....
(3 marks)

40. Sylvia wants to find an estimate for the number of birds in a reserve.

On Monday, she catches 90 of the birds.
She puts a ring on each of the birds and returns them to the reserve.

On Tuesday, she catches 120 of the birds.
She find that 20 of the birds have rings on them.

a) Work out an estimate for the total number of birds in the reserve.

.....
(3 marks)

Sylvia assumes that none of the rings have fallen off between Monday and Tuesday.

b) If Sylvia's assumption is wrong, explain what effect this would have on your answer to part (a).

.....

.....

.....

(1 mark)

End of Booklet