Index Number: .....

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SECTION A
[40 marks]

Answer **all** *the questions in this section.*
All *questions carry* **equal** *marks.*

1. *(a)* Given that $(7 - 2x)$, 9, $(5x + 17)$ are consecutive terms of a Geometric Progression (*G. P.*) with common ratio, $r > 0$, find the values of x.

(b) Two positive numbers are in the ratio 3 : 4. The sum of **thrice** the first number and **twice** the second is 68. Find the **smaller** number.

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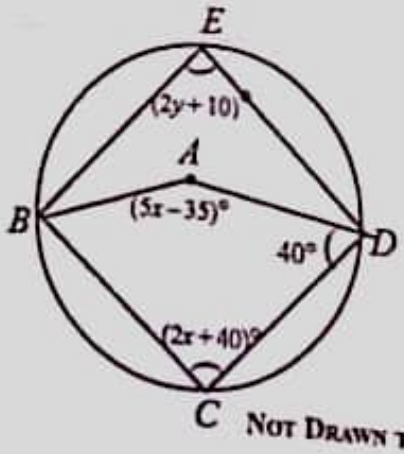
2. Given that $y = \left(\frac{pr}{m} - p^3r\right)^{\frac{-3}{2}}$.

(a) make r the subject;

(b) find the value of r when $y = -8$, $m = 1$ and $p = 3$.

Index Number: .....

3. A chord subtends an angle of 72° at the centre of a circle of radius $24.5\ m$. Calculate the perimeter of the minor segment. [Take $\pi = \frac{22}{7}$]



NOT DRAWN TO SCALE

In the diagram, $BCDE$ is a circle with centre A. $\angle BCD = (2x + 40)^{\circ}$, $\angle BAD = (5x - 35)^{\circ}$, $\angle BED = (2y + 10)^{\circ}$ and $\angle ADC = 40^{\circ}$. Find:

(a) the values of x and y;

(b) $\angle ABC$.

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Index Number: .....

5. *(a)* Given that $m = \tan 30°$ and $n = \tan 45°$, simplify, without using calculator, $\frac{m - n}{mn}$, leaving the answer in the form $p + \sqrt{q}$.

(b) There are 20 women in a bus. 15 of them wear glasses and 10 wear wrist watches. If a woman is chosen at random from the bus, find the probability that she wears **both** glasses and wrist watch.

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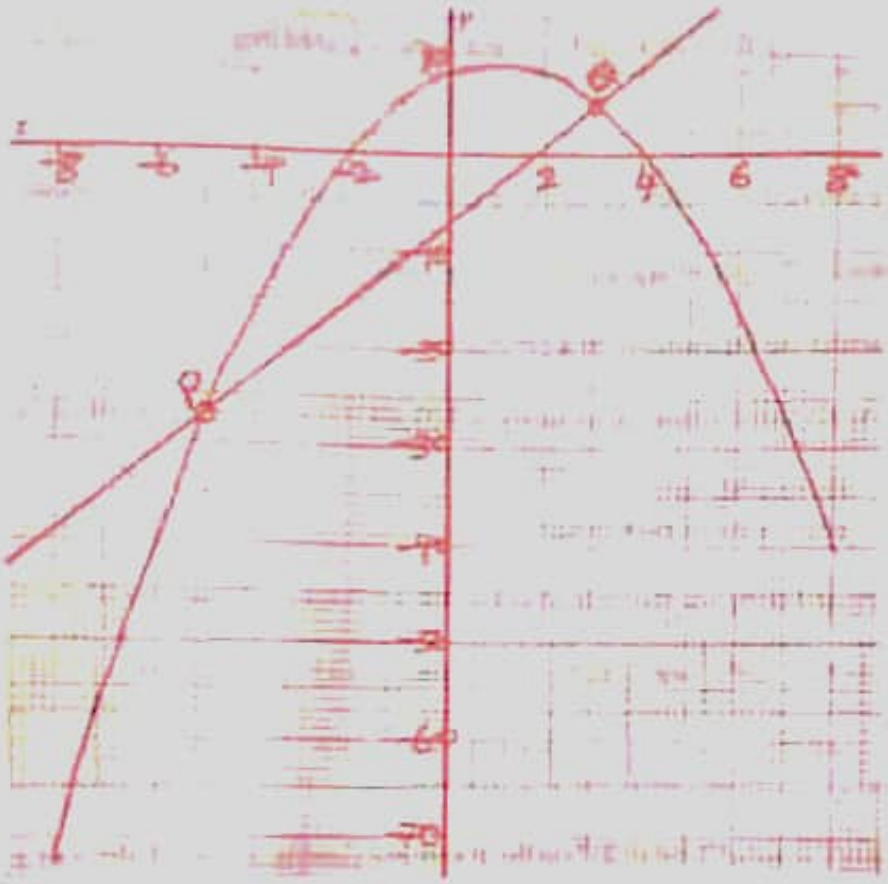
SECTION B

[60 marks]

Answer **five** *questions* **only** *from this section.*

All *questions carry* **equal** *marks.*

6.



The graph shows the relation of the form $y = mx^2 + nx + r$, where m, n and r are constants.
Using the graph:

(a) state the scale **used on both axes;**

(b) find the values of m, n and r;

(c) find the gradient of the line through **P** and **Q**;

(d) state the range of values of x for which $y > 0$.

7. *(a)* A man purchased 180 copies of a book at ₦ 250.00 **each**. He sold y copies at ₦ 300.00 **each** and the rest at a discount of 5 *kobo* in the Naira of the cost price. If he made a profit of ₦ 7,125.00, find the value of y.

Index Number: .....

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(b) A trader bought x bags of rice at a cost, $c = 24x + 103$ and sold them at a price, $s = 33x - \frac{x^2}{20}$.

(i) Find the expression for the profit.
(ii) If 20 bags of rice were sold, calculate the percentage profit.

8.

Item	*Food and drinks*	*Fuel*	*Rent*	*Building Project*	*Education*	*Savings*
Percentage(%)	35	7.5	10	15	17.5	x

The table shows the monthly expenditure (in percentage) of Mr. Okafor's salary.

(a) Calculate the percentage of Mr. Okafor's salary that was put into savings.

(b) Illustrate the information on a pie chart.

(c) If Mr. Okafor's annual gross salary is $ 28,800.00 and he pays tax of 12 %, calculate:

(i) his monthly tax;
(ii) amount saved **each** month.

9. (a) Copy and complete the table of values for $y = 3 \sin x + 7 \cos x$ for $0° \leq x \leq 180°$.

x	0°	20°	40°	60°	80°	100°	120°	140°	160°	180°
y	7.0				4.2		−0.9			

(b) Using a scale of 2 *cm* to 20° on the x-axis and 2 *cm* to 2 units on the y-axis, draw the graph of $y = 3 \sin x + 7 \cos x$ for $0 \leq x \leq 180°$.

(c) Using the graph, find the:
(i) value of y when $x = 150°$;
(ii) range of values of x for which $y > 0$.

10.

Age (years)	3	4	5	6	7	8	9	10
Number of Children	2	6	5	x	6	9	8	5

The table shows the distribution of ages of a number of children in a school. If the mean of the distribution is 7, find the:

(a) value of x;
(b) standard deviation of their ages.

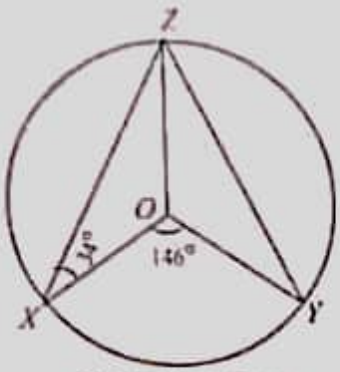
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11. *(a)* The exterior angles of a polygon are 42°, 38°, 57°, $x°$, $(x + y)°$, $(2x - 15)°$ and $(3x - y)°$. If x is 7° less than y, find the values of x and y.

(b)



NOT DRAWN TO SCALE

In the diagram, O is the centre of the circle XYZ. $\angle ZXO = 34°$ and $\angle XOY = 146°$. Find $\angle OYZ$.

12. *(a)* The probability that an athlete will **not** win any of the **three** races is $\frac{1}{4}$.

If the athlete runs in all the races, what is the probability that the athlete will win:

(i) **only the second** race;

(ii) **all the three** races;

(iii) **only two** of the races?

(b) A cone with perpendicular height 24 *cm* has a volume of 1200 cm^3. Find the volume of a cone with same base radius and height 84 *cm*. [Take $\pi = \frac{22}{7}$]

13. *(a)* The diameter of a cylinder closed at both ends is 7 *cm*. If the total surface area is 209 cm^2, calculate the height. [Take $\pi = \frac{22}{7}$]

(b) The points X and Y, 19 *m* apart are on the same side of a tree. The angles of elevation of the top, T, of the tree from X and Y on the horizontal ground with the foot of the tree are 43° and 38° respectively.

(i) Illustrate the information in a diagram.

(ii) Find, correct to **one** decimal place, the height of the tree.

Index Number:.....

Answer **all** *the questions.*

Mathematical tables may be used in any question.

The use of non-programmable, silent and cordless calculator is allowed.

Each *question is followed by* **four** *options lettered* A *to* D. *Find the correct option for* **each** *question and shade* **in pencil**, *on your answer sheet, the answer space which bears the same letter as the option you have chosen. Give only* **one** *answer to* **each** *question. An example is given below.*

The ages, in years, of four boys are 10, 12, 14 and 18. What is the average age of the boys?

A. 12 years

B. $12\frac{1}{2}$ years

C. 13 years

D. $13\frac{1}{2}$ years

The correct answer is $13\frac{1}{2}$ years, *which is lettered* D, *and therefore answer space* D *would be shaded.*

[A] [B] [C] [■]

Think carefully before you shade the answer spaces; erase completely any answer you wish to change.

Do **all** *rough work on this question paper.*

Now answer the following questions.

1. Evaluate, correct to four significant figures, (573.06×184.25).

A. 105600.00

B. 105622.00

C. 105500.00

D. 105532.00

2. Change 432_{five} to a number in base three.

A. 10100_{three}

B. 11100_{three}

C. 11101_{three}

D. 10110_{three}

3. Given that A and B are sets such that $n(A) = 8$, $n(B) = 12$ and $n(A \cap B) = 3$, find $n(A \cup B)$.

A. 15

B. 17

C. 20

D. 23

4. If $\sqrt{24} + \sqrt{96} - \sqrt{600} = y\sqrt{6}$, find the value of y.

A. 4

B. 2

C. −2

D. −4

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Index Number:.....

5. Evaluate $23 \times 54 \pmod 7$.

A. 2
B. 3
C. 5
D. 6

6. If $4^{3x} = 16^{x+1}$, find the value of x.

A. -2
B. 2
C. 1
D. -1

7. A weaver bought a bundle of grass for S 50.00 from which he made 8 mats. If each mat was sold for S 15.00, find the percentage profit.

A. 240 %
B. 140 %
C. 120 %
D. 40 %

8. Find the 17^{th} term of the Arithmetic Progression (*A. P.*): $-6, -1, 4, \ldots$.

A. -91
B. -86
C. 74
D. 79

9. M varies directly as n and inversely as the square of p. If $M = 3$ when $n = 2$ and $p = 1$, find M in terms of n and p.

A. $M = \frac{3n}{2p^2}$

B. $M = \frac{2n}{3p^2}$

C. $M = \frac{2n}{3p}$

D. $M = \frac{3n^2}{2p^2}$

10. If $a = 3$ and $b = -7$, find the value of $\frac{5b+(a+b)^2}{(a-b)^2}$.

A. 0.51
B. 0.19
C. -0.19
D. -0.51

11. Three boys shared D 10,500.00 in the ratio 6 : 7 : 8. Find the largest share.

A. D 4,000.00
B. D 5,000.00
C. D 4,500.00
D. D 3,500.00

12. The length of a piece of stick is 1.75 m. A boy measured it as 1.80 m. Find the percentage error.

A. $4\frac{4}{7}\%$

B. $2\frac{6}{7}\%$

C. $2\frac{7}{9}\%$

D. $4\frac{7}{9}\%$

13. If $5x + 3y = 4$ and $5x - 3y = 2$, what is the value of $(25x^2 - 9y^2)$?

A. 20
B. 16
C. 2
D. 8

14. Mary has S 3.00 more than Ben but S 5.00 less than Jane. If Mary has S x, how much does Jane and Ben have altogether?

A. $S(2x - 8)$
B. $S(2x + 8)$
C. $S(2x - 2)$
D. $S(2x + 2)$

Index Number:.....

15. Consider the statements:

p: Stephen is intelligent
q: Stephen is good at Mathematics

If $p \Rightarrow q$, which of the following is a **valid** conclusion?

A. If Stephen is good at Mathematics, then he is intelligent
B. If Stephen is not good at Mathematics, then he is not intelligent
C. If Stephen is not intelligent, then he is not good at Mathematics
D. If Stephen is not good at Mathematics, then he is intelligent

16. What value of p will make $(x^2 - 4x + p)$ a perfect square?

A. -2
B. 16
C. 4
D. -8

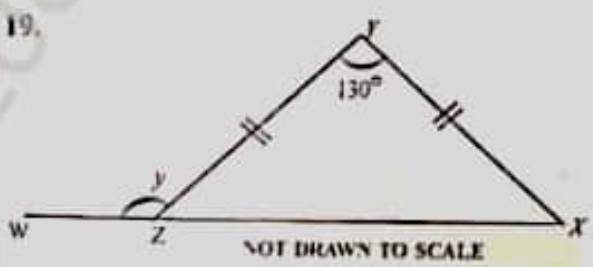
17. Find the value of x such that $\frac{1}{x} + \frac{4}{3x} - \frac{5}{6x} + 1$ is zero.

A. $\frac{1}{6}$
B. $\frac{1}{4}$
C. $-\frac{3}{2}$
D. $-\frac{7}{6}$

18. Make t the subject of $k = m\sqrt{\frac{t-p}{r}}$.

A. $t = \frac{rk^2 + p}{m^2}$
B. $t = \frac{rk^2 - pm^2}{m^2}$
C. $t = \frac{rk^2 - p}{m^2}$
D. $t = \frac{rk^2 + p^2}{m^2}$

19.



In the diagram, $|\overline{XY}| = |\overline{YZ}|$ and $\angle XYZ = 130°$. Find the value of y.

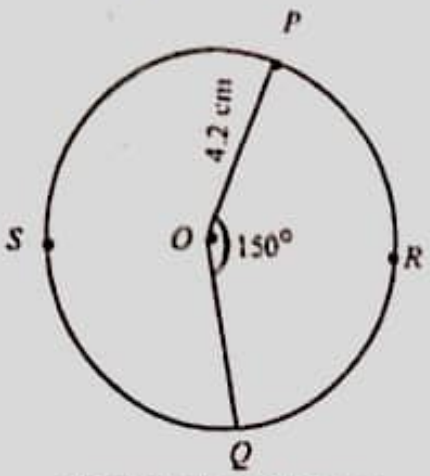
A. 50°
B. 65°
C. 25°
D. 155°

20. An exterior angle of a regular polygon is 22.5°. Find the number of sides.

A. 13
B. 14
C. 15
D. 16

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Index Number:.....



NOT DRAWN TO SCALE

In the diagram, $\angle POQ = 150°$ and the radius of the circle $PSQR$ is 4.2 *cm*.

[Take $\pi = \frac{22}{7}$]

Use the information to answer questions **21** *and* **22**.

21. Find the length of the minor arc PRQ.

A. 11.00 *cm*
B. 15.40 *cm*
C. 17.64 *cm*
D. 23.10 *cm*

22. Find the area of the sector $OPSQ$.

A. 15.40 cm^2
B. 17.64 cm^2
C. 23.10 cm^2
D. 32.34 cm^2

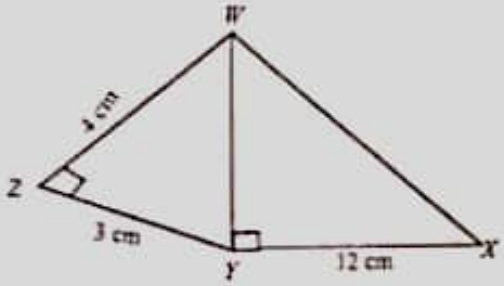
23. A ladder 6 *m* long leans against a vertical wall at an angle 53° to the horizontal. How high up the wall does the ladder reach?

A. 3.611 *m*
B. 4.521 *m*
C. 4.792 *m*
D. 3.962 *m*

24. A cylinder, opened at one end, has a radius of 3.5 *cm* and height 8 *cm*. Calculate the total surface area.

[Take $\pi = \frac{22}{7}$]

A. 126.5 cm^2
B. 165.0 cm^2
C. 212.0 cm^2
D. 214.5 cm^2



NOT DRAWN TO SCALE

25. In the diagram, $\angle WZY$ and $\angle WYX$ are right angles. Find the perimeter of $WXYZ$.

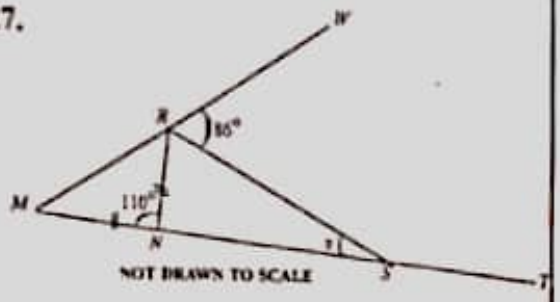
A. 30 *cm*
B. 32 *cm*
C. 35 *cm*
D. 37 *cm*

26. The length of a rectangle is 10 *cm*. If its perimeter is 28 *cm*, find the area.

A. 30 cm^2
B. 40 cm^2
C. 60 cm^2
D. 80 cm^2

Index Number:.....

27.



In the diagram, MRW and $MNST$ are straight lines. $|\overline{MN}| = |\overline{NR}|$, $\angle MNR = 110°$ and $\angle WRS = 86°$. Find the value of x.

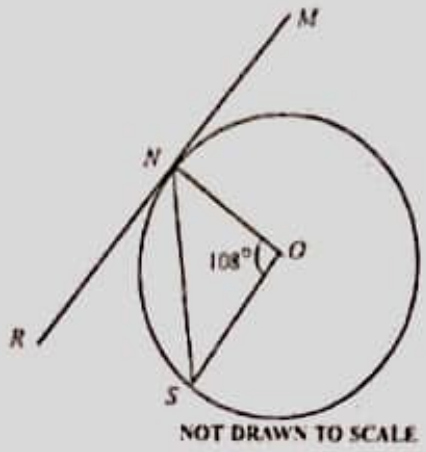
A. 86°
B. 70°
C. 51°
D. 42°

28. A boy 1.4 m tall, stood 10 m away from a tree of height 12 m. Calculate, correct to the **nearest** degree, the angle of elevation of the top of the tree from the boy's eyes.

A. 71°
B. 47°
C. 19°
D. 8°

29. Given that $\sin(5x-28)° = \cos(3x-50)°$, $0° \leq x \leq 90°$, find the value of x.

A. 39
B. 32
C. 21
D. 14



In the diagram, MNR is a tangent to the circle centre O at N and $\angle NOS = 108°$. *Use the information to answer questions* **30** *and* **31**.

30. Find $\angle OSN$.

A. 72°
B. 42°
C. 36°
D. 18°

31. Find $\angle SNR$.

A. 36°
B. 42°
C. 54°
D. 72°

32. Mrs Gabriel is pregnant. The probability that she will give birth to a girl is $\frac{1}{2}$ and the probability that the baby will have blue eyes is $\frac{1}{4}$. What is the probability that she will give birth to a girl with blue eyes?

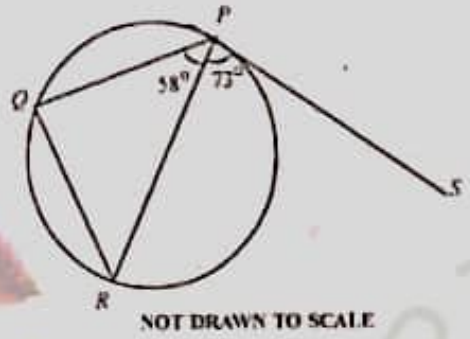
A. 1
B. $\frac{3}{4}$
C. $\frac{1}{8}$
D. $\frac{1}{4}$

Index Number:.....

33. The mean of a set of 10 numbers is 56. If the mean of the **first** nine numbers is 55, find the 10^{th} number.
    A. 75
    B. 65
    C. 55
    D. 45

34. Simplify: $\frac{2-18m^2}{1+3m}$.
    A. $2(1+3m)$
    B. $2(1+3m^2)$
    C. $2(1-3m)$
    D. $2(1-3m^2)$

35.



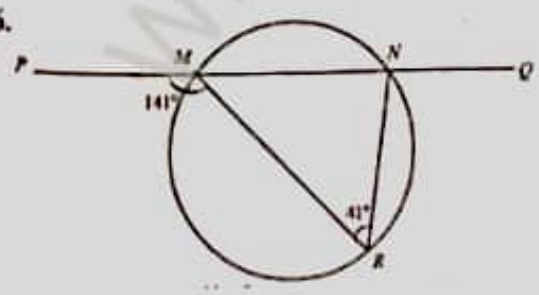
NOT DRAWN TO SCALE

The diagram shows triangle PQR inscribed in a circle. $\overline{PS}$ is a tangent to the circle at P.

Find $\angle PRQ$.

A. 49°
B. 58°
C. 73°
D. 131°

36.



NOT DRAWN TO SCALE

In the diagram, triangle MNR is inscribed in circle MNR and $\overline{PQ}$ is a straight line. If $\angle MRN = 41°$ and $\angle PMR = 141°$, find $\angle QNR$.

A. 39°
B. 80°
C. 110°
D. 141°

37. Solve: $\frac{y+2}{4} - \frac{y-1}{3} > 1$.
    A. $y < -10$
    B. $y < -2$
    C. $y < 2$
    D. $y < 10$

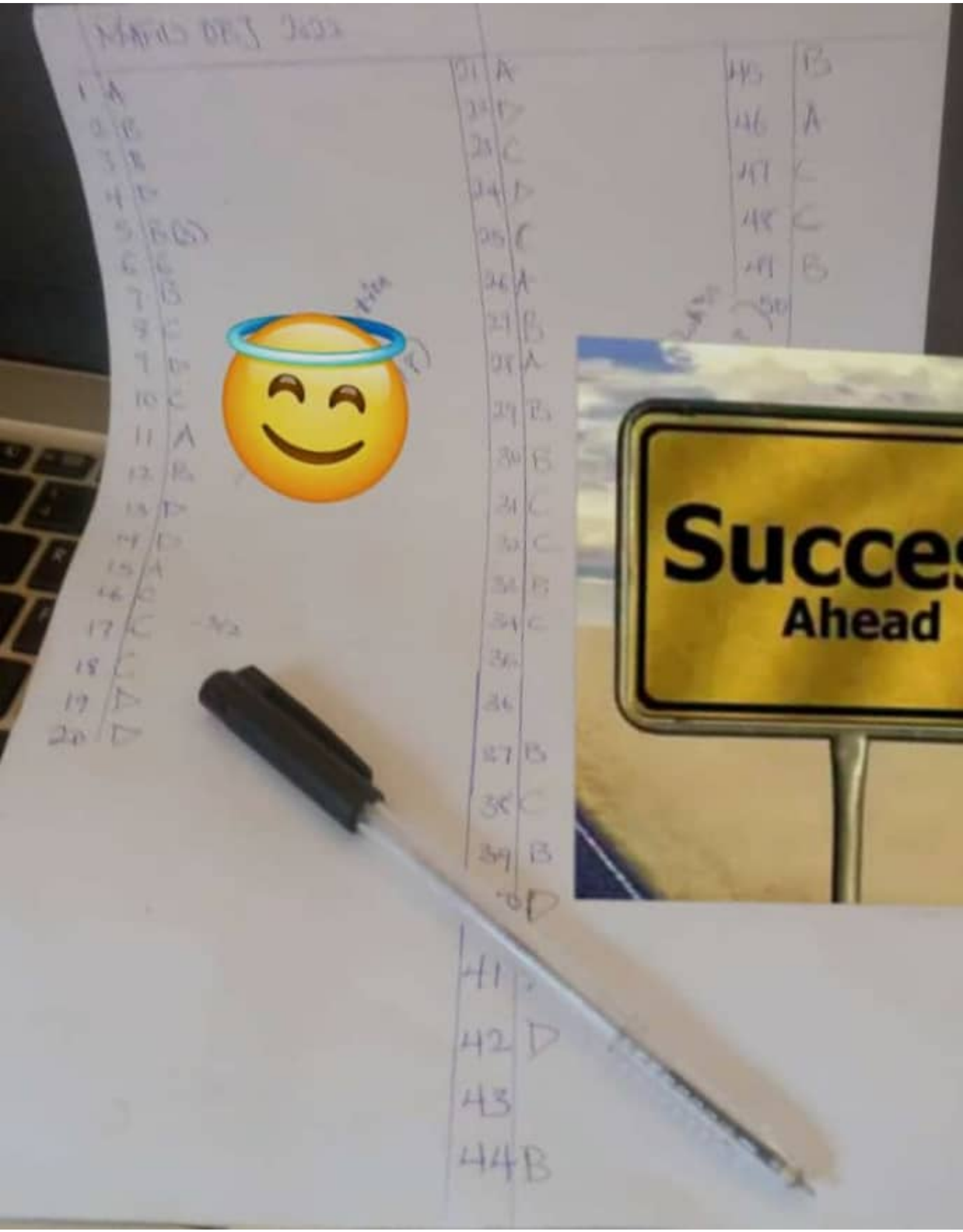
The ages (years) of some members in a singing group are: 12, 47, 49, 15, 43, 41, 13, 39, 43, 41 and 36. *Use the information to answer questions* **38** *and* **39.**

38. Find the lower quartile.
    A. 12
    B. 13
    C. 15
    D. 20

39. Find the mean.
    A. 33.35
    B. 35.54
    C. 34.45
    D. 36.44

40. Find, correct to **two** decimal places, the volume of a sphere whose radius is 3 *cm*. [Take $\pi = \frac{22}{7}$]
    A. 72.57 cm^3
    B. 88.12 cm^3
    C. 105.29 cm^3
    D. 113.14 cm^3

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Succes
Ahead

SECTION A
[40 marks]

Answer **all** *the questions in this section.* **All** *questions carry* **equal** *marks.*

1. The terms $\frac{1}{64}$, $\frac{1}{32}$, $\frac{1}{16}$ ... form a Geometric Progression (G.P).

   If the sum of the G.P is $(2^{36} - 2^{-6})$, find the number of terms.

2. Given that $p = \sqrt{\frac{mx}{t} - t^2x}$,

   (*a*) make x the subject.

   (*b*) If $m = 7$, $p = -3$ and $t = 4$, find the value of x.

3. The diagonal of a rectangular field is 169 m. If the ratio of the length to the width is 12 : 5, find the:

   (*a*) dimensions;

   (*b*) perimeter of the field.

4. Two regular polygons X and Y are such that the number of sides of X is 3 more than the number of sides of Y. If the sum of the exterior angles of X and Y is 117^0, how many sides has X?

5. The scores of 10 learners in a test arranged in ascending order is: 12, 13, 13, a, $(a + 3)$, $(52 - 2a)$, $(2a - 8)$, 23, 23 and 24. If the median mark is 20, find the:

   (*a*) value of a;

   (*b*) mean.

Section B

[60 marks]

Answer **five** *questions* **only** *from this section.* **All** *questions carry* **equal** *marks.*

6. (*a*) Copy and complete the table for $y = 2x^2 + 3x - 7$ for $-4 \leq x \leq 2$.

x	-4	-3	-2	-1	0	1	2
y		2			-7		

(*b*) Using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 5 units on the y-axis, draw the graph of $y = 2x^2 + 3x - 7$ for $-4 \leq x \leq 2$.

(*c*) Use the graph to find the roots of:

(i) $2x^2 + 3x - 7 = 0$;

(ii) $2x^2 + 5x - 4 = 0$.

7. (*a*) Three friends shared an amount in the ratio $\frac{2}{3} : \frac{3}{5} : \frac{1}{4}$. If the **largest** share was Le 12,000.00, how much was shared between them?

(*b*) A shopkeeper gave a bill to a customer. The bill was in two digits but was mistakenly interchanged thereby undercharging the customer by $ 45.00. If the sum of the digits is 9, find the actual value of the bill.

8. (*a*) The lengths of twelve poles form an Arithmetic Progression (A.P). If the **third** pole is 3 m and the **eighth** pole is 5 m, find the:

(i) length of the **first** pole;

(ii) sum of the lengths of the poles.

(*b*) The cost of three chairs and four tables is GHȼ 320.00. If two chairs and five tables of same kind cost GHȼ 330.00, find the cost of:

(i) 4 chairs;

(ii) 3 tables.

9. (*a*) Copy and complete the table of values for $y = 2\cos x + \sin x$, $0° \leq x \leq 360°$

y	0°	45°	90°	135°	180°	225°	270°	315°	360°
x	2.0		1.0		− 2.0		− 1.0		

(*b*) Using a scale of 2 cm to 45° on the x-axis and 2 cm to 1 unit on the y-axis, draw the graph of $y = 2\cos x + \sin x$ for $0° \leq x \leq 360°$.

(*c*) On the same axes, draw the graph of $y = 1$.

(*d*) From the graph, find the:

(i) minimum value of $y = 2\cos x + \sin x$;
(ii) values of x for which $2\cos x + \sin x - 1 = 0$.

10.

Height (cm)	1	2	3	4	5	6	7
No of seedlings	4	5	$x-2$	x	y	$y-12$	1

The table shows the height (cm) of 50 seedlings in a garden. Given that the mean height of the seedlings is 4 cm, find the:

(*a*) values of x and y;

(*b*) median height.

11. (*a*) A bus has petrol tank in the shape of a cylinder. The cylinder is 125 cm long and has a diameter of 42 cm.

(i) How much will a full tank of petrol cost at the rate of GH¢ 5.23 per litre?

(ii) If the bus uses petrol at the rate of 12.5 litres for every 50 km, how far can the bus travel on a full tank of petrol?

(*b*) The interior angle of a regular polygon is x. If x is 9° less than the average of 153° and 145°, find the number of sides of the polygon.

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12. (*a*) A bag contains 18 balls that differ only in colour; 11 are blue and 7 red.
If two balls are picked, one after the other **without replacement**, find the probability that both are:

(i) blue;

(ii) of **same** colour;

(iii) of **different** colours.

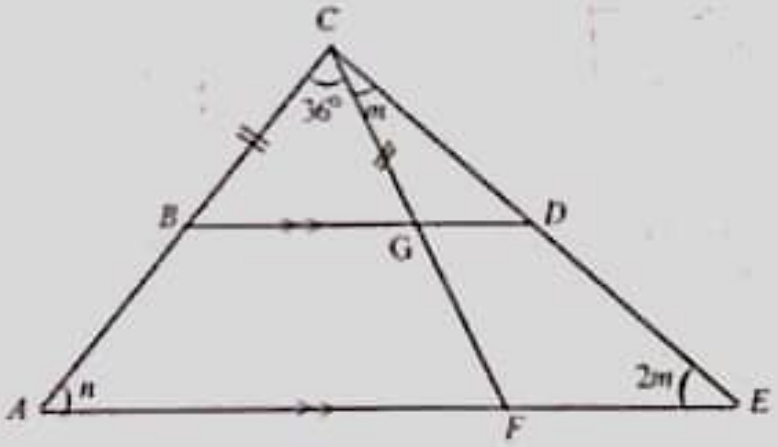
(*b*) If $\cos y = 0.8$, $0^\circ \leq y \leq 90^\circ$, find the value of $\dfrac{4 \tan y}{\cos y - \sin y}$.

13. (*a*) The radius and slant height of a right circular cone are 9 cm and 15 cm respectively. Find, correct to **one** decimal place, the:

(i) height;

(ii) volume of the cone.

(*b*)



NOT DRAWN TO SCALE

In the diagram, $\overline{BD} // \overline{AE}$. If $\angle ACF = 36^\circ$ and $|\overline{BC}| = |\overline{CG}|$, find the values of m and n.

END OF PAPER

1)a) $r = \frac{9}{7-2x} = \frac{5x+17}{9}$

$(5x+17)(7-2x) = 81$

$35x - 10x + 119 - 34x = 81$

$-9x = 81 - 119 = -38$

$x = -38/-9 = 38/9$

1b) $\frac{p}{q} = \frac{3}{4}$ $\therefore 4p = 3q$ $\therefore p = \frac{3q}{4}$ ——①

$3p + 2q = 68$ ——②

Substitute $p = 3q/4$ into equ ②)

$3\left(\frac{3q}{4}\right) + 2q = 68$

$\frac{9q}{4} + \frac{2q}{1} = 68$

$\frac{9q + 8q}{4} = 68$

$17q = 272$

$q = \frac{272}{17} = 16$

$p = \frac{3(16)}{4} = 12$

$\therefore$ Smaller number = 12

5a

$m = \tan 30°, \quad n = \tan 45°$

$$\frac{m-n}{mn} = \frac{\tan 30° - \tan 45°}{(\tan 30°)(\tan 45°)}$$

$$= \frac{\frac{\sqrt{3}}{3} - 1}{\left(\frac{\sqrt{3}}{3}\right)(1)}$$

$$= \frac{\frac{\sqrt{3} - 3}{3}}{\frac{\sqrt{3}}{3}}$$

$$= \frac{\sqrt{3} - 3}{\sqrt{3}}$$

$$= \frac{\sqrt{3} - 3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{(\sqrt{3} - 3)\sqrt{3}}{3}$$

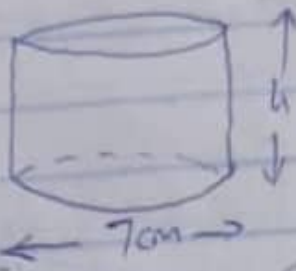
$$= \frac{3 - 3\sqrt{3}}{3}$$

$$= 1 - \sqrt{3}$$

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QUESTION 13

(a)



$r = 14/2 = 7/2$

Total surface area, $S = 2\pi rh + 2\pi r^2$

$= 2\pi r(h + r)$

$209 = 2 \times \frac{22}{7} \times \frac{7}{2}(h + 7/2)$

$209 = 22(h + 7/2)$

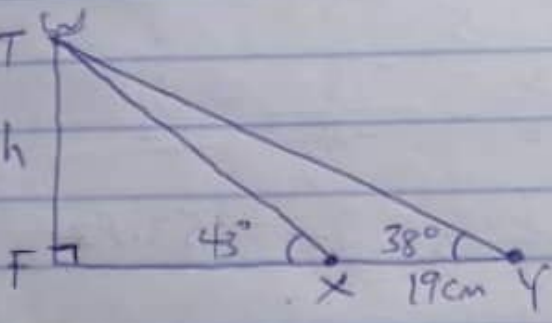
$\frac{209}{22} = h + 7/2$

$19/2 = h + 7/2$

$h = 19/2 - 7/2 = 12/2 = 6cm$

Height, $h = 6cm$

(b)(i)



(ii) $\frac{h}{FX + 19} = \tan 38°$ and $\frac{h}{FX} = \tan 43°$

$h = \tan 38°(FX + 19) = FX \tan 43°$

$(FX + 19) = FX\left(\frac{\tan 43°}{\tan 38°}\right)$

$FX + 19 = 1.19356\,FX$

$\Rightarrow 1.19356\,FX - FX = 19$

$0.19356\,FX = 19$

$FX = \frac{19}{0.19356}$

But $h = FX \tan 43$

$h = \frac{19}{0.19356} \times 0.9325$

height, $h = 91.5$ metres

QUESTION 11

(a) Given: $y = x + 7$ ——— (1)

$42 + 38 + 57 + x + (x+y) + (2x-15) + (3x-y) = 360°$ (ext. ∠s of a polygon)

$122 + 7x = 360°$

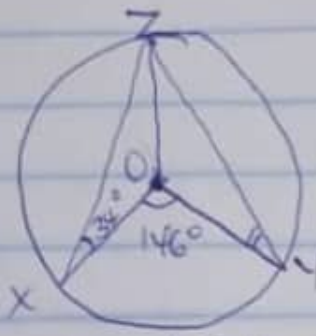
$7x = 360 - 122 = 238$

$x = 238/7 = 34$

$y = x + 7$

$y = 34 + 7 = 41$

(b)



$\angle OZX = \angle ZXO = 34°$ (base angles of Isosceles △OZX are equal)

$\angle ZOX = 180° - (\angle OZX + \angle ZXO)$ (sum of ∠s in a △ = 180°)

$= 180° - 34 - 34$

$= 112°$

$\angle ZOY = 360° - (\angle ZOX + \angle XOY)$ (sum of ∠s at a point = 360°)

$= 360° - 112 - 146$

$= 102°$

$\angle OZY = \angle OYZ$ (base ∠s of Isosceles OZY)

But $\angle ZOY + \angle OZY + \angle OYZ = 180°$ (sum of ∠s in a triangle)

$102 + \angle OYZ + \angle OYZ = 180°$

$2\angle OYZ = 180 - 102$

$2\angle OYZ = 78$

$\angle OYZ = 78/2 = 39°$

Let Age = x (10)

Number of children = f

x	f	fx	$x-\bar{x}$
3	2	6	−4
4	6	24	−3
5	5	25	−2
6	x	$6x$	−1
7	6	42	0
8	9	72	1
9	8	72	2
10	5	50	3

$\Sigma f = 2+6+5+x+6+9+8+5$

$= 41+x$

$\Sigma fx = 6+24+25+6x+42+72+72+50$

$= 291+6x$

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$7 = \frac{291+6x}{41+x}$

$7(41+x) = 291+6x$

$287+7x = 291+6x$

$291-287 = 7x-6x$

$\therefore x = 4$

(10b)

At age = 6, number of children = 6×4 = 24

Standard Deviation = $\sqrt{\frac{\Sigma f(x-\bar{x})^2}{\Sigma f}}$

$= \sqrt{(-4)^2}$

$= \sqrt{16}$

$= 4$.

(13a)

$d = 7cm$, $r = 7/2 = 3.5cm$

Total surface area = $209cm^2$

$209 = 2\pi rh + 2\pi r^2$

$= 2\pi r(h+r)$

$= 2\times\frac{22}{7}\times3.5(h+3.5)$

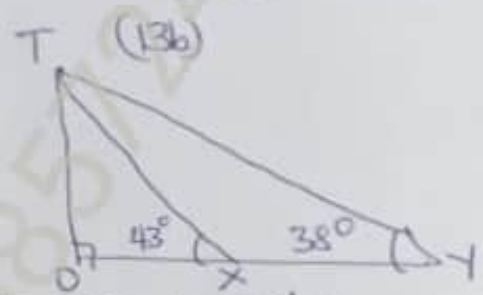
$\frac{209}{22} = \frac{22(h+3.5)}{22}$

$9.5 = h+3.5$

$\therefore h = 9.5-3.5$

$h = 6.0cm$

(13b)



From Triangle $T\hat{X}Y$

$Y\hat{T}X + 38° = 43°$ (exterior $\angle$ of Δ)

$Y\hat{T}X = 43° - 38°$

$= 5°$

$T\hat{X}Y + 43° = 180°$ (angle on a straight line)

$TXY = 180-143$

$TXY = 137°$

Using Sine rule

$\frac{|TY|}{\sin 137°} = \frac{|XY|}{\sin 5°}$

$|TY| = \frac{19\sin 137°}{\sin 50}$

$= 148.68cm$

$\sin 38° = \frac{|TO|}{|TY|}$

$0.6157 = \frac{|TO|}{148.68}$

$|TO| = 91.54cm \approx$

$91.3cm$ (1 decimal place)

QUESTION 10

(a)

Age x	Number of children, f	fx	$x-\bar{x}$	$(x-\bar{x})^2$	$f(x-\bar{x})^2$
3	2	6	-4	16	32
4	6	24	-3	9	54
5	5	25	-2	4	20
6	x=4	6x=24	-1	1	4
7	6	42	0	0	0
8	9	72	1	1	9
9	8	72	2	4	32
10	5	50	3	9	45
	$\Sigma f = x+41$	$\Sigma fx = 6x+291$			$\Sigma f(x-\bar{x})^2 = 196$

Mean, $\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$\bar{x} = 7 = \frac{6x+291}{x+41}$

$7x + 287 = 6x + 291$

$7x - 6x = 291 - 287$

$x = 4$

(b) $S.D = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{\Sigma f}} = \sqrt{\frac{196}{x+41}} = \sqrt{\frac{196}{45}}$

$S.D \simeq 2.1$

QUESTION 7

(a) Given: Cost price = ₦250.00 per book

Total cost price = ₦250 × 180 books

= ₦45,000

Selling price = (₦300 × y books) + 95% of ₦250 × (180 − y) books

= ₦300y + ₦237.5(180 − y)

= ₦(62.5y + 42750)

Now, profit = Total S.P − Total C.P

i.e. $62.5y + 42750 - 45000 = 7125$

$62.5y - 2250 = 7125$

$62.5y = 7125 + 2250$

$62.5y = 9375$

$y = 9375/62.5$

$y = 150$

(b)(i) Profit = S − C

$= 33x - \frac{x^2}{20} - 24x - 103$

$P = \frac{-x^2}{20} + 9x - 103$

(ii) when $x = 20$

$P = \frac{-20^2}{20} + 9(20) - 103$

$= -20 + 180 - 103 = 57$

Cost price, $C = 24x + 103$

$= 24(20) + 103$

$= 583$

% profit $= \frac{P}{C} \times 100\%$

$= \frac{57}{583} \times 100\% = 9.777\%$

QUESTION 6

(a) 1cm to 1 unit on x-axis
1cm to 5 units on y-axis

(b) From the graph,
Roots are $x = -2$ or $x = 4$
factor are $(x+2)(x-4) = 0$

$y = x^2 - 4x + 2x - 8 = 0$

$y = x^2 - 2x - 8 = 0$

Comparing with $mx^2 + nx + r = y$

$m = 1$; $n = -2$ and $r = -8$

(c) gradient, $s = \frac{-15-(-35)}{-2-(-7)} = \frac{35-15}{7-2}$

$= 20/5 = 4$

(d) $y = x^2 - 2x - 8 > 0$

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

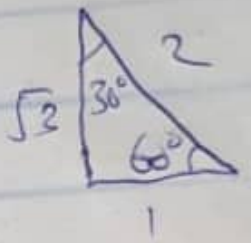
either $x+2 > 0$ OR $x-4 < 0$

$x > -2$ OR $x < 4$

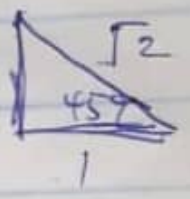
i.e $-2 < x < 4$

QUESTION 5

(a) Given: $m = \tan 30^\circ = \frac{1}{\sqrt{3}}$



$n = \tan 45 = 1$

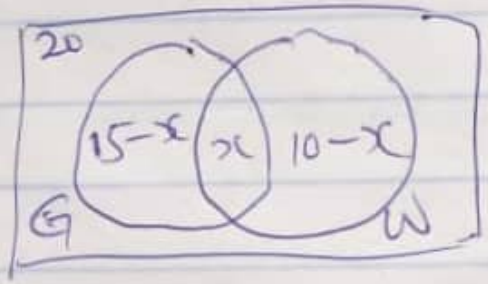


$$\frac{m-n}{mn} = \frac{\frac{1}{\sqrt{3}} - 1}{\left(\frac{1}{\sqrt{3}}\right)(1)}$$

$$= \sqrt{3}\left(\frac{1}{\sqrt{3}} - 1\right)$$

$$= 1 - \sqrt{3}$$

(b)



Let x be the number that wear both.

$$15 - x + x + 10 - x = 20$$

$$25 - x = 20$$

$$x = 25 - 20 = 5$$

$$\text{Prob(both)} = 5/20 = 1/4$$

QUESTION 4

(i) $2(2y+10) = 5x-35$ [angle at centre = twice at circum]

$4y + 20 = 5x - 35$

$5x = 4y + 55$

$x = \frac{4}{5}y + 11$ ——— (1)

$(2y+10)+(2x+40) = 180$ [supplementary $\angle$s]

$2x + 2y + 50 = 180$

$x + y = 65$ ——— (2)

put (1) into (2)

$\frac{4}{5}y + 11 + y = 65$

$\frac{9}{5}y = 54$

$y = \frac{5}{9} \times 54 = 30$

From (2) $x = 65 - y = 65 - 30 = 35$

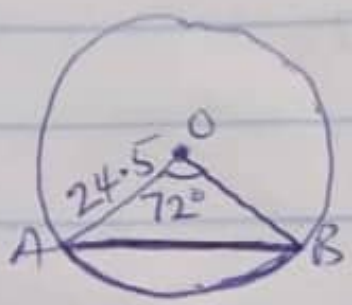
(ii) $\angle ABC = 360 - (5x - 35 + 40 + 2x + 40)$ [sum of $\angle$s in a quad.]

$= 360 - (175 - 35 + 40 + 70 + 40)$

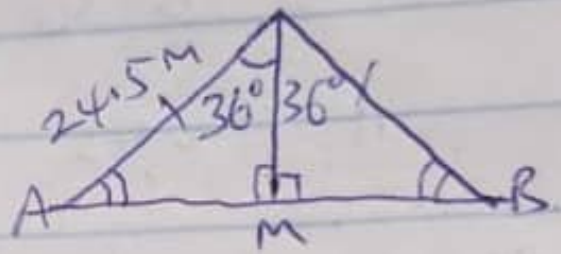
$= 360 - 290$

$= 70°$

QUESTION 3



$\Rightarrow$



perimeter of minor segment = $\overline{AB} + \overset{\frown}{AB}$

$\overline{AB} = 2AM = 2r\sin 36°$

$= 2 \times 24.5 \times \sin 36°$

$= 28.8\,m$

$\overset{\frown}{AB} = \frac{72°}{360} \times 2 \times \frac{22}{7} \times 24.5$

$= \frac{72}{360} \times 154 = 30.8\,m$

$\therefore$ perimeter $= 30.8 + 28.8$

$= 59.6\,m$

QUESTION 2

(a) Given: $y = \left[\frac{Pr}{M} - P^2 r\right]^{-3/2}$

$$y^{-2/3} = \frac{Pr - P^2 r}{M} = \frac{r(P - P^2)}{M}$$

$$r = \left(\frac{M}{P - P^2}\right) y^{-2/3} \quad \text{OR} \quad \frac{M}{y^{2/3}[P - P^2]}$$

(b) when $y = -8$, $M = 1$ and $P = 3$

$$r = \frac{1}{(-8)^{2/3}(3 - 3^2)}$$

$$= \frac{1}{[(-2)^3]^{2/3}(3 - 9)}$$

$$= \frac{1}{(-2)^2(-6)}$$

$$= \frac{-1}{24}$$

QUESTION 1

(a) GIVEN: G.P → $(7-2x), 9, (5x+17)$

For G.P.

$$\frac{9}{7-2x} = \frac{5x+17}{9}$$

$$(7-2x)(5x+17) = 81$$

$$35x + 119 - 10x^2 - 34x = 81$$

$$-10x^2 + x + 38 = 0$$

i.e $10x^2 - x - 38 = 0$

$$10x^2 - 20x + 19x - 38 = 0$$

$$10x(x-2) + 19(x-2) = 0$$

$$(10x+19)(x-2) = 0$$

For $r > 0$

$$x - 2 = 0$$

$$x = 2$$

(b) Let the numbers be x and y

$$\frac{x}{y} = \frac{3}{4}$$

$$x = \frac{3}{4}y \quad \text{——} \quad (1)$$

$$3x + 2y = 68 \quad \text{——} \quad (2)$$

put eq (1) into eqn (2)

$$3\left(\frac{3}{4}y\right) + 2y = 68$$

$$\frac{9y}{4} + 2y = 68$$

$$\frac{17y}{4} = 68$$

$$17y = 4 \times 68$$

$$y = \frac{4 \times 68}{17} = 16$$

$$x = \frac{3}{4}y = \frac{3}{4} \times 16 = 12$$

The smaller number is 12

(8a)

Item	Percentage (%)
Food and drinks	35
Fuel	7.5
Rent	10
Building project	15
Education	17.5
Savings	$x = 15$

$35 + 7.5 + 10 + 15 + 17.5 = 100$

$85 + x = 100$

$x = 100 - 85$

$= 15$

$\frac{15}{100} \times \frac{100\%}{1} = 15\%$

(8b)

%	$^\circ$
35	$\frac{35}{100} \times \frac{360^\circ}{1} = 126^\circ$
7.5	$\frac{7.5}{100} \times \frac{360^\circ}{1} = 27^\circ$
10	$\frac{10}{100} \times \frac{360^\circ}{1} = 36^\circ$
15	$\frac{15}{100} \times \frac{360^\circ}{1} = 54^\circ$
17.5	$\frac{17.5}{100} \times \frac{360^\circ}{1} = 63^\circ$
15	$\frac{15}{100} \times \frac{360^\circ}{1} = 54^\circ$

Pie Chart



(8c)

$\frac{\$28,800}{12}$ per month

$= \$2,400$ per month

(i) Monthly tax of Mr. Olola

$\frac{12}{100} \times \frac{240^\circ}{1} = \$288.00$

(ii) Amount Saved monthly

$\$2,400 - \$288$

$= \$2,112.00$

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2(a)

$$y = \left(\frac{pr}{m} - p^2 r\right)^{-3/2}$$

Multiply both index by $-2/3$

$$y^{-2/3} = \left(\frac{pr}{m} - p^2 r\right)^{-3/2 \times -2/3}$$

$$\frac{y^{-2/3}}{1} = \frac{pr}{m} - \frac{p^2 r}{1}$$

L.C.M $= m$

$$m y^{-2/3} = pr - mp^2 r$$

$$\frac{m y^{-2/3}}{p - mp^2} = \frac{r(p - mp^2)}{p - mp^2}$$

$$\frac{m}{(p - mp^2) y^{2/3}} = r$$

2(b)

$$r = \frac{m}{(p - mp^2) y^{2/3}}$$

$y = -8, m = 1, p = 3$

$$r = \frac{1}{(3 - 1 \times 3^2) \times -8^{2/3}}$$

$$r = \frac{1}{(3 - 9) \times (\sqrt[3]{-8})^2}$$

$$r = \frac{1}{-6 \times (-2)^2} = \frac{1}{-6 \times 4} = \frac{1}{-24}$$

$$\therefore r = \frac{-1}{24}$$

(10)

Let Age = x

Number of children = f

x	f	fx	$x-\bar{x}$
3	2	6	−4
4	6	24	−3
5	5	25	−2
6	x	$6x$ = 24	−1
7	6	42	0
8	9	72	1
9	8	72	2
10	5	50	3

$\Sigma f = 2+6+5+x+6+9+8+5$

$= 41+x$

$\Sigma fx = 6+24+25+6x+42+72+72+50$

$= 291+6x$

$\bar{X} = \frac{\Sigma fx}{\Sigma f}$

$7 = \frac{291+6x}{41+x}$

$7(41+x) = 291+6x$

$287+7x = 291+6x$

$291-287 = 7x-6x$

$\therefore x = 4$

(10b)

At age = 6, number of children = 6×4 = 24

Standard Deviation = $\sqrt{\frac{\Sigma f(x-\bar{x})^2}{\Sigma f}}$

$= \sqrt{(-4)^2}$

$= \sqrt{16}$

$= 4$