GENIUS
ACADEMY LTD.

EDEXCEL

GCSE

MATHEMATICS

REVISION & PRACTICE [PREDICTED PAPERS 2025 NON CALCULATER]

Master GCSE Maths with clarity and confidence—turning knowledge into real success.

Preface

The GCSE Maths Book 2025: Exam-Style Questions and Predicted Papers has been designed to provide students with a challenging and effective preparation experience. **These predicted papers are 10% harder than the actual GCSE Maths exams,** ensuring that students build resilience, confidence, and strong problem-solving skills. To account for the increased difficulty, the grade boundaries for a **Grade 8 are set at 60%, while a Grade 9 requires 73% aligning with a high standard of assessment** while maintaining a realistic grading scale.

Practicing harder-than-standard exam papers offers several key advantages. It boosts confidence by making the actual exam feel more manageable, strengthens problem-solving skills, and enhances time management by training students to work efficiently under pressure. It also improves adaptability, allowing students to handle unfamiliar or complex questions with ease, and fosters a deeper understanding of mathematical concepts rather than relying on memorization. **Exposure to more difficult problems leads to higher exam scores, reduces exam anxiety, and develops mental endurance for long problem-solving tasks.** Furthermore, it gives students an edge over their peers, preparing them for more advanced mathematics, including A-Level Maths.

This book is designed not only to help students achieve their target grades but also to equip them with essential mathematical skills that will serve them well beyond GCSEs. By practicing these challenging predicted papers, students will develop the confidence and competence needed to excel in their exams and future mathematical studies.

”Master GCSE Maths with clarity and confidence—turning knowledge into real success." Genius Academy Team

10 Tips for Avoiding Common Pitfalls in Your GCSE Maths Exams

🔵 1. Don't Panic If You Get Stuck
There are lots of questions on the paper. If you can't do one, **don't panic**! Move on and come back to it later.

✅ 2. Check if Your Answer is Realistic
Does your answer make sense?
❌ Can a second-hand car cost **£7 million**?
❌ Does the Earth weigh **4kg**?
If it doesn't seem right, you might have made a simple error.

🟡 3. Don't Spend Too Long on One Question
If you've spent **more than 5 minutes** on a question, leave it and come back.
💡 Use the **"one mark per minute"** rule as a guide, but don't obsess over the clock.

🟢 4. Check Other Parts of a Question
If you can't do **part (a)**, check **part (b)** before moving on.
📌 Parts are often **independent**, so you might still be able to answer the next one.

🔴 5. Re-read the Question After Answering
Make sure you've answered **everything** that was asked!
❌ Many students calculate **area** when **perimeter** was asked for or give an answer in **cm** when it should be in **metres**.

🔵 6. If You're Stuck, Write Something Down
Think about the maths that might be relevant and jot something down.
✏️ For multi-mark questions, **early marks** can be gained for simple steps like **rearranging an equation**.

🟡 7. Cross Out Work You Don't Want Marked
If you have two solutions—one right and one wrong—clearly cross out the incorrect one.
❌ If both are visible, the examiner may not give you full credit.

🟢 8. Keep Your Work Organised
Organise your working out clearly.
📚 This helps **examiners** find credit-worthy work and makes it easier for **you** to check later.

🔴 9. Use a Familiar Calculator
For calculator papers, use a calculator you are **familiar** with.
🔢 Make sure you know how to use all its functions properly.

🔵 10. Use All the Time You Have
When you've finished, go through the paper and **check all your work**.
✅ Even if you couldn't complete a question, you might pick up **extra marks** for making a start.

GCSE Mathematics Predicted Paper 2025

Non-Calculator (Paper 1: Set 1)

Higher Tier

We (Genius Academy) are one of the fastest growing Tuition Centres in the UK. We have experienced and qualified Tutors who are supporting **more than 600 students** with Tutoring, Detailed Revision Notes, Predicted Papers for a range of UK exam boards including AQA, Edexcel, OCR.

We offer one to one, group classes, and Paper classes for 11+, 13+ **Key Stages, GCSE, iGCSE and Advanced Levels for a wider range of subjects including: Maths, Further Maths, Physics, Chemistry, Biology, Computer Science, English, Geography, Psychology, Business Studies and Economics.

Our aim is to provide a high-quality teaching and learning experience while motivating our students and guiding them to perform well in their studies.

Email: geniusacademy.uk@gmail.com

Telephone No: 07878467435

Genius Academy - Your Pathway to Success (geniusacademytutors.com)

This GCSE Maths paper 1: Set 1 (Predicted Paper 2025) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

GENIUS Academy Ltd.
"Your Pathway to Success"

GCSE Mathematics
Paper 1(Non-Calculator)
Higher Tier

Paper Reference: Paper 1 (Set 1)	**Student Name:**
Time Allowed: 1.5 hour	**Total Marks:** /100

Instructions:

- *Calculators can be used for this paper.*
- *Fill in the boxes with your name/ID.*
- *Answer all questions.*
- *Use the spaces provided to answer the questions.*
- *All steps should be included in you answer.*
- *Diagrams unless otherwise indicated, are NOT accurately drawn,*

Information:

- *The total mark for this paper is 80.*
- *The marks that each question carries are provided.*

Advice:

- *Each question should be read carefully before answering.*
- *The management is important.*
- *Try to answer all questions provided.*
- *If you have time left at the end, re-check your answers.*

For Examiner's Use	
Question	**Mark**
TOTAL	

1.

Find the highest common factor (HCF) of 84 and 108.

(2)

2.

Six-sided dice is biased.

The probabilities of the dice landing on each of the numbers are

Number	1	2	3	4	5	6
Probability	n	0.15	0.20	0.15	n+0.15	0.15

Dice is thrown 2 times

Calculate the probability that Dice will land on 5 (Both times).

(2)

3.

(a) Fully Factorise $(xy)^3 - 25xy$

(b) Make m *as subject*

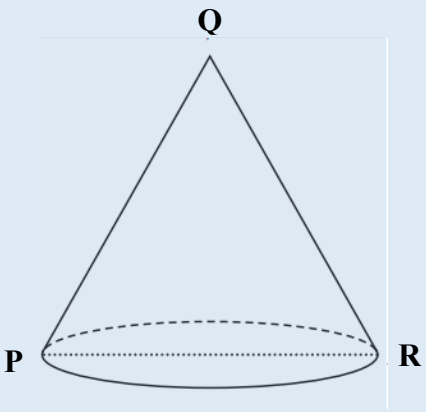
$$\frac{m^2}{m^2-t} - \mu = 0$$

(3)

4.

$$\frac{Area\ of\ the\ base\ of\ the\ cone}{Total\ surface\ area\ of\ the\ cone} = \frac{\sqrt{3}}{2+\sqrt{3}}$$

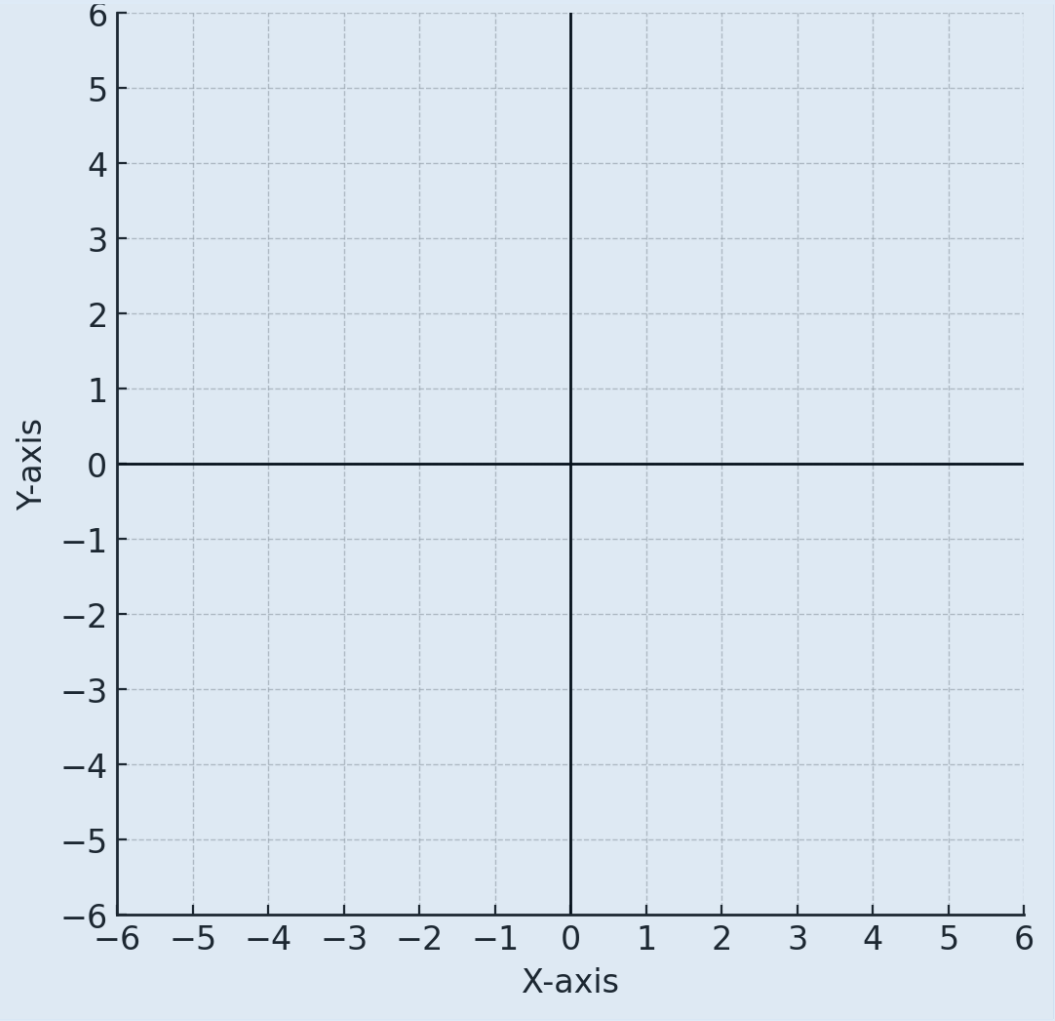
Find the Angle of PQR



(4)

5.

a) On the grid, construct the graph of $x^2 + y^2 = 6.25$



b) Define the following inequality region in the figure above:

$$x^2 + y^2 \leq 6.25$$

$$y > \frac{x}{2} - 1$$

(3)

6.

Find the exact vale of $\left(\frac{\sin 60 \times \tan 30}{\sin 30}\right)^3$

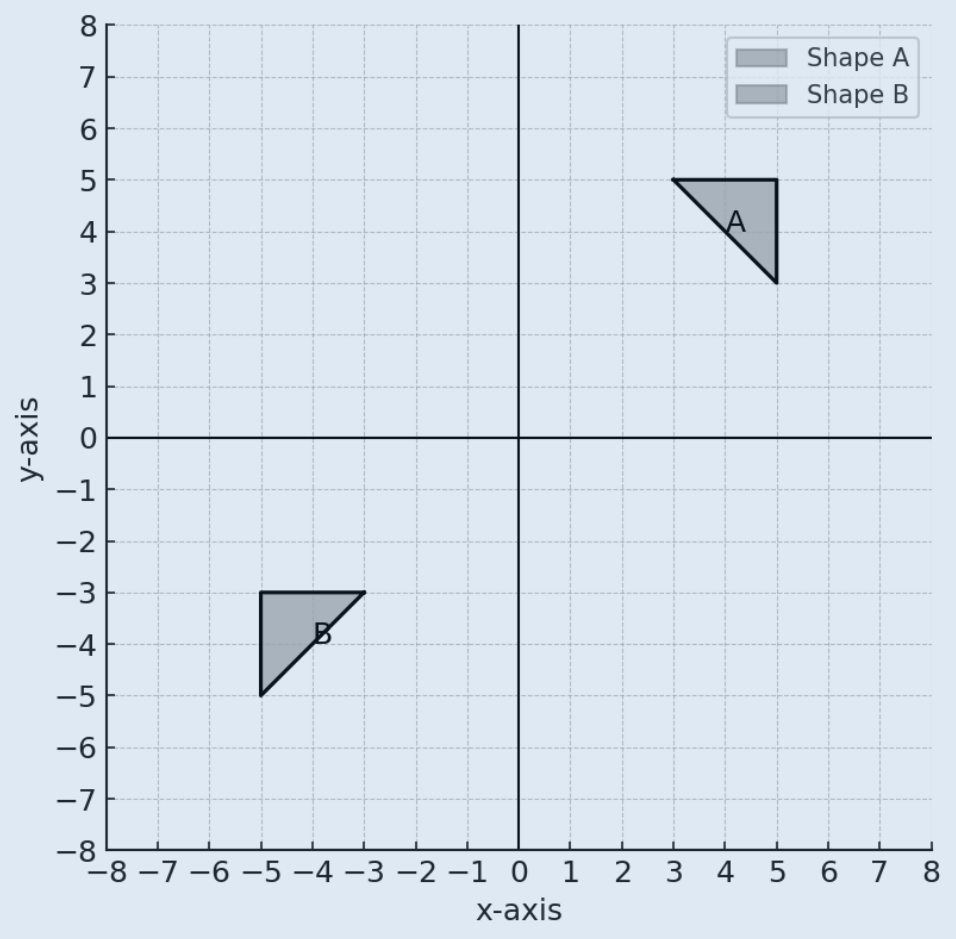
Give your answers in its simplest form

(3)

7.

Shape A can be transformed to shape B by a reflection in the y-axis followed by a translation: $\begin{pmatrix} p \\ q \end{pmatrix}$

Find the values of p and q.



(3)

8.

(a) Complete the table of values for $y = 2x^2 - 2x - 3$

x	-2	-1	0	0	2	3
y						

(b) On the grid, draw the graph of $y = 2x^2 - 2x - 3$ for values of x from -2 to 3

(c) Use your graph to find estimates of the solutions of the equation

$x^2 + 2x - 1 = 0$

(4)

9.

Given that $(x^2 - 5)$: $(4x + 1) = 2:5$, find the possible values of x in the form of surd

(3)

10.

The line $y = 2x + 5$ is the perpendicular bisector of the line PQ where: P has coordinates $(a, 5)$ and Q has coordinates $(2, b)$ Find the coordinates of the midpoint of the line PQ.

(5)

11.

Given the ratios:

a : b = 3 : 4

4b : c = 2 : 5

Work out a : b : c

(3)

12.

Find the set of possible values of x for which

(a) $6x^2 - 14x - 12 \leq 0$ ***or*** $4x^2 + 2x > 30$

(b) $6x^2 - 14x - 12 \leq 0$ ***and*** $4x^2 + 2x > 30$

(5)

13.

For the curve $y = 12 + 6px - 2x^2$, find the coordinates of the maximum point in term of p.

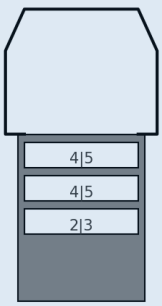
(3)

14.

A combination lock has three dials.

Each dial can be set to one of the numbers 1, 2, 3, 4, 5 or 6

For example, the three-digit number 664 is one way the dials can be set, as shown in the diagram.

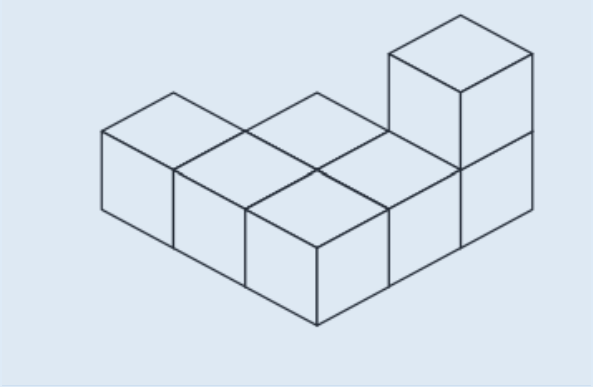


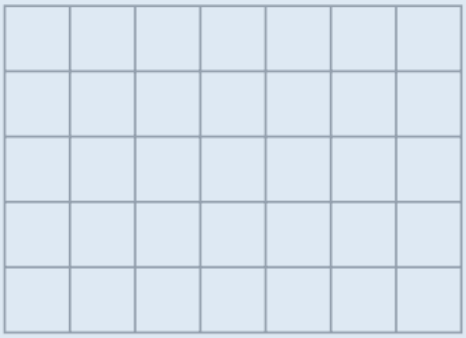
(a) Work out the number of different three-digit numbers that can be set for the combination lock.

(b) How many of the possible three-digit numbers have three different digits?

(3)

15.





The image shows a 3D structure composed of seven 1 cm^3 cubes.

Using the centimetre grid above, draw a top-down view (plan) of the solid, representing how it would look from above.

(4)

16.

Two mathematically similar cones are made from metal. The ratio of the surface area of the smaller cone to the surface area of the larger cone is 9:16. If the volume of the smaller cone is 250 cm^3, find the volume of the larger cone.

(2)

17.

Using algebra, find the value of $\frac{0.3\dot{5}}{0.5\dot{5}}$

(2)

18.

The n^{th} term of a sequence is given by $pn^2 + qn$ where a and b are integers.The 2^{nd} term of the sequence is 2 and the 4^{th} term of the sequence is 10

(a) Find the 5^{th} term of the sequence.

(b) Here are the first 5 terms of a different quadratic sequence find the nth term of this sequence

0 4 12 24 40

(3)

19.

Simplify the expression:

$$\frac{7\left(\sqrt{11}+2\right)}{1-\frac{2}{\sqrt{11}}}$$

Express your answer in the form $a + b\sqrt{11}$, where a, b are integers.

(3)

20.

(a) The function $f(x) = 2^{2x+2} + 14$

$$g(x) = \frac{x^2 - 2}{5}$$

$$h(x) = \sin x^o$$

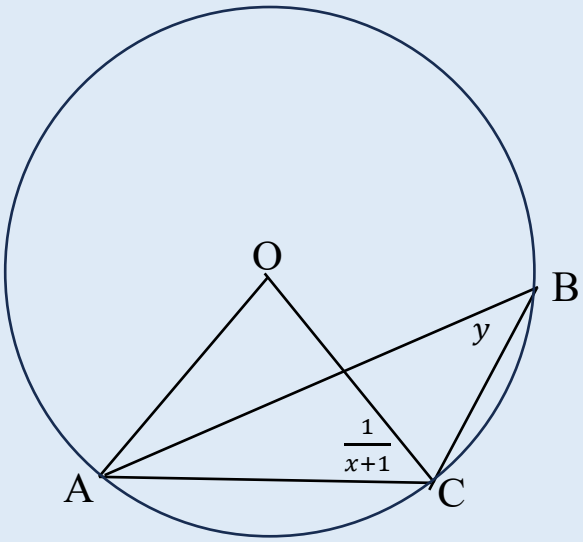
(a) Find $g^{-1}(x)$

(b) Find the value $hf(1)$

(c) $f(x+2) = a(2^x)^b + c$ Find the value of a, b, c

(4)

21.



A, B, C are points on a circle with centre O. Angle (OCA) $= \frac{1}{x+1}$

Find the value of angle (ABC) $y = f(x)$ where:

$y = \frac{ax+b}{x+1}$ a, b are integers, find the value of a and b.

(4)

22.

Given that n can be any integer such that $k \geq 1$, prove that $(k^3 - k)$ is never an odd number.

(3)

23.

Express as a single fraction in its simplest form

$$(t+1) \div \left(\frac{t(4t+3)+4t+3}{12t^2+25t+12} \right)$$

(3)

24.

k is inversely proportional to n

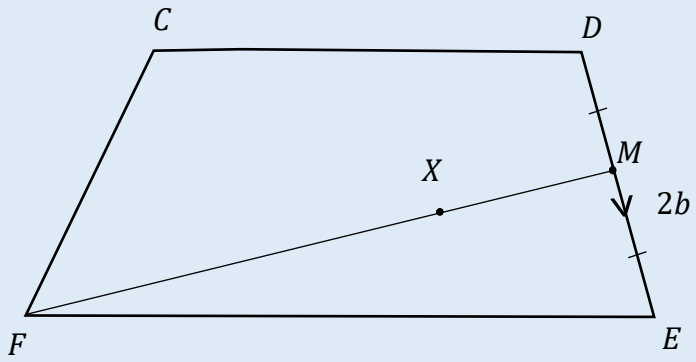
n is directly proportional to $\sqrt{r}$

Given that k = 5 and r = 25 when n = 2,

find a formula for k in terms of r.

(2)

25.



VeGeometryQ

CDEF is a quadrilateral.

$\overrightarrow{CD} = 2a$, $\overrightarrow{DE} = 2b$, and $\overrightarrow{FC} = 2a - 2b$

(a) Express $\overrightarrow{FE}$ in terms of a and/or b.

Give your answer in its simplest form.

M is the midpoint of DE.

X is the point on FM such that FX:XM = μ: 1

CXE is a straight line.

(b) Work out the value of μ

(4)

END

GCSE Mathematics Predicted Paper 2025

Non Calculator (Paper 1: Set 1)

Higher Tier

Answers

1.

HCF of 84 and 108

$84 = (2) \times (2) \times (3) \times 7$

$108 = (2) \times (2) \times (3) \times 3 \times 3$

HCF (84,108)

$= 2 \times 2 \times 3$

$= 12$

2.

Since the sum of all probabilities must be 1

$n + 0.15 + 0.20 + 0.15 + n + 0.15 + 0.15 = 1$

$2n + 0.80 = 1$

$2n = 0.20$

$n = 0.10$

$p(5) = n + 0.15 = 0.10 + 0.15 = 0.25$

The die is thrown twice, the probability of landing on 5 both times is

$p = (5,5) = p(5) \times p(5) = 0.25 \times 0.25 = 0.0625$

3.

a) $(xy)^3 - 25xy$

$xy((xy)^2 - 25)$

$xy((xy)^2 - 5^2)$

$xy((xy - 5)(xy + 5))$

b) $\frac{m^2}{m^2 - t} - \mu = 0$

$\frac{m^2}{m^2 - t} = \mu$

$m^2 = \mu(m^2 - t)$

$m^2 - \mu m^2 = -\mu t$

$$m^2(1-\mu) = -\mu t$$

$$m^2 = \frac{-\mu t}{(1-\mu)}$$

$$m = \pm\sqrt{\frac{-\mu t}{(1-\mu)}}$$

4.

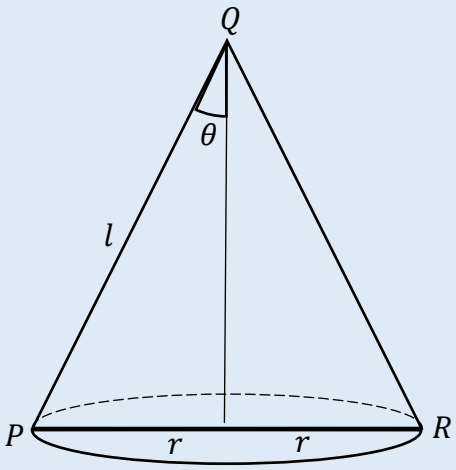
$$\frac{\text{Area of the base of the cone}}{\text{Total surface area of the cone}} = \frac{\sqrt{3}}{2+\sqrt{3}} = \frac{\pi r^2}{\pi r^2 + \pi r t}$$

$$\frac{r^2}{r^2 + rl} = \frac{\sqrt{3}}{2+\sqrt{3}}$$

$$r^2\left(2+\sqrt{3}\right) = (r^2 + rl)\sqrt{3}$$

$$2r^2 = \sqrt{3}rl$$

$$r = \frac{\sqrt{3}}{2}l$$



$$\sin\theta = \frac{r}{l}$$

$$= \frac{\sqrt{3}/2\, l}{l}$$

$$\sin\theta = \sqrt{3}/2$$

$$\sin\theta = \sin 60°$$

$$\theta = \pi/3$$

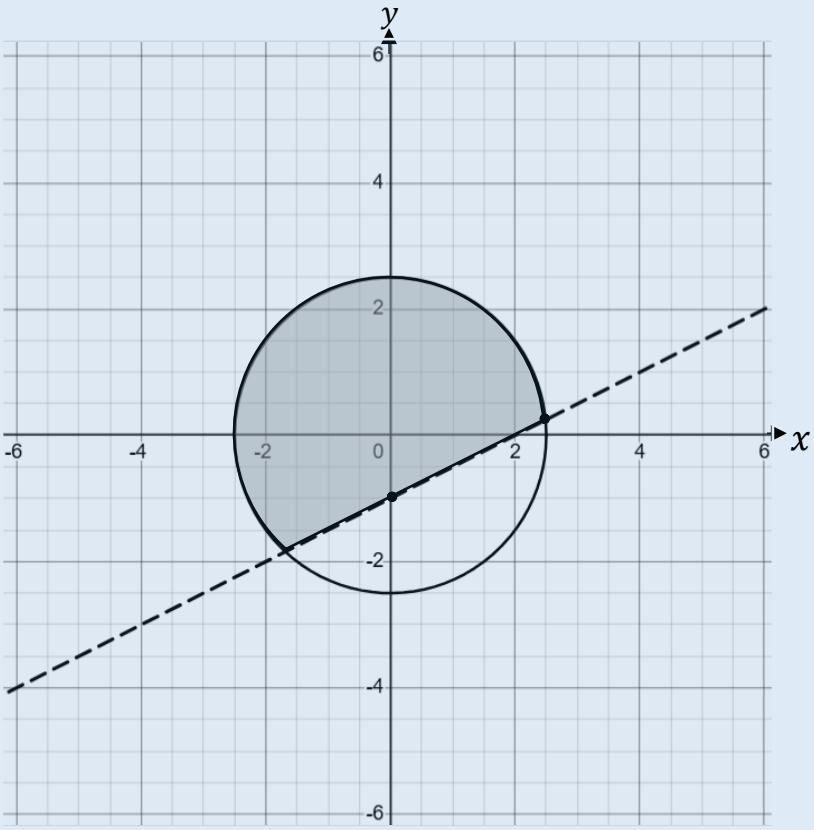
$$P\hat{Q}R = 2\theta$$

$$= \frac{2\pi}{3}$$

$$= 120°$$

5.

a)



$y = {}^{x}/_{2} - 1$

X	0	2
Y	-1	0

6.

$$\left(\frac{\sin 60 \times \tan 30}{\sin 30}\right)^3$$

$$= \left(\frac{\sqrt{{}^{3}/_{2}} \times \frac{1}{\sqrt{3}}}{{}^{1}/_{2}}\right)^3$$

$$= \left(\frac{{}^{1}/_{2}}{{}^{1}/_{2}}\right)^3$$

$= 1$

7.

Reflection of $(3,5) \Rightarrow (-3,5)$

Transformation

$x \longrightarrow$ no translation $\Rightarrow p = 0$

$y \longrightarrow 5 - 8 = -3$ $(-8$ translation$)$

$\Rightarrow q = -8$

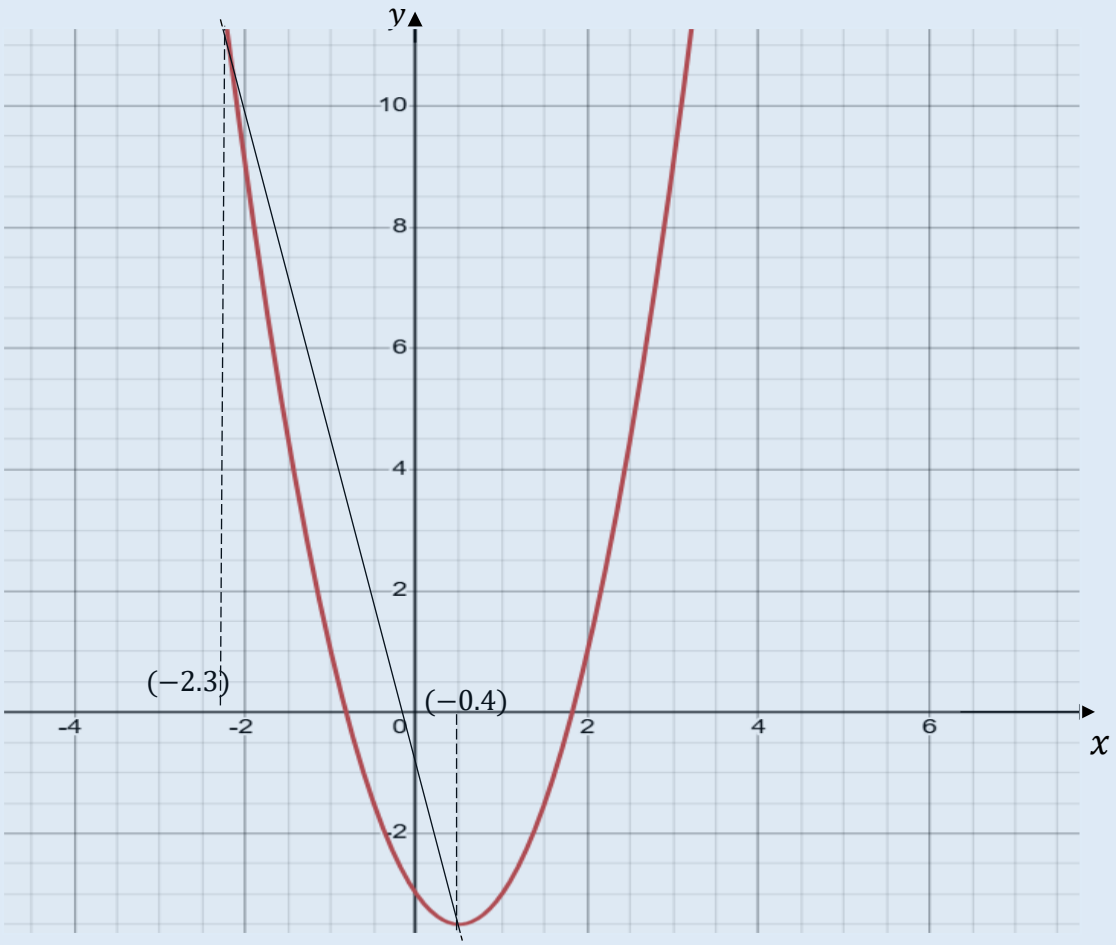
$\begin{pmatrix} 0 \\ -8 \end{pmatrix}$

8.

a)

x	-2	-1	0	0	2	3
y	9	1	-3	-3	1	9

b)



$y = -6x - 2$

x	0	1
y	-2	-8

$$x^2 + 2x - 1 = 0$$

$$2x^2 + 4x - 1 = 0$$

$$2x^2 - 2x + 6x - 3 + 2 = 0$$

$$2x^2 - 2x - 3 = -6x - 2$$

Solutions $\Rightarrow x = -0.4, -2.3$

9.

$(x^2 - 5) : (4x + 1) = 2 : 5$

$$\frac{x^2 - 5}{4x + 1} = \frac{2}{5}$$

$$5(x^2 - 5) = 2(4x + 1)$$

$$5x^2 - 25 = 8x + 2$$

$$5x^2 - 8x - 27 = 0$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 5 \times (-27)}}{2 \times 5}$$

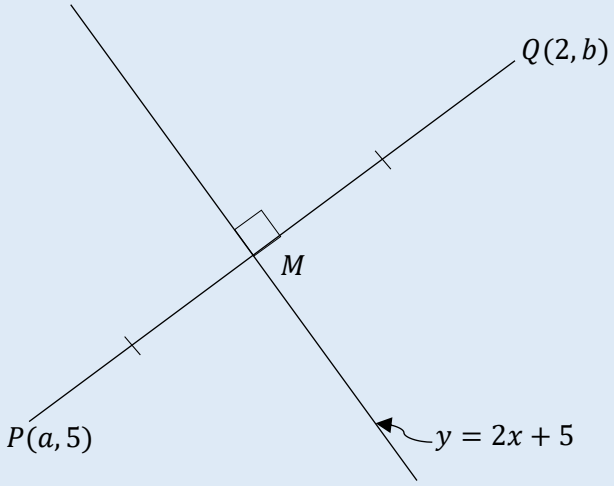
$$= \frac{8 \pm \sqrt{64 + 540}}{10}$$

$$= \frac{8 \pm \sqrt{604}}{10}$$

$$= \frac{8 \pm 2\sqrt{151}}{10}$$

$$x = \frac{4 + \sqrt{151}}{5}$$

10.



M coordinate $= \left(\frac{a+2}{2}, \frac{5+b}{2}\right)$

$\frac{5+b}{2} = 2\left(\frac{a+2}{2}\right) + 5$

$\frac{5+b}{2} = a + 7$

$5 + b = 2a + 14$

$b - 2a = 9$ —— ①

Gradient of line $= 2$

Gradient of $PQ = {}^{-1}/_{2}$

Gradient Of $PQ = \frac{5-b}{a-2}$

${}^{-1}/_{2} = \frac{5-b}{a-2}$

$2 - a = 10 - 2b$

$2b - a = 8$ — ②

① $\times 2 -$ ② $\Rightarrow -3a = 10$

$a = {}^{-10}/_{3}$

① $\Rightarrow b + {}^{20}/_{3} = 9$

$b = {}^{7}/_{3}$

Midpoint $\left(\frac{{}^{-10}/_{3}+2}{2}, \frac{5+{}^{7}/_{3}}{2}\right)$

$({}^{-2}/_{3}, {}^{11}/_{3})$

11.

$a : b = 3 : 4$

$4b : c = 2 : 5$

Work out $a : b : c$

$\frac{a}{b} = \frac{3}{4}$

$\frac{4b}{c} = \frac{2}{5} \Rightarrow \frac{b}{c} = \frac{2}{20} = \frac{1}{10}$

a	:	b	:	c
3	:	4		
		1	:	10
		1×4	:	10×4
3	:	4	:	40

12.

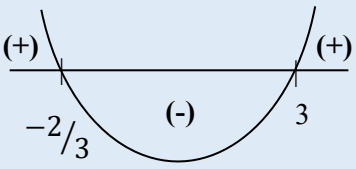
$6x^2 - 14x - 12 \leq 0$ or $4x^2 + 2x > 30$

$6x^2 - 14x - 12 \leq 0$ or $2x(2x + 1) > 30$

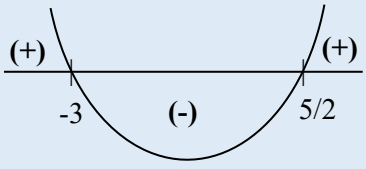
$2(3x^2 - 7x - 6) \leq 0$ or $x(2x + 1) > 15$

$2(3x + 2)(x - 3) \leq 0$ or $2x^2 + x - 15 > 0$

$2(3x + 2)(x - 3) \leq 0$ or $(2x - 5)(x + 3) > 0$



$-2/3 \leq x \leq 3$



$-3 > x$ or $x > 5/2$

Or $x < -3$ or $x \geq {}^{-2}/_{3}$

And $3 \geq x > 5/2$

13.

$Y = 12 + 6px - 2x^2$

$Y = -2(x^2 - 3px - 6)$

$= -2\left[\left(x - \frac{3p}{2}\right)^2 - \left(\frac{3p}{2}\right)^2 - b\right]$

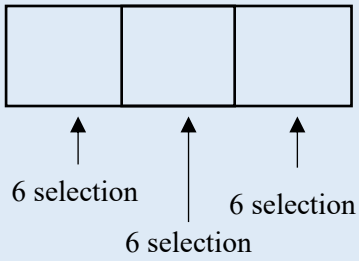
$= -2\left[\left(x - \frac{3p}{2}\right)^2 - \left(\frac{9p^2 + 24}{4}\right)\right]$

$= -2\left(x - \frac{3p}{2}\right)^2 + \frac{9p^2 + 24}{2}$

Max. point $\left(\frac{3p}{2}, \frac{9p^2+24}{4}\right)$

14.

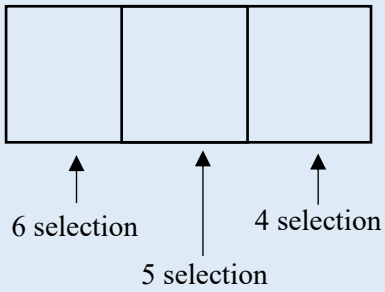
a)



total combination $= 6 \times 6 \times 6$

$= 216$

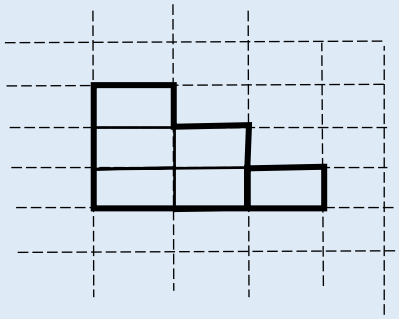
b)



total $\Rightarrow 6 \times 5 \times 4$

$\Rightarrow 120$

15.



16.

		Small	:	large
Area ratio	=	9	:	16
Volume ratio	=	$(\sqrt{9})^3$	:	$(\sqrt{16})^3$
	=	27	:	64

Therefore, large volume $= \frac{250}{27} \times 64 = 592.6cm^3$

17.

$x = 0.3\dot{5}$

$10x = 3.\dot{5}$ — ①

$100x = 35.\dot{5}$ — ②

② − ① ⇒ $90x = 32$

$x = {}^{32}/_{90}$

$y = 0.5\dot{5} = 0.\dot{5}$ — ③

$10y = 5.\dot{5}$ — ④

④ − ③ ⇒ $9y = 5$

$y = {}^{5}/_{9}$

$$\Rightarrow {}^{x}/_{y} = \frac{{}^{32}/_{90}}{{}^{5}/_{9}} = \frac{32}{50} = {}^{16}/_{25}$$

18.

nth term $\Rightarrow\ pn^2 + qn$

$n = 2\ /\qquad 2 = p2^2 + q(2)$

$1 = 2p + q$ — ①

$n = 4\ /\qquad 10 = p(4)^2 + 4q$

$10 = 16p + 4q$

$5 = 8p + 2q$ — ②

① $\times 2 \Rightarrow\quad 2 = 4p + 2q$ — ③

② $-$ ③ $\Rightarrow\quad 3 = 4p$

$p = {}^{3}/_{4}$

$1 = 2({}^{3}/_{4}) + q$

$q = 1\ {}^{-6}/_{4} = {}^{-2}/_{4}$

$q = {}^{-1}/_{2}$

Equation $\Rightarrow\ {}^{3}/_{4}\,n^2\ {}^{-1}/_{2}\,n$

a) $n = 5\ /\quad {}^{3}/_{4}\,(5)^2\ {}^{-1}/_{2}\,(5)$

$\Rightarrow\ {}^{75}/_{4}\ {}^{-5}/_{2} = {}^{65}/_{4}$

b) 0 , 4 , 12 , 24 , 40

4 8 12 16

4 4 4

$2a = 4\qquad ,\qquad 3a + b = 4\qquad a + b + c = 0$

$a = 2\qquad\qquad 6 + b = 4\qquad 2 + (-2) + c = 0$

$b = (-2)$

$\Rightarrow\ 2n^2 - 2n$

19.

$$\frac{7(\sqrt{11}+2)}{1-{}^{2}/_{\sqrt{11}}} \Rightarrow \frac{7(\sqrt{11}+2)}{\frac{\sqrt{11}-2}{\sqrt{11}}} = 7\sqrt{11}\left(\frac{\sqrt{11}+2}{\sqrt{11}-2}\right)$$

$$\Rightarrow 7\sqrt{11}\frac{(\sqrt{11}+2)}{(\sqrt{11}-2)}\ \frac{(\sqrt{11}+2)}{(\sqrt{11}+2)}$$

$$\Rightarrow \frac{7\sqrt{11}(\sqrt{11}+2)^2}{11-4}$$

$$\Rightarrow \frac{7\sqrt{11}(11+4+4\sqrt{11})}{7} \Rightarrow 15\sqrt{11}+44$$

20.

$f(x) = 2^{2x+2} + 14$

$g(x) = \frac{x^2-2}{5}$

$h(x) = \sin x^{\circ}$

a) $y = \frac{x^2-2}{5}$

$5y = x^2 - 2$

$x^2 = 5y + 2$

$x = \pm\sqrt{5y+2}$

$g^{-1}(x) = \sqrt{5x+2}$

b) $f(1) = 2^{2(1)+2} + 14$

$= 2^4 + 14$

$= 16 + 14$

$= 30$

$h\,f(1) = \sin 30°$

$= {}^{1}/_{2}$

c) $f(x+2) = 2^{2(x+2)+2} + 14$

$= 2^{2x+6} + 14$

$a(2^x)^b + c = a(2^{bx}) + c$

There fore $2^{2x+6} + 14 = a(2^{bx}) + c$

$\Rightarrow 2^{2x} \times 2^6 + 14 = a(2^{bx}) + c$

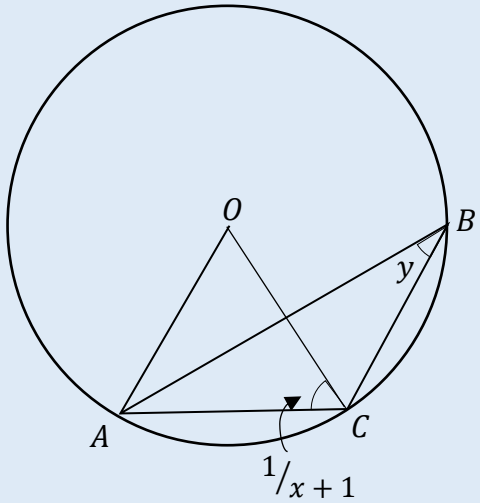
$\Rightarrow 64(2^{2x}) + 14 = a(2^{bx}) + c$

$a = 64$

$b = 2$

$c = 14$

21.



$OA = OC$ (radius)

There fore $\Rightarrow O\hat{A}C = O\hat{C}A$ (isosceles triangle)

Angle $A\hat{O}C = 180 - 2\left(\frac{1}{x+1}\right)$

$= 180 - \frac{2}{x+1}$

However

Angle $AOC = 2$ angle ABC (angle on Celes is $2x$ angle on circle)

$180 - \frac{2}{x+1} = 2y$

$y = 90 - \frac{1}{x+1} = \frac{90x+90-1}{x+1}$

$y = \frac{90x+89}{x+1}$

22.

$k^3 - k$

$\Rightarrow k(k^2 - 1)$

$\Rightarrow k(k-1)(k+1)$

$\Rightarrow (k-1)\ k\ (k+1)$

$k-1,\ k,\ k+1$ are consecutive number

Any of this number should an even number.

If $k-1$ is even $\Rightarrow 2n$

$k+1$ is even $\Rightarrow 2n+2$

There fore $(k-1)\ (k)\ (k+1)$

$\Rightarrow 2n(2n+1)(2n+2)$

is even

if $k-1$ is odd $\Rightarrow 2n+1$

k is even $\Rightarrow 2n+2$

there fore $(k-1)\ (k)\ (k+1)$

$\Rightarrow (2n+1)(2n+2)(2n+3)$

$\Rightarrow 2[(2n+1)(n+1)(2n+3)]$

is even

there fore always even.

23.

$$(t+1) \div \left(\frac{t(4t+3)+4t+3}{12t^2+25t+12}\right)$$

$$(t+1) \times \left[\frac{(3t+4)(4t+3)}{t(4t+3)+(4t+3)}\right]$$

$$\Rightarrow (t+1) \times \left[\frac{(3t+4)(4t+3)}{(4t+3)(t+1)}\right]$$

$\Rightarrow 3t+4$

24.

$k = {}^{p}/_{n}$ — ①

$n = m\sqrt{r}$ — ②

$n = 2$ / ① $\Rightarrow$ $5 = {}^{p}/_{2}$ $\Rightarrow k = {}^{10}/_{n}$

$p = 10$

② $\Rightarrow$ $2 = m\sqrt{25}$

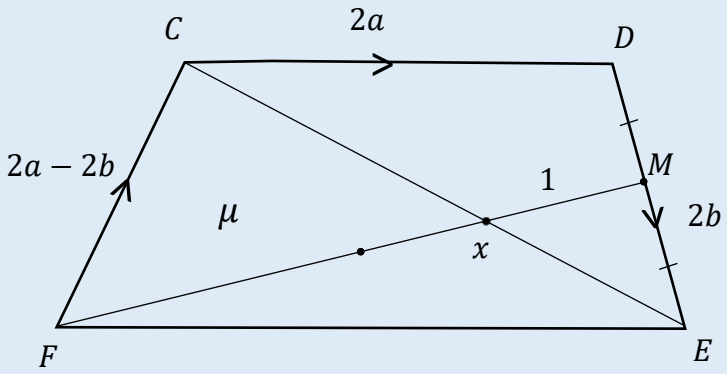
$2 = m(5) \Rightarrow n = {}^{2}/_{5}\sqrt{r}$

$m = {}^{2}/_{5}$

Combine $\Rightarrow k = \frac{10}{{}^{2}/_{5}\sqrt{r}} \Rightarrow \frac{50}{2\sqrt{r}}$

$k = \frac{25}{\sqrt{r}}$

25.



a) $\overrightarrow{FE} = 2\underset{\sim}{a} - 2\underset{\sim}{b} + 2\underset{\sim}{a} + 2\underset{\sim}{b}$

$= 4\underset{\sim}{a}$

$FE \parallel CD$

b)

$\overrightarrow{FM} = \frac{\mu + 1}{\mu}\overrightarrow{FX}$ — ①

$\overrightarrow{FM} = \overrightarrow{FE} + \overrightarrow{EM}$

$\overrightarrow{FE} = 4\underset{\sim}{a} - \underset{\sim}{b}$ — ②

$\overrightarrow{FM} = \frac{\mu + 1}{\mu}(\overrightarrow{FC} + \overrightarrow{CX})$

$= \frac{\mu + 1}{\mu}(2\underset{\sim}{a} - 2\underset{\sim}{b} + \overrightarrow{CX})$

$\overrightarrow{CX} = \lambda\overrightarrow{CE}$

$\overrightarrow{CX} = \lambda(\overrightarrow{CD} + \overrightarrow{DE})$

$= \lambda(2\underset{\sim}{a} + 2\underset{\sim}{b})$

$\overrightarrow{FM} = \frac{\mu+1}{\mu}(2\underset{\sim}{a} - 2\underset{\sim}{b} + \lambda(2\underset{\sim}{a} + 2\underset{\sim}{b}))$

$= \frac{\mu+1}{\mu}((\lambda+1)2\underset{\sim}{a} + (\lambda-1)2\underset{\sim}{b}) \text{ — } ③$

②, ③ ⇒

$4\underset{\sim}{a} - \underset{\sim}{b} = \frac{(\lambda+1)\mu + 1(2\underset{\sim}{a})}{\mu} + \frac{(\lambda-1)(\mu+1)2\underset{\sim}{b}}{\mu}$

Consider $\underset{\sim}{a}$

$4 = \frac{(\lambda+1)(\mu+1)\times 2}{\mu}$

$2\mu = (\lambda+1)(\mu+1) \text{ — } ④$

Consider $\underset{\sim}{b}$

$-1 = \frac{(\lambda-1)(\mu+1)2}{\mu}$

$-\mu = (\lambda-1)(\mu+1)\times 2 \text{ — } ⑤$

$\frac{④}{⑤} \Rightarrow -2 = \frac{\lambda+1}{2(\lambda-1)}$

$-4\lambda + 4 = \lambda + 1$

$3 = 5\lambda$

$\lambda = {}^{3}/_{5}$

$④ \Rightarrow 2\mu = \left({}^{3}/_{5} + 1\right)(\mu+1)$

$2\mu = {}^{8}/_{5}(\mu+1)$

$10\mu = 8\mu + 8$

$2\mu = 8$

$\mu = 4$

GCSE Mathematics Predicted Paper 2025

Non Calculator (Paper 1: Set 2)

Higher Tier

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This GCSE Maths paper 1: Set 2 (Predicted Paper 2025) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

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GCSE Mathematics
Paper 1(Non-Calculator)
Higher Tier

Paper Reference: Paper 1 (Set 2)	**Student Name:**
Time Allowed: 1.5 hour.	**Total Marks:** /100

Instructions:

- *Calculators can be used for this paper.*
- *Fill in the boxes with your name/ID.*
- *Answer all questions.*
- *Use the spaces provided to answer the questions.*
- *All steps should be included in you answer.*
- *Diagrams unless otherwise indicated, are NOT accurately drawn,*

Information:

- *The total mark for this paper is 80.*
- *The marks that each question carries are provided.*

Advice:

- *Each question should be read carefully before answering.*
- *The management is important.*
- *Try to answer all questions provided.*
- *If you have time left at the end, re-check your answers.*

For Examiner's Use	
Question	**Mark**
TOTAL	

1.

A number k is rounded to 2 decimal places.

The result is 0.75

Write down the error interval for k.

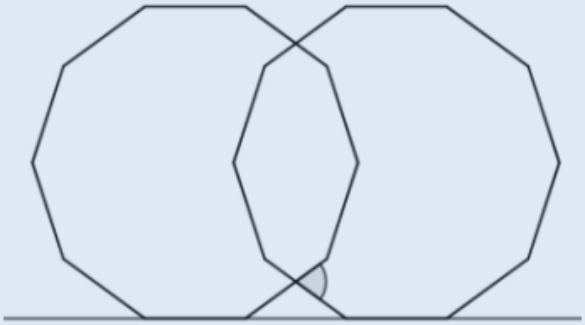
(2)

2.

Find the value of $\left(\frac{1}{0.16}\right)^{1.5}$

(2)

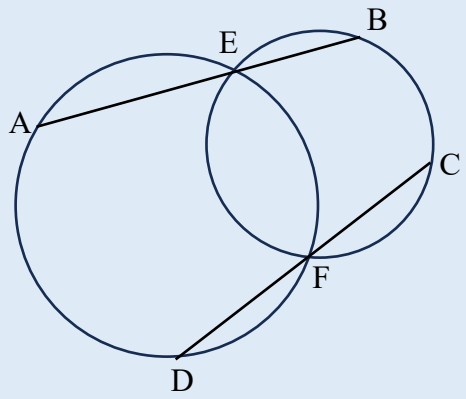
3.



The Figure shows two identical decagons with their bases aligned parallel and at the same height. Determine the measure of the shaded angle in the diagram.

(3)

4.

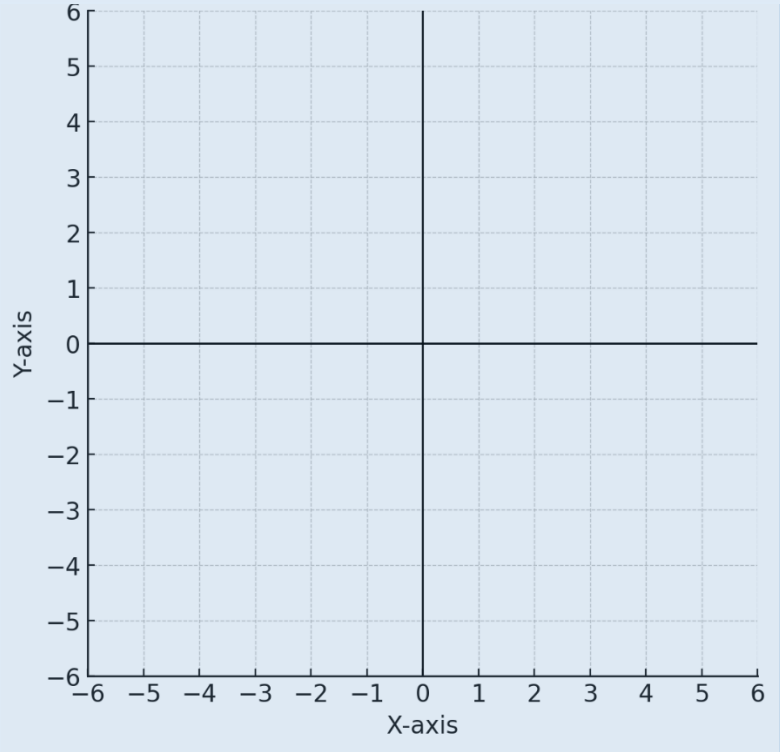


Two circles intersect at points E and F. Additionally, AEB and DEC are straight lines. Prove that AD and BC are parallel.

(3)

5.

a) On the grid, construct the graph of $x^2 + y^2 = 25$



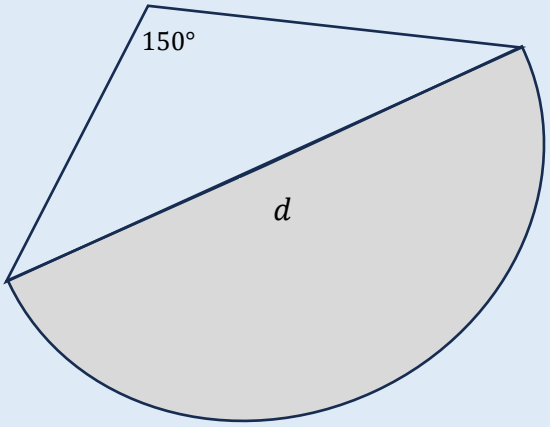
b) Find estimates for the solutions of the simultaneous equations.

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

$$y = -2x + 3$$

(2)

6.



The diagram depicts a sector with centre O, a diameter of d, and a subtended angle of 150∘. Show that the area of the shaded segment, which is the region within the sector excluding the triangle formed by the two radii and the chord, is given by: $\frac{d^2}{48}(5\pi - 3)$

(3)

7.

a) Express $10 - 6x - 2x^2$ in the form $p - r(x + q)^2$, where p ,r and q are constants.

b) Use your answer to part (a) to solve the equation $10 - 6(y + 2) - 2(y + 2)^2 = 0$.
Give your solutions in the form $e \pm \sqrt{f}$, where e and f are integers.

c) For the curve $y = 5 - 6(x - 3)^2$, find the coordinates of the maximum point.

(4)

8.

A box contains k red balls and $4k$ blue balls. A ball is drawn randomly and replaced after each trial. Find the probability that, after n trials $(n \geq 2)$, at least one red ball and one blue ball have been selected.

(2)

9.

The distance between the points $(10, n)$ and $(n, 12)$ is 10. Find the possible values of n.

(2)

10.

Calculate the mean of the numbers:

$$\sqrt{72}, \quad 2(\sqrt{8})^3, \quad 10\sqrt{2}$$

Express your answer in the form $b\sqrt{2}$, where b is an integer.

(3)

11.

Prove that $(4n+6)^2 - (4n-6)^2$ is divisible by 24 for all positive integers n.

(3)

12.

Find the set of possible values of x for which

$$3x^2 - 7x - 6 \leq 0 \textbf{ and } 2x^2 + x - 15 > 0 \textbf{ and } x^2 - 5x + 6 > 0$$

(5)

13.

Make n the subject of the equation:

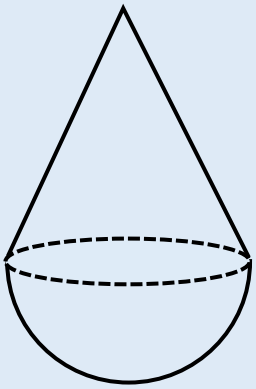
$$m = \frac{3n + 4}{\frac{1}{n} + 5}$$

(4)

14.

James is constructing solid plastic toys with the shape illustrated below. Each toy consists of a cone mounted on top of a hemisphere. The hemisphere has a diameter of 12a cm, and the cone has a slant height of 10a cm.

Determine the volume and surface area of the toy, expressing both in terms of π and a



(5)

15.

a) Solve $2x^2 + 4x - 3 = 0$

Give your solutions in surds format

b) Solve $\frac{2}{z^2} + \frac{4}{z} - 3 = 0$

Give your solutions in surds format

(4)

16.

A cylinder of radius $4x$ and height $5x$ is melted and reshaped into a cone of the same volume. the cone has a base radius r and a height of $8x$. Find an expression for r in terms of x.

(3)

17.

Using algebra, find the value of $0.2\dot{5} \times 0.3\dot{5}$

(3)

18.

The table gives information about the widths w metres, of trees in some wood.

Width (w m)	**Frequency**
$0 < h \leq 3$	3
$3 < h \leq 4$	4
$4 < h \leq 7$	15
$7 < h \leq 15$	24
$15 < h \leq 21$	12

Draw a histogram to show this information.

(3)

19.

Simplify the expression:

$$\frac{\sqrt{5}+2}{\sqrt{5}-3}+\frac{4}{\sqrt{5}+3}$$

Express your answer in the form $\frac{a\sqrt{5}+b}{c}$, where a, b *and* c are integers.

(4)

20.

(a) The function $f(x) = 3x^2 - 5$ is defined for $x \geq 0$.

Show that $f^{-1}(1) = \sqrt{2}$.

(b) The functions $g(x) = x + 3$ and $h(x) = 2x^2 - 1$ are given. Find the value of x for which $hg(x) = 8x + 15$.

(4)

21.

a) Quadratic sequence has its n-th term given by $T_n = an^2 + bn + c$. If the first three terms are $8,15$ and 24, find the constants a, b and c.

b) Find the 100^{th} term

(4)

22.

A circle has its centre at $(-2,3)$ and radius 5. Prove that point P $(1,7)$ lies on the circle. Then find the equation of the tangent at P point in the form $ax + by + c = 0$.

(3)

23.

Express as a single fraction in its simplest form

$$\frac{1}{x^2-4x+3} \div \left(\frac{3}{x^2-9} - \frac{5}{x-3}\right)$$

(3)

24.

$6x^2 = 20y^2 - 7xy$ where $x > 0$ and $y > 0$

Find the ratio $x : y$

(2)

25.

P, Q and R are three points

$\overrightarrow{PQ} = 6a + 10b$

$\overrightarrow{QR} = 24a + 40b$

a) Prove that P, Q and R lie on a straight line.

A, B and C are three points on a straight line such that

$AB = 5a + 10b$

$AC = -12.5a - 25b$

b) Find the ratio

Length of AC: length of AB

(4)

END

GCSE Mathematics Predicted Paper 2025

Non Calculator (Paper 1: Set 2)

Higher Tier

Answers

1.

$0.745 \leq k < 0.755$

2.

$$\left(\frac{1}{0.16}\right)^{1.5} = \left(\frac{1}{0.16}\right)^{3/2}$$

$$= \left[\left(\frac{1}{0.4}\right)^{2}\right]^{3/2}$$

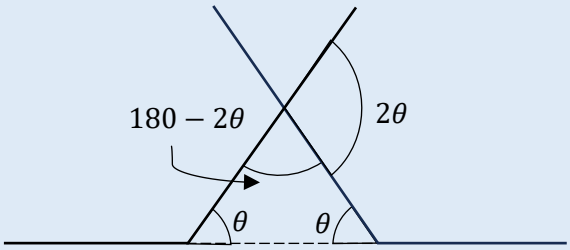
$$= \left(\frac{1}{0.4}\right)^{3}$$

$$= 15.625$$

3.

External angle $(\theta) = \frac{360}{10} = 36°$

Angle $= 2 \times 36 = 72°$



4.

Let $E\hat{A}D = \theta$

$D\hat{F}E = 180 - \theta$ (Cyclic quadrilateral)

$E\hat{F}C = \theta$ (angle on straight line is 180°)

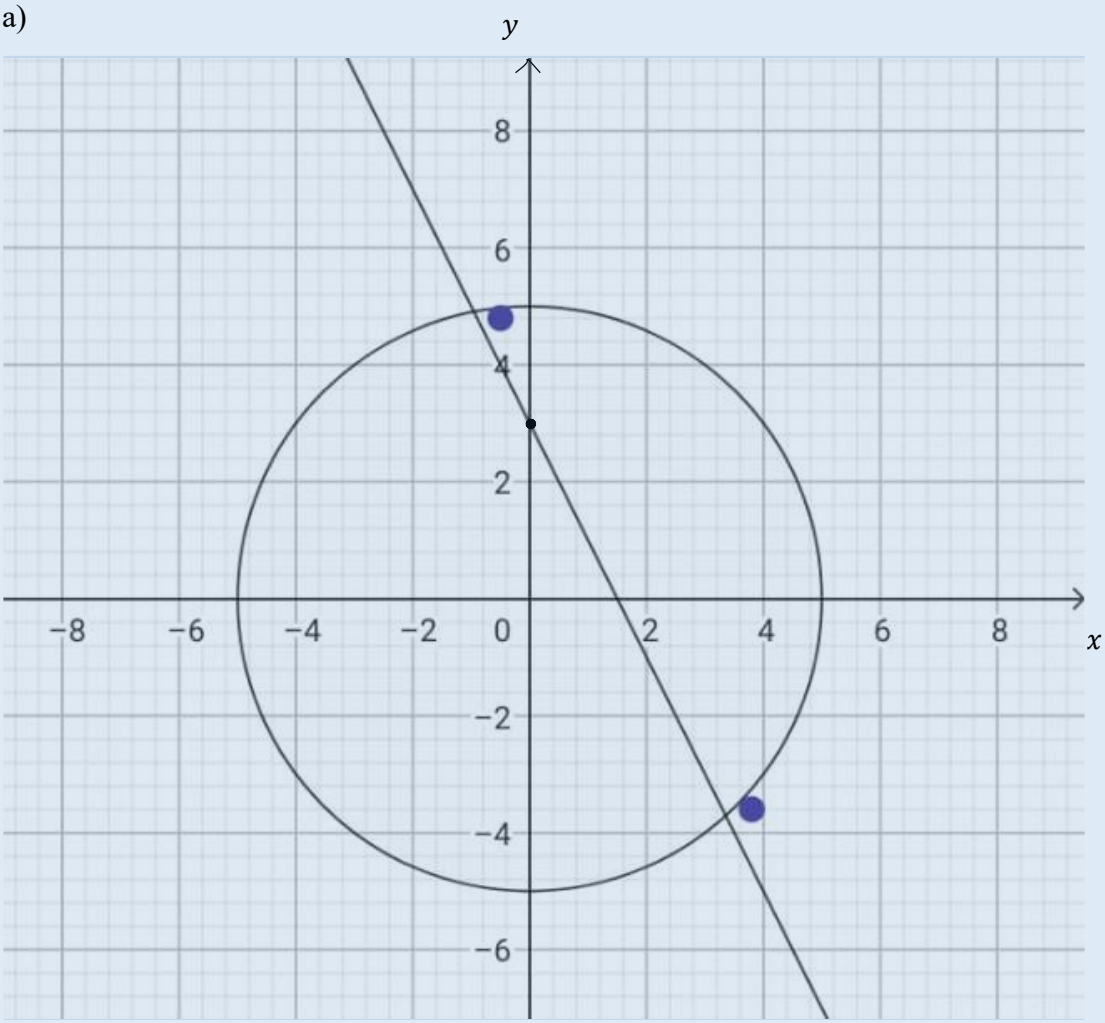
$E\hat{B}C = 180 - \theta$ (Cyclic quadrilateral)

$E\hat{A}D + E\hat{B}C = 180°$

$E\hat{B}C$ and $E\hat{A}D$ are co-interior therefore BC is parell to AD

5.

a)



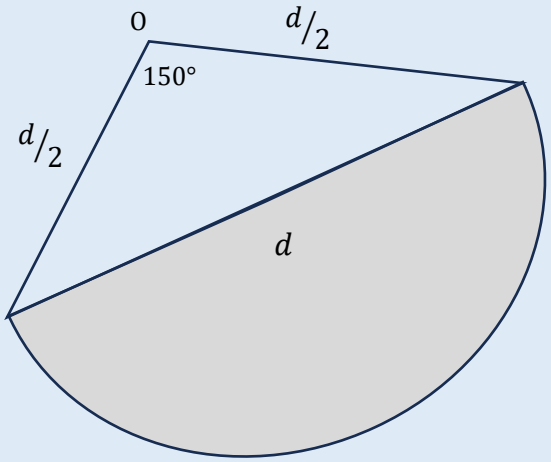
b)

$y = -2x + 3$

x	0	1
y	3	1

x	y
- 0.5	4.8
3.8	- 3.6

6.



Shaded region $= \frac{150}{360} \times \pi \times \left(d/2\right)^2 - 1/2\left(d/2\right)^2 \times \sin 150$

$$= \frac{5\pi d^2}{48} - \frac{3d^2}{48}$$

$$= \frac{d^2(5\pi - 3)}{48}$$

7.

a) $-2(x^2 + 3x - 5)$

$-2\left[(x + 3/2)^2 - 9/4 - 5\right]$

$\Rightarrow -2\left[(x + 3/2)^2 - 29/4\right]$

$\Rightarrow 29/2 - 2(x + 3/2)^2$

b) $29/2 - 2(y + 2 + 3/2)^2 = 0$

$(y + 7/2)^2 = 29/4$

$y + 7/2 = \pm \frac{\sqrt{29}}{2}$

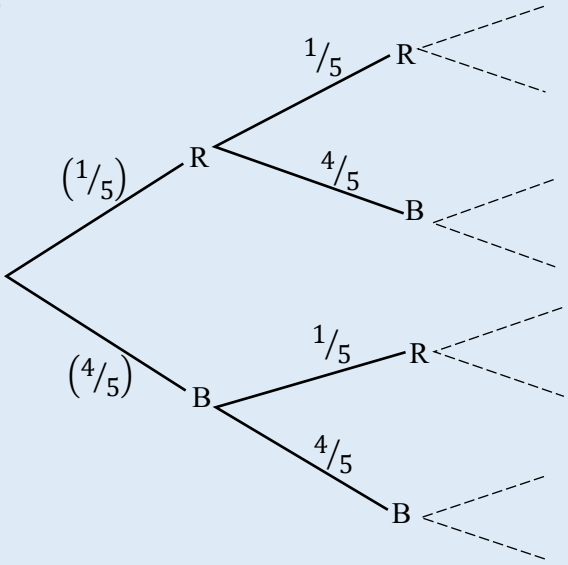
$y = \frac{-7 \pm \sqrt{29}}{2}$

c) $y = 5 - 6(x - 3)^2 \Rightarrow (3,5)$

8.

Probability $\Rightarrow 1 - P_{(all\ red)} - P_{(all\ blue)}$

$$\Rightarrow 1 - \left({}^{1}/_{5}\right)^{n} - \left({}^{4}/_{5}\right)^{n}$$



9.

$$10 = \sqrt{(10-n)^2 + (n-12)^2}$$

$$100 = 100 - 20n + n^2 + n^2 + 144 - 24n$$

$$n^2 - 22n + 72 = 0$$

$$(n-18)(n-4) = 0$$

$$n = 18 \quad \text{or} \quad n = 4$$

10.

Mean $\Rightarrow \frac{\sqrt{72}+2\left(\sqrt{8}\right)^3+10\sqrt{2}}{3}$

$$\Rightarrow \frac{6\sqrt{2}+32\sqrt{2}+10\sqrt{2}}{3}$$

$$\Rightarrow \frac{48\sqrt{2}}{3}$$

$$\Rightarrow 16\sqrt{2}$$

11.

$(4n+6)^2-(4n-6)^2$

$\Rightarrow (4n+6-4n+6)(4n+6+4n-6)$

$\Rightarrow (8n)\quad (12)$

$\Rightarrow 72n$

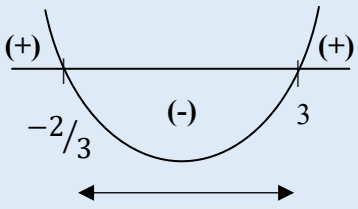
$\Rightarrow 24\times(3n)$

Devisable by 24

12.

$3x^2-7x-6\leq 0$

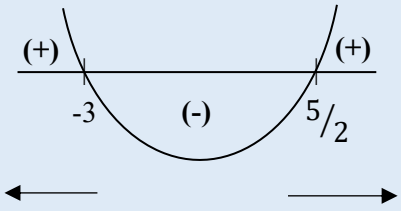
$(3x+2)(x-3)\leq 0$



$\left(-2/3\leq x\leq 3\right)$

$2x^2+x-15>0$

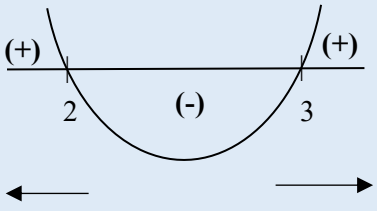
$(2x-5)(x+3)>0$



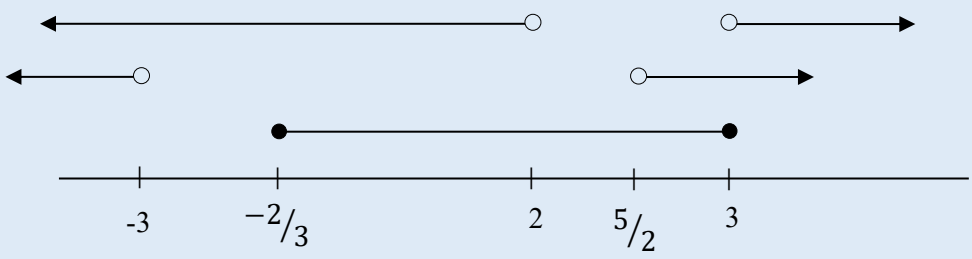
$\left(x<-3\quad \text{or}\quad x>5/2\right)$

$x^2-5x+6>0$

$(x-2)(x-2)>0$



$(x<2\quad \text{or}\quad x>3)$



No solutions

13.

$$m = \frac{3n+4}{1/n+5}$$

$$\frac{m}{n} + 5m = 3n + 4$$

$$m + 5mn = 3n^2 + 4n$$

$$3n^2 + (4 - 5m)n - m = 0$$

$$n = \frac{-(4-5m) \pm \sqrt{(4-5m)^2 - 4(3)(-m)}}{3 \times 2} = \frac{(5m-4) \pm \sqrt{(4-5m)^2 + 12m}}{6}$$

14.

Volume $= \frac{2}{3}\pi(6a)^3 + \frac{1}{3}\pi(6a)^2 \times 8a$

$$= \frac{1}{3}\pi(432a^3 + 288a^3)$$

$$= \frac{1}{3}\pi(720a^3)$$

$$= 240\pi a^3 \ cm^3$$

S A $= 3\pi(6a)^2 + \pi(6a)(10a)$

$$= 3\pi \times 36a^2 + \pi \times 60a^2$$

$$= 168\pi a^2$$

15.

a) $2x^2 + 4x - 3 = 0$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-3)}}{4}$$

$$= \frac{-4 \pm \sqrt{16+24}}{4}$$

$$x = \frac{-4 \pm \sqrt{40}}{4}$$

$$x = \frac{-2 \pm \sqrt{10}}{2}$$

b) $1/z = \frac{-2\pm\sqrt{10}}{2}$

$z = \frac{2}{-2\pm\sqrt{10}}$

$z = \frac{2}{-2+\sqrt{10}}$ or $z = \frac{2}{-2-\sqrt{10}}$

$= \frac{2}{\sqrt{10}-2}$ $z = \frac{-2}{(\sqrt{10}+2)}$

$\Rightarrow \frac{2(\sqrt{10}+2)}{6}$ $= \frac{-2(\sqrt{10}-2)}{6}$

$z \Rightarrow \frac{\sqrt{10}+2}{3}$ $z = \frac{-(\sqrt{10}-2)}{3}$

16.

$\pi(4x)^2 \times 5x = 1/3\,\pi \times r^2 \times 8x$

$80x^3\pi = \frac{8x\pi r^2}{3}$

$10x^2 = r^2/3$

$r^2 = 30x^2$

$r = x\sqrt{30}$

17.

$0.2\dot{5} \times 0.3\dot{5}$

$x = 0.2\dot{5}$ $x = 0.3\dot{5}$

$10x = 2.\dot{5}$ $10x = 3.\dot{5}$

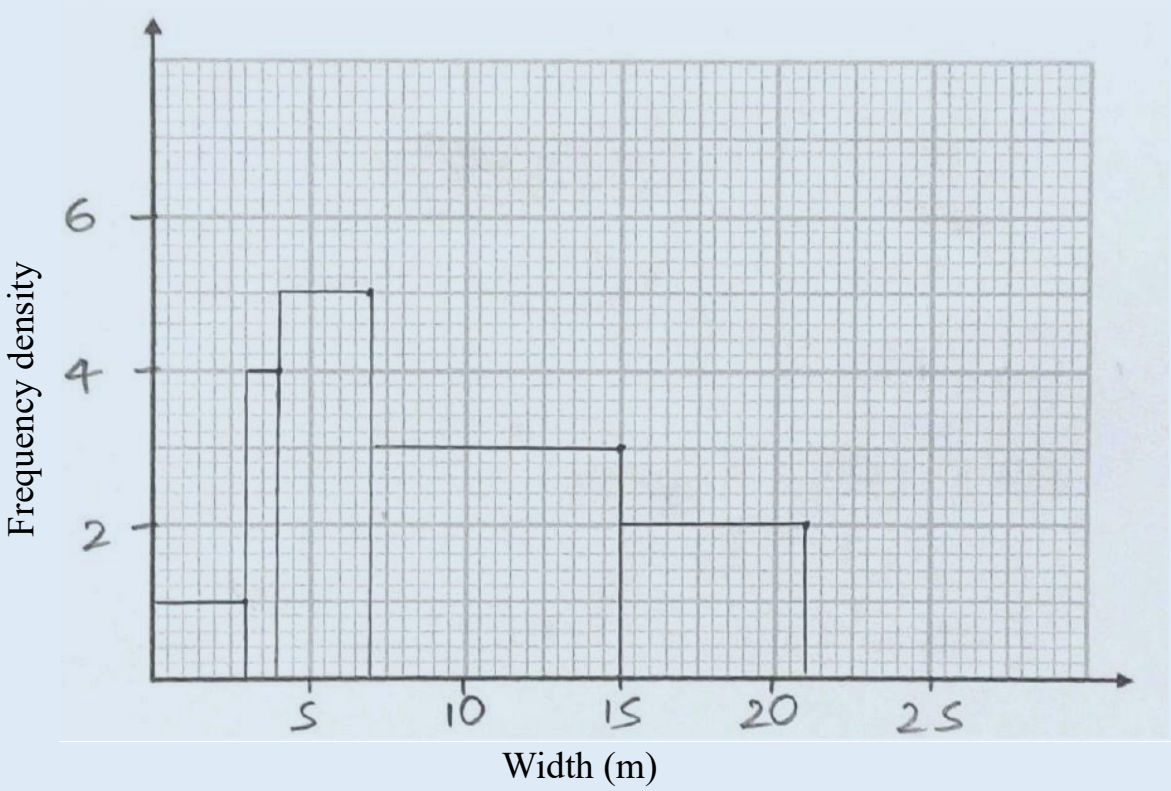
$100x = 25.\dot{5}$ $100x = 35.\dot{5}$

$90x = 23$ $90x = 32$

$x = 23/90$ $x = 32/90$

$$23/90 \times 32/90 = \frac{184}{2025}$$

18.



$$\text{F. D} = \frac{\text{Class width}}{\text{Frequency}}$$

Frequency	Frequency density
3	1
4	4
15	5
24	3
12	2

19.

$$\frac{\sqrt{5}+2}{\sqrt{5}-3}+\frac{4}{\sqrt{5}+3}$$

$$\Rightarrow \frac{(\sqrt{5}+2)}{(\sqrt{5}-3)}\times\frac{(\sqrt{5}+3)}{(\sqrt{5}+3)}+\frac{4}{\sqrt{5}+3}\times\frac{(\sqrt{5}-3)}{\sqrt{5}-3}$$

$$\Rightarrow \frac{5+5\sqrt{5}+6}{5-9}+\frac{4\sqrt{5}-12}{5-9}$$

$$\Rightarrow \frac{11+9\sqrt{5}-12}{(-4)}$$

$$\Rightarrow \frac{9\sqrt{5}-1}{(-4)} \Rightarrow \frac{1-9\sqrt{5}}{4}$$

20.

a) $f_{(n)} = 3x^2 - 5$

$f_{(\sqrt{2})} = 3(\sqrt{2})^2 - 5 = 3 \times 2 - 5 = 1$

$f^{-1}(1) = \sqrt{2}$

b) $hg(x) = 2(g(x)^2) - 1$

$= 2((x+3)^2) - 1$

$\Rightarrow 2(x^2 + 6x + 9) - 1 \quad \Rightarrow 2x^2 + 6x + 17$

$2x^2 + 12x + 17 = 8x + 15$

$2x^2 + 4x + 2 = 0$

$x^2 + 2x + 1 = 0$

$(x+1)^2 = 0$

$x = (-1)$

21.

8, 15, 24, ……

7 9

2

$2a = 2$ $\quad$ $3a + b = 7$ $\quad$ $a + b + c = 8$

$a = 1$ $\quad$ $3 + b = 7$ $\quad$ $5 + c = 8$

$b = 4$ $\quad$ $c = 3$

$T_n = n^2 + 4n + 3$

$n = 100/T_{100} = 100^2 + 4(100) + 3$

$= 10403$

22.

a) $x^2 + y^2 = r^2$

$\Rightarrow x^2 + y^2 = 5^2 = 25$

Transform $x \to x + 2$

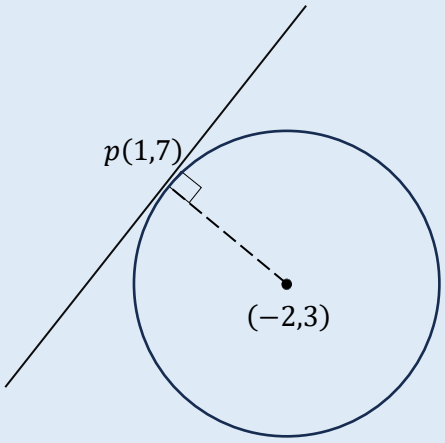
$y \to y - 3$

$\Rightarrow (x + 2)^2 + (y - 3)^2 = 25$

Include $(1,7) \Rightarrow (1 + 2)^2 + (7 - 3)^2$

$\Rightarrow 3^2 + 4^2$

$\Rightarrow 25(R.H.S)$



Gradient $\Rightarrow \frac{7-3}{1-(-2)} = \frac{4}{3}$, tangent $\Rightarrow -3/4$

Equation $\Rightarrow y = -3/4\,x + C$

$(1,7) \Rightarrow \quad 7 = -3/4\,(1) + C$

$C = 7 + 3/4$

$= 31/4$

$(y = -3/4\,x + 31/4)$

23.

$$\frac{1}{x^2-4x+3} \div \left(\frac{3}{x^2-9} - \frac{5}{x-3}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{3}{(x-3)(x+3)} - \frac{5}{(x-3)}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{3-5(x+3)}{(x-3)(x+3)}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{-5x-12}{(x-3)(x+3)}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \times \left(\frac{(x-3)(x+3)}{-(5x+12)}\right)$$

$$\Rightarrow \frac{-(x+3)}{(x-1)(5x+12)}$$

24.

$6x^2 = 20y^2 - 7xy$

$6x^2 + 7xy - 20y^2 = 0$

$6x^2 + 15xy - 8xy - 20y^2 = 0$

$3x(2x + 5y) - 4y(2x + 5y) = 0$

$(3x - 4y)(2x + 5y) = 0$

$^x/_y = {}^4/_3$ or $^x/_y = {}^{-5}/_2$ x and y positive: Answer is 4/3

25.

$\overrightarrow{PQ} = 6\underset{\sim}{a} + 10\underset{\sim}{b}$

$\overrightarrow{QR} = 24\underset{\sim}{a} + 40\underset{\sim}{b}$

$\overrightarrow{PQ} = {}^1/_4\,(24\underset{\sim}{a} + 40\underset{\sim}{b}) = {}^1/_4\,\overrightarrow{QR}$

= PQ and QR on same line as Q is a common point

$\overrightarrow{AB} = 5\underset{\sim}{a} + 10\underset{\sim}{b}$

$\overrightarrow{AC} = -12.5\underset{\sim}{a} + 25\underset{\sim}{b}$

$\overrightarrow{AC} = -2.5(5\underset{\sim}{a} + 10\underset{\sim}{b})$

$\overrightarrow{AC} = -2.5(\overrightarrow{AB})$

Therefore

$AC = 2.5(AB)$

$\frac{AC}{AB} = \frac{2.5}{1} = \frac{5}{2}$

GCSE Mathematics Predicted Paper 2025

Non Calculator (Paper 1): Set 3

Higher Tier

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This GCSE Maths paper 1 (Predicted Paper 2025: Set 3) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

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GCSE Mathematics
Paper 1(Non Calculator)
Higher Tier: Set 3

Paper Reference: Paper 1	**Student Name:**
Time Allowed: 1.5 hour	**Total Marks:** /100

Instructions:

- *Calculators can be used for this paper.*
- *Fill in the boxes with your name/ID.*
- *Answer all questions.*
- *Use the spaces provided to answer the questions.*
- *All steps should be included in you answer.*
- *Diagrams unless otherwise indicated, are NOT accurately drawn,*

Information:

- *The total mark for this paper is 80.*
- *The marks that each question carries are provided.*

Advice:

- *Each question should be read carefully before answering.*
- *The management is important.*
- *Try to answer all questions provided.*
- *If you have time left at the end, re-check your answers.*

For Examiner's Use	
Question	**Mark**
TOTAL	

1.

Write 750 as a product of powers of its prime factors.

(2)

2.

James invests £ k in a savings account for n years. The account pays compound interest at a rate of r % per annum. Calculate the total amount of interest James will get at the end of n years (Find the answers in k, n, r).

(3)

3.

$(my^5)^{\frac{3}{n}} = 4y^{2.5}$

Work out the value of n and the value of m.

(2)

4.

(a) Work out the value of $(25 \times 10^6) \div (5 \times 10^4)$. Give your answer as an ordinary number.

(b) Write in standard form: $8 \times 5^{25} \times 2^{28}$

(3)

5.

Use algebra to solve the simultaneous equation.

$$6sinx + 2siny = 3$$

$$3sinx - 4siny = -3$$

(2)

6.

In a fast-food restaurant, a meal consists of a burger, a side, a drink, and a dessert.

- There are 5 types of burgers.
- There are k types of sides.
- There are k+3 types of drinks.
- There are 2 types of desserts.

If there are 700 different ways to create a meal by choosing one item from each category, find the value of k.

(3)

7.

Given the following ratios

$3a : 4c = 5 : 25$

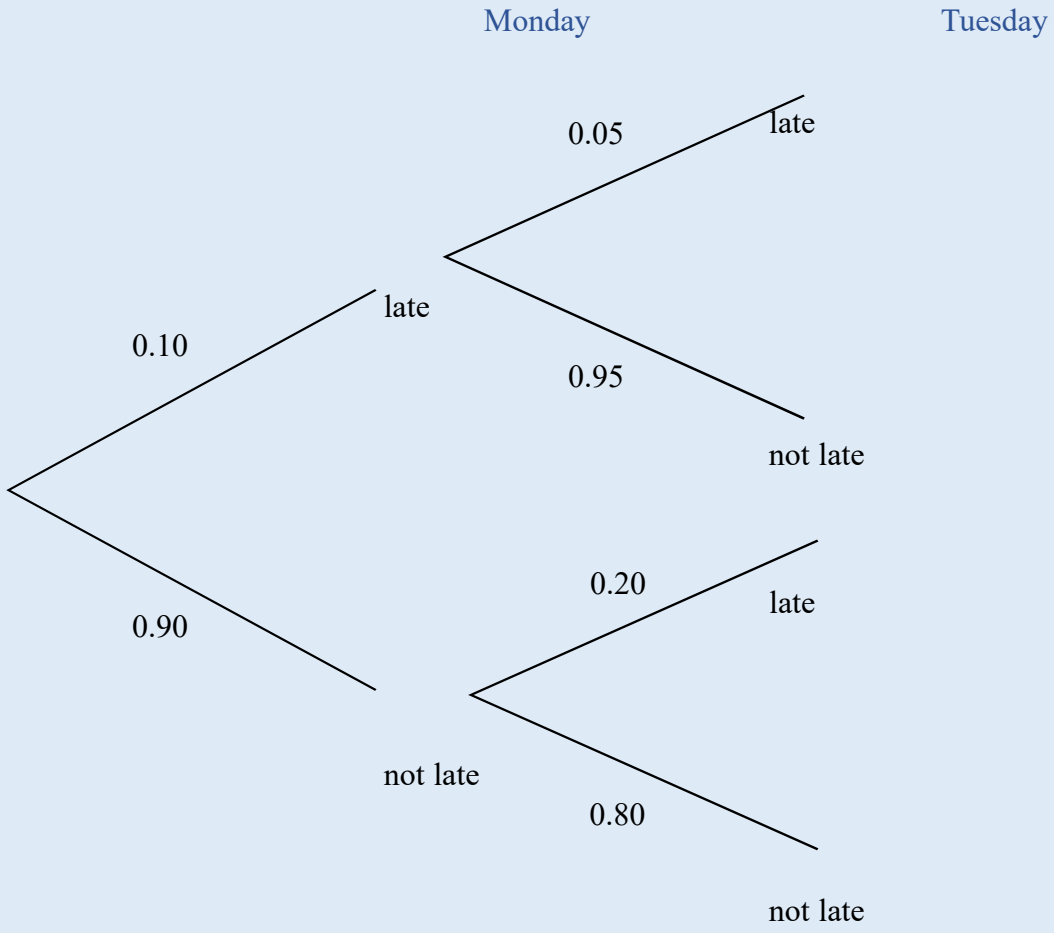
$4b : 6c = 12 : 20$

Find the ratio of $a + b : b + c$

(3)

8.

The probability tree diagram shows the probabilities that Peter will be late for work on two days next week.



Calculate the probability that Peter will be late on exactly one of the two days.

(3)

9.

A number P is rounded to 2 decimal places.

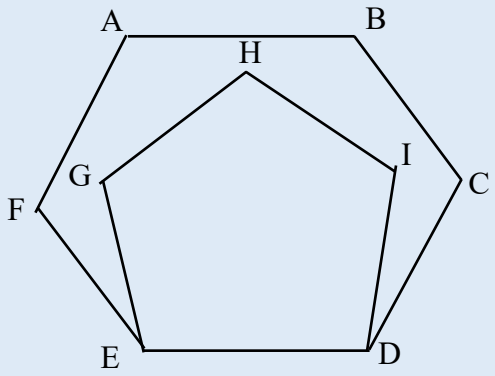
The result is 0.47

Write down the error interval for P.

(2)

10.

Figure shows that regular pentagon (EGHID) and regular hexagon (ABCDEF). Find the angle of FGE.



(3)

11.

Make θ the subject of

$$\sqrt{sin\theta} + \sqrt{r} = \frac{nsin\theta + m}{\sqrt{sin\theta} - \sqrt{r}} + \frac{k}{n(\sqrt{sin\theta} - \sqrt{r})}$$

(4)

12.

Find the set of possible values of x for which

$$2x^2 - 10 < 0 \textbf{ and } \quad 12 + 5x - 3x^2 > 0$$

You must show all your working.

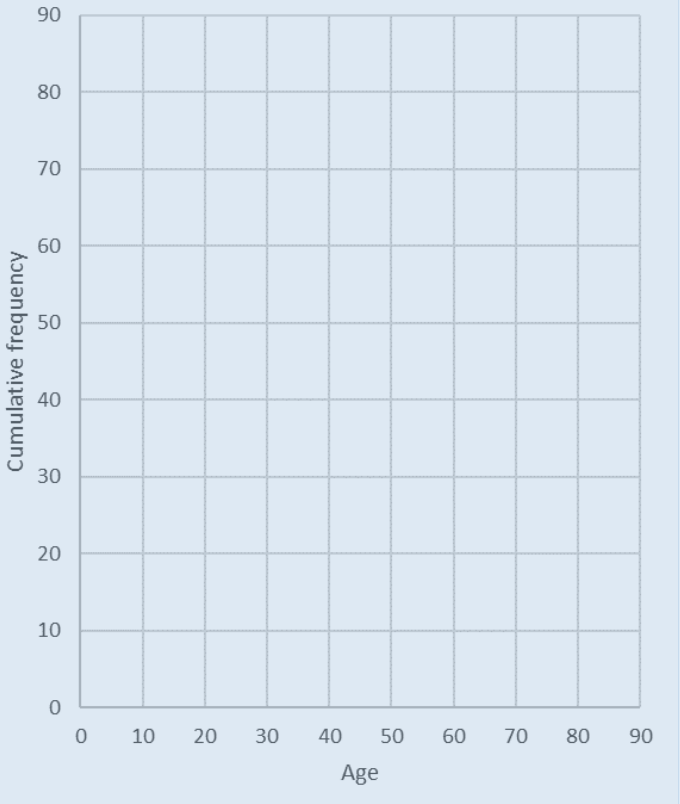
(4)

13.

The cumulative frequency table gives information about the ages of 90 people working for a company.

Age (x years)	Cumulative frequency
$20 < x \leq 30$	19
$20 < x \leq 40$	37
$20 < x \leq 50$	60
$20 < x \leq 60$	82
$20 < x \leq 70$	90

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



(b) Use your graph to find an estimate for the **Median Age, and Interquartile Range (IQR)**

(4)

14.

The function g is defined as $g(x) = \frac{\sqrt{x^2+2n^2}}{x}$ and $x > 0$ and where n is a positive number

(a) Find the value of a such that $g^{-1}(a) = n\sqrt{2}$

$$f(x) = 5x^2 + 7x - 2$$

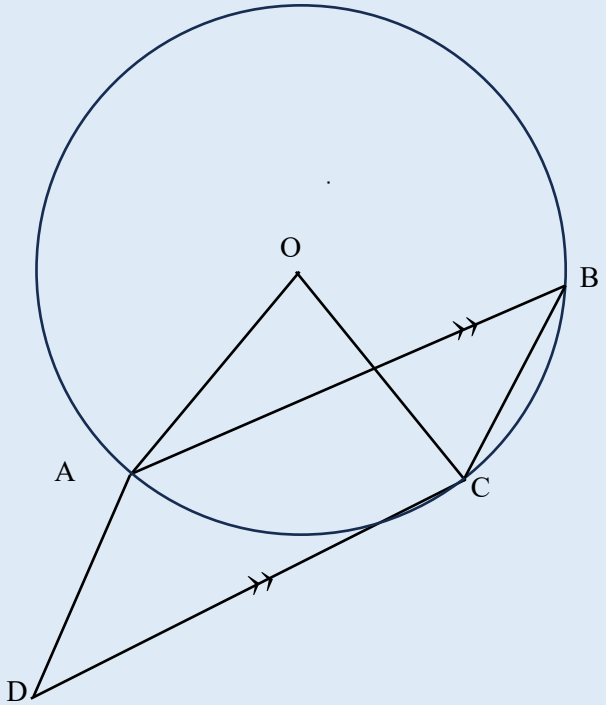
$$g(x) = \frac{3x}{5x+2}$$

(b) Find the function of $f(7)$

(c) Find $g(f(x))$

(5)

15.



A, B, C are points on a circle, Centre O.

AB and CD are parallel.

CD is a tangent to the circle at C

Prove that AC = BC

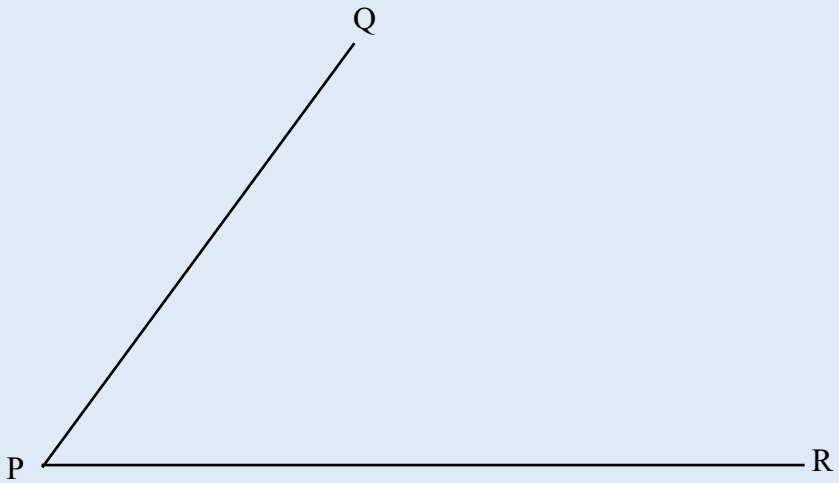
(4)

16.

Use ruler and compasses to construct the bisector of angle QPR

Use ruler and compasses to construct a perpendicular bisector of the line PR

A point X is to be placed where the two paths cross. Mark the position of point X



(3)

17.

Using algebra, find the value of $0.1\dot{5} \times 0.23\dot{5}$

(3)

18.

The coordinates of $y = f(x)$ maximum points are (3, 4)

Write down the coordinates of the maximum point on the following curve with the equation.

(a) $y = f(x - 2)$

(b) $y = 3f(x - 2) + 4$

(3)

19.

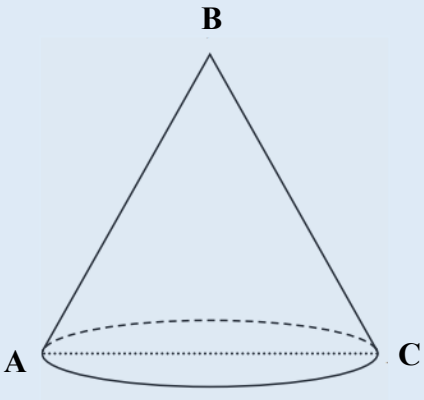
A curve with equation $y = 4x^2 + 10x + 6$ crosses a straight line with an equation $2y = 4x + 10$ in two places. Find the coordinates of the two points where the lines intersect. Give your answers in surds form.

(4)

20.

$$\frac{Area\ of\ the\ base\ of\ the\ cone}{Total\ surface\ area\ of\ the\ cone} = \frac{1}{3}$$

Find the Angle of ABC



(4)

21.

Solve it.

$$\sqrt{11}(x + 1) = 2x + \sqrt{44}$$

Give your answer in the form $\frac{m+n\sqrt{p}}{q}$ where m, n, p and q are real numbers

(4)

22.

K is inversely proportional to the square of P.

K = 1.0 when $P = \sqrt{7}$.

Find the value of K when R = 5

(3)

23.

Express as a single fraction in its simplest form

$$\frac{1}{24 - 10x} \times \left(\frac{37}{2x^2 - 50} - \frac{5}{2x - 10}\right)$$

(3)

24.

Six-sided dice is biased.

The probabilities of the dice landing on each of the numbers are

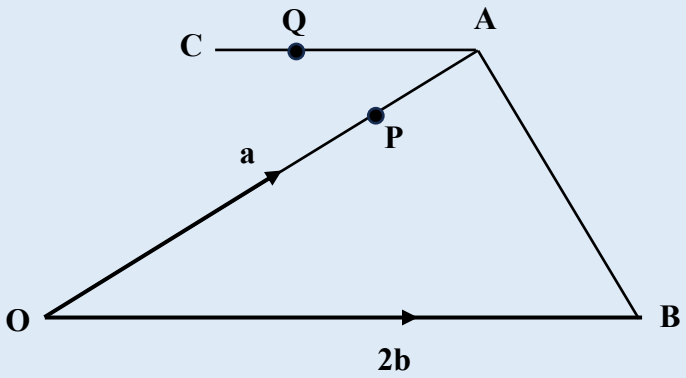
Number	1	2	3	4	5	6
Probability	x	0.15	0.10	0.15	x+0.2	0.10

Dice is thrown 2 times

Calculate the probability that Dice will land on 1 (Both times).

(2)

25.



$\overrightarrow{OA} = a$, $\overrightarrow{OB} = 2b$, $\overrightarrow{AC} = -b$.

Q is the point on CA such that CQ:QA = 1:5.

P is the point on OA such that BPQ is straight line.

Use the vector method to find OP : PA

Show your working clearly

(4)

END

GCSE Mathematics Predicted Paper 2025

Non Calculator (Paper 1: Set 3)

Higher Tier

Answers

1.

$$\begin{array}{r|l} 3 & 750 \\ 5 & 250 \\ 5 & 50 \\ 5 & 10 \\ & 2 \end{array}$$

$$750 = 2 \times 3 \times 5 \times 5 \times 5$$
$$= 2 \times 3 \times 5^3$$

2.

Total interest = balance money with interest − Invested money

$$= k\left(1 + \frac{r}{100}\right)^n - k$$
$$= k((1 + 0.01r)^n - 1)$$

3.

$$(m\, y^5)^{3/n} = 4\, y^{2.5}$$

$$m^{3/n} \times y^{15/n} = 4y^{2.5}$$

y $\quad {}^{15}/_n = 2.5$ $\qquad$ ${}^{3}/_6 = 4$

$n = \frac{15}{2.5} = 6$ $\qquad$ ${}^{1}/_2 = 4$

$m = 4^2 = 16$

4.

a) $(25 \times 10^6) \div (5 \times 10^4)$

$= \frac{25 \times 10^6}{5 \times 10^4}$

$= 5 \times 10^2$

$= 500$

b) $8 \times 5^{25} \times 2^{28}$

$= 8 \times 5^{25} \times 2^{25} \times 2^3$

$= 8 \times 2^3 \times (5 \times 2)^{25}$

$= 64 \times 10^{25}$

$= 6.4 \times 10^{26}$

5. $sinx = p$ and $siny = k$

$6p + 2k = 3$ —— ①

$3p - 4k = -3$ —— ②

① $\times 2 \Rightarrow$ $12p + 4k = 6$ —— ③

② + ③ $\Rightarrow 15p = 3$

$p = {}^1/_5$

In ① st equation

$6\left({}^1/_5\right) + 2k = 3$

$2k = 3 \; {}^{-6}/_5 = {}^9/_5$

$k = {}^9/_{10}$

$sinx = p = 1/5$ and $siny = k = 9/10$

Answers: $x = 11.54$ *and* $y = 64.16$

6.

Total combination $\Rightarrow 5 \times k \times (k+3) \times 2$

$$700 = 10 \times (k^2 + 3k)$$

$$k^2 + 3k = 70$$

$$k^2 + 3k - 70 = 0$$

$$(k+10)\,(k-7) = 0$$

$$k = (-10)\ or\ \ k = 7$$

$(k = 7)$

Positive number

7.

$3a : 4c = 5 : 25$

$\Rightarrow 3a : 4c = 1:5$ —— ①

$4b : 6c = 12 : 20$

$\Rightarrow 2b : 3c = 3:5$ —— ②

① $\Rightarrow \frac{3a}{4c} = \frac{1}{5}$ ② $\Rightarrow \frac{2b}{3c} = \frac{3}{5}$

$a = \frac{4c}{15}$ $b = \frac{9c}{10}$

$$a + b : b + c \Rightarrow \frac{a+b}{b+c} = \frac{{}^{4c}/_{15} + \frac{9c}{10}}{{}^{9c}/_{10} + c}$$

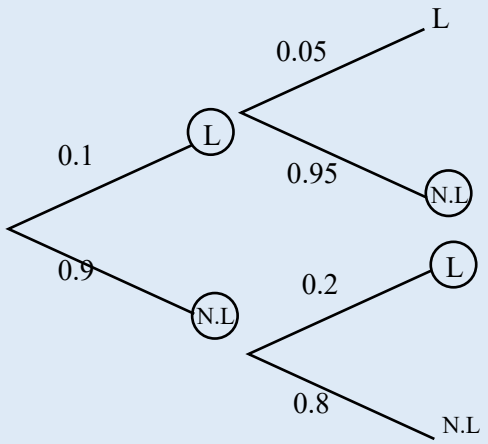
$$= \frac{{}^{4}/_{15} + {}^{9}/_{10}}{{}^{9}/_{10} + 1}$$

$$= \frac{\frac{8+27}{30}}{\frac{9+10}{10}}$$

$$= \frac{35}{3 \times 19}$$

$\boxed{a + b : b + c = 35:57}$ $= \frac{35}{57}$

8.



Not late exactly one day $\Rightarrow 0.1 \times 0.95 + 0.9 \times 0.2$

$\Rightarrow 0.095 + 0.18$

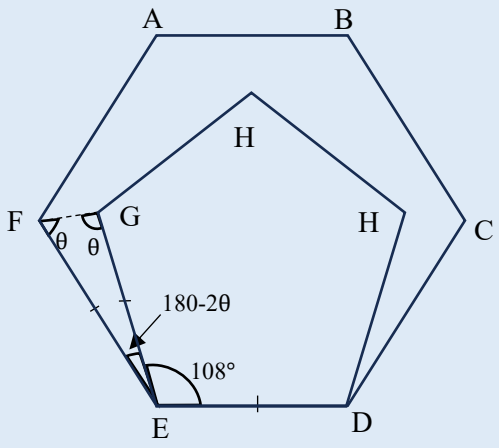
$\Rightarrow 0.275$ or $^{11}/_{40}$

9.

$P \rightarrow 0.47$

$0.465 \leq P < 0.475$

10.



$FE = ED = GE$

(Regular pentagon and hexagon)

One internal angle of pentagon $= \frac{(n-2)180}{n}$; $n = 5$

$= \frac{3\times180}{5}$

$= 108°$

One internal angle of hexagon $= \frac{4\times180}{6}$

$= 120°$

$180 - 2\theta = 120 - 108$

$180 - 2\theta = 12$

$\theta = 84°$

11.

$$\sqrt{\sin\theta} + \sqrt{r} = \frac{n\sin\theta+m}{\sqrt{\sin\theta}-\sqrt{r}} + \frac{k}{n(\sqrt{\sin\theta}-\sqrt{r})}$$

$$\sqrt{\sin\theta} + \sqrt{r} = \frac{(n\sin\theta+m)(n)+k}{n(\sqrt{\sin\theta}-\sqrt{r})}$$

$$\sqrt{\sin\theta} + \sqrt{r} = \frac{n^2\sin\theta+mn+k}{n(\sqrt{\sin\theta}-\sqrt{r})}$$

$$n(\sqrt{\sin\theta} + \sqrt{r})(\sqrt{\sin\theta} - \sqrt{r}) = n^2\sin\theta + mn + k$$

$$n(\sin\theta - r) = n^2\sin\theta + mn + k$$

$$sin\,\theta\,(n - n^2) = mn + k + nr$$

$$\theta = \sin^{-1}\left(\frac{mn + k + nr}{(n - n^2)}\right)$$

12.

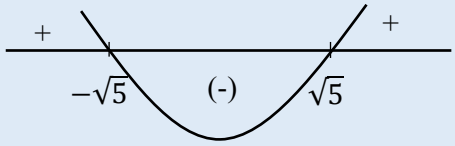
$2x^2 - 10 < 0$ and $12 + 5x - 3x^2 > 0$

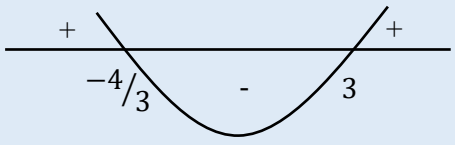
$\Rightarrow \frac{2x^2-10}{2} < \frac{0}{2}$ $3x^2 - 5x - 12 < 0$

$\Rightarrow x^2 - 5 < 0$ $(3x + 4)(x - 3) < 0$

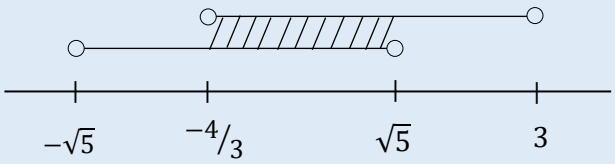
$\Rightarrow (x - \sqrt{5})(x + \sqrt{5}) < 0$ Roots $x = 3$ or $^{-4}/_{3}$

Roots $x = \sqrt{5}$ or $-\sqrt{5}$



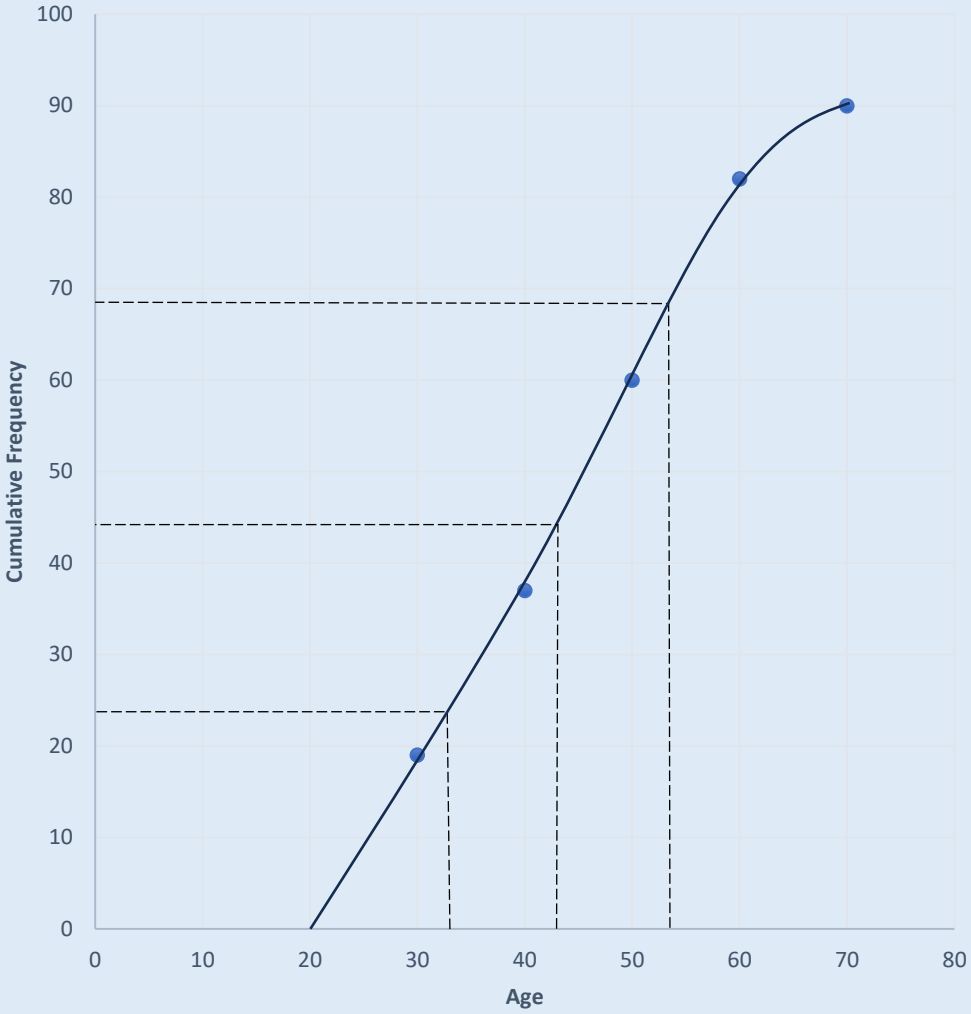


$-\sqrt{5} < x < +\sqrt{5}$ $^{-4}/_{3} < x < 3$



13.

a)



b)

$$\text{median} \rightarrow 90 \times {}^{1}/_{2} = 45^{\text{th}} \Rightarrow 43$$

$$\text{U.Q} \Rightarrow 90 \times {}^{3}/_{4} \Rightarrow 67.5 \Rightarrow 54$$

$$\text{L.Q} \Rightarrow 90 \times {}^{1}/_{4} \Rightarrow 22.5 \Rightarrow 33$$

$$\text{I. Q. R} = 54 - 33 = 21$$

14.

$$g(x) = \frac{\sqrt{x^2+2n^2}}{x}, \; x > 0$$

a) $g^{-1}(x) \rightarrow y = \frac{\sqrt{x^2+2n^2}}{x}$

$$y^2 = \frac{x^2+2n^2}{x^2}$$

$$y^2x^2 = x^2 + 2n^2$$

$$x^2(y^2-1)=2n^2$$

$$x^2=\frac{2n^2}{y^2-1}$$

$$x=\sqrt{\frac{2n^2}{y^2-1}}$$

$$g^{-1}(x)=\sqrt{\frac{2n^2}{x^2-1}}$$

$$g^{-1}(a)=n\sqrt{2}$$

$$\sqrt{\frac{2n^2}{a^2-1}}=n\sqrt{2}$$

$$\frac{n\sqrt{2}}{\sqrt{a^2-1}}=n\sqrt{2}$$

$$\sqrt{a^2-1}=1 \rightarrow a^2-1=1$$

$$a^2=2$$

$$a=\pm\sqrt{2}$$

b) $f_{(x)}=5x^2+7x-2$

$$f_{(7)}=5(7)^2+7(7)-2$$

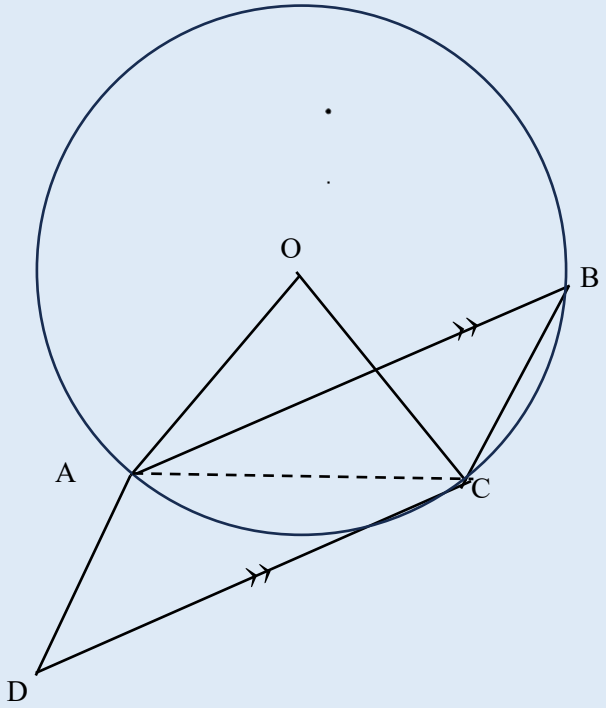
$$=292$$

c) $g(f_{(x)})=\frac{3(f_{(x)})}{5(f_{(x)})+2}$

$$=\frac{3(5x^2+7x-2)}{5(5x^2+7x-2)+2}$$

$$=\frac{3(5x^2+7x-2)}{25x^2+35x-8}$$

15.



Take $B\hat{A}C = \theta$

There fore $A\hat{C}D = \theta$ (alternative angles are equal $A\hat{C}D = C\hat{A}B$)

But $A\hat{B}C = \theta$ (alternative segment theorem $A\hat{C}D = A\hat{B}C$)

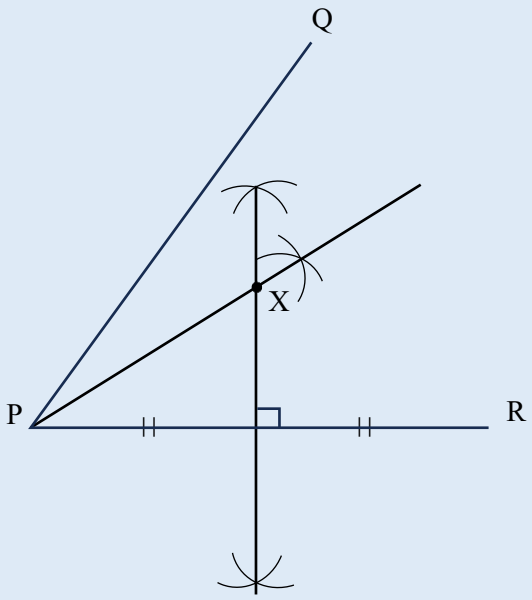
In triangle ABC

$A\hat{B}C = B\hat{A}C = \theta$

There fore

$AC = CB$ (isosceles triangle)

16.



17.

$0.1\dot{5} \times 0.23\dot{5}$

Take $0.1\dot{5}$

$x = 0.1\dot{5}$

$10x = 1.\dot{5}$ — (1)

$100x = 15.\dot{5}$ — (2)

(2) - (1) $\Rightarrow$ $90x = 14$

$x = {}^{14}/_{90}$

Take $0.23\dot{5}$

$y = 0.23\dot{5}$

$100y = 23.\dot{5}$

$1000y = 235.\dot{5}$

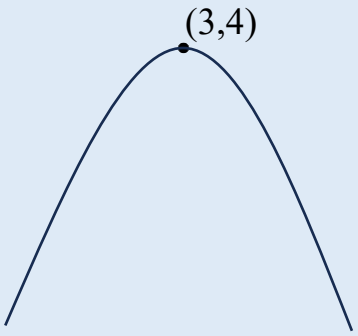
(4) - (3) $\Rightarrow$ $900y = 212$

$y = \frac{212}{900}$

$$\Rightarrow {}^{14}/_{90} \times \frac{212}{900} = \frac{371}{10125}$$

18.

$y = f_{(x)}$



a) $y = f_{(x-2)}$

transformation in $x \rightarrow (+2)$

$y \rightarrow$ no transformation

New coordinate $\Rightarrow (3+2, 4)$

$\Rightarrow (5,4)$

b) $y = 3f_{(x-2)+4}$

transformation in $x \rightarrow +2$

$y \rightarrow y \times 2 + 4$

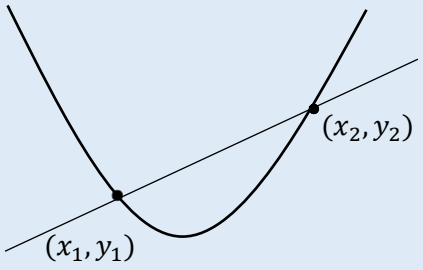
New coordinate $\Rightarrow (3+2, 4\times 3+4)$

$\Rightarrow (5,16)$

19.

$y = 4x^2 + 10x + 6$

$y = 2x + 5$



$2x + 5 = 4x^2 + 10x + 6$

$\Rightarrow \quad 4x^2 + 8x + 1 = 0$

$\Rightarrow \quad x = \frac{-8 \pm \sqrt{8^2 - 4(4)(1)}}{2(4)}$

$= \frac{-8 \pm \sqrt{64-16}}{8}$

$= \frac{-8 \pm \sqrt{48}}{8}$

$x = \frac{-8 \pm 4\sqrt{3}}{8}$

$x_1 = \frac{-2+\sqrt{3}}{2}$ $\qquad$ $x_2 = \frac{-2-\sqrt{3}}{2}$

$y = 2\left(\frac{-2+\sqrt{3}}{2}\right) + 5$ $\qquad$ $y = 2\left(\frac{-2-\sqrt{3}}{2}\right) + 5$

$y = 3 + \sqrt{3}$ $\qquad$ $y = 3 - \sqrt{3}$

20.

Base area $= \pi r^2$

Total area $= \pi r^2 + \pi rl$

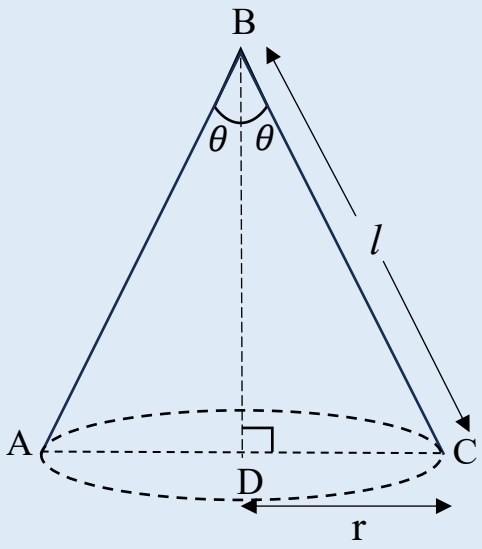
$\frac{\pi r^2}{\pi r^2 + \pi rl} = \frac{1}{3}$

$\frac{r}{r+l} = \frac{1}{3}$

$3r = r + l$

$2r = l$ —①

$r/l = 1/2$



Consider $\underline{\sin\theta}$ for ABD

$\sin\theta = \frac{r}{l} = 1/2$

$\theta = 30°$

There fore ABC angle $\Rightarrow 2\theta$

$\Rightarrow 60°$

21.

$$\sqrt{11}(x+1) = 2x + \sqrt{44}$$

$$\sqrt{11x} + \sqrt{11} = 2x + \sqrt{44}$$

$$\sqrt{11x} - 2x = \sqrt{44} - \sqrt{11}$$

$$x\left(\sqrt{11} - 2\right) = \sqrt{44} - \sqrt{11}$$

$$x = \frac{\sqrt{44}-\sqrt{11}}{\sqrt{11}-2} = \frac{2\sqrt{11}-\sqrt{11}}{\sqrt{11}-2}$$

$$\Rightarrow x = \frac{\sqrt{11}}{\sqrt{11}-2}$$

$$= \frac{\sqrt{11}}{\sqrt{11}-2} \times \left(\frac{\sqrt{11}+2}{\sqrt{11}+2}\right)$$

$$= \frac{11+2\sqrt{11}}{11-4}$$

$$= {}^{11}/_{7} + {}^{2}/_{7}\sqrt{11} \quad \text{or} \quad \frac{11+2\sqrt{11}}{7}$$

$$\left[m = 11, \quad n = 2, \quad p = \sqrt{11}, \quad q = 7\right]$$

22.

$$k\alpha \frac{1}{p^2}$$

$$k = \frac{m}{p^2}$$

When $\left(\begin{matrix} k=1 \\ p=\sqrt{7} \end{matrix}\right) \Rightarrow 1 = \frac{m}{(\sqrt{7})^2}$

$$m = 1 \times 7 = 7$$

Equation $\Rightarrow k = \frac{7}{p^2}$

$p = 5$

$$k = \frac{7}{5^2}$$

$$k = \frac{7}{25} = 0.28$$

23.

$$\frac{1}{24-10x}\left(\frac{37}{2x^2-50}-\frac{5}{2x-10}\right)$$

$$=\frac{1}{2(12-5x)}\left(\frac{37}{2(x^2-25)}-\frac{5}{2(x-5)}\right)$$

$$=\frac{1}{4(12-5x)}\left(\frac{37}{(x-5)(x+5)}-\frac{5}{(x-5)}\right)$$

$$=\frac{1}{4(12-5x)(x-5)}\left(\frac{37}{x+5}-5\right)$$

$$=\frac{1}{4(12-5x)(x-5)}\left(\frac{37-5(x+5)}{x+5}\right)$$

$$=\frac{1}{4(12-5x)(x-5)}\left(\frac{12-5x}{x+5}\right)$$

$$=\frac{1}{4(x-5)(x+5)}$$

24.

Number	1	2	3	4	5	6
Probability	x	0.15	0.1	0.15	$x + 0.2$	0.1

$x + 0.15 + 0.1 + 0.15 + x + 0.2 + 0.1 = 1$

$2x + 0.7 = 1$

$2x = 0.3$

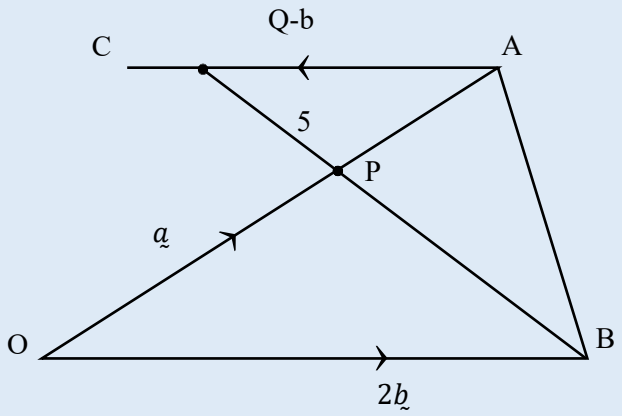
$x = 0.15$

$P_{(1,1)} = P_{(1)} \times P_{(1)}$

$= 0.15 \times 0.15$

$= 0.0225$

25.



Take $OP = \lambda OA$

There fore $\overrightarrow{OP} = \lambda\overrightarrow{OA}$

$$\overrightarrow{OP} = \lambda\underset{\sim}{a} \text{ ——— } (1)$$

$$\overrightarrow{OP} = \overrightarrow{OB} + \overrightarrow{BP} \text{ ——— } (2)$$

Where $\overrightarrow{BP} = \mu\overrightarrow{BQ}$

$$\overrightarrow{BP} = \mu(\overrightarrow{BA} + \overrightarrow{AQ})$$

$$= \mu\left(-2\underset{\sim}{b} + \underset{\sim}{a} + \frac{5}{6}(-b)\right)$$

$$= \mu\left(\underset{\sim}{a} - \underset{\sim}{b}\left(2 + {}^{5}/_{6}\right)\right)$$

$$= \mu\left(\underset{\sim}{a} - \underset{\sim}{b}\left({}^{17}/_{6}\right)\right)$$

$(2) \Rightarrow \overrightarrow{OP} = 2\underset{\sim}{b} + \mu\underset{\sim}{a} - {}^{17}/_{6}\mu\underset{\sim}{b}$

$(1), (2) \Rightarrow \lambda\underset{\sim}{a} = \mu\underset{\sim}{a} + (2 - {}^{17}/_{6}\mu)\underset{\sim}{b}$

$\underset{\sim}{b} \rightarrow \quad 2 - {}^{17}/_{6}\mu = 0$

$\Rightarrow \mu = {}^{12}/_{17}$

$\underset{\sim}{a} \rightarrow \quad \overrightarrow{OP} = {}^{12}/_{17}\overrightarrow{OA}$

there fore $\frac{OP}{PA} = \frac{12}{5}$

$\lambda = {}^{12}/_{17}$