YUAN CHING SECONDARY SCHOOL
Secondary Four Normal (Academic) Course
Preliminary Examination 2024

CANDIDATE NAME

CLASS

INDEX NUMBER

MATHEMATICS **4045/01**

Paper 1 **5 August 2024**

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staple, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total number of marks for this paper is 70.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

	MARKS
Total	/ 70

This paper consists of **20** printed pages.

[Turn Over]

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ is in radians

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer **all** the questions.

1 $-4.4 \quad -2.1^2 \quad \pi \quad \frac{22}{7} \quad \sqrt[3]{27}$

Write these numbers in order of size, starting with the smallest.

Answer ……, ……, ……, ……, …… [2]
smallest

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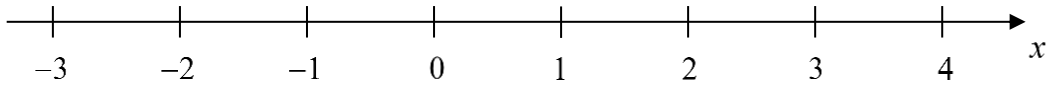
2 **(a)** Represent $-1 < x \leq 3$ on the number line below.

Answer



[1]

(b) Solve the inequality $-3x \leq 7$.

Answer …… [1]

(c) State the smallest integer that satisfy $-3x \leq 7$.

Answer …… [1]

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3 2940 expressed as a product of its prime factors is $2^2 \times 3 \times 5 \times 7^2$.

(a) Express 504 as a product of its prime factors.

Answer ..... [1]

(b) Find the lowest common multiple of 2940 and 504.

Answer ..... [1]

(c) Find the smallest integer *k* such that 2940k is a perfect square.

Answer ..... [1]

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4 Which of these ratio(s) are equivalent to the ratio $a:b$?

$a^b : b^a$ $\quad$ $a^2 : b^2$ $\quad$ $4a : 4b$ $\quad$ $\frac{1}{b} : \frac{1}{a}$ $\quad$ $a+2 : b+2$

Answer ..... [2]

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5 Gracia has a map drawn to a scale $1:25\,000$.

(a) Rewrite the scale in the form 1 cm to x km.

Answer ……cm to ……..…km [1]

(b) A road on the map is 13 cm long.
Find the actual length of the road in kilometres.

Answer …… km [1]

(c) A plot of land has an area of 120 km^2.
Find the area of the plot of land on the map in square centimetres.

Answer …… cm^2 [2]

6 $x^2 + 6x - 2 = (x + a)^2 + b$

(a) Find the value of a and b.

Answer a = ……, b = …… [2]

(b) Hence, solve $x^2 + 6x - 2 = 0$.
Give your answers correct to 2 decimal places.

Answer x = ……, x = …… [2]

7 $v = 3w + 8u^2$

(a) Find v when $w = 4$ and $u = -2$.

Answer $v =$ ..... [1]

(b) Rearrange the formula to make u the subject.

Answer ..... [2]

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8 Solve $\frac{x}{2} - \frac{3+x}{3} = 1$.

Answer $x =$ ..... [2]

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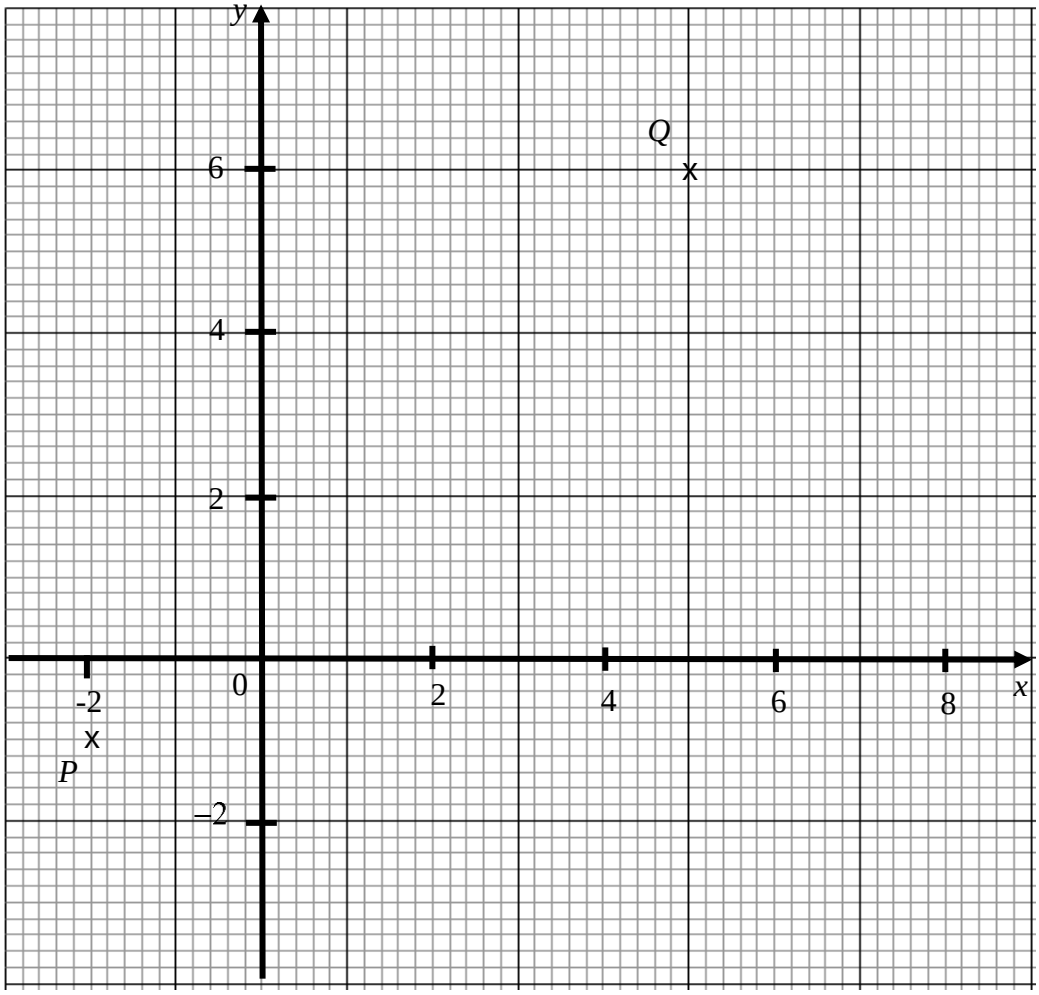
9 P is the point $(-2,-1)$ and Q is the point $(5,6)$.



(a) Find the length of PQ.

Answer ..... units [1]

(b) R is the point $(8,k)$.
Given that the gradient of QR is -3, find the value of k.

Answer $k =$ ..... [2]

(c) Find the equation of line QR.

Answer ..... [2]

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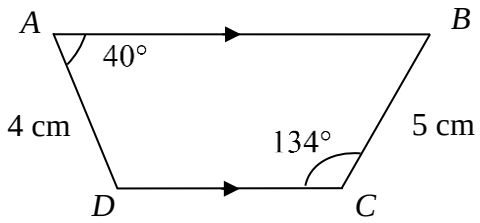
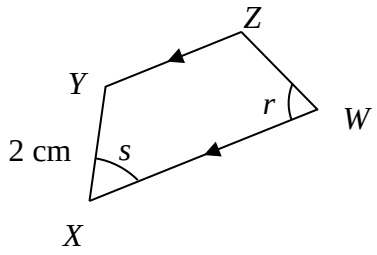
10 In the diagram below, $ABCD$ is similar to $WXYZ$.
AB is parallel to CD.





(a) Find the value of r.

Answer $r =$ .....° [1]

(b) Find the value of s.

Answer $s =$ .....° [1]

(c) Find the length of WZ.

Answer ..... cm [2]

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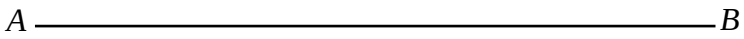
11 ABC is a triangle with AB = 9 cm, angle $BAC = 45°$ and angle $ABC = 70°$.

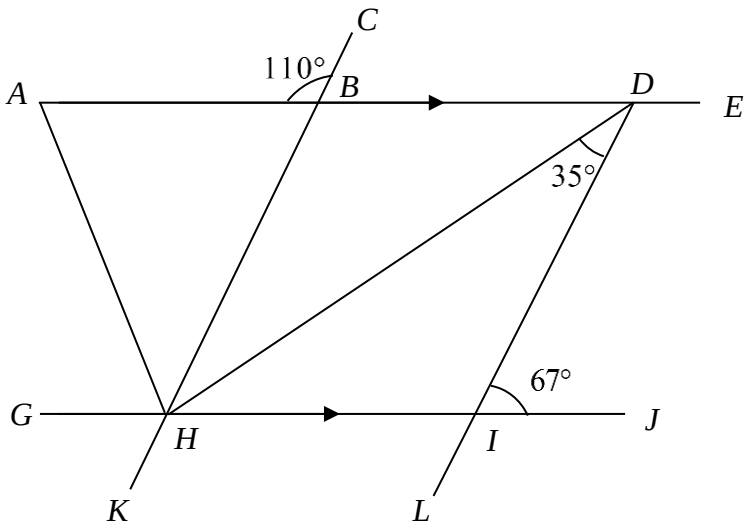
(a) Construct triangle ABC.
AB has been drawn for you.



[2]

(b) The perpendicular bisector of AB and the angle bisector of ACB meet at point T.
Label point T. [2]

12 *AE*, *GJ*, *CK* and *DL* are straight lines.
AE and *GJ* are parallel to each other.
Angle $DIJ = 67°$, angle $HDI = 35°$, angle $ABC = 110°$.



Find, stating reasons,

(a) **(i)** angle *HBD*,

Answer ..... ° [1]

(ii) angle *DHI*.

Answer ..... ° [2]

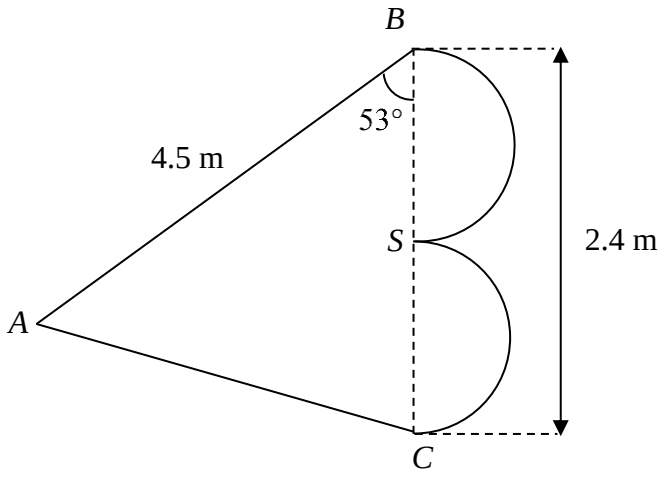
(b) Is *BDIH* a parallelogram?
Explain and show your working clearly.
Answer

.....

.....

..... [1]

13 A playground is made up of a triangle *ABC* and two congruent semicircles with diameter *BS* and *SC* respectively.
Angle $ABC = 53°$, $AB = 4.5$ m and $BC = 2.4$ m.



(a) Calculate the perimeter of the playground.

Answer …… m [3]

(b) (i) Calculate the area of the playground.

Answer …… m^2 [3]

(ii) Convert your answer in **(b)(i)** to cm^2.

Answer ..... cm^2 [1]

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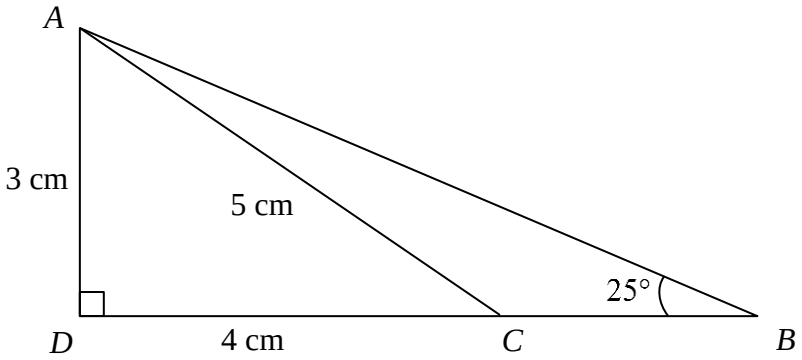
14 In the diagram below, angle $ADB = 90°$, angle $ABD = 25°$.
$AC = 5$ cm, $AD = 3$ cm and $DC = 4$ cm.



(a) Find the exact value of $\cos ACB$.

Answer ..... [1]

(b) Calculate *BC*.

Answer ..... cm [2]

---

15 Mrs Leow wishes to invest $5000 in the bank for 6 years.
She has researched and found two options.

Bank A	Bank B
Simple interest at 2.5% per annum.	Compound interest at 2.4% per annum, compounded yearly.

Which bank should Mrs Leow invest in?
Show your working to support your answer.

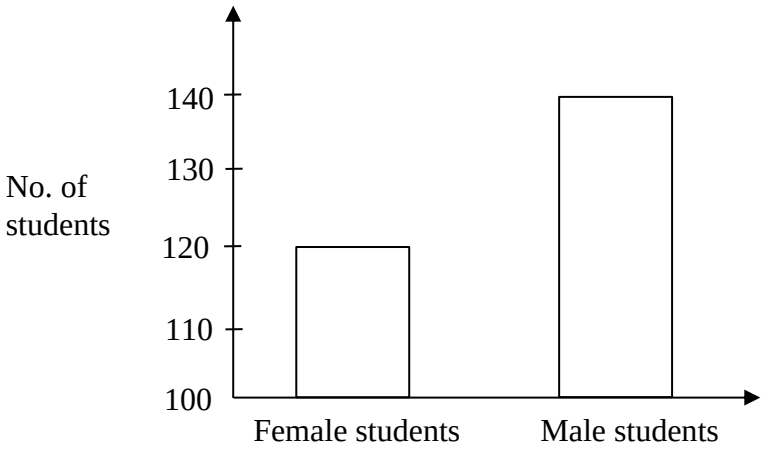
Answer

Mrs Leow should invest in Bank …… because …….

…….

……. [4]

16 The following bar graph shows the number of male and female students who spends more than five hours on their phones per day.



State one feature of the bar graph that is misleading and explain why.

Answer

……

……

…… [1]

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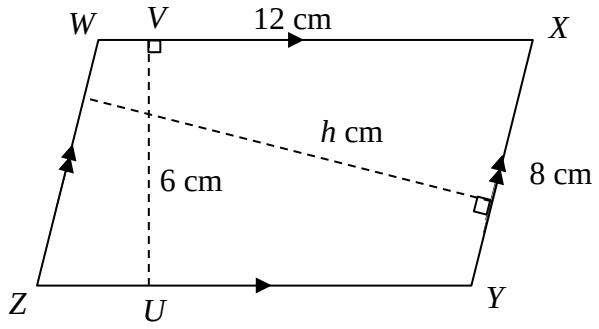
17 The diagram shows parallelogram *WXYZ*.
$WX = 12$ cm, $XY = 8$ cm and $VU = 6$ cm.
Find the length of *h*.



Answer …… cm [2]

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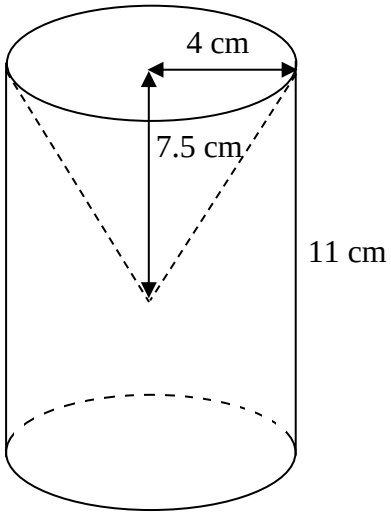
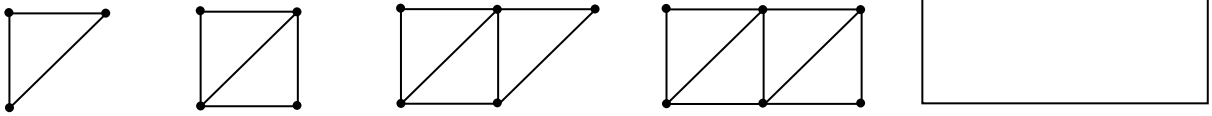
18 The diagram shows a solid formed by removing a cone from a cylinder.



The cylinder and the cone have a common radius of 4 cm.
The height of the cone is 7.5 cm, and the height of the cylinder is 11 cm.
Calculate the volume of the solid.

Answer …… cm^3 [3]

19 The diagram below shows a pattern created using match sticks.



Pattern 1 Pattern 2 Pattern 3 Pattern 4 Pattern 5

(a) Draw pattern 5 in the box above. [1]

(b) Write down an expression, in terms of n, for the number of sticks in pattern n.

Answer …… [1]

(c) Will there be a pattern number with 100 match sticks?
If yes, find the pattern number.
Otherwise, explain why no such pattern number exists.

Answer

……

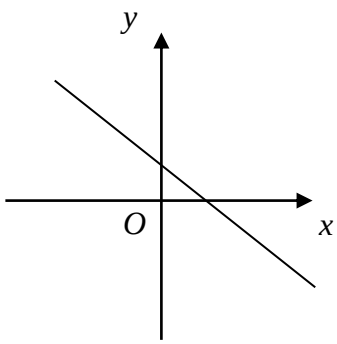
……

…… [1]

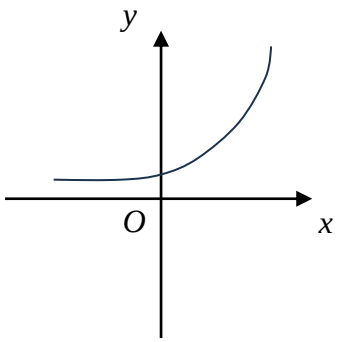
20 Match the following functions to their graphs.

A: $y = -\frac{3}{x}$

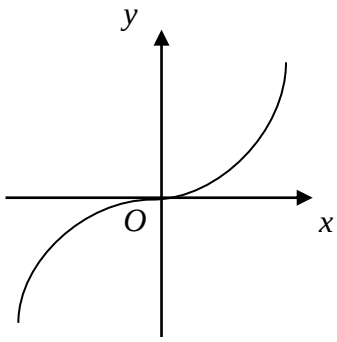
B: $y = 2^x$



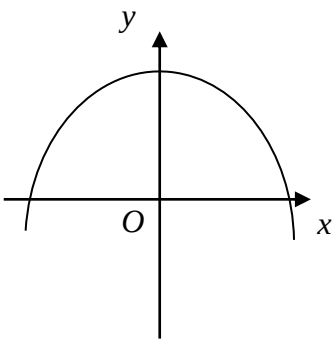
Graph 1



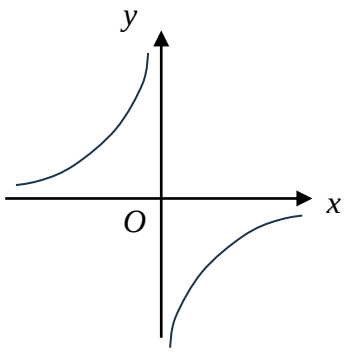
Graph 2



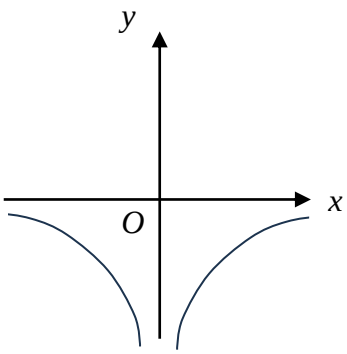
Graph 3



Graph 4



Graph 5

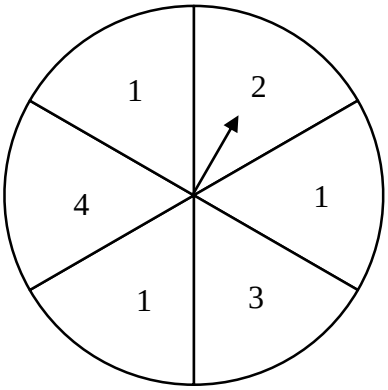


Graph 6

Answer **A:** Graph …… [1]

B: Graph …… [1]

21 A stall runs a spinner game at a fair.



Each player will spin the wheel twice.
Find the probability that

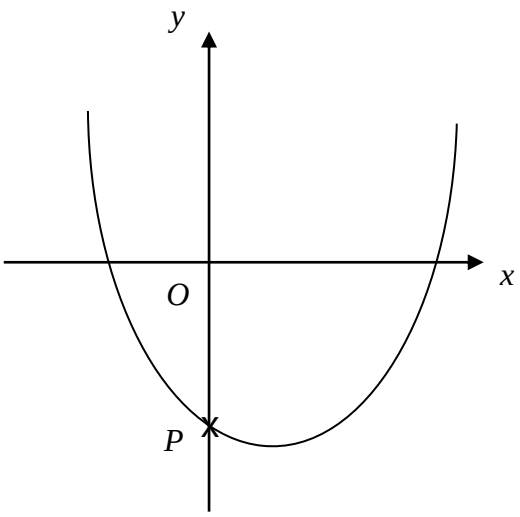
(a) the spinner will land on odd numbers on both spins.

Answer …… [1]

(b) the total score of both spins is greater than 6.

Answer …… [2]

22 The diagram shows a sketch of the graph $y = (x+3)(x-5)$.



(a) Find the coordinates of point P.

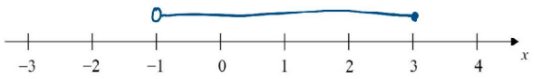
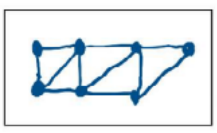
Answer P (…….. , ……..) [1]

(b) State the equation of the line of symmetry of the graph.

Answer …… [1]

----- END OF PAPER -----

Efforts Today, Rewards Tomorrow

Q1	$-2.1^2, -4.4, \sqrt[3]{27}, \pi, \frac{22}{7}$	**Q10**	**a)** 40
Q2	Answer **i)**  		**b)** 46
	ii) $x \geq -2\frac{1}{3}$		**c)** 1.6
	iii) -2	**Q11**	See below
Q3	**a)** $2^3 \times 3^2 \times 7$	**Q12**	**ai)** 110
	b) 17640		**aii)** 32
	c) 15		**b)** No
Q4	$4a : 4b, \frac{1}{b} : \frac{1}{a}$	**Q13**	**a)** 11.9
Q5	**a)** $1 : 0.25$		**b)** 5.44
	b) 3.25		**c)** 54 400
	c) 1920	**Q14**	**a)** $-\frac{4}{5}$
Q6	**a)** $a = 3, b = -11$		**b)** 2.43
	b) $x = 0.32, x = -6.32$	**Q15**	Bank B
Q7	**a)** $v = 44$	**Q16**	Vertical axis does not start from 0
	b) $u = \pm\sqrt{\frac{v-3w}{8}}$	**Q17**	9
Q8	$x = 12$	**Q18**	427
Q9	**a)** 9.90	**Q19**	**a)**  Pattern 5
	b) -3		**b)** 2n+1
	c) $y = -3x + 21$		**c)** Not odd

Q20	**A:** 5**, B:** 2	**Q22**	**a)** $(0,-15)$
Q21	**a)** $\frac{4}{9}$		**b)** $x=1$
	b) $\frac{1}{18}$		

Q11)