Section A (52 marks)

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

[moderate]

1. Solve the simultaneous equations

$$2x - 5y = 19$$

$$3x + 7y = -15$$

[3]

[moderate]

2. (a) A designer watch appreciates in value by 8% each year.
The cost of a new designer watch is $2875. Calculate the value of the watch after 2 years.

[2]

(b) A part-time staff at a bookstore is paid a normal rate of $\$x$ per hour and an overtime rate of $y per hour.
On a weekday, he works for 12 hours at normal rate and 4 hours at overtime rate. He was paid $138.

Show that $6x + 2y = 69$

[1]

[simple]

3. The variable y is inversely proportional to the square of the variable $3x$. It is also given that when $y = 2$, $x = 5$.

Find

(a) the equation relating y and x,

[2]

(b) the values of x when $y = 2$.

[2]

[moderate]

4. Based on an annual report in 2017, the income generated by a manufacturing Company X was estimated to be \$14.65 million. (1 million = 1×10^6)

(a) Express 14.65 million in standard form.

[1]

(b) Company X generated \$14.65 million from the sale of 230 000 hard disks which were manufactured and sold in 2017.
Calculate the average cost of 1 hard disk.

[1]

[moderate]

5. Erfan is x years old.
His uncle is 23 years older than Erfan.
7 years later, his uncle will be twice as old as Erfan.

(a) Write down an expression in x for Erfan's age 7 years later.

[1]

(b) Write down an expression in x for his uncle's age 7 years later.

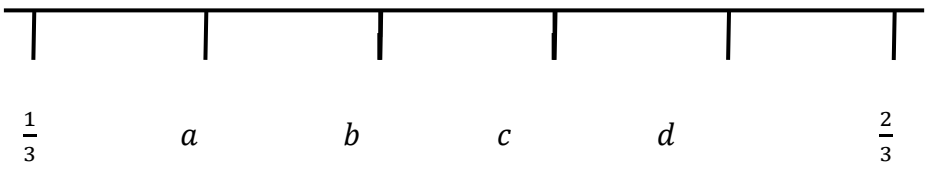
[1]

(c) Form an equation x, and solve it to find Erfan's age

[3]

[simple]

6. On the number line given below, the fractions are placed at equal distances apart.

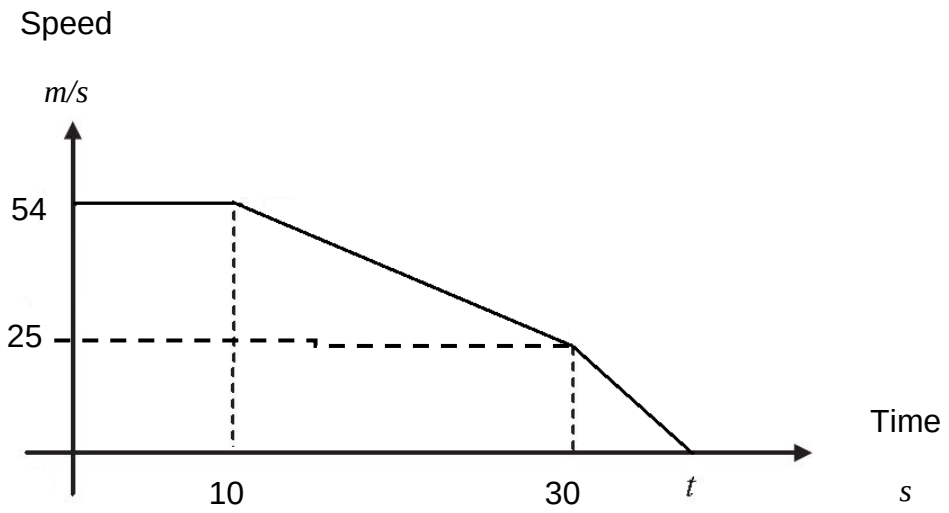


Find the fractions a, b, c and d.

[2]

[difficult]

7. The graph below shows the speed-time graph of a car during a period of *t* seconds.



(a) Calculate the speed of the motorcycle at 20*s*,

[2]

(b) After 30*s*, its deceleration doubled. Find the value of *t*

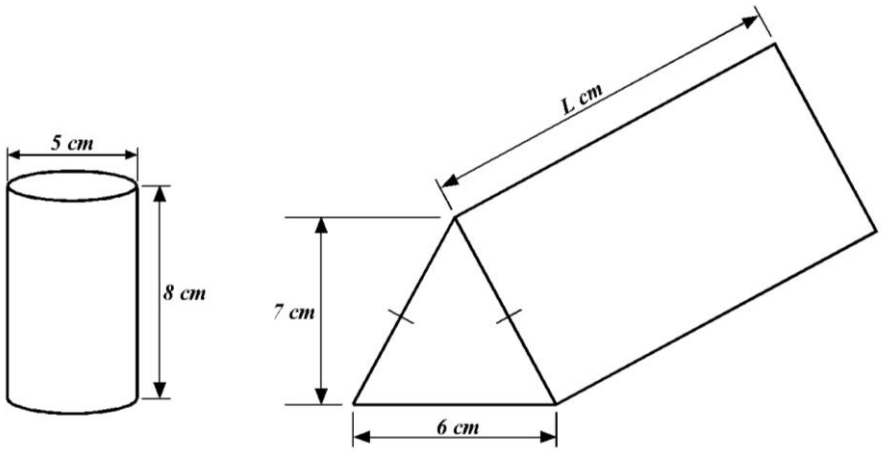
[2]

(c) Calculate the average speed of the motorcycle for the whole journey.

[2]

[moderate]

8. The diagram below shows two solid metal figures, a cylinder and a prism.
The cylinder has a diameter of 5 cm and height of 8 cm.
The prism has a cross-sectional area in the shape of a triangle with height 7 cm and base 6 cm.
The prism has a length of Lcm.



(a) Calculate the volume of the cylinder. (Take $\pi = 3.14$)

[2]

(b) Calculate the cross-sectional area of the prism.

[1]

(c) Given that the volume of the prism is 315 cm^3, find the length, L of the prism.

[2]

(d) If the metal can be melted and remoulded into another shape, what is the minimum number of cylinder(s) required to form a prism?

[1]

[moderate]

9. The weights of a shipment of boxes are represented in the following stem-and-leaf diagram.

Stem	Leaf							
1	0	4	7	7	7			
2	3	4	5	6				
3	1	2	2	***w***	5	5	6	7
4	0	1	5	6	7			
5	1	4						

Key: 1 | 0 means 10 kg

(a) Find

(i) the value of ***w*** if the median weight of the boxes is 32.5 kg,

[1]

(ii) the modal weight

[1]

(iii) the percentage of boxes less than the modal weight

[1]

[moderate**]**

10. (a) Factorise completely $12a^2 - 6ab + 4ac - 2bc$.

[2]

(b) Simplify $\frac{6x+1}{2} - \frac{4x}{3}$

[2]

[moderate]

11. The table below shows an extract of the tax rates from the Tax Authority last year.

Chargeable Income	Rate (%)	Gross Tax Payable ($)
First $20 000 Next $10 000	0 2	0 200
First $30 000 Next $10 000	- 3.50	200 350
First $40 000 Next $40 000	- 7	550 2800
First $80 000 Next $40 000	- 11.5	3350 4600
First $120 000 Next $40 000	- 15	7950 6000
First $160 000 Next $40 000	- 17	13950 6800

(a) Calculate the tax payable for a chargeable income of $115 000 according to the tax rates given in the table above.

[2]

(b) An additional information on reliefs is given below.

Relief:

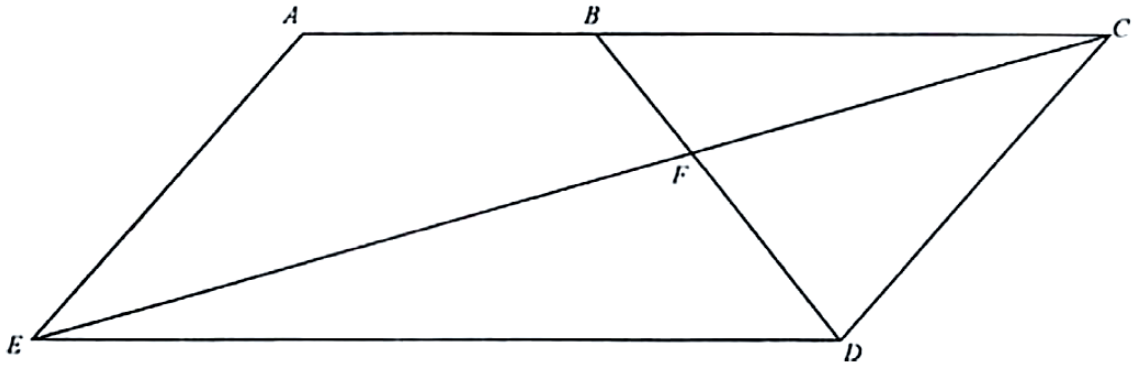
NS man	$200
4-room dwelling	$300
wife	$2000
children	$1500 each
parent	$4500 per parent.

Mr Amir who is an NS man, has four children and he has to support his wife and mother. He lives in a 4 – room dwelling.

Calculate the amount of income tax that Mr Amir has to pay if his annual income is $65 000. [2]

[moderate]

12. The diagram below shows a parallelogram *ACDE*. *CE* is the diagonal of *ACDE* and *CE* meets *BD* at *F*.



(a) Prove that triangle *BCF* and triangle *DEF* are similar.

[2]

(b) Given that $3DE = 5BC$ and $CF = 6.3$ cm, find the length of *EF*.

[2]

(c) Find

(i) $\dfrac{\text{area of triangle } BCF}{\text{area of triangle } DEF}$

[1]

(ii) $\dfrac{\text{area of triangle } BCF}{\text{area of triangle } FCD}$

[1]

(iii) $\dfrac{\text{area of triangle } BCF}{\text{area of parallelogram } ACDE}$

[2]

[simple]

13. Use the data below,

24, 20, 18, 25, 22, 32, 30, 29, 35, 30, 28, 24, 38

(a) to create a box-and-whisker plot for the data. [1]

(b) What is the range? [1]

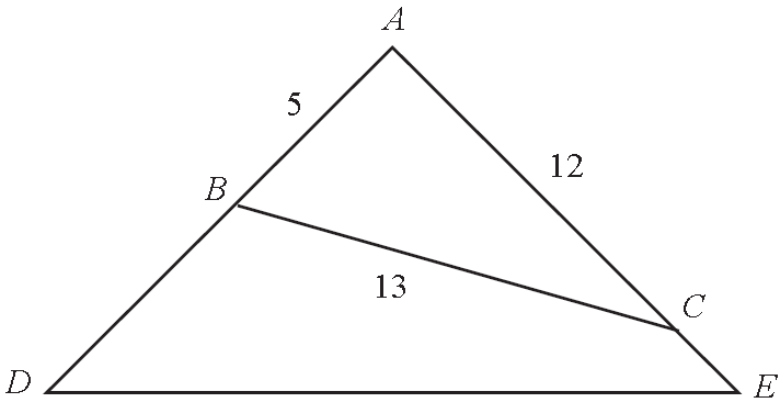
Section B (8 marks)

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

[moderate]

14. (a) A triangle in the diagram below is not drawn to scale. It has the following measurements;

AB = 5 cm, AC = 12 cm and BC = 13 cm.



(i) Give a reason why angle BAC is a right-angled.

[2]

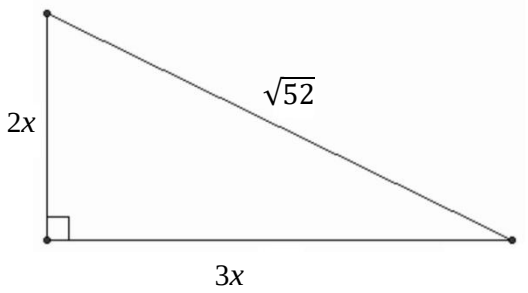
AC is produced to E such that CE = 4 cm. Triangle ABC is similar to triangle AED.

(i) Calculate BD

[2]

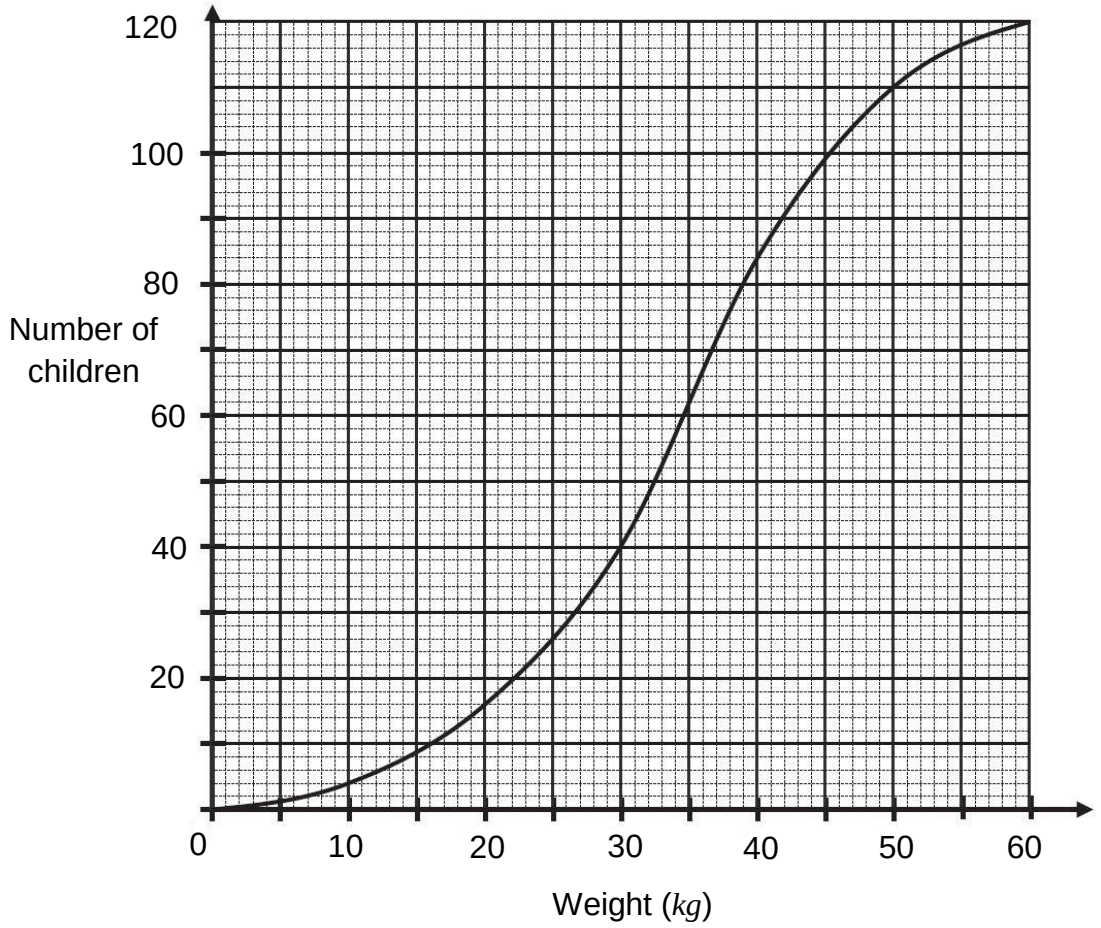
(ii) Find the exact value of $\cos \angle ADE$. [2]

(b) Calculate the value of x in the diagram below. [2]



[moderate]

15. The cumulative frequency curve below shows the weights of 120 children of the same age group at Village A.



(a) Refer to the graph.

Find

(i) the median weight,

[1]

(ii) the inter-quartile range,

[2]

(iii) the 80^{th} percentile.

[1]

(iv) the number of children who weigh more than 50 kg.

[1]

(v) The grouped frequency distribution of the weights of the 120 children is shown below. Find the value of k.

Weight (x)	Frequency
$0 \leq x < 10$	4
$10 \leq x < 20$	12
$20 \leq x < 30$	k
$30 \leq x < 40$	44
$40 \leq x < 50$	26
$50 \leq x < 60$	10

[1]

(vi) If 2 children are chosen, what is the probability that one weighs less than 20 kg and the other weighs more than 50 kg.

[2]