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2023 Preliminary Examination Secondary Four Normal Academic

CANDIDATE
NAME

CLASS

INDEX
NUMBER

MATHEMATICS SYLLABUS A

4045/01

Paper 1

27 July 2023

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on 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 paper clips, 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 in the space below the question.
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.

You are reminded of the need for clear presentation in your answers.
Up to 2 marks may be deducted for improper presentation.

| Question Number | Marks | Marks Obtained |
|-----------------|-----------|----------------|
| 1 | 2 | |
| 2 | 3 | |
| 3 | 2 | |
| 4 | 5 | |
| 5 | 4 | |
| 6 | 3 | |
| 7 | 6 | |
| 8 | 5 | |
| 9 | 3 | |
| 10 | 4 | |
| 11 | 3 | |
| 12 | 3 | |
| 13 | 3 | |
| 14 | 3 | |
| 15 | 3 | |
| 16 | 1 | |
| 17 | 3 | |
| 18 | 4 | |
| 19 | 6 | |
| 20 | 4 | |
| TOTAL | 70 | |

Mathematical Formulae*Compound Interest*

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

Measurement

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer all the questions

1 $\frac{7}{2}$ 330% $\frac{\pi}{2}$ 0.325 $\frac{12}{15}$

Write these numbers in descending order.

Answer: , , , , [2]

2 (i) Solve $-4x - 6 \leq -21$ and represent your answer on a number line.

[2]

(ii) Hence, find the smallest integer that satisfies $-4x - 6 \leq -21$.

Answer: [1]

3 (a) Sarah mixes 0.4 kg of flour with 250 g of butter.

Write the ratio of butter : flour in its simplest form.

Answer: : [1]

(b) A bag contains only blue and pink bean bags.

$\frac{3}{11}$ of the bean bags are pink.

Write the ratio pink bean bags : blue bean bags in its simplest form.

Answer: : [1]

[Turn over

- 4 (a) Write 628 as a product of its prime factors.

Answer: [1]

- (b) Find the largest perfect square that is a factor of 600.

Answer: [2]

- (c) $280 = 2^3 \times 5 \times 7$

Find the lowest common multiple (LCM) of 280 and 600. Give your answer as a product of its prime factors.

Answer: [1]

- (d) Find the smallest positive integer of x such that $600x$ is a perfect cube.

Answer: [1]

[Turn over

- 5 (a) Given that $v = \frac{d^2}{2} - a$, find the value of v when $a = 5$ and $d = -8$.

Answer: [2]

- (b) Make d the subject of the formula $v = \frac{d^2}{2} - a$.

Answer: $d =$ [2]

- 6 Simplify $\frac{(5ad)^2}{x} \times \frac{a}{6} \div \frac{d^3}{2^0}$.

Answer: [3]

- 7 (i) Sheldon wanted to invest \$18 000 in a saving plans with a compound interest of 5% half yearly for 4 years in Bank A. Calculate the total interest that he received at the end of the 4 years.

Answer: \$..... [3]

- (ii) Sheldon is also thinking of investing in Bank B with the same amount of \$18 000 and the same duration of 4 years. However, Bank B charged a simple interest rate at 6% per annum. Which bank should Sheldon invest in? Explain your answer.

Answer: Bank

This is because

.....

..... [3]

8 Expand and simplify

(i) $2(c + p) - (-7p + 4c)$,

Answer: [2]

(ii) $(5x - 2)(2x + 3) - 2(5x - 3)(x + 1)$.

Answer: [3]

9 (i) Expand $p^2 - (p + a)(p - a)$.

Answer: [2]

(ii) Hence, write down the value of $123456^2 - (123459)(123453)$.

Answer: [1]

10 $x^2 - 16x + 8 = (x - a)^2 + b$

(a) Find the value of a and of b .

Answer: $a = \dots\dots\dots$

$b = \dots\dots\dots$ [2]

(b) Hence, solve $x^2 - 16x + 8 = 0$, giving your answers correct to 2 decimal places.

Answer: $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

11 Janelle travelled from Singapore to Thailand. She exchanged 400 Singapore dollars (\$) into Thai Baht (THB) when the exchange rate was 1 THB = \$0.03875. While in Thailand, she spent 6500 THB. On her return, she exchanged her remaining Thai Baht when the exchange rate was 1 THB = \$0.03765. How much Singapore dollars did she receive?

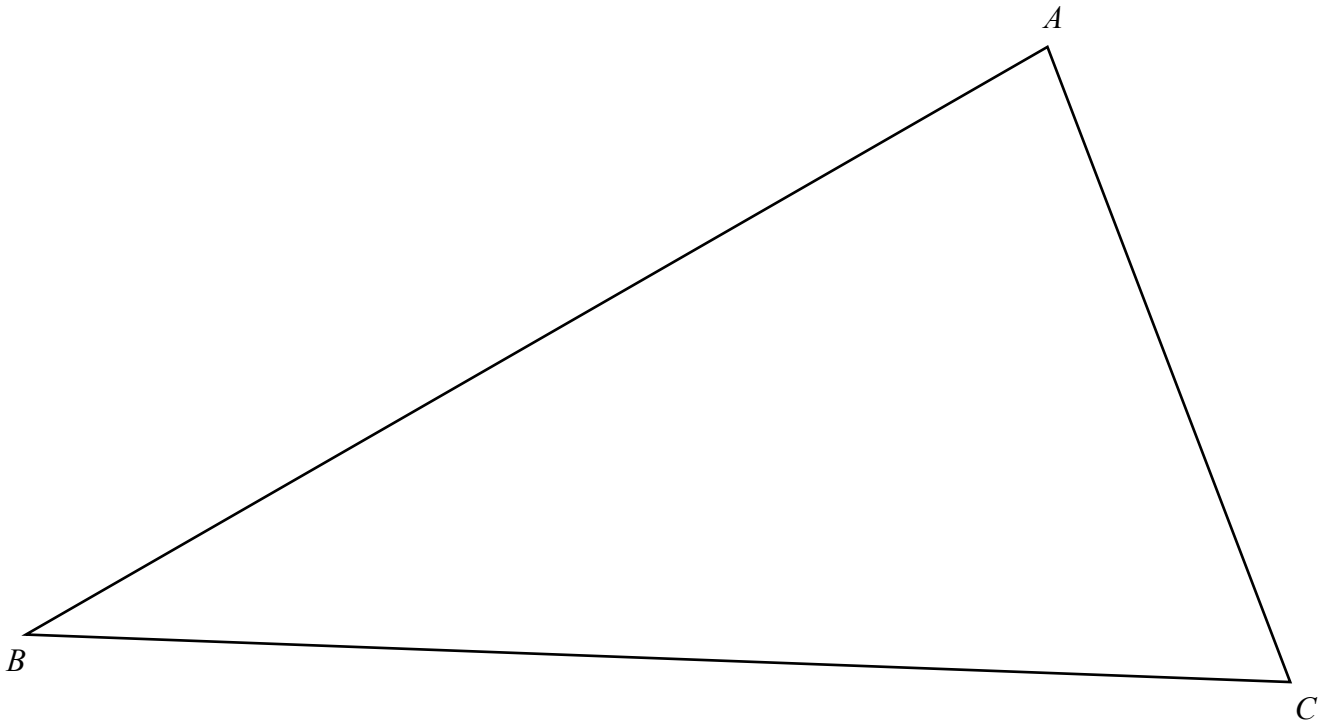
Answer: \$..... [3]

[Turn over

12 Point E is on the intersection point of the bisector of angle ACB and perpendicular bisector of BC .

(a) Use only ruler and compass to locate and label E in the answer space below. [2]

Answer:

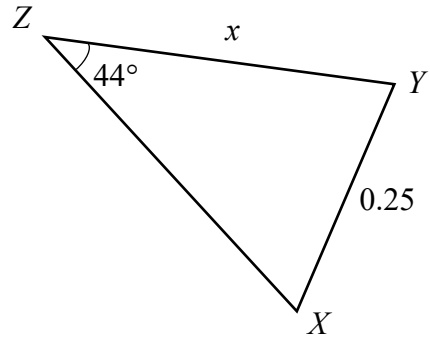
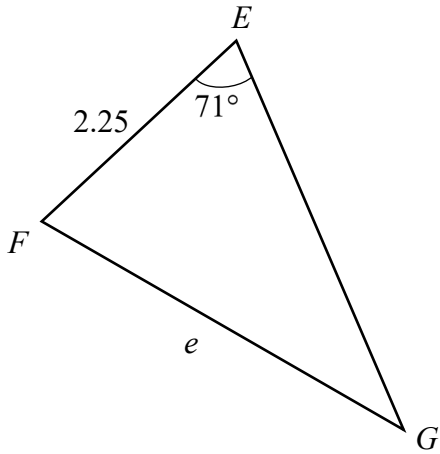


(b) Measure BE .

Answer: cm [1]

[Turn over

13 EFG and XYZ are similar triangles with all the lengths given in cm.



(a) Find $\angle EFG$.

Answer: [1]

(b) Triangle EFG is an enlargement of triangle XYZ . Find the scale factor.

Answer: [1]

(c) Hence, find x in terms of e .

Answer: [1]

- 14 The y -intercept of the line $ky - 5x + 14 = 0$ is -2 . Find
- (a) the value of k .

Answer: $k = \dots\dots\dots$ [2]

- (b) the gradient of the line.

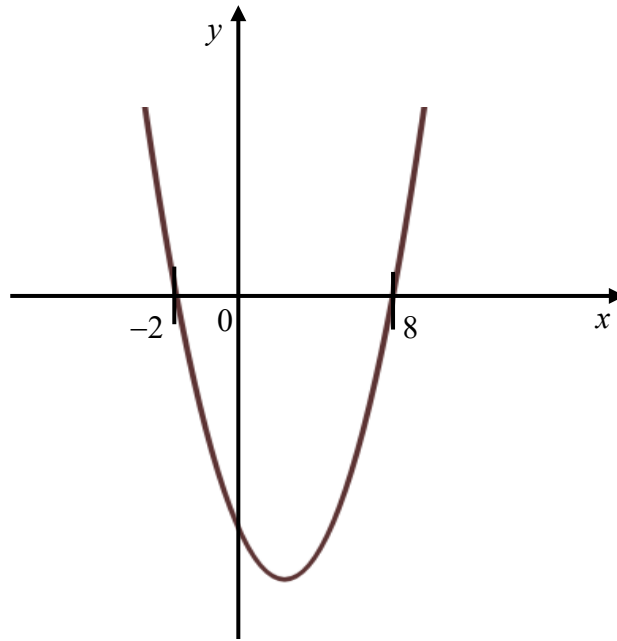
Answer: $\dots\dots\dots$ [1]

- 15 There are three points $X(1, 8)$, $Y(3, m)$ and $Z(-1, 13)$. If $XY = XZ$, find the value of m where $m > 5$.

Answer: $m = \dots\dots\dots$ [3]

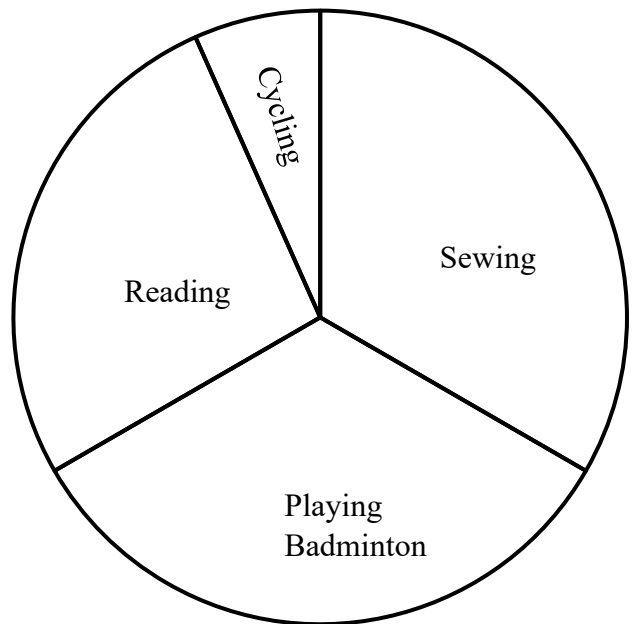
[Turn over

16 State the equation of the line of symmetry of the following quadratic curve.



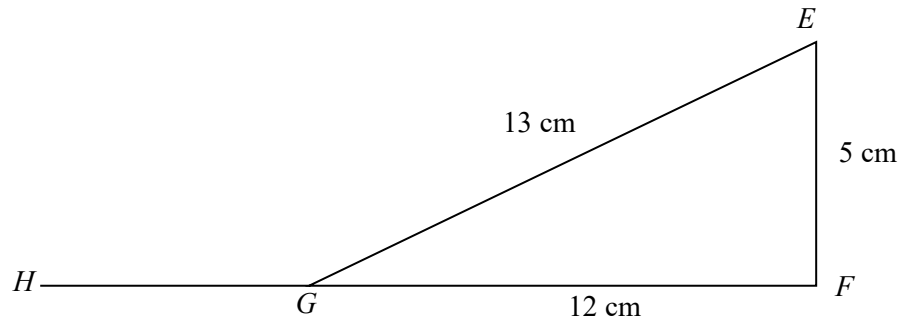
Answer: $x = \dots\dots\dots$ [1]

17 A group of elderly were asked for their favourite hobby. The results are summarised in the accurate pie chart below. The number of elderly who like reading is 50 more than the number of elderly who like cycling. Find the total number of elderly in the group.



Answer: $\dots\dots\dots$ [3]

18 In the figure, EF and FG are straight lines. It is also given that $EF = 5$ cm and $EG = 13$ cm.



(a) Showing clearly your working steps, determine whether triangle EFG is a right-angled triangle.

Answer:

.....

.....

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.....

.....

..... [2]

(b) Expressing your answer as a fraction, write down

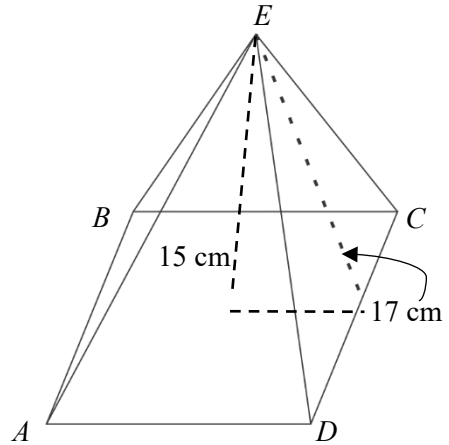
(i) $\sin \angle FEG$,

Answer: $\sin \angle FEG = \dots\dots\dots$ [1]

(ii) $\cos \angle EGH$.

Answer: $\cos \angle EGH = \dots\dots\dots$ [1]

- 19 The diagram shows a candle in the shape of a pyramid $ABCDE$. The slant height of the surface is 17 cm and the vertical height is 15 cm.



- (a) Explain why the base length of the pyramid is 16 cm.

Answer:

[2]

- (b) Calculate the volume of the pyramid.

Answer: cm^3 [2]

- (c) The candle is melted and reshaped into a sphere with diameter 4 cm. Find the maximum number of spheres that can be formed.

Answer: [2]

[Turn over

20 The stem-and-leaf diagram below represents the mass of 30 boys and girls in class 2 Respect.

| Leaf for boys | Stem | Leaf for girls |
|---------------|------|----------------|
| 8 | 3 | 5 6 |
| 7 2 | 4 | 4 8 9 |
| 8 5 6 2 | 5 | 0 0 1 2 5 7 9 |
| 4 7 5 2 2 0 | 6 | 2 5 |
| 5 1 | 7 | 3 |

Key (Boys): 2|5 represents 52 kg

Key (Girls): 5|0 represents 50 kg

(a) Find the modal mass of the girls.

Answer: kg [1]

(b) Find the median mass of the boys.

Answer: kg [1]

(c) A girl who was previously absent has her mass measured as 55 kg. Explain with calculations whether this new data will have any effect on the median mass for the girls.

Answer:

.....

.....

..... [2]

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2023 Preliminary Examination Secondary Four Normal Academic

CANDIDATE
NAME

CLASS

INDEX
NUMBER

MATHEMATICS SYLLABUS A

4045/02

Paper 2

31 July 2023

2 hours

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Section A

Answer **all** questions.

Section B

Answer **one** question.

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| 9 | 9 | |
| 10 | 8 | |
| 11 | 8 | |
| 12 | 8 | |
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Section A (62 marks)

Answer **all** the questions in this section.

- 1 (a) Evaluate $\frac{1.8056}{8.1349+13.8321}$. Write down all the figures shown on your calculator as the answer.

- (b) Give your answer to **part (a)** correct to
 (i) 3 significant figures,
 (ii) 2 decimal places.

Answer (a) [1]

(b)(i) [1]

(b)(ii) [1]

- 2 As of 31 May 2023, the number of COVID-19 cases reported in Singapore and Bhutan are 2 459 457 and 62 671 respectively.

Source : [WHO Coronavirus \(COVID-19\) Dashboard | WHO Coronavirus \(COVID-19\) Dashboard With Vaccination Data](#)

- (a) Find the difference in the number of cases reported between Singapore and Bhutan. Give your answer in standard form correct to 3 significant figures.

Answer [2]

- (b) Find the number of times the number of cases reported in Singapore as compared to Bhutan. Give your answer correct to the nearest 10.

Answer [2]

[Turn over

- 3 (a) The coordinates of P and Q are $(-4, 3)$ and $(2, 15)$ respectively.
Find the equation of the line PQ .

Answer [3]

- (b) The line CD is parallel to the line PQ . $R(7, 11)$ is a point on the line CD .
Work out the equation of the line CD .

Answer [2]

[Turn over

- 4 (a) Solve the simultaneous equations.

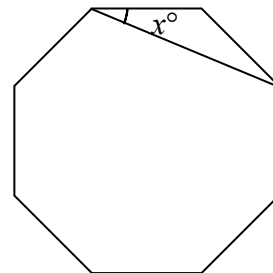
$$3x + y = 12$$

$$x - 2y = 11$$

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [3]

- (b) The diagram shows a regular octagon. Find the value of x .



Answer $\dots\dots\dots$ [3]

- 5 (a) Factorise $12m - 3m^3$ completely.

Answer [2]

- (b) Solve the equation $3^{x+6} = 27^x$.

Answer $x =$ [2]

- (c) Solve the equation $3x^2 + 4x - 9 = 0$.
Give your answers correct to 2 decimal places.

Answer $x =$ or $x =$ [3]

[Turn over

6 (a) y is directly proportional to the positive square root of x . When $x = 9, y = 54$.

(i) Find an equation connecting x and y .

Answer $y = \dots\dots\dots$ [2]

(ii) Find the value of x when $y = 72$.

Answer $x = \dots\dots\dots$ [2]

(b) Observe the following pattern.

first pattern : $1 \times 3 = 2^2 - 1$

second pattern : $3 \times 5 = 4^2 - 1$

third pattern : $5 \times 7 = 6^2 - 1$

(i) Write down the fourth pattern.

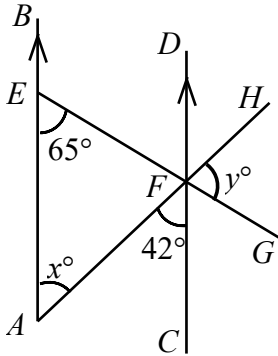
Answer $\dots\dots\dots$ [1]

(ii) Hence, write down an expression for the n th pattern.

Answer $\dots\dots\dots$ [2]

[Turn over

- 7 (a) In the diagram, AB is parallel to CD . AEB , AFH and EFG are straight lines. Find the value of x and of y .



Answer $x = \dots\dots\dots$ [1]

$y = \dots\dots\dots$ [2]

- (b) The value of a car decreases over time. Its value decreases by 10% every year. The original price of the car is \$168 000. Work out the total percentage decrease at the end of the 2nd year.

Answer $\dots\dots\dots$ % [3]

[Turn over

- 8 (a) The scale of a map is 1 : 25 000. The area of a park is 10 cm^2 on the map. Find the actual area in square kilometres.

Answer km^2 [3]

- (b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm. Fuel flows along this pipe at a rate of 2 metres per second. It takes 24 minutes to fill the tank. Calculate the capacity of the tank. Give your answer to the nearest litres.

Answer litres [4]

[Turn over

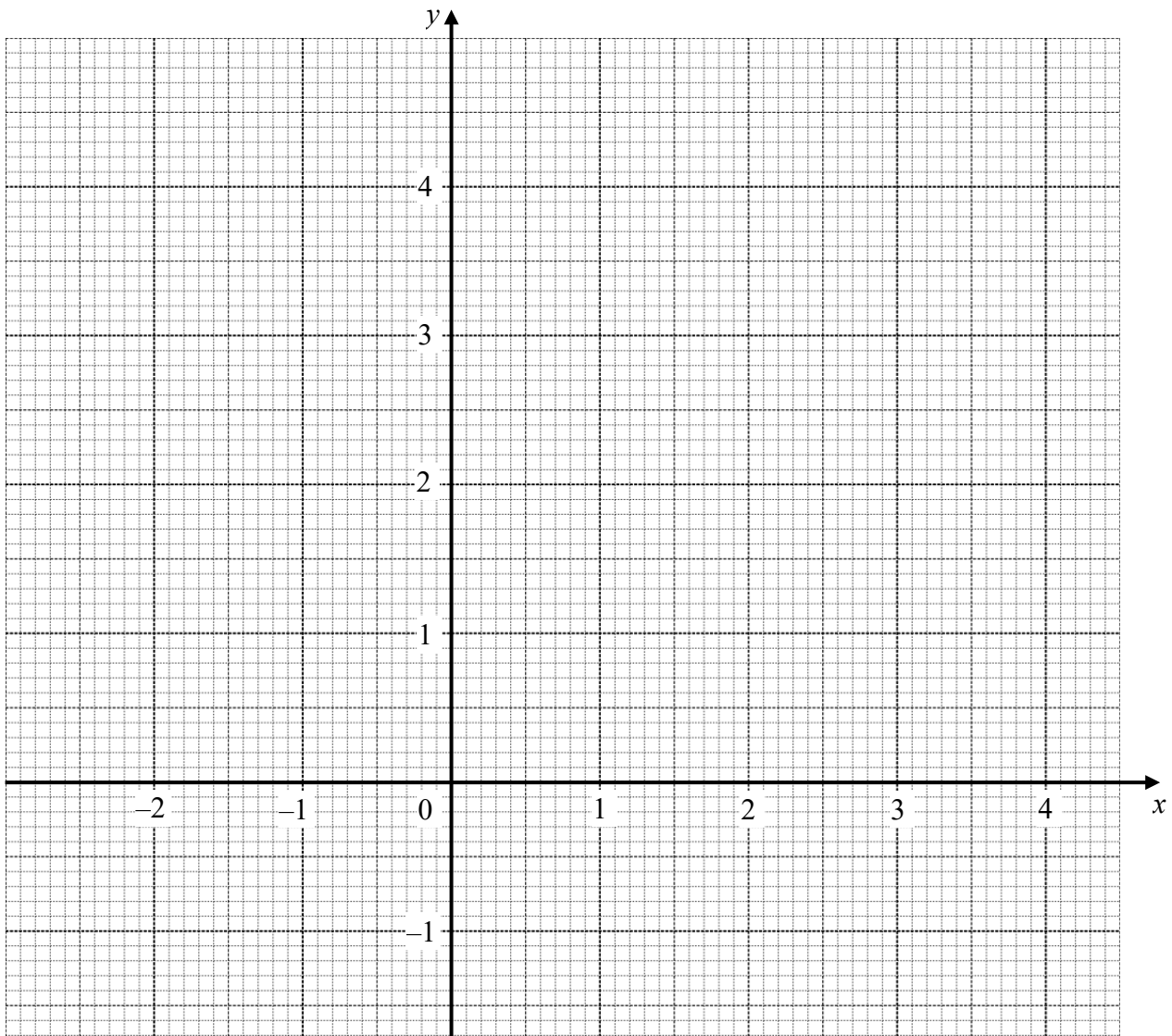
- 9 (a) Complete the table of values for $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2$.

Give your answers correct to 1 decimal place.

| | | | | | | | | | | | |
|-----|------|------|-----|------|---|-----|-----|-----|-----|-----|-----|
| x | -2 | -1.5 | -1 | -0.5 | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 |
| y | -0.7 | 1.3 | 2.2 | | 2 | | 0.8 | 0.5 | 0.7 | 1.6 | 3.5 |

[2]

- (b) On the grid, plot the graph of $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2$ for $-2 \leq x \leq 3$.



[3]

- (c) By drawing a suitable tangent, find the gradient of the curve when $x = 2.5$.

Answer [2]

- (d) Use your graph to determine the number of solution(s) to the equation $2x^3 + 12 = 3x^2 + 6x$. Explain briefly.

Answer

.....

..... [2]

- 10 Amy plans to further her studies at a polytechnic after her GCE O-Level examination.

The tables below give information that Amy can use to work out the amount of money she might earn by taking on some temporary job offer before her course starts in April 2024.

| | |
|--|-------------------|
| ABC Singapore Pte Ltd Tele-marketing cum Administrative Assistant ✓ 5-day week, 8 a.m. – 5p.m. ✓ 3 or 4 months contract ✓ No experience needed, training provided | \$1600 monthly |
|--|-------------------|

| | |
|---|-------------|
| Appetit Singapore Pte Ltd Casual Kitchen Assistant ✓ work on weekends ✓ 10 a.m. – 6 p.m. ✓ lunch & dinner provided ✓ lunch, 30 min (flexi arrangement from 11 a.m. – 1 p.m.) ✓ dinner, 30 min (flexi arrangement from 4 p.m. – 6 p.m.) | \$11 hourly |
|---|-------------|

Amy intends to work for 4 full months from Dec 2023 to Mar 2024.

For weekdays, she would work for ABC Singapore Pte Ltd and work on weekends at Appetit Singapore Pte Ltd.

- (a) (i) Assume there are 4 weeks in a month, show that Amy's monthly salary is \$616 working with Appetit Singapore Pte Ltd.
You must show clearly your working steps. [2]

Answer

- (ii) Every Singaporean and Singapore Permanent Resident (SPR) employee below the age of 55 years old must contribute 20% of their salaries to the Central Provident Fund (CPF) Board. Calculate Amy’s monthly CPF contribution, from working in ABC Singapore and Appetit Singapore, rounded to the nearest dollars.

Answer \$ [2]

- (b) Amy did a quick calculation using the information provided in the following tables based on current year information. She claimed that she would be able to pay for her first year course fees with the money earned from working from Dec 2023 to Mar 2024 after deducting her CPF contributions and monthly expenses.

Do you agree with her? Justify your decision with calculations.

**Course Fees (With MOE Tuition Grant)
- Admission Year 2023**

| Type of Fee | Singapore Citizens (S\$) |
|--------------------------------------|--------------------------|
| Subsidised Tuition Fee Payable | 3,000.00 |
| Supplementary Fee (inclusive of GST) | 86.50 |
| Course Fees Per Academic Year | 3086.50 |

Source : <https://www.rp.edu.sg/financial-matters>

Monthly Expenses (\$)

| | |
|------------------------------|-----|
| hybrid concession pass, (\$) | 54 |
| mobile phone subscription | 10 |
| expenditure | 400 |

Answer Yes / No because

..... [4]

Section B (8 marks)

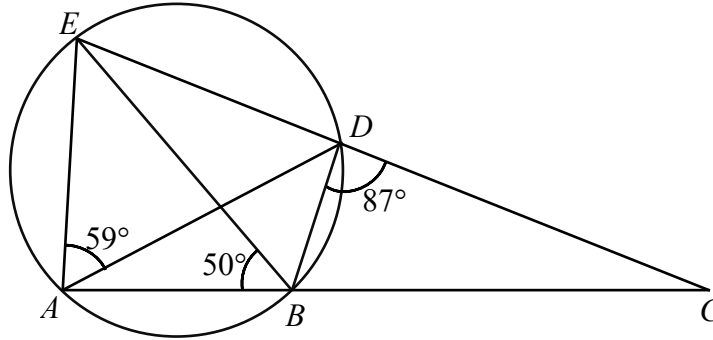
Answer **one** question from this section. Each question carries 8 marks.

11 (a) A, B, D, E are points on the circumference of a circle.

ABC and EDC are straight lines.

Angle $DAE = 59^\circ$, angle $ABE = 50^\circ$ and angle $BDC = 87^\circ$.

State clearly the reasons in your working steps, find



(i) angle AED ,

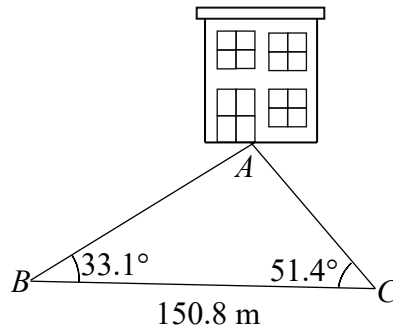
Answer angle $AED = \dots\dots\dots$ [2]

(ii) angle BCD .

Answer angle $BCD = \dots\dots\dots$ [2]

[Turn over

- (b) In the diagram, BC represents a straight road at the same level as the foot A of a vertical building. A surveyor found that $BC = 150.8$ m, angle $ABC = 33.1^\circ$ and angle $ACB = 51.4^\circ$.



- (i) Find the distance AB .

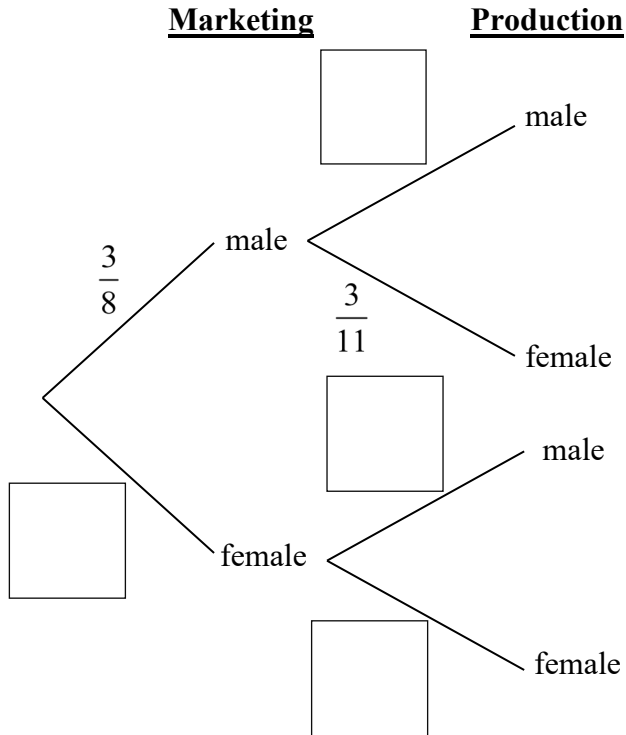
Answer $AB = \dots\dots\dots$ m [2]

- (ii) The angle of elevation of the top of the building from B is 25° . Calculate the height of the building to the nearest metres.

Answer $\dots\dots\dots$ m [2]

- 12 (a) In a company, the marketing department has 3 male staff and 5 female staff. The production department has 8 male staff and 3 female staff. A member from each department is selected at random to form a project team.

- (i) Complete the tree diagram below.

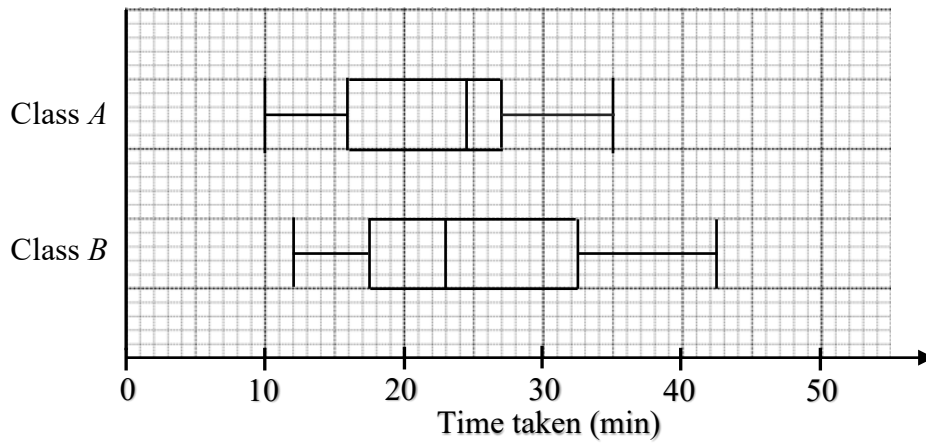


[2]

- (ii) Find the probability that the team members are of the same gender.

Answer [2]

- (b) The box-and-whisker plots represent the distributions of the time taken by two classes of students, *A* and *B*, to solve a challenging Mathematics problem.



- (i) Write down the median time for each class.

Answer median time of class *A* = minutes

median time of class *B* = minutes [2]

- (ii) Make two comparisons between the time taken by the students of class *A* and class *B*.

Answer

1

.....

2

.....

.....

[2]

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中正中学 义顺

CHUNG CHENG HIGH SCHOOL (YISHUN)



2023 Preliminary Examination Secondary Four Normal Academic

CANDIDATE
NAME

MARKING SCHEME

CLASS

INDEX
NUMBER

MATHEMATICS

4045/01

Paper 1

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2 hours

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| 5 | 4 | | 15 | 3 | |
| 6 | 3 | | 16 | 1 | |
| 7 | 6 | | 17 | 3 | |
| 8 | 5 | | 18 | 4 | |
| 9 | 3 | | 19 | 6 | |
| 10 | 4 | | 20 | 4 | |
| Presentation Deduction | | - 1 / - 2 | | | |
| TOTAL | 70 | | | | |

This document consists of 15 printed pages and 1 blank page.

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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 $\frac{7}{2}$ 330% $\frac{\pi}{2}$ 0.325 $\frac{12}{15}$

Write these numbers in descending order.

Answer: $\frac{7}{2}$, 330%, $\frac{\pi}{2}$, $\frac{12}{15}$, 0.325 [2]

2 (i) Solve $-4x - 6 \leq -21$ and represent your answer on a number line.

Answer:

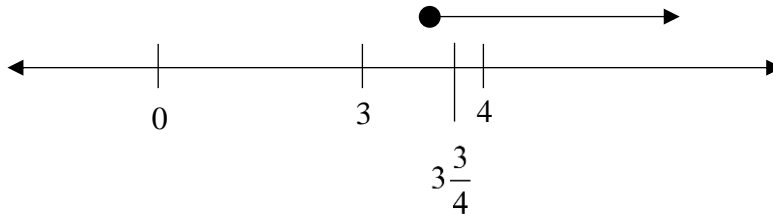
$$-4x - 6 \leq -21$$

$$-4x \leq -21 + 6$$

$$-4x \leq -15$$

$$x \geq \frac{-15}{-4}$$

$$x \geq 3\frac{3}{4}$$



(ii) Hence, find the smallest integer that satisfies $-4x - 6 \leq -21$.

Answer:4..... [1]

3 (a) Sarah mixes 0.4 kg of flour with 250 g of butter.

Write the ratio of butter : flour in its simplest form.

$$250 : 400$$

$$5 : 8$$

Answer:5..... :8..... [1]

- (b) A bag contains only blue and pink bean bags.

$\frac{3}{11}$ of the bean bags are pink.

Write the ratio pink bean bags : blue bean bags in its simplest form.

Answer:³..... :⁸..... [1]

- 4 (a) Write 628 as a product of its prime factors.

$$628 = 2^2 \times 157$$

Answer: $628 = 2^2 \times 157$ [1]

- (b) Find the largest perfect square that is a factor of 600.

$$600 = 2^3 \times 3 \times 5^2$$

$$\begin{aligned} \text{Largest square} &= 2^2 \times 5^2 \\ &= 100 \end{aligned}$$

Answer:¹⁰⁰..... [2]

- (c) $280 = 2^3 \times 5 \times 7$

Find the lowest common multiple (LCM) of 280 and 600. Give your answer as a product of its prime factors.

$$\text{LCM of 280 and 600} = 2^3 \times 3 \times 5^2 \times 7$$

Answer: $2^3 \times 3 \times 5^2 \times 7$ [1]

- (d) Find the smallest positive integer of x such that $600x$ is a perfect cube.

$$600 = 2^3 \times 3 \times 5^2$$

$$600x = 2^3 \times 3 \times 5^2 \times 3^2 \times 5$$

$$x = 45$$

Answer:⁴⁵..... [1]

- 5 (a) Given that $v = \frac{d^2}{2} - a$, find the value of v when $a = 5$ and $d = -8$.

$$v = \frac{(-8)^2}{2} - (5)$$

$$v = 27$$

Answer: 27 [2]

- (b) Make d the subject of the formula $v = \frac{d^2}{2} - a$.

$$\frac{d^2}{2} = v + a$$

$$d^2 = 2(v + a)$$

$$d = \pm\sqrt{2(v + a)}$$

$$d = \pm\sqrt{2(v + a)}$$

Answer: [2]

- 6 Simplify $\frac{(5ad)^2}{x} \times \frac{a}{6} \div \frac{d^3}{2^0}$.

$$= \frac{25a^2d^2}{x} \times \frac{a}{6} \times \frac{1}{d^3}$$

$$= \frac{25a^3}{6dx}$$

Answer: $\frac{25a^3}{6dx}$ [3]

- 7 (i) Sheldon wanted to invest \$18 000 in a saving plans with a compound interest of 5% half yearly for 4 years in Bank A. Calculate the total interest that he received at the end of the 4 years.

$$A = \$18000 \left(1 + \frac{5/2}{100} \right)^{4 \times 2}$$

$$A = \$21931.25216$$

$$I = \$21931.25216 - \$18000$$

$$I = \$3931.25216$$

$$I = \$3931.25 \text{ (2 dp)}$$

Answer: \$..... **3931.25** [3]

- (ii) Sheldon is also thinking of investing in Bank B with the same amount of \$18 000 and the same duration of 4 years. However, Bank B charged simple interest with rate of 6% per annum. Which Bank should Sheldon invest in? Explain your answer with reasonings.

$$I = \$ \frac{18000(6)(4)}{100}$$

$$I = \$4320$$

$$I_B > I_A$$

Answer: Bank **B**

This is because **Bank B will allow Sheldon to earn more interest as compared to Bank A.**

.....
..... [3]

- 8 Expand and simplify

(i) $2(c + p) - (-7p + 4c),$

$$2c + 2p + 7p - 4c$$

$$= 9p - 2c$$

Answer: **$9p - 2c$** [2]

(i) $(5x-2)(2x+3) - 2(5x-3)(x+1)$.

$$= (10x^2 + 15x - 4x - 6) - (2(5x^2 + 5x - 3x - 3))$$

$$= 10x^2 + 11x - 6 - (2(5x^2 + 2x - 3))$$

$$= 10x^2 + 11x - 6 - 10x^2 - 4x + 6$$

$$= 7x$$

Answer: $7x$ [3]

9 (i) Expand $p^2 - (p+a)(p-a)$.

$$p^2 - (p^2 - a^2)$$

$$= p^2 - p^2 + a^2$$

$$= a^2$$

Answer: a^2 [2]

(ii) Hence, write down the value of $123456^2 - (123459)(123453)$.

$$123456^2 - (123456+3)(123456-3)$$

$$= 3^2$$

$$= 9$$

Answer: 9 [1]

$$10 \quad x^2 - 16x + 8 = (x - a)^2 + b$$

(a) Find the value of a and of b .

$$(x - 8)^2 - (8)^2 + 8$$

$$(x - 8)^2 - 56$$

$$\text{Answer: } a = \dots\dots\dots 8, b = \dots\dots\dots -56 \quad [2]$$

(b) Hence, solve $x^2 - 16x + 8 = 0$, giving your answers correct to 2 decimal places.

$$(x - 8)^2 - 56 = 0$$

$$(x - 8)^2 = 56$$

$$(x - 8) = \pm\sqrt{56}$$

$$x = \sqrt{56} + 8 \text{ or } x = -\sqrt{56} + 8$$

$$x = 15.48331 \text{ or } x = 0.51669$$

$$\text{Answer: } x = \dots\dots\dots 15.48 \text{ or } x = \dots\dots\dots 0.52 \quad [2]$$

11 Janelle travels from Singapore to Thailand. She exchanged \$400 into Thai Baht when the exchange rate was 1 Thai Baht = \$0.03875. While in Thailand, she spent 6500 Baht. On her return, she exchanged the remaining Baht into dollars when the exchange rate was 1 Thai Baht = \$0.03765. How much Singapore dollars did she receive?

$$\$1 = \frac{1}{0.03875} \text{ Thai Baht}$$

$$\$400 = \frac{1}{0.03875} \times 400 \text{ Thai Baht}$$

$$= 10322.58065 \text{ Thai Baht}$$

Remaining amount of Thai Baht

$$= 10322.58065 - 6500$$

$$= 3822.58065$$

$$1 \text{ Thai Baht} = \$0.03765$$

$$3822.58065 \text{ Thai Baht} = \$0.03765 \times 3822.58065$$

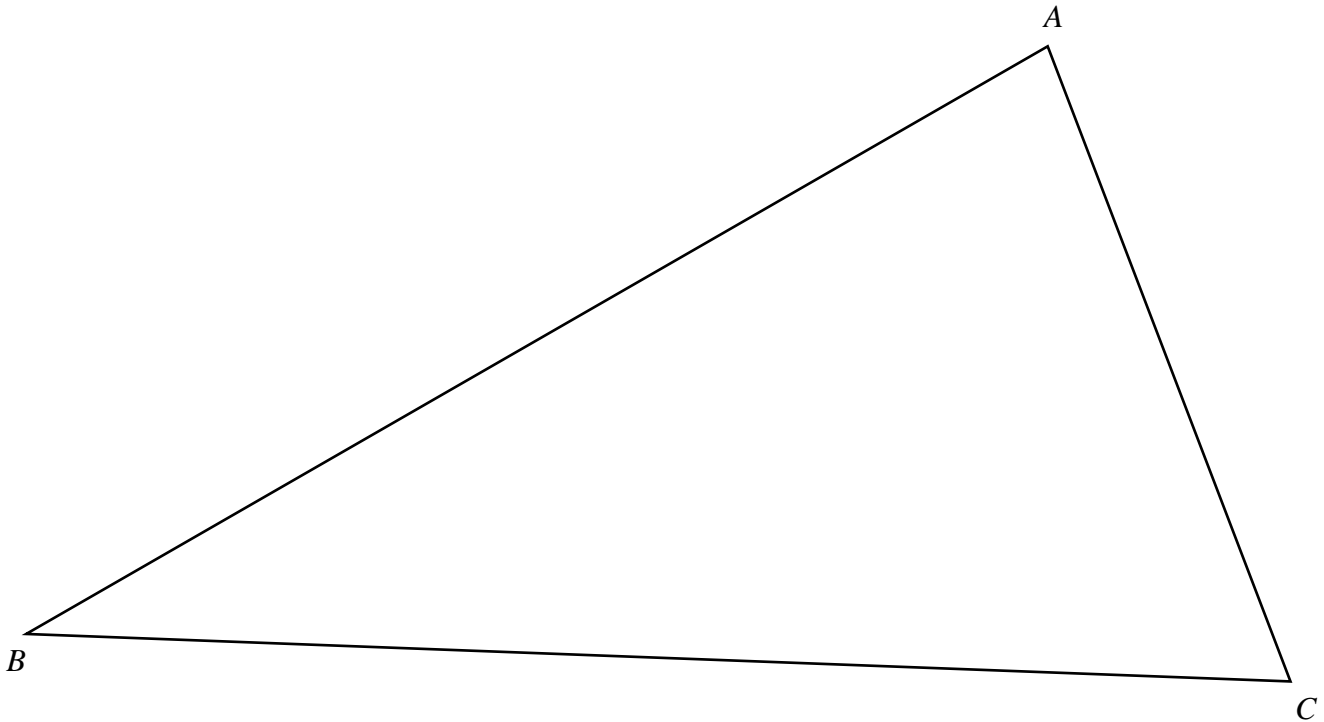
$$= \$143.92016$$

$$\text{Answer: } \$ \dots\dots\dots 143.92 \quad [3]$$

12 Point E is on the intersection point of the bisector of angle ACB and perpendicular bisector of BC .

(a) Use only ruler and compass to locate and label E in the answer space below. [2]

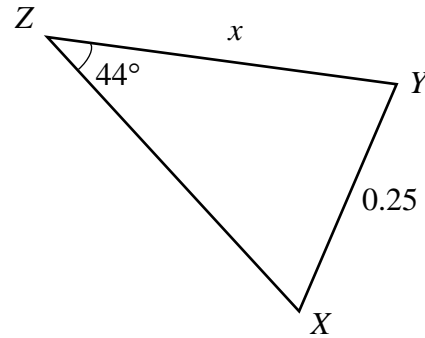
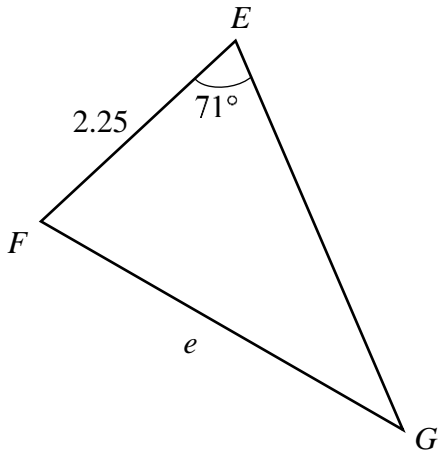
Answer:



(b) Measure BE .

Answer:10.1..... cm [1]

13 EFG and XYZ are similar triangles with all the length given in cm.



(a) Find $\angle EFG$.

$$\angle G = 44^\circ \text{ (corresponding } \angle \text{ in a triangle)}$$

$$\angle EFG = 180^\circ - 44^\circ - 71^\circ \text{ (} \angle \text{ sum of a triangle)}$$

$$= 65^\circ$$

Answer: 75° $^\circ$ [1]

(b) Triangle EFG is an enlargement of triangle XYZ . Find the scale factor.

$$\text{Scale factor} = \frac{2.25}{0.25}$$

$$= 9$$

Answer: 9 [1]

(c) Hence, find x in terms of e .

$$\frac{e}{x} = 9$$

$$x = \frac{e}{9}$$

Answer: $x = \frac{e}{9}$ [1]

14 The y-intercept of the line $ky - 5x + 14 = 0$ is -2 . Find

(a) the value of k .

$$ky = 5x - 14$$

$$y = \frac{5}{k}x - \frac{14}{k}$$

$$-\frac{14}{k} = -2$$

$$k = 7$$

Answer: $k = \dots 7 \dots$ [2]

(b) the gradient of the line.

$$\text{Gradient} = \frac{5}{7}$$

Answer: $\dots \frac{5}{7} \dots$ [1]

15 There are three points $X(1, 8)$, $Y(3, m)$ and $Z(-1, 13)$. If $XY = XZ$, find the value of m where $m > 5$.

$$\sqrt{(1-3)^2 + (8-m)^2} = \sqrt{(1-(-1))^2 + (8-13)^2}$$

$$(1-3)^2 + (8-m)^2 = (2)^2 + (-5)^2$$

$$(8-m)^2 = 4 + 25 - 4$$

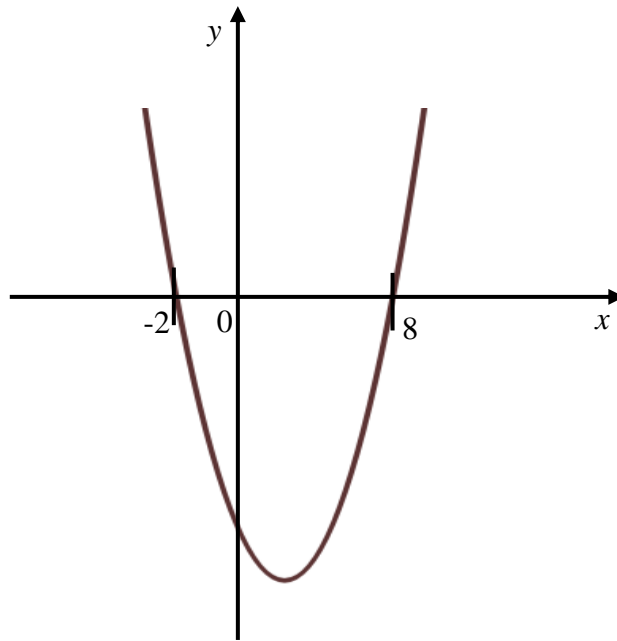
$$8-m = \pm\sqrt{25}$$

$$m = 8+5 \text{ or } m = 8-5$$

$$m = 13 \text{ or } m = 3 \text{ (rej as } m > 5)$$

Answer: $m = \dots 13 \dots$ [3]

16 State the equation of the line of symmetry of the following quadratic curve.



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

Answer: $x = 3$ [1]

17 A group of elderly were asked for their favourite hobby. The results are summarised on the accurate pie chart below. The number of elderly who like reading is 50 more than the number of elderly who like cycling. Find the total number of elderly in the group.

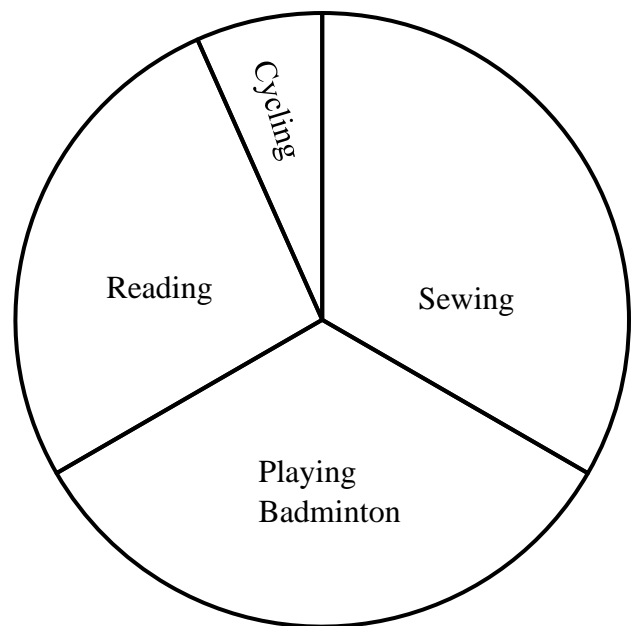
$$96^\circ - 24^\circ = 72^\circ$$

$$72^\circ - 50 \text{ elderly}$$

$$1^\circ - \frac{50}{72} \text{ elderly}$$

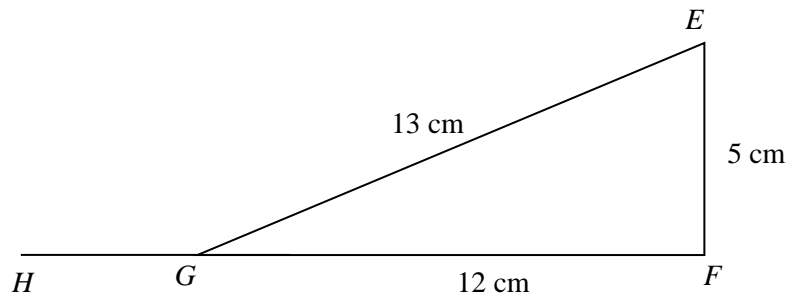
$$360^\circ - \frac{50}{72} \times 360 \text{ elderly}$$

$$= 250$$



Answer: 250 [3]

18 In the figure, EF and FG are straight lines. It is also given that $EF = 5$ cm and $EG = 13$ cm.



(a) Showing clearly your working steps, determine whether triangle EFG is a right-angled triangle.

Answer: $EG^2 = 13^2$ $EF^2 + GF^2$
 $EG^2 = 169$ $5^2 + 12^2 = 169$
 $EG^2 = EF^2 + GF^2$
 By converse of Pythagoras Theorem, $\triangle EFG$ is a right-angle Δ

[2]

(b) Expressing your answer as a fraction, write down

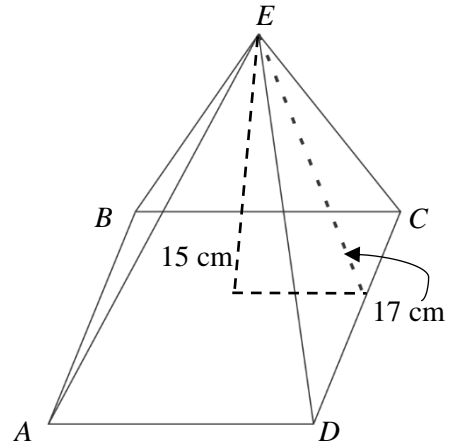
(i) $\sin \angle FEG$,

Answer: $\sin \angle FEG = \frac{12}{13}$ [1]

(ii) $\cos \angle EGH$.

Answer: $\cos \angle EGH = \frac{12}{13}$ [1]

- 19 The diagram shows a candle in the shape of a pyramid $ABCDE$. The slant height of the surface is 17 cm and the vertical height is 15 cm.



- (a) Explain why the base length of the pyramid is 16 cm.

Answer:

[2]

Let MX be the distance from the of the base to the end of the base

$$17^2 = 15^2 + MX^2$$

$$MX^2 = 17^2 - 15^2$$

$$MX = 8$$

Therefore base length = $8 \times 2 = 16$ cm

- (b) Calculate the volume of the pyramid.

$$\begin{aligned} \text{Volume} &= \frac{1}{3} \times (16 \times 16) \times 15 \\ &= 1280 \text{ cm}^3 \end{aligned}$$

Answer: 1280 cm³ [2]

- (c) The candle is melted and reshaped into a sphere with diameter 4 cm. Find the maximum number of spheres that can be formed.

$$\begin{aligned} \text{Volume of sphere} &= \frac{4}{3} \times \pi \times (2)^3 \\ &= \frac{32\pi}{3} \end{aligned}$$

$$\begin{aligned} \text{No of sphere} &= 1280 \div \frac{32\pi}{3} \\ &= 38.19719 \end{aligned}$$

Answer: 38 cm [2]

20 The stem-and-leaf diagram below represents the mass of 30 boys and girls in class 2 Respect.

| Leaf for boys | Stem | Leaf for girls |
|---------------|------|----------------|
| 8 | 3 | 5 6 |
| 7 2 | 4 | 4 8 9 |
| 8 5 6 2 | 5 | 0 0 1 2 5 7 9 |
| 4 7 5 2 2 0 | 6 | 2 5 |
| 5 1 | 7 | 3 |

Key (Girls): 5|0 represents 50 kg

Key (Boys): 2|5 represents 52 kg

(a) Find the modal mass for the girls.

Answer:50.....kg [1]

(b) Find the median mass of the boys.

Answer:60.....kg [1]

(c) A girl who was previously absent has her mass measured as 55 kg. Explain with calculations whether this new data will have any effect on the median mass for the girls.

Old median = 51 kg

$$\text{New median} = \frac{51+52}{2} = 51.5 \text{ kg}$$

Answer:

There is a change of 0.5kg from the old median to the new one.

.....

.....

..... [2]

Solution to 2023 CCHY Preliminary Examination 4NA Maths 4045/2

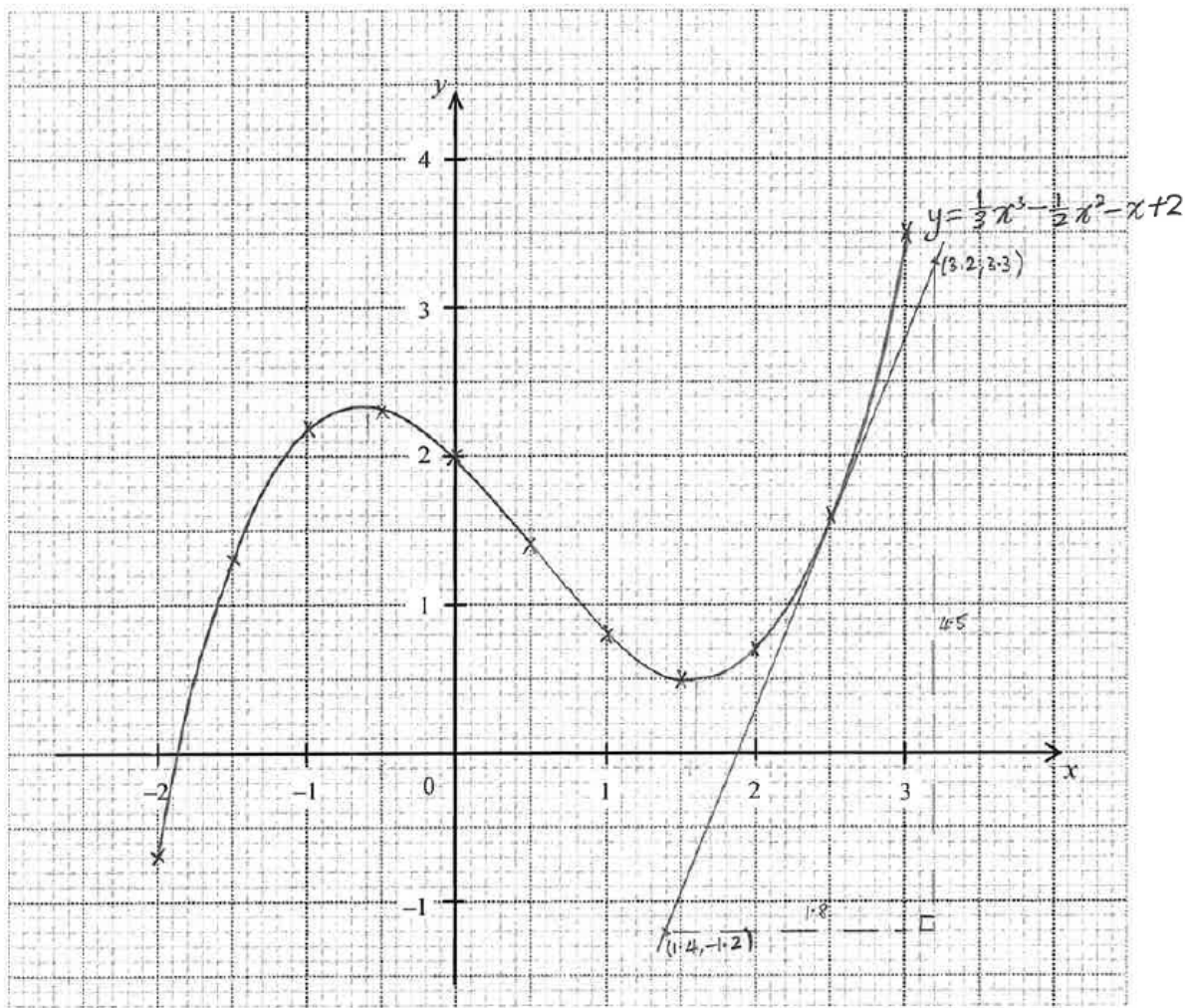
| S/N | Solution |
|--------|---|
| 1(a) | $\frac{1.8056}{8.1349 + 13.8321} = 0.082196021$ |
| 1b(i) | 0.0822 |
| 1b(ii) | 0.08 |
| 2(a) | $2\,459\,457 - 62\,671 = 2.396786 \times 10^6$ $= 2.40 \times 10^6 \text{ (3sf) \#}$ |
| 2(b) | $\frac{2459457}{62671} = 39.24394058$ $= 40 \text{ (nearest 10) \#}$ |
| 3(a) | $P(-4,3), Q(2,15)$ gradient $PQ = \frac{15-3}{2-(-4)}$ $= 2$ equation of PQ : $y = 2x + c$ At $(-4,3)$, $3 = 2(-4) + c$ $c = 3 + 8$ $= 11$ \therefore equation of PQ is $y = 2x + 11$ # |
| 3(b) | gradient of $CD = 2$ equation of CD : $y = 2x + c$ At $R(7,11)$, $11 = 2(7) + c$ $c = 11 - 14$ $= -3$ \therefore equation of CD is $y = 2x - 3$ # |
| 4(a) | $3x + y = 12$ ——— (1) $x - 2y = 11$ ——— (2) from (1), $y = 12 - 3x$ ——— (3) subst (3) into (2), $x - 2(12 - 3x) = 11$ $x - 24 + 6x = 11$ $7x = 35$ $\div 7, \quad x = 5$ |

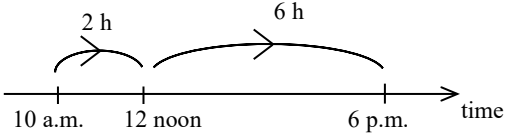
| | |
|--------|--|
| | <p>subst $x = 5$ into (3),</p> $y = 12 - 3(5)$ $= -3$ <p>Hence, $x = 5, y = -3$ #</p> |
| 4(b) | <p>interior angle = $\frac{(8-2) \times 180^\circ}{8}$</p> $= 135^\circ$ <p>$x^\circ + x^\circ + 135^\circ = 180^\circ$ (\angle sum of Δ)</p> $x^\circ = \frac{180^\circ - 135^\circ}{2}$ $= 22.5^\circ$ <p>$\therefore x = 22.5$ #</p> |
| 5(a) | $12m - 3m^3 = 3m(4 - m^2)$ $= 3m(2 + m)(2 - m)$ # |
| 5(b) | $3^{x+6} = 27^x$ $= 3^{3x}$ $x + 6 = 3x$ $6 = 2x$ <p>$\div 2, \quad x = 3$ #</p> |
| 5(c) | $3x^2 + 4x - 9 = 0$ $x = \frac{-4 \pm \sqrt{(-4)^2 - 4(3)(-9)}}{2(3)}$ $= \frac{-4 \pm \sqrt{124}}{6}$ $x = \frac{-4 + \sqrt{124}}{6} \quad \text{or} \quad x = \frac{-4 - \sqrt{124}}{6}$ $= 1.18925 \quad \quad = -2.52259$ $= 1.19 \text{ (2dp)} \quad \quad = -2.52 \text{ (2dp)}$ <p>$\therefore x = -2.52$ or $x = 1.19$ #</p> |
| 6a(i) | $y = k\sqrt{x}$ $54 = k\sqrt{9}$ $= 3k$ $k = \frac{54}{3}$ $= 18$ <p>$\therefore y = 18\sqrt{x}$ #</p> |
| 6a(ii) | $72 = 18\sqrt{x}$ |

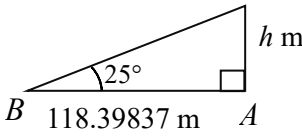
| | $\sqrt{x} = \frac{72}{18}$ $= 4$ $x = 4^2$ $= 16 \#$ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|----------------|-------------|--------------------|----------------|-------------|--------------------|----------------|-------------|--------------------|----------------|-------------|---|---|---|----------------------|-------------|--------------------------|----------------------|-------------|--------------------------|----------------------|-------------|--------------------------|----------------------|-------------|--------------------------|
| 6(b) | <table border="1"> <tbody> <tr> <td>1st pattern</td> <td>$= 1 \times 3$</td> <td>$= 2^2 - 1$</td> </tr> <tr> <td>2nd pattern</td> <td>$= 3 \times 5$</td> <td>$= 4^2 - 1$</td> </tr> <tr> <td>3rd pattern</td> <td>$= 5 \times 7$</td> <td>$= 6^2 - 1$</td> </tr> <tr> <td>4th pattern</td> <td>$= 7 \times 9$</td> <td>$= 8^2 - 1$</td> </tr> </tbody> </table> <p>Pattern for</p> <table border="1"> <thead> <tr> <th>1st no. of 2nd column</th> <th>2nd no. of 2nd column</th> <th>1st no. of 3rd column</th> </tr> </thead> <tbody> <tr> <td>$1 \times 2 - 1 = 1$</td> <td>$1 + 2 = 3$</td> <td>$\frac{1+3}{2} = 2, 2^2$</td> </tr> <tr> <td>$2 \times 2 - 1 = 3$</td> <td>$3 + 2 = 5$</td> <td>$\frac{3+5}{2} = 4, 4^2$</td> </tr> <tr> <td>$3 \times 2 - 1 = 5$</td> <td>$5 + 2 = 7$</td> <td>$\frac{5+7}{2} = 6, 6^2$</td> </tr> <tr> <td>$4 \times 2 - 1 = 7$</td> <td>$7 + 2 = 9$</td> <td>$\frac{7+9}{2} = 8, 8^2$</td> </tr> </tbody> </table> <p> $(2n - 1) \times (2n - 1 + 2) = (2n - 1)(2n + 1)$ $\frac{2n - 1 + 2n + 1}{2} = 2n$ \therefore the n^{th} pattern $= (2n - 1)(2n + 1) = 4n^2 - 1 \#$ </p> | 1st pattern | $= 1 \times 3$ | $= 2^2 - 1$ | 2nd pattern | $= 3 \times 5$ | $= 4^2 - 1$ | 3rd pattern | $= 5 \times 7$ | $= 6^2 - 1$ | 4th pattern | $= 7 \times 9$ | $= 8^2 - 1$ | 1 st no. of 2 nd column | 2 nd no. of 2 nd column | 1 st no. of 3 rd column | $1 \times 2 - 1 = 1$ | $1 + 2 = 3$ | $\frac{1+3}{2} = 2, 2^2$ | $2 \times 2 - 1 = 3$ | $3 + 2 = 5$ | $\frac{3+5}{2} = 4, 4^2$ | $3 \times 2 - 1 = 5$ | $5 + 2 = 7$ | $\frac{5+7}{2} = 6, 6^2$ | $4 \times 2 - 1 = 7$ | $7 + 2 = 9$ | $\frac{7+9}{2} = 8, 8^2$ |
| 1st pattern | $= 1 \times 3$ | $= 2^2 - 1$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2nd pattern | $= 3 \times 5$ | $= 4^2 - 1$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3rd pattern | $= 5 \times 7$ | $= 6^2 - 1$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4th pattern | $= 7 \times 9$ | $= 8^2 - 1$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 st no. of 2 nd column | 2 nd no. of 2 nd column | 1 st no. of 3 rd column | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $1 \times 2 - 1 = 1$ | $1 + 2 = 3$ | $\frac{1+3}{2} = 2, 2^2$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $2 \times 2 - 1 = 3$ | $3 + 2 = 5$ | $\frac{3+5}{2} = 4, 4^2$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $3 \times 2 - 1 = 5$ | $5 + 2 = 7$ | $\frac{5+7}{2} = 6, 6^2$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $4 \times 2 - 1 = 7$ | $7 + 2 = 9$ | $\frac{7+9}{2} = 8, 8^2$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7(a) | <p> $x^\circ = 42^\circ$ (alt \angles, $AB \parallel CD$) $\therefore x = 42 \#$ </p> <p>Method 1</p> <p> $65^\circ + \angle AFE + 42^\circ = 180^\circ$ (int \angles, $AB \parallel CD$) $\angle AFE = 180^\circ - 65^\circ - 42^\circ$ $= 73^\circ$ $y^\circ = \angle AFE$ (vert opp \angles) $= 73^\circ \#$ </p> <p>$\therefore y = 73$</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | <p>Method 2 to find y</p> $65^\circ + \angle AFE + 42^\circ = 180^\circ \text{ (int } \angle\text{s, } AB \parallel CD)$ $\angle AFE = 180^\circ - 65^\circ - 42^\circ$ $= 73^\circ$ $73^\circ + \angle EFH = 180^\circ \text{ (adj } \angle\text{s on a st line)}$ $\angle EFH = 180^\circ - 73^\circ$ $= 107^\circ$ $y^\circ + 107^\circ = 180^\circ \text{ (adj } \angle\text{s on a st line)}$ $y^\circ = 180^\circ - 107^\circ$ $= 73^\circ$ <p>$\therefore y = 73$</p> | | | | | | | | |
|------------------------------------|---|----------------------------------|----------------------------------|----------------|----------------|------------------------------------|------------------------------------|--------------|--------------|
| 7(b) | <table border="1"> <thead> <tr> <th>Price after 1st year</th> <th>Price after 2nd year</th> </tr> </thead> <tbody> <tr> <td>90% x \$168000</td> <td>90% x \$151200</td> </tr> <tr> <td>$= \frac{90}{100} \times \\168000</td> <td>$= \frac{90}{100} \times \\151200</td> </tr> <tr> <td>$= \\$151200$</td> <td>$= \\136080</td> </tr> </tbody> </table> <p>price decrease = \$(168000 - 136080)</p> $= \$31920$ <p>percentage decrease = $\frac{31920}{168000} \times 100\%$</p> $= 19\% \#$ | Price after 1 st year | Price after 2 nd year | 90% x \$168000 | 90% x \$151200 | $= \frac{90}{100} \times \168000 | $= \frac{90}{100} \times \151200 | $= \$151200$ | $= \$136080$ |
| Price after 1 st year | Price after 2 nd year | | | | | | | | |
| 90% x \$168000 | 90% x \$151200 | | | | | | | | |
| $= \frac{90}{100} \times \168000 | $= \frac{90}{100} \times \151200 | | | | | | | | |
| $= \$151200$ | $= \$136080$ | | | | | | | | |
| 8(a) | <p>1 cm ——— 25000 cm</p> $= 0.25 \text{ km}$ <p>10 cm² ——— 10 x 1 cm x 1 cm</p> $= 10 \times 0.25 \text{ km} \times 0.25 \text{ km}$ $= 0.625 \text{ km}^2$ <p>\therefore the actual area is 0.625 km² #</p> | | | | | | | | |
| 8(b) | <p>volume of fuel per second :</p> $\pi r^2 h = \pi \times \left(\frac{8 \text{ cm}}{2}\right)^2 \times (2 \times 100 \text{ cm})$ $= 3200\pi \text{ cm}^3$ <p>Total volume of fuel = 3200π cm³ x 24 x 60</p> $= 4608000 \pi \text{ cm}^3$ $= 4608\pi \text{ litres}$ $= 14476.45895 \text{ litres}$ $= 14476 \text{ litres (nearest litres) \#}$ | | | | | | | | |

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| 9(a) | 2.3 1.4 |
| 9(b) | P1 : plot the points correctly C1 : join the points to show a cubic curve C1 : smooth curve |
| 9(c) | draw tangent line $\text{gradient} = \frac{4.5}{1.8}$ $= 2.5$ acceptable range : 2.14 to 2.75 |



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| 9(d) | $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2 \text{ ——— (1)}$ $2x^3 + 12 = 3x^2 + 6x$ $\div 6, \quad \frac{1}{3}x^3 + 2 = \frac{1}{2}x^2 + x$ $\frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2 = 0 \text{ ——— (2)}$ <p>subst (1) into (2), $y = 0$</p> <p>$2x^3 + 12 = 3x^2 + 6x$ and $\frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2 = 0$ are equivalent equations. The graph of $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2$ cuts the x-axis at only 1 point, hence, the equation $2x^3 + 12 = 3x^2 + 6x$ has only 1 solution.</p> |
| 10a(i) |  <p>number of working hours per day = $(2 + 6 - 1)$ h $= 7$ h</p> <p>number of days working in a month = 4×2 days $= 8$ days</p> <p>monthly salary = $8 \times 7 \times \\$11$ $= \\$616 \text{ #}$</p> |
| 10a(ii) | $20\% \text{ of } \$(616 + 1600) = \frac{20}{100} \times \2216 $= \$443.20$ $= \$443 \text{ (nearest dollar)}$ <p>\therefore Amy's monthly contribution to CPF is \$443 #</p> |
| 10(b) | <p>take home pay = $\\$(1600 + 616) - \\443.20 $= \\$1772.80$</p> <p>savings per month = $\\$(1772.80 - 10 - 54 - 400)$ $= \\$1308.80$</p> <p>savings for 4 months = $4 \times \\$1308.80$ $= \\$5235.20$</p> <p>savings of $\\$5235.20 > \\3086.50, hence Amy is correct.</p> |

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| | Yes because her savings from the 4 months is more than the course fees. |
| 11a(i) | $\angle EBD = \angle EAD \text{ (}\angle\text{s in the same segment)}$ $= 59^\circ$ $\angle AED + 50^\circ + 59^\circ = 180^\circ \text{ (}\angle\text{s in opp segment)}$ $\angle AED = 180^\circ - 50^\circ - 59^\circ$ $= 71^\circ \#$ |
| 11a(ii) | <p>Method 1</p> <p>In $\triangle BCD$,</p> $87^\circ + \angle BCD = 50^\circ + 59^\circ \text{ (ext } \angle \text{ of } \Delta)$ $\angle BCD = 50^\circ + 59^\circ - 87^\circ$ $= 22^\circ \#$ |
| | <p>Method 2</p> $50^\circ + 59^\circ + \angle DBC = 180^\circ \text{ (adj } \angle\text{s on a st line)}$ $\angle DBC = 180^\circ - 50^\circ - 59^\circ$ $= 71^\circ$ <p>In $\triangle BCD$,</p> $87^\circ + 71^\circ + \angle BCD = 180^\circ \text{ (}\angle \text{ sum of } \Delta)$ $\angle BCD = 180^\circ - 87^\circ - 71^\circ$ $= 22^\circ$ |
| 11b(i) | $\angle BAC = 180^\circ - 33.1^\circ - 51.4^\circ$ $= 95.5^\circ$ <p>Using Sine Rule,</p> $\frac{AB}{\sin 51.4^\circ} = \frac{150.8}{\sin 95.5^\circ}$ $AB = \frac{150.8 \sin 51.4^\circ}{\sin 95.5^\circ}$ $= 118.39837$ $= 118 \text{ (3sf)}$ <p>$\therefore AB = 118 \text{ m } \#$</p> |
| 11b(ii) |  <p>$\tan 25^\circ = \frac{h}{118.39837}$</p> $h = 118.39837 \tan 25^\circ$ $= 55.21007$ $= 55 \text{ (nearest whole number)}$ <p>\therefore height of building is 55 m #</p> |

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| 12a(i) | $\frac{5}{8}$ $\frac{8}{11}, \frac{8}{11}, \frac{3}{11}$ |
| 12a(ii) | <p>P(same gender) = P(both male) + P(both female)</p> $= \frac{3}{8} \times \frac{8}{11} + \frac{5}{8} \times \frac{3}{11}$ $= \frac{39}{88} \#$ |
| 12b(i) | <p>24.5</p> <p>23</p> |
| 12b(ii) | <p>Students in class A take longer time than class B to complete the problem since median of class A (24.5 min) is greater than the median of class B (23 min).</p> <p>Interquartile range : Class A : (27 – 16) min = 11 min Class B (32.5 – 17.5) min = 15 min The spread of time taken is lesser in class A (11 min) compared to class B (15 min) as the interquartile range in class A is smaller than that in class B.</p> <p>Or</p> <p>The time taken by students in class A are more consistent than that in class B because the interquartile range for class A (11 min) is less than that for class B (15 min).</p> <p>Or</p> <p>Students in class A takes a shorter time to complete the problem than students in class B since 75% of them completed in 27 min in class A compared to 32.5 min in class B.</p> <p>Or</p> <p>Students in class A takes shorter time to complete the problem than class B since the longest time taken by students in class A is 35 min while that for class B is 42.5 min</p> |