

2021 WASSCE MATHEMATICS PAPER 2 - SOLUTION

1

(a) Mr Sarfo borrowed \$25,000 from Afia financial services at 21% simple interest per annum for 3 years if he was able to pay back the loan in two years at equal yearly installments how much did he pay each year?

(b) Two consecutive numbers are such that the sum of thrice the smaller and twice the larger is 17.

find correct through three significant figures the smaller number as a percentage of the sum of the two numbers

SOLUTION

$$(a) \text{ interests} = \frac{25000 \times 3 \times 21}{100}$$

$$= \$ 15750.00$$

$$\text{amount paid} = 225000 + 15750$$

$$= \$40,750.00$$

$$\text{amounts paid by year} = 40750.00 / 2$$

$$= \$ 20375.00$$

(b) let's be consecutive numbers be X and X + 1

$$3X + 2(X + 1) = 17$$

$$3X + 2X + 2 = 17$$

$$5x = 15$$

$$x = 3$$

$$\text{some of the numbers} = 3 + 4 = 7$$

$$\text{Percentage} = \frac{3}{7} * 100$$

$$= 42.857 \text{ or } 42.9\%$$

2

A man left town M at 10:00 AM and traveled by car to town N at an average speed of 72 km/h.

He spent 2 hours for a meeting and returned through town M by bus at an average speed of 40 km/h.

If the distance covered by the bus was 2 km longer than that of the car and he arrived at town M at 1:55 PM.

calculate distance from M to N.

SOLUTION

Time spent traveling = 3 hours 55 minutes - 2 hours

= 1 hr 55 mins

Let x be the distance from M - N

and t , time spent from M - N

Then $t = x / 72$

Return time = (23 / 12) - t

$(23 / 12) - t = (x + 2) / 40$

$(23 / 12) - (x / 72) = (x + 2) / 40$

$$\frac{138 - x}{9} = \frac{x + 2}{5}$$

$$690 - 5x = 9x + 18$$

$$14x = 672$$

$$x = 48 \text{ km}$$

3

The points X, Y and Z are located such that Y is 15 km south of X, Z is 20 km from X on a bearing of 270° .

Calculate, correct: (a) two significant figures, $|YZ|$

(b) The nearest degree, the bearing of Y from Z

SOLUTION

$$|YZ|^2 = 15^2 + 20^2$$

$$= 225 + 400 = 625$$

$$YZ = \sqrt{625}$$

$$YZ = 25$$

$$(b) \tan \theta = \frac{15}{20}$$

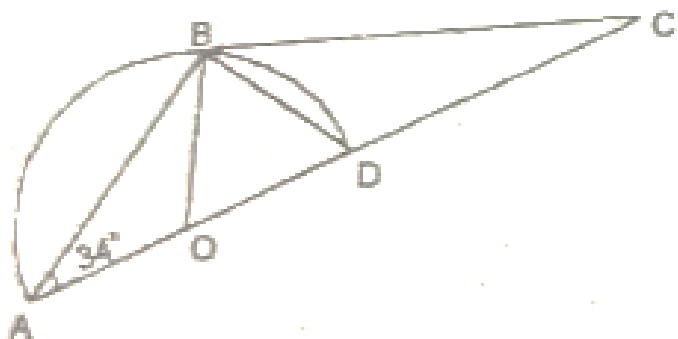
$$\tan \theta = 0.75$$

$$\theta = \tan^{-1}(0.75)$$

$$= 36.87^\circ$$

$$\text{Bearing of Y from Z} = (90 + 36.87)^\circ = 126.87^\circ$$

$$= 127^\circ$$



In the diagram, AD is a diameter of a circle with Centre O. If ABD is a triangle in a semi-circle $\angle OAB=34^\circ$,

find: (a) $\angle OAB$ (b) $\angle OCB$

SOLUTION

$\angle OAB = \angle OBA=34^\circ$

$\angle OBA=90$

$\angle OBD = \angle ABD - \angle OBA = 90 - 34 = 56$

From triangle OBC

$\angle BOC + \angle OBC + \angle OCB= 180^\circ$

$\angle BOD = 2\angle OAB=68^\circ$

$= 68^\circ + 90^\circ + \angle OCB=180$

$\angle OCB= 180-158 =22$

(a) A man shared his property among his children as follows:

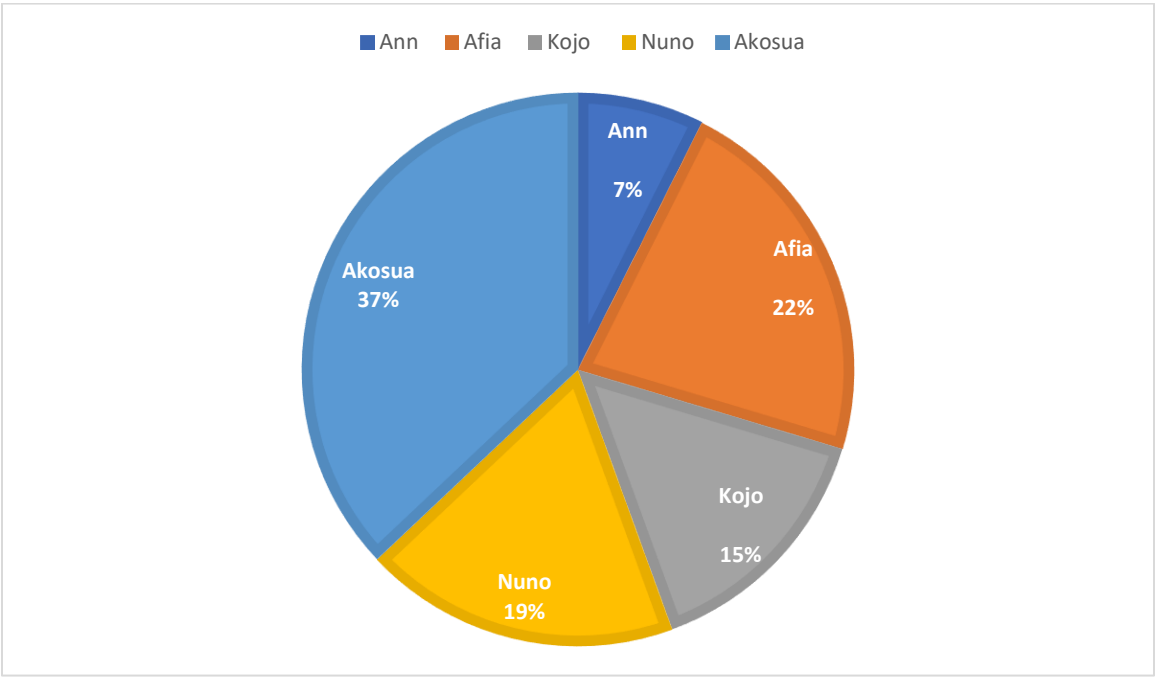
Child's name	Ann	Afia	Kojo	Nuno	Akom
Percentage share	5	15	10	45	25

Represent the information on a pie chart

(b) A box contains 5 red, 3 green and 4 blue identical beads. Calculate the probability th a girl takes away two red beads, one after the other, from the box.

SOLUTION

Child's Name	Percentage Share (%)	Angle(°)
Ann	5	$5/100 \times 360 = 18$
Afia	15	$15/100 \times 360 = 54$
Kojo	10	$10/100 \times 360 = 36$
Nuno	45	$45/100 \times 360 = 162$
Akosua	25	$25/100 \times 360 = 90$
Total	100	360



(b) $P(1st\ red) = 5/12$

$P(2nd\ red) = 4/11$

Probability (two red beads) = $5/12 \times 4/11$

= $5/33$ (Accept 0.1515)

(a) In a class of 80 students, 34 study Biology and 35 study Physics.

If each student studies at least one of the subjects:

(i) draw a Venn diagram to represent this information

(ii) how many students study both subjects

(iii) find the fraction of the class that study Biology but not Physics.

(b) Johnson and Jocatol Ltd. owned a business office with floor measuring 15m by 8 m which was to be carpeted.

The cost of carpeting was Gh¢ 890.00 per square metre. If a total of GH 216,120.00 was spent on painting and carpeting, how much was the cost of painting?

SOLUTION

x = students that study both

(ii) $60 - x + x + 48 - x = 80$

$x = 108 - 80$

$= 28$

(iii) Fraction $\rightarrow (60 - 28) / 80$

$= 32 / 80$ or $2 / 5$

(b) Area of floor = $15 \times 8 = 120 \text{m}^2$

Cost of carpeting = $120 \times \text{GHC } 890$

$= \text{GHC } 106,800.00$

Cost of painting = $\text{GHC}(216,120 - 106,800)$

$= \text{GHC } 109,320.00$

(a) Copy and complete the table of values for the relation $y=2x^2 - x - 2$ for $4 \leq x \leq 4$.

x	-4	-3	-2	-2	0	1	2	3	4
y		19			-2				26

(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 $y = 2x^2 - x - 2$ for $4 \leq x \leq 4$.

(c) On the same axes, draw the graph of $y = 2x + 3$.

(d) Use the graph to find the: (i) roots of the equation $2x-3r-5\ 0$;

(i) range of values of x for which $2x^2 - x - 2<0$.

SOLUTION

x	-4	-3	-2	-2	0	1	2	3	4
y	34	19	8	1	-2	-1	4	13	26

(c) Straight line graph of $y = 2x + 3$

(d) The roots of $2x^2 - 3x - 5 = 0$ are $x=-1 \pm 0.1$ or 2.5 ± 0.1

(ii) The range of values of x for which $-x - 2 < 0$ is $(-0.7 \pm 0.1) < x < (1.3 \pm 0.1)$

.(a) In APQR, $\angle PQR= 90^\circ$. If its area is 216cm^2 and $|PQ|:|QR|$ is 3:4, find $|PR|$.

(b) The present ages of a man and his son are 47 years and 17 years respectively. In how many years would the man's age be twice that of his son?

$$(a) \frac{1}{2} |PQ| |gr| = 216$$

$$\frac{|PQ|}{|QR|} = \frac{3}{4}$$

$$PQ = \frac{3}{4}$$

$$\frac{1}{2} * \frac{3}{4} |QR| |QR| = 216$$

$$|QR|^2 = \frac{216 * 4 * 2}{3}$$

$$|QR| = \sqrt{576} = 24\text{cm}$$

$$|PQ| = \frac{3}{4} \times 24 = 18\text{cm}$$

$$|PR| = \sqrt{(24^2 + 18^2)} = 30\text{cm}$$

(b) Let m be the number of years:

$$47 + m = 2(17 + m)$$

$$47 + m = 34 + 2m$$

$$2m - m = 47 - 34$$

$$m = 13 \text{ years}$$

(a) A cottage is on a bearing of 200° and 110° from Dogbe's and Manu's farms respectively. If Dogbe walked 5 km and Manu 3 km from the cottage to their farms, find, correct to:

- (i) two significant figures, the distance between the two farms,
- (ii) the nearest degree, the bearing of Manu's farm from Dogbe's.

(b) A ladder 10 m long leaned against a vertical wall x m high. The distance between the wall and the foot of the ladder is 2 m longer than the height of the wall.

Calculate the value of x

SOLUTION

a)

$$(i) \text{ Distance between Manu and Dogbe's farm} = \sqrt{32+52}$$

$$= 5.83\text{km or } 5.8 \text{ km}$$

$$(i) \tan \theta = 0.6$$

$$\theta = \tan^{-1} (0.6)$$

$$= 30.96^\circ$$

$$\text{Bearing} = 30.96^\circ + 200^\circ = 230.96$$

$$= 231^\circ \text{ (nearest degree)}$$

$$(b) x^2 + (x+2) = 102$$

$$2x^2 + 4x - 96 = 0$$

$$(x-6) (x+8) = 0$$

$$x = 6, x = -8$$

$$\therefore x = 6\text{cm}$$

The table shows the distribution of the number of hours per day spent in studying by 50 students.

Number of hours per day	4	5	6	7	8	9	10	11
Number of students	5	7	5	9	12	4	3	5

Calculate, correct to two decimal places,

the:

(a) mean;

(b) standard deviation.

SOLUTION

x	f	fx	fx ²
4	5	20	80
5	7	35	175
6	5	30	180
7	9	63	441
8	12	96	768
9	4	36	324
10	3	30	300
11	5	55	605
	£f = 50	£fx = 365	£fx ² = 2,873

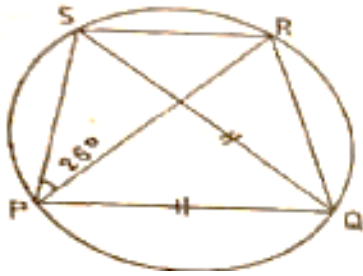
(a) Mean(\bar{x}) = $\frac{365}{50} = 7.30$ (2 d.p.)

(b) Standard deviation = $\sqrt{(\frac{2873}{50}) - (7.3)^2}$

= $\sqrt{4.17}$

= 2.0421

= 2.04 (2 d.p.)



In the diagram, PQRS is a circle. $|PQ| = |RS|$. $\angle SPR = 26^\circ$ and the interior angles of PQS are in the ratio 2:3:3.

Calculate:

(i) $\angle PQR$;

(ii) $\angle RPQ$;

(iii) $\angle PRQ$

(b) The coordinates of two points P and Q in a plane are (7, 3) and (5, x) respectively, where X is a real number.

If $|PQ| = 29$ units, find the value of x.

SOLUTION

$$(a)(i) \angle PSQ = \angle QPS$$

$$\angle PQS = \frac{2}{8} \times 180^\circ$$

$$= 45^\circ$$

$$\angle SPQ = \angle PSQ$$

$$= \frac{3}{8} \times 180 = 67.5^\circ$$

$$\angle SQR = \angle SPR = 26^\circ$$

$$\angle PQR = \angle PQS + \angle SQR$$

$$= 45^\circ + 26^\circ$$

$$= 71^\circ$$

$$(ii) \angle RPQ = \angle SPQ - \angle SPR$$

$$= 67.5^\circ - 26^\circ$$

$$= 41.5^\circ$$