NAME : _____( ) MARKS :_____/50

CLASS : 2_____

MATHEMATICS
PAPER 1

Friday **29 September 2023** **1 hour 15 minutes**

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JUYING SECONDARY SCHOOL
END OF YEAR EXAMINATION
SECONDARY TWO G3

READ THESE INSTRUCTIONS FIRST

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
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For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

Answer all questions.

1. It is given that $f = \frac{GMm}{r^2}$.

(a) Find f when $G = 10, M = 15, m = 3$ and $r = -3$.

Answer $f =$ ..... [1]

(b) Express r in terms of f, G, M and m.

Answer $r =$ ..... [2]

---

2. **(a)** Solve the inequality $15 > 1 - 2x$.

Answer ..... [2]

(b) '$x = -7$ fulfils the inequality $15 > 1 - 2x$.'

Determine if this statement is true or false.

Answer

This statement is ..... because .....

..... [1]

---

3. **(a)** Factorise $16 - 9x^2$.

Answer ..... [1]

(b) **Hence,** express $\frac{1}{3x+4} - \frac{x}{(16-9x^2)}$ as a single fraction in its simplest form.

Answer ..... [2]

4. Expand and simplify the following.

(a) $9xy - (x + 3y)^2$

Answer ..... [2]

(b) $(4x - 1)(x^2 - 2x + 3)$

Answer ..... [2]

---

5. Factorise completely.

(a) $4x^2 + 10xy - 14y^2$

Answer ..... [2]

(b) $4 - 4x^2 + y + xy$

Answer ..... [3]

---

6. The land area of Singapore is 25 km^2.
This area is represented on a map as 1 cm^2

(a) Find the actual area of a park that is represented by 0.7 cm^2 on the map.

Answer ..... [1]

(b) The running path within the park measures at 8400 m.
Find the distance, in centimetres, of the running path on the map.

Answer ..... cm [2]

(c) A new scale of 1: 400000 is used.
Find the distance, in centimetres, of the running path on the map using this new scale.

Answer ..... cm [2]

7. Andrew works at an insurance company. He needs to call clients quite often.
The following table records the talk time, in minutes, he has used on his mobile phone for the past 15 days.

32	51	23	36	20
49	37	15	40	34
8	45	5	17	10

(a) Complete the stem and leaf diagram to illustrate the information above.

Answer [2]

Stem	Leaf
0	
1	
2	
3	
4	
5	

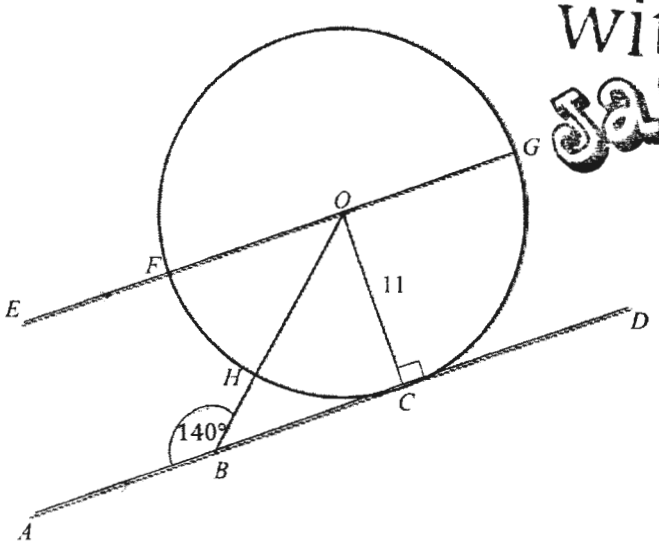
Key: 0|5 represents 5 minutes

(b) Find the percentage of his usage that is more than 14 minutes and less than 41 minutes.

Answer .....% [2]

8. The diagram shows a circle with centre O and radius 11 cm.
C, H, F and G are points on the circumference of the circle.
The line AD touches the circle at C and is parallel to EG.
B is a point on AD such that angle $ABO = 140°$ and angle $OCD = 90°$.

Tuition with Jason



Calculate the length of BH.

Answer ..... [4]

9. The table shows the lifespans, x hours, of 12 light bulbs.

13	17	23	6
27	15	21	17
3	24	14	13

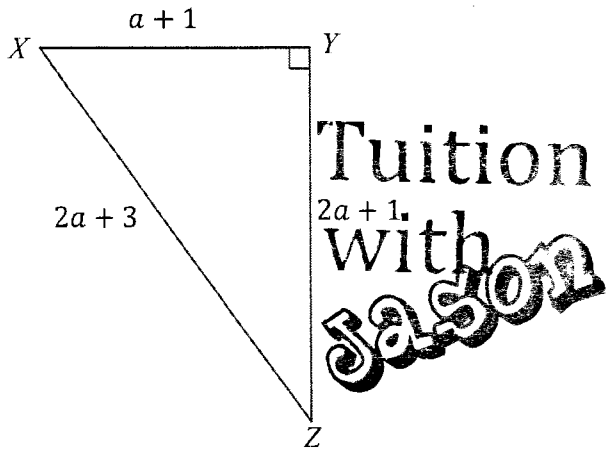
(a) Complete the group frequency table for the lifespan of the light bulbs. [2]

Lifespan, x hours	Frequency
$0 < x \leq 5$	
$5 < x \leq 10$	
$10 < x \leq 15$	
$15 < x \leq 20$	
$20 < x \leq 25$	
$25 < x \leq 30$	

(b) Using the frequency table in **(a)**, calculate an estimate for the mean lifespans of the light bulbs.

Answer ..... hours [2]

10. The diagram below shows triangle XYZ in which $\angle XYZ = 90^{\circ}$, $XY = (a+1)$ cm, $YZ = (2a+1)$ cm and $XZ = (2a+3)$ cm.



Tuition with Jason

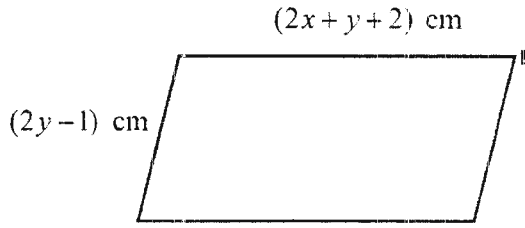
(a) Form an equation in a and show that it reduces to $a^2 - 6a - 7 = 0$.

Answer [2]

(b) Hence, calculate the length of XZ.

Answer $x =$..... [3]

11. The figure shows a parallelogram with its sides as indicated.



Tuition with Jason

(a) By forming two equations in terms of x and y, solve them simultaneously to find the values of x and of y.

Answer $x =$.....

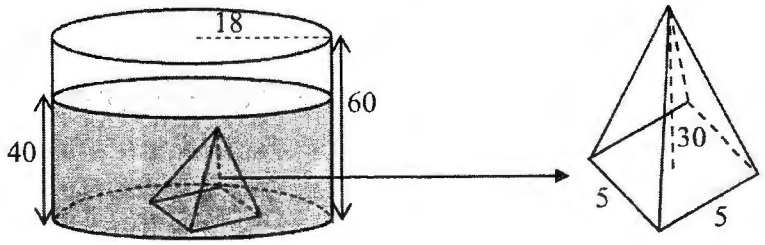
$y =$..... [4]

(b) Hence, find the perimeter of the parallelogram.

Answer .....cm [2]

12. An open cylindrical container has height 60 cm and radius 18 cm.
A solid metal pyramid with height of 30 cm and square base with length of 5 cm is put into the container.
Water is then poured into the container to a depth of 40 cm.

Calculate the volume of water poured into the container.
(Volume of cylinder = $\pi r^2 h$)



Answer ..... cm^3 [4]

End of Paper

NAME : _____( ) MARKS :_____/50

CLASS : 2_____

MATHEMATICS
PAPER 2

Tuesday **3 October 2022** **1 hour 15 minutes**

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JUYING SECONDARY SCHOOL
END OF YEAR EXAMINATION
SECONDARY TWO G3

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Answer **all** questions.
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Omission of essential working will result in loss of marks.
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For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

Answer all questions.

1. Solve the simultaneous equations

$$x = 7 - y$$
$$3x + 5y = 26$$

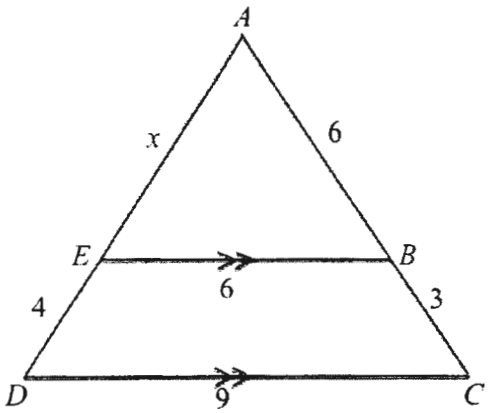
Answer $x =$.....

$y =$..... [3]

2. Show that $(2n + 6)^2 + 4$ is a multiple of 4 for all integer values of n.

Answer [2]

3. The diagram shows similar triangles ACD and ABE.
EB is parallel to DC.
$AB = 6$ cm, $EB = 6$ cm, $DC = 9$ cm, $BC = 3$ cm and $ED = 4$ cm.



(a) State the scale factor of the enlargement.

Answer [1]

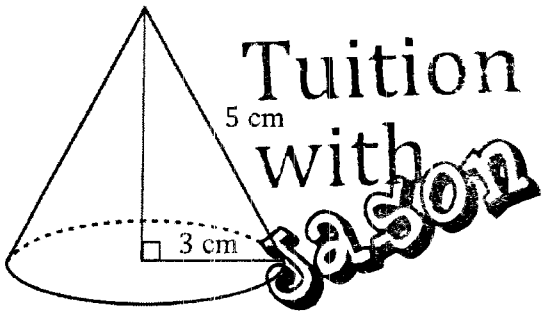
(b) Find the value of x.

Answer $x =$ ..... cm [3]

(c) Point M lies on AD such that triangle ACM is congruent to DCM.
Determine how far point M is from A.

Answer ..... cm [2]

4. A solid cone has radius 3 cm and a slant height of 5 cm.



Tuition with Jason

(a) Find the total surface area of the cone.

Answer ..... cm^2 [3]

(b) Find the volume of the cone.

Answer ..... cm^3 [3]

(c) The cones are to be painted orange.
A tin of orange paint can paint an area of 85 cm^2 .
Determine the number of tins required to paint 15 such cones.

Answer ..... tins [2]

5. **(a)** Express $\frac{x-8}{(x+4)(x-2)} - \frac{2}{x+4}$ as a single fraction in its simplest form.

Answer ..... [3]

(b) **Hence**, find the values of p and q in $\frac{x-8}{(x+4)(x-2)} - \frac{2}{x+4} = \frac{x-p}{x-q} - 1$.

Answer ..... [3]

6. Solve the equation $\frac{9}{x^2-81} - \frac{2}{x+9} = \frac{1}{x^2-81}$

Answer $x =$ ..... [3]

7. y is inversely proportional to x.
It is given that $y = 4$ when $x = 1$.

(a) Form an equation connecting y and x.

Answer ..... [2]

(b) Find the value of x when $y = 6$.

Answer ..... [1]

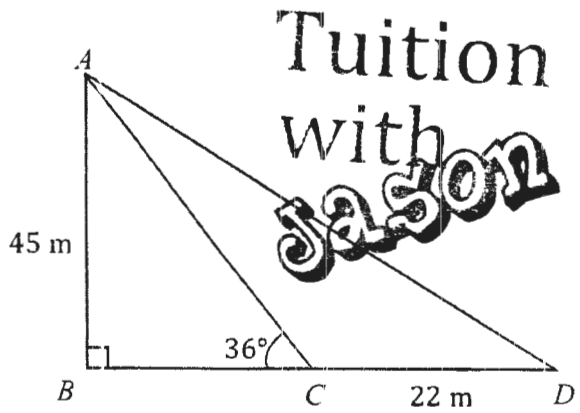
(c) 'When x increases by 300%, y is half its original value.'
Determine if the above statement is true or false.

Answer

The statement is ..... because .....

..... [2]

8.



Tuition with Jason

The diagram represents a wooden pole, AB, built on horizontal ground.
The height of the wooden pole is 45m.
A semi-elastic steel wire, AC, is used to secure the wooden pole in place at an angle of 36° to the horizontal.
Point D is 22m from C and BCD is a straight line.

(a) Calculate angle ADB.

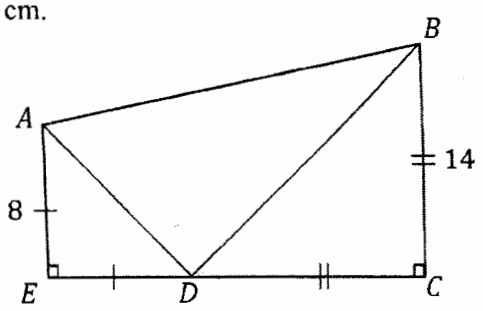
Answer ..... m [4]

(b) The steel wire has a maximum stretch length of 90m, after which it will snap.
Explain if the steel wire can be stretched from A to D without snapping.

Answer

The steel wire .... be stretched from A to D without snapping. [2]

9. A piece of paper is cut into the shape below.
$AE = 8$ cm and $BC = 14$ cm.



(a) Calculate the length of BD.

Answer ..... cm [2]

(b) It is given that $AB = \sqrt{520}$ cm.
Determine if triangle ADB is a right-angled triangle.

Answer [3]

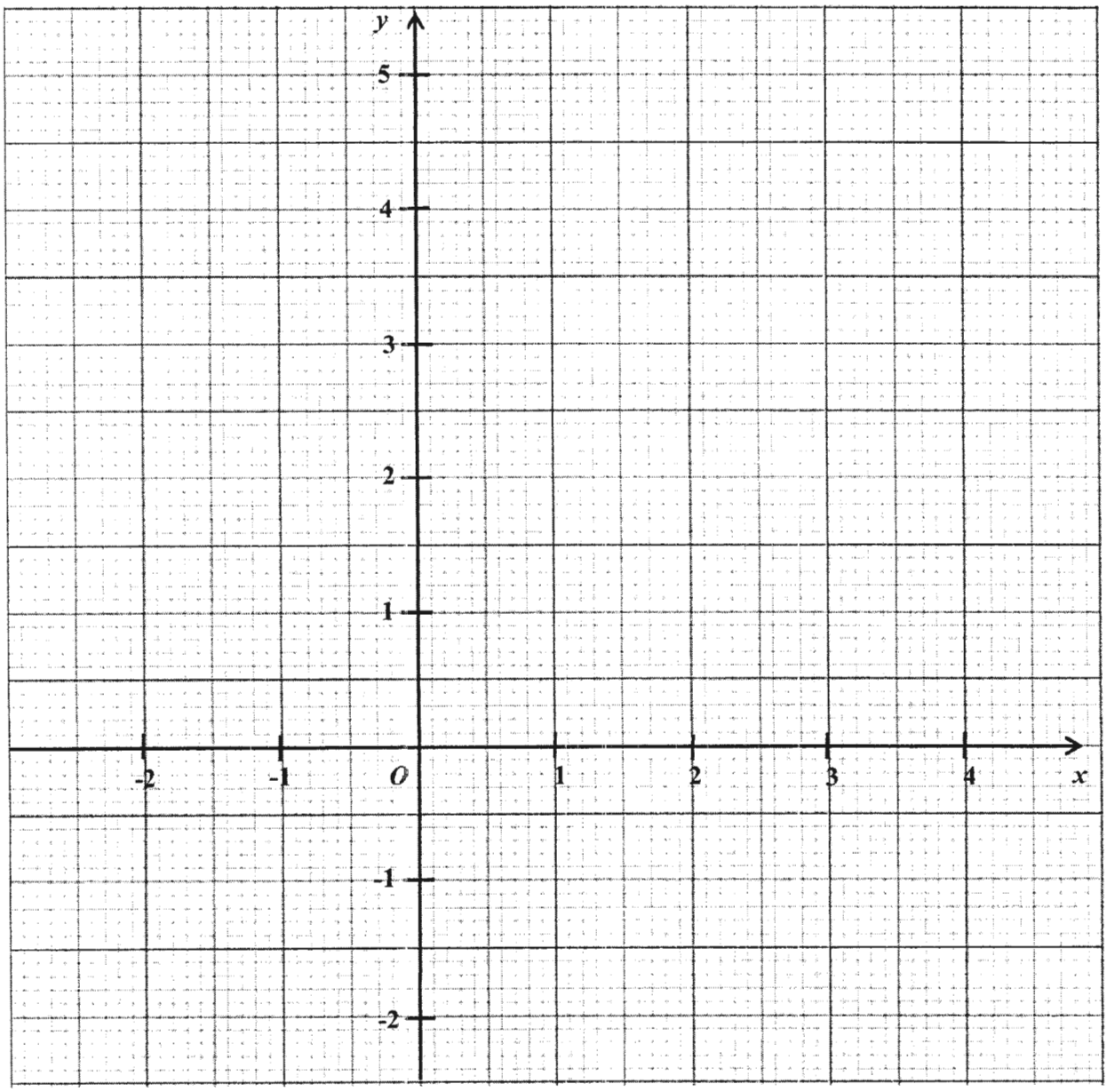
10. The table below shows the corresponding values of x and y, where $y = x^2 - 1.5x - 1.5$.

x	−1.5	−1	0	1	2	3
y	a	1	−1.5	−2	−0.5	3

(a) Find the value of a.

Answer $a =$ ..... [1]

(b) On the grid, plot the graph of $y = x^2 - 1.5x - 1.5$ for $-1.5 \leq x \leq 3$. [2]



(c) **(i)** Using your graph in part **(b)**, write down the coordinates of the turning point.

Answer (....., ...) [1]

(iii) Draw $y = 2$ and hence, find the values of x when $x^2 - 1.5x - 1.5 = 2$.

Answer x =..... or ..... [2]

End of Paper

NAME : _____( ) MARKS :_____/50

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MATHEMATICS
PAPER 1

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The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

Setter: Mr Elisha Asilvatham
Vetter: Mrs Wong-Chia Pei San

This Question Paper consists of 12 printed pages including this page.

Mathematical Formulae

Compound interest

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

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

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

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

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

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

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

Trigonometry

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

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

Statistics

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

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

Answer all questions.

1. It is given that $f = \frac{GMm}{r^2}$.

(a) Find f when $G = 10, M = 15, m = 3$ and $r = -3$.

$f = \frac{10(15)(3)}{(-3)^2} = 50$ ---B1

Answer $f =$ ..... [1]

(b) Express r in terms of f, G, M and m.

$r = \pm\sqrt{\frac{GMm}{f}}$ --- B1 for $\pm$

--- B1 for rest

Answer $r =$ ..... [2]

---

2. **(a)** Solve the inequality $15 > 1 - 2x$.

$-2x < 14$ ---M1

$2x > -14$

$x > -7$ --- A1

Tuition with Jason

Answer ..... [2]

(b) '$x = -7$ fulfils the inequality $15 > 1 - 2x$.'

Determine if this statement is true or false.

Answer [1]

This statement is False because x must be bigger than -7

False ---B1

---

3. **(a)** Factorise $16 - 9x^2$.

$(4 - 3x)(4 + 3x)$ --- B1

Answer ..... [1]

(b) **Hence,** express $\frac{1}{3x+4} - \frac{x}{(16-9x^2)}$ as a single fraction in its simplest form.

$$\frac{1}{3x+4} - \frac{x}{(16-9x^2)} = \frac{1}{3x+4} - \frac{x}{(4-3x)(4+3x)}$$

$$= \frac{4-3x-x}{(4-3x)(4+3x)}$$ ---M1 (award M1 for same denominator seen)

$$= \frac{4-4x}{(4-3x)(4+3x)}$$ ---A1

Answer ..... [2]

4. Expand and simplify the following.

(a) $9xy - (x + 3y)^2$,

$9xy - (x^2 + 6xy + 9y^2)$
$9xy - x^2 - 6xy - 9y^2$ ---M1 (Award M1 is expansion of $(x + 3y)^2$ seen)
$= 3xy - x^2 - 9y^2$ --- A1

Tuitic with Jason

Answer ..... [2]

(b) $(4x - 1)(x^2 - 2x + 3)$

$4x^3 - 8x^2 + 12x - x^2 + 2x - 3$ ---M1
$= 4x^3 - 9x^2 + 14x - 3$ --- A1

Answer ..... [2]

---

5. Factorise completely.

(a) $4x^2 + 10xy - 14y^2$

$2(2x^2 + 5xy - 7y^2)$ ---M1 (Award for (2x+7y)(2x-2y) or (4x+14y)(x-y) seen
$= 2(2x + 7y)(x - y)$ ---A1

Answer ..... [2]

(b) $4 - 4x^2 + y + xy$

$4(1 - x^2) + y(1 + x)$ ---M1
$= 4(1 + x)(1 - x) + y(1 + x)$ --- M1
$= (1 + x)(4 - 4x + y)$ ---A1

Answer ..... [3]

---

6. The land area of Singapore is 25 km^2.
This area is represented on a map as 1 cm^2

(a) Find the actual area of a park that is represented by 0.7 cm^2 on the map.

$1cm^2 : 25km^2$
$0.7cm^2 : 17.5km^2$ --- B1

Answer ..... [1]

(b) The running path within the park measures at 8400 m.
Find the distance, in centimetres, of the running path on the map.

$1cm^2 : 25km^2$
$1cm : 5km$ --- M1
$1.68cm : 8.4km$ ---A1

Answer ..... cm [2]

(c) A new scale of 1: 400000 is used.
Find the distance, in centimetres, of the running path on the map using this new scale.

$1cm : 4km$ --- M1 (or if 8400m=8.4km seen)
$2.1cm : 8.4km$ ---A1

Answer ..... cm [2]

7. Andrew works at an insurance company. He needs to call clients quite often.
The following table records the talk time he has used on his mobile phone for the past 15 days.

32	51	23	36	20
49	37	15	40	34
8	45	5	17	10

(a) Complete the stem and leaf diagram to illustrate the information above.

Answer [2]

Tuition with Jason

Stem	Leaves
0	5 8
1	0 5 7
2	0 3
3	2 4 6 7
4	0 5 9
5	1

All correct --- B2
1-2 mistakes --- B1
3 or more mistakes --- B0

Note: entries on correct row but not ascending order ---B1

No deduction of mark if comma seen

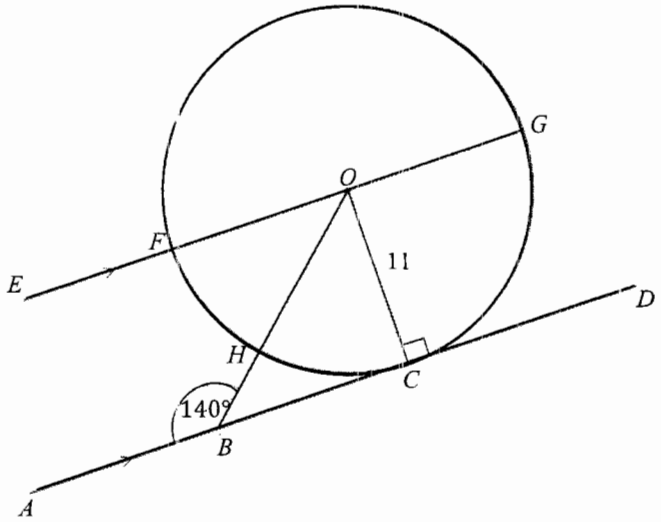
Key: 0|5 represents 5 mins

(b) Find the percentage of his usage that is more than 14 minutes and less than 41 minutes.

$\frac{9}{15} \times 100\%$ --- M1
$= 60\%$ ---A1

Answer .....% [2]

8. The diagram shows a circle with centre O and radius 11 cm.
C, F, G and H are points on the circumference of the circle.
The line AD touches the circle at C and is parallel to EG.
B is a point on AD such that angle $ABO = 140°$ and angle $OCD = 90°$.



Calculate the length of BH.

Angle OBC: $180 - 140 = 40$ --- M1

$sin40 = \frac{11}{OB}$

$OB = \frac{11}{\sin 40}$ either --- M1

$OB = 17.1129$

$BH = 17.1129 - 11$ ---M1 (allow for ECF is OB calculated wrongly)

$= 6.1129$

≈ 6.11 --- A1

Tuition with Jason

Answer ..... [4]

9. The table shows the lifespans, x hours, of 12 light bulbs.

13	17	23	6
27	15	21	17
3	24	14	13

(a) Complete the group frequency table for the lifespan of the light bulbs. [2]

x hours	frequency
$0 < x \leq 5$	1
$5 < x \leq 10$	1
$10 < x \leq 15$	4
$15 < x \leq 20$	2
$20 < x \leq 25$	3
$25 < x \leq 30$	1

All correct --- B2
1 mistake --- B1
2 or more mistakes --- B0

Accept tally

(b) Using the frequency table in **(a)**, calculate an estimate mean lifespan of the light bulbs.

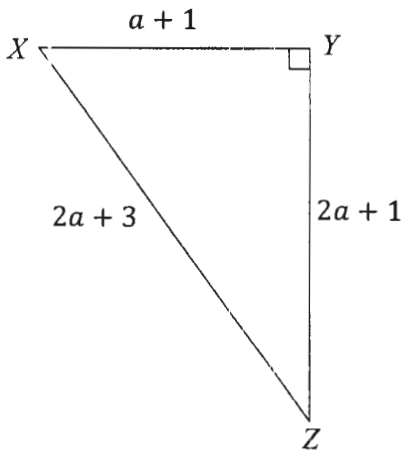
Tuition with Sasori

$\frac{1(2.5)+1(7.5)+4(12.5)+2(17.5)+3(22.5)+1(27.5)}{12} = 15.8333$ --- M1 (allow for ECF from (a))

15.8 ---A1

Answer ..... hours [2]

10. The diagram below shows triangle XYZ in which $\angle XYZ = 90°$, $XY = (a+1)$ cm, $YZ = (2a + 1)$ cm and $XZ = (2a + 3)$ cm.



(a) Form an equation in a and show that it reduces to $a^2 - 6a - 7 = 0$.

Answer [2]

By P.T.
$(a+1)^2 + (2a+1)^2 = (2a+3)^2$ --- B1
$a^2 + 2a + 1 + 4a^2 + 4a + 1 = 4a^2 + 12a + 9$ --- B1
$a^2 - 6a - 7 = 0$ (shown)

(b) Hence, calculate the length of XZ.

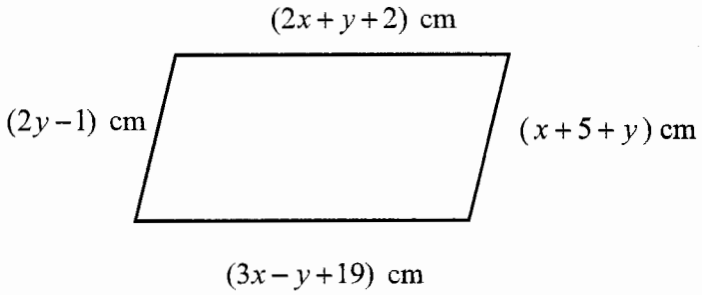
$a^2 - 6a - 7 = 0$
$(a-7)(a+1) = 0$ ---M1
$a = 7, a = -1$ *(reject)* ---M1 (accept is students get answer without factorisation. Accept if student did not reject a=-7)

$XZ = 2(7) + 3 = 17$ ---A1

Tuition with Jason

Answer $x =$..... [3]

11. The figure shows a parallelogram with its sides as indicated.



(a) By forming two equations in terms of x and y, solve them simultaneously to find the values of x and of y.

$2x + y + 2 = 3x - y + 19$ ----(1) ---M1
$2y - 1 = x + 5 + y$ ----(2) ---M1
From (1),
$2y - 17 = x$ ----(3)
Sub (3) into (2)
$2y - 1 = 2y - 17 + 5 + y$
$y = 11$ ---A1
$x = 5$ ---A1

Answer $x =$.....

$y =$..... [4]

(b) Hence, find the perimeter of the parallelogram.

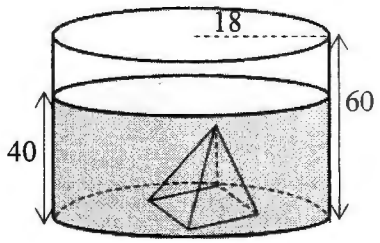
$2(5) + 11 + 2 + 5 + 5 + 11 + 3(5) - 11 + 19 + 2(11) - 1 = 88$ -----M1, A1
(Allow for ECF from part (a))

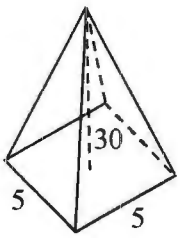
Tuition with Jason

Answer .....cm [2]

12. An open cylindrical container has height 60 cm and radius 18 cm.
A solid metal pyramid with height of 30 cm and square base with length of 5 cm is put into the container.
Water is then poured into the container to a depth of 40 cm.

Calculate the volume of water poured into the container.
(Volume of cylinder = $\pi r^2 h$)





Vol of cylinder up to 40cm $\pi(18)^2(40) = 40715.0407\ cm^3$	---M1 (award for use of formula)
Vol of pyramid $1/3(5)^2(30) = 250\ cm^3$	---M1 (award for use of formula)
Vol of water $40715.0407 - 250 = 40465.0407\ cm^3$ $= 40500\ cm^3$ ---A1	---M1 (allow for ECF)

Answer ..... cm^3 [4]

End of Paper

NAME : _____( ) MARKS :_____/50

CLASS : 2_____

MATHEMATICS
PAPER 2

Tuesday **3 October 2022** **1 hour 15 minutes**

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JUYING SECONDARY SCHOOL
END OF YEAR EXAMINATION
SECONDARY TWO G3

READ THESE INSTRUCTIONS FIRST

Write your name, register number, class and date in the space provided.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
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 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, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 50.

Setter: Mr Elisha Asilvatham
Vetter: Mrs Wong-Chia Pei San

This Question Paper consists of 14 printed pages including this page.

Mathematical Formulae

Compound interest

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

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

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

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

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

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

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

Trigonometry

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

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

Statistics

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

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

Answer all questions.

1. Solve the simultaneous equations

$$x = 7 - y$$
$$3x + 5y = 26$$

Substitution
$3(7 - y) + 5y = 26$ ---M1
$21 - 3y + 5y = 26$
$2y = 5$
$y = 2.5$ ---A1
$x = 4.5$ ---A1

Elimination
$3x + 3y = 21$
$-2y = -5$ ---M1
$2y = 5$
$y = 2.5$ ---A1
$x = 4.5$ ---A1

Answer $x =$.....

$y =$..... [3]

2. Show that $(2n + 6)^2 + 4$ is a multiple of 4 for all integer values of n.

Answer [2]

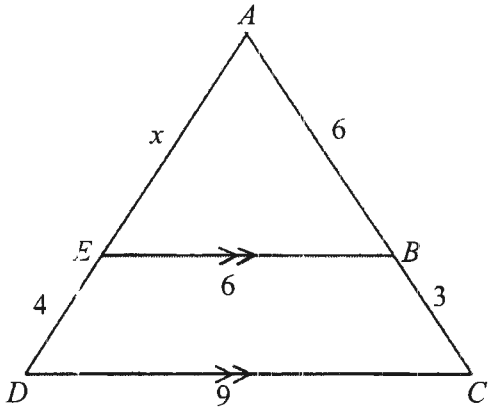
$(2n + 6)^2 + 4 = 4n^2 + 24n + 40$ ---B1
$4n^2 + 24n + 40 = 4(n^2 + 6n + 10)$ ---B1

OR

Since $(2n+6)^2 + 4$ has a factor 4, it is a multiple of 4 for all integer values of n. --- B2

Do not accept $4n^2 + 24n + 40 = n^2 + 6n + 10$

3. The diagram shows similar triangles ACD and ABE.
EB is parallel to DC.
$AB = 6$ cm, $EB = 6$ cm, $DC = 9$ cm, $BC = 3$ cm and $ED = 4$ cm.



(a) State the scale factor of the enlargement.

Answer

$\frac{9}{6} = \frac{3}{2}$ ---B1

Accept 2:3 or 3:2

[1]

Tuition with Jason

(b) Find the lengths of x.

$\frac{EB}{DC} = \frac{2}{3}$

$\frac{AE}{AD} = \frac{x}{x+4} = \frac{2}{3}$ --- M1

$3x = 2x + 8$

$x = 8$ --- A1

OR

$\frac{AB}{BC} = \frac{AE}{DE}$

$\frac{6}{3} = \frac{x}{4}$ --- M1

$3x = 24$

$x = 8$ --- A1

Answer $x =$ ..... cm

[2]

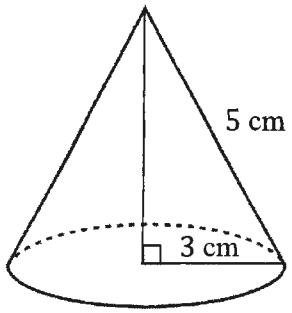
(c) Point M lies on AD such that triangle ACM is congruent to DCM.
Determine how far point M is from A.

AD = 8+4
=12 --- M1 (Allow for ECF from (b))

M lies $\frac{12}{2} = 6$ cm from A. --- A1

Answer ..... cm [2]

4. A solid cone has radius 3 cm and a slant height of 5 cm.



(a) Find the total surface area of the cone.

Answer [3]

$\pi rl + \pi r^2 = \pi(3)(5) + \pi(3)^2$ ---- M1, M1
$= 75.398$
$= 75.4\ cm^2$ --- A1

(b) Find the volume of the cone.

Answer [3]

Height = $\sqrt{5^2 - 3^2} = 4$ --- M1

$\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(3^2)(4)$ --- M1 (Allow for ECF if height is calculated wrongly BUT no ECF if student uses height=5cm)
$= 37.699$
≈ 37.7 --- A1

Tuition with Sasi

(c) The cones are to be painted orange.
A tin of orange paint can paint an area of 85 cm^2 .
Determine the number of tins required to paint 15 such cones.

Answer [2]

$75.398 \times 15 = 1130.97335$
$1130.97335 \div 85 = 13.30$ --- M1 (allow for ECF from (a))
14 Tins are needed --- A1

5. **(a)** Express $\frac{x-8}{(x+4)(x-2)} - \frac{2}{x+4}$ as a single fraction in its simplest form.

$= \frac{x-8-2(x-2)}{(x+4)(x-2)}$ ---M1

$= \frac{x-8-2x+4}{(x+4)(x-2)}$

$= \frac{-4-x}{(x+4)(x-2)}$ --- M1

$= \frac{-(4+x)}{(x+4)(x-2)}$

$= \frac{-1}{(x-2)}$ --- A1

Answer ..... [3]

(b) **Hence**, find the values of p and q in $\frac{x-8}{(x+4)(x-2)} - \frac{2}{x+4} = \frac{x-p}{x-q} - 1$.

$\frac{-1}{(x-2)} = \frac{x-p}{x-q} - 1$

$\frac{-1}{(x-2)} = \frac{x-p}{x-q} - \frac{x-q}{x-q}$ --- M1

$\frac{-1}{(x-2)} = \frac{x-p-x+q}{x-q}$

$\frac{-1}{(x-2)} = \frac{q-p}{x-q}$

$q = 2$ --- B1

$-1 = 2 - p$

$p = 3$ --- B1

Tuition with Jason

Answer ..... [3]

6. Solve the equation $\frac{9}{x^2-81} - \frac{2}{x+9} = \frac{1}{x^2-81}$

$\frac{9}{(x+9)(x-9)} - \frac{2}{x+9} = \frac{1}{x^2-81}$ --- M1

$\frac{9-2(x-9)}{(x+9)(x-9)} = \frac{1}{x^2-81}$

$9 - 2x + 18 = 1$ --- M1

$-2x = 1 - 18 - 9$

$-2x = -26$

$x = 13$ --- A1

OR

$\frac{9}{x^2-81} - \frac{1}{x^2-81} = \frac{2}{x+9}$ ---M1

$\frac{8}{(x-9)(x+9)} = \frac{2}{x+9}$

$8 = 2(x - 9)$

$8 = 2x - 18$ ---M1

$2x = 26$

$x = 13$ ---A1

Answer $x =$ ..... [3]

7. y is inversely proportional to x.
It is given that $y = 4$ when $x = 1$.

(a) Form an equation connecting y and x.

$y = \frac{k}{x}$
$4 = \frac{k}{1}$
$k = 4$ --- M1
$y = \frac{4}{x}$ --- A1

Answer ..... [2]

(b) Find the value of x when $y = 6$.

$6 = \frac{4}{x}$
$x = \frac{4}{6}$
$= \frac{2}{3}$ --- B1

Answer ..... [1]

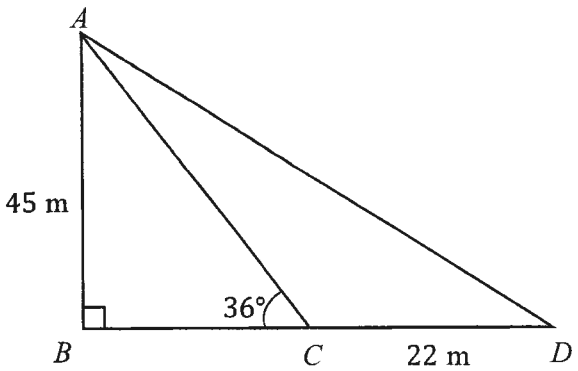
(c) 'When x increases by 300%, y is half its original value.'
Determine if the above statement is true or false.

Answer [2]

x → 4x --- B1 (4x seen)
$y = \frac{4}{4x}$
$= \left(\frac{1}{4}\right)\left(\frac{4}{x}\right)$
The statement is <u>false</u> ---B1 (if student states false award the mark)

Tuition with Jason

8.



The diagram represents a wooden pole, AB, built on horizontal ground.
The height of the wooden pole is 45m.
A semi-elastic steel wire, AC, is used to secure the wooden pole in place at an angle of 36° to the horizontal.
Point D is 22m from C and BCD is a straight line.

(a) Calculate angle ADB.

$\tan 36 = \frac{45}{BC}$ --- M1

$BC = \frac{45}{\tan 36}$

$= 61.9371$

$BD = 22 + 61.9371$ --- M1

$= 83.9371$

$\tan \angle ADB = \frac{45}{83.9371}$ --- M1 (Allow for ECF (BC = 61.9371))

$\angle ADB = tan^{-1}\frac{45}{83.9371}$

$= 28.3°$ --- A1

Answer ..... m [4]

(b) The steel wire has a maximum stretch length of 90m, after which it will snap.
Explain if the steel wire can be stretched from A to D without snapping.

[2]

Answer

By P.T.

$AD = \sqrt{45^2 + 83.9371^2}$

$= 95.238$

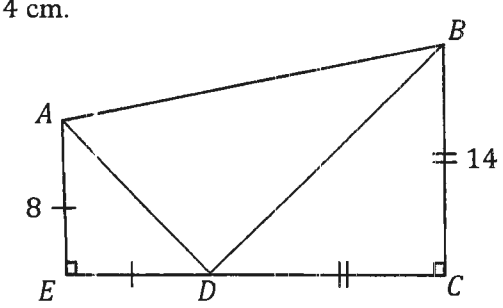
$= 95.2$ --- M1 (Allow for ECF if value used from (a) and correct method)

$> 90m$

The steel wire cannot be stretched from A to --- A1 (No A1 if M1 not awarded)

Tuition with Sajon

9. A piece of paper is cut into the shape below.
$AE = 8$ cm and $BC = 14$ cm.



(a) Calculate the length of BD.

By P.T.
$BD = \sqrt{14^2 + 14^2}$ --- M1
$= \sqrt{392}$
$= 19.798$
$= 19.8$ cm --- A1

Answer ..... cm [2]

(b) It is given that $AB = \sqrt{520}$ cm.
Determine if triangle ADB is a right-angled triangle.

Answer [3]

By P.T.
$AD = \sqrt{8^2 + 8^2}$ --- M1
$= \sqrt{128}$

$AB^2 = \sqrt{520}^2$ --- M1
$= 520$
$AD^2 + DB^2 = \sqrt{128}^2 + \sqrt{392}^2$ --- M1
$= 520$

Since $AD^2 + DB^2 = AB^2$, by the converse of Pythagoras theorem, triangle ADB is a right-angled triangle and angle $ADB = 90$. --- A1

Notes:

1) If Presentation is poor but follows the convers of PT, award no marks for working but A1 for final statement.
2) If student uses PT to show that it is a right angle triangle, award NO marks even if statement is correct.

10. The table below shows the corresponding values of x and y, where $y = x^2 - 1.5x - 1.5$.

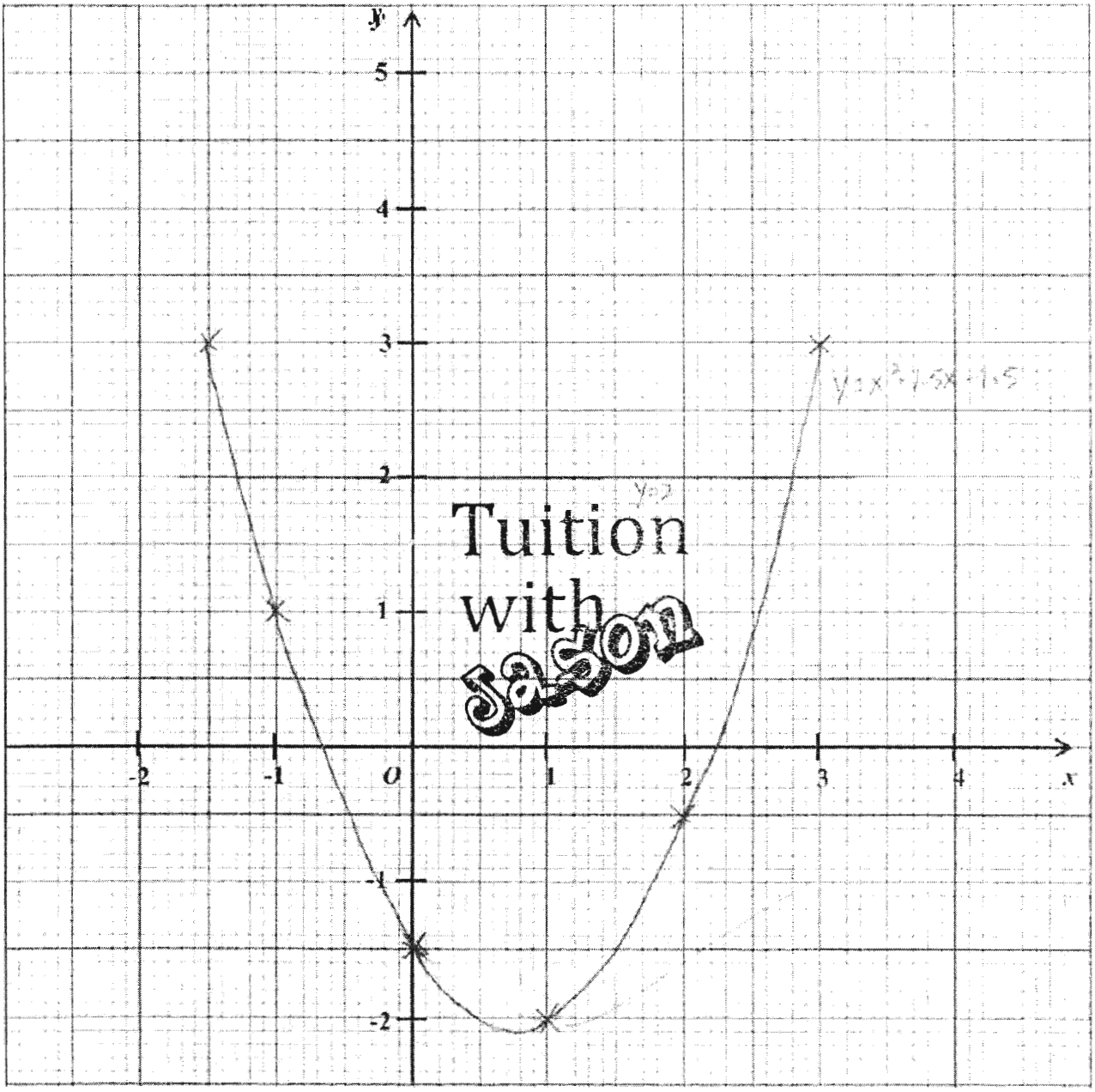
x	−1.5	−1	0	1	2	3
y	a	1	−1.5	−2	−0.5	3

(a) Find the value of a.

3 --- B1

Answer $a =$ ..... [1]

(b) On the grid, plot the graph of $y = x^2 - 1.5x - 1.5$ for $-1.5 \leq x \leq 3$. [2]



(c) **(i)** Using your graph in part **(b)**, write down the coordinates of the turning point.

(0.75, -2.1) --- B1 Accept with +- 0.1

Answer (..... , ...) [1]

(iii) Draw $y = 2$ and hence, find the values of x when $x^2 - 1.5x - 1.5 = 2$.

-1.25 --- B1 2.8 --- B1 Accept with +- 0.1 Accept with +- 0.1

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

End of Paper