

1. No Log.

146.34	2.1654×2	} ①
0.0063	$\bar{3}.7993$	
cos 54	$T.7692$	

$$\begin{array}{r} 2.1654 \\ \times 2 \\ \hline 4.3308 \end{array} \text{ ①}$$

$$\begin{array}{r} 4.3308 \\ + \bar{3}.7993 \\ \hline 2.1301 \end{array} \text{ ①}$$

$$\begin{array}{r} 2.1301 \\ - \bar{1}.7692 \\ \hline 2.3609 \\ 3 \end{array} = 0.7869 \text{ ①}$$

$$6.123 \times 10^0 = 6.123 \text{ ①}$$

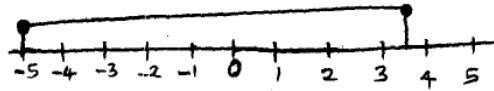
5. $3x - 2 \leq 5x + 8$

$$\frac{-2x \leq 10}{-2} \quad x \geq -5 \checkmark \text{ ①}$$

$$5x + 8 \leq 3x + 15$$

$$\frac{2x \leq 7}{2} \quad x \leq 3\frac{1}{2} \checkmark \text{ ①}$$

$$-5 \leq x \leq 3\frac{1}{2} \checkmark \text{ ①}$$



Integral values

$$-4, -3, -2, -1, 0, 1, 2, 3 \checkmark \text{ ①}$$

2.

3	3	7	11	13
7	1	7	11	13
11	1	1	11	13
13	1	1	1	13

$$3 \times 7 \times 11 \times 13 = 3003 + 1$$

$$= 3004$$

6. $a = \frac{v-u}{t}$

$$5 = \frac{60-u}{5} \checkmark \text{ ①}$$

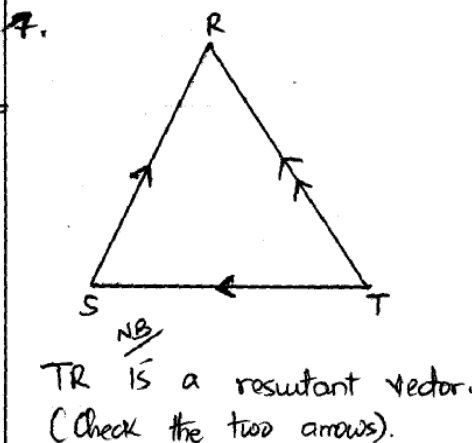
$$25 = 60 - u \quad u = 60 - 25$$

Initial velocity = 35 m/s $\checkmark \text{ ①}$

(check units)

3. $\sqrt{144} = 12\text{cm} \rightarrow \text{One side} \checkmark \text{ ①}$

Perimeter = $12 \times 4 = 48\text{m} \checkmark \text{ ①}$



4. $2x^2 - x - 6 \text{ m}$

$$P = -12 \quad S = -1 \quad F = -4, 3$$

$$2x^2 - 4x + 3x - 6 \checkmark \text{ ①}$$

$$2x(x-2) + 3(x-2)$$

$$(2x+3)(x-2) \checkmark \text{ ①}$$

$$(2x+3)(x-2) = 0$$

$$x = -1\frac{1}{2} \text{ or } 2 \checkmark \text{ ①}$$

8(a) $\begin{pmatrix} 1 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$

(b) $\begin{pmatrix} 3 \\ 0 \end{pmatrix} + \begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$

$$7. \quad 9^x + 3^{2x} = 54$$

$$3^{2x} + 3^{2x} = 54$$

$$\text{let } 3^{2x} = y$$

$$2y = 54 \quad y = 27$$

$$3^{2x} = 3^3 \quad 2x = 3 \quad x = 1\frac{1}{2}$$

$$\frac{(2^6 \times 3^3)^{1/3}}{(2^4 \times 11^2)^{1/2}} \checkmark \textcircled{1} = \frac{2^2 \times 3}{2^2 \times 11} = \frac{3}{11} \checkmark \textcircled{1}$$

$$12. \quad \frac{16}{2.674} = 16 \times \frac{1}{2.674} \checkmark \textcircled{1}$$

$$0.3739 \times 16 = 5.984 \checkmark \textcircled{1}$$

$$\frac{24}{0.1396} \quad 24 \times \frac{1}{0.1396} \checkmark$$

$$7.163 \times 24 = 171.912 \checkmark \textcircled{1}$$

$$5.984 + 171.912 = 177.896 \checkmark \textcircled{1}$$

$$0. \quad \text{Sum of interior angles} \\ \frac{180(n-2)}{180} = \frac{3240}{180} \checkmark \textcircled{1}$$

$$n-2 = 18 \quad n = 20 \text{ sides}$$

$$\text{exterior} = \frac{360}{20} = 18^\circ$$

$$11. \quad \begin{array}{c} 1728 \\ \swarrow 2 \\ 864 \\ \swarrow 2 \\ 432 \\ \swarrow 2 \\ 216 \\ \swarrow 2 \\ 108 \\ \swarrow 2 \\ 54 \\ \swarrow 2 \\ 27 \\ \swarrow 3 \\ 9 \\ \swarrow 3 \\ 3 \end{array}$$

$$1728 = 2^6 \times 3^3 \checkmark \textcircled{1}$$

$$\begin{array}{c} 1936 \\ \swarrow 2 \\ 968 \\ \swarrow 2 \\ 484 \\ \swarrow 2 \\ 242 \\ \swarrow 2 \\ 121 \\ \swarrow 11 \\ 11 \end{array}$$

$$1936 = 2^4 \times 11^2 \checkmark \textcircled{1}$$

13. Numerator.

$$\frac{5}{2} - \frac{2}{3} = \frac{15-4}{6} = \frac{11}{6}$$

$$\frac{1}{2} \text{ of } \frac{7}{2} = \frac{7}{4} \quad \frac{5}{2} \times \frac{11}{6} = \frac{55}{12}$$

$$\frac{7}{4} + \frac{11}{4} = \frac{18}{4} = 4\frac{1}{2} \checkmark \textcircled{1}$$

Denominator

$$\frac{3}{4} \text{ of } \frac{5}{2} = \frac{15}{8} \times \frac{24}{1} = \frac{15}{4} \checkmark \textcircled{1}$$

$$\frac{3}{2} \times \frac{4^2}{15} = \frac{6}{5} = 1\frac{1}{5} \checkmark \textcircled{1}$$

$$14. \quad 2x + 3y = 1$$

$$\frac{2x}{2} = \frac{1-3y}{2}$$

$$x = \frac{1-3y}{2} \checkmark \textcircled{1}$$

$$3\left(\frac{1-3y}{2}\right) - 2y = 8$$

$$\frac{3(1-3y)^{x^2}}{2} - 2y^{x^2} = 8 \times 2$$

$$3(1-3y) - 4y = 16$$

$$3 - 9y - 4y = 16$$

$$-13y = 13$$

$$y = -1 \quad \checkmark \textcircled{1}$$

$$x = \frac{1-(3 \times -1)}{2} = \frac{1+3}{2} = \frac{4}{2} = 2 \quad \checkmark \textcircled{1}$$

$$i. \quad 3y + 2x = 9$$

$$\frac{3y}{3} = \frac{-2x+9}{3} \quad \frac{9}{3}$$

$$y = -\frac{2}{3}x + 3 \quad \checkmark \textcircled{1}$$

Gradients are equal (parallel lines)

$$= -\frac{2}{3}$$

$$\frac{a-7}{13-a} = \frac{2}{3} \quad \checkmark \textcircled{1}$$

$$3(a-7) = -2(13-a)$$

$$3a - 21 = -26 + 2a$$

$$a = -5 \quad \checkmark \textcircled{1}$$

$$5. \quad ASF = 16:25$$

$$LSF = \sqrt{16} : \sqrt{25} \quad \checkmark \textcircled{2}$$

$$= 4 : 5 \quad \checkmark$$

smaller bigger.

$$\frac{4}{5} = \frac{28}{x}$$

$$\frac{4x}{4} = \frac{5 \times 28}{4}$$

$$x = 35 \text{ cm} - \text{diameter}$$

$$R = \frac{35}{2} = 17.5 \text{ cm}$$

17(a) SECTION B.

Marks

F

x

fx

199 - 203

5

201

1005

204 - 208

2

206

412

209 - 213

3

211

633

214 - 218

2

216

432

219 - 223

2

221

442

224 - 228

7

226

1582

229 - 233

1

231

231

234 - 238

0

236

0

239 - 243

3

241

723

244 - 248

1

246

246

249 - 253

4

251

1004

$\Sigma f = 30$

$\Sigma fx = 6710$

(b) Modal class = 224 - 228 $\checkmark \textcircled{1}$

(c) Mean = $\frac{\Sigma fx}{\Sigma f} = \frac{6710}{30} = 223.67$

$\checkmark \textcircled{3}$

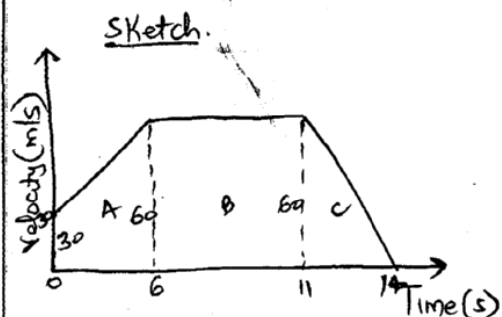
(d) $\frac{30^{th}}{2} = \frac{15^{th} + 16^{th}}{2} = 15.5^{th}$

$$223.5 + \left(\frac{15.5 - 14}{7} \times 5 \right)$$

$$223.5 + \left(\frac{1.5}{7} \times 5 \right)$$

$$= 224.57 \text{ Marks}$$

18.



(a)

(Graph Paper).
* Check scale
- units on both
axis.

(b)

$$\frac{60-30}{6} = \frac{30}{6} = 5 \text{ m/s}^2 \checkmark \textcircled{2}$$

(Check units)

(c)

Total distance - Area under the graph.

$$\frac{1}{2} \times 90 \times 6 = 270 \text{ m} \checkmark \textcircled{1}$$

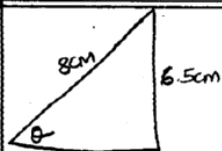
$$5 \times 60 = 300 \text{ m} \checkmark \textcircled{1}$$

$$\frac{1}{2} \times 3 \times 60 = 90 \checkmark \textcircled{1}$$

$$270 + 300 + 90 = 660 \text{ m} \checkmark \textcircled{1}$$

19.

(a)



$$\sin^{-1}\left(\frac{6.5}{8}\right) = \sin^{-1} 0.8125$$

$$54.34 \times 2$$

$$\angle xoy = 108.68^\circ \checkmark \textcircled{1}$$

(b)

$$\sin^{-1} \frac{6.5}{10} \quad \sin^{-1} 0.65 = 40.54 \times 2$$

$$\angle xoy = 81.08^\circ \checkmark \textcircled{1}$$

$$(c) \frac{\pi r^2 \theta}{360}$$

$$3.142 \times 8 \times 8 \times \frac{108.68}{360} = 60.71 \text{ cm}^2 \checkmark \textcircled{2}$$

$$(d) 3.142 \times 10 \times 10 \times \frac{81.08}{360}$$

$$= 70.765 \text{ cm}^2 \checkmark \textcircled{1}$$

$$(e) \frac{1}{2} \times 8 \times 8 \sin 108.68$$

=

$$60.71 - 30.31 \text{ cm}^2$$

$$= 30.4 \text{ cm}^2 \checkmark \textcircled{1}$$

$$\frac{1}{2} \times 10 \times 10 \sin 81.08$$

$$= 49.4 \text{ cm}^2$$

$$70.765 - 49.4$$

$$= 21.365 \text{ cm}^2 \checkmark \textcircled{1}$$

$$30.4 + 21.365$$

$$= 51.765 \text{ cm}^2 \checkmark \textcircled{2}$$

20(a)

$$(i) \vec{AB} = \vec{AO} + \vec{OB}$$

$$= -\vec{a} + \vec{b} \quad \vec{b} - \vec{a} \checkmark \textcircled{1}$$

$$(ii) \vec{OM} = \vec{OA} + \vec{AM} \checkmark \textcircled{1}$$

$$= \vec{a} + \frac{2}{5}(\vec{b} - \vec{a})$$

$$= \vec{a} + \frac{2}{5}\vec{b} - \frac{2}{5}\vec{a}$$

$$= \frac{3}{5}\vec{a} + \frac{2}{5}\vec{b} \checkmark \textcircled{1}$$

$$(iii) \vec{BK} = \vec{BO} + \vec{OK} \checkmark \textcircled{1}$$

$$= -\vec{b} + \frac{1}{2}\vec{a} \checkmark \textcircled{1}$$

(b)

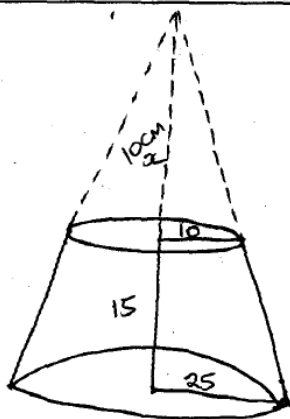
$$\begin{aligned} \text{(i)} \quad \vec{PQ} &= \vec{OQ} - \vec{OP} \\ &= \begin{pmatrix} 8 \\ 14 \end{pmatrix} - \begin{pmatrix} 6 \\ 10 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix} \checkmark \textcircled{1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \frac{6+8}{2}, \frac{10+14}{2} &\checkmark \textcircled{1} \\ (7, 12) &\checkmark \textcircled{1} \end{aligned}$$

$$\text{(c)} \quad \vec{P} = \begin{pmatrix} 6 \\ 8 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 12 \\ -16 \end{pmatrix} \checkmark \textcircled{1}$$

$$\begin{aligned} \vec{P} &= \begin{pmatrix} 16 \\ -9 \end{pmatrix} \quad \sqrt{16^2 + (-9)^2} \\ &= \sqrt{337} \checkmark \textcircled{1} \\ &= 18.36 \text{ units} \end{aligned}$$

(21)



$$\begin{aligned} \frac{25}{10} &= \frac{x+15}{x} & 25x &= 10x + 150 \\ & & 15x &= 150 \\ & & x &= 10 \text{ cm} \end{aligned}$$

$$\text{(i)} \quad 10 + 15 = 25 \text{ cm}$$

(ii) Volume of bigger cone

$$\begin{aligned} \frac{1}{3} \times 3.142 \times 25 \times 25 \times 25 &\checkmark \textcircled{1} \\ &= 16364.58 \text{ cm}^3 \end{aligned}$$

Volume of smaller cone.

$$\begin{aligned} \frac{1}{3} \times 3.142 \times 10 \times 10 \times 10 \\ &= 1047.33 \text{ cm}^3 \checkmark \textcircled{1} \end{aligned}$$

$$\begin{aligned} \text{Frustrum} &= 16364.58 - 1047.33 \\ &= 15317.25 \text{ litres.} \end{aligned}$$

$$\begin{aligned} \text{(iii) slant height (L)} &= \sqrt{25^2 + 25^2} \\ &= 35.36 \text{ cm.} \\ (L) &= 10^2 + 10^2 \\ &= 14.142 \text{ cm.} \end{aligned}$$

Curved area.

$$\begin{aligned} 3.142 \times 25 \times 35.36 &= 2777.53 \text{ cm}^2 \\ 3.142 \times 10 \times 14.142 &= 444.34 \text{ cm}^2 \\ \hline &2333.19 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} 3.142 \times 10 \times 10 &= 314.2 \text{ cm}^2 \\ 3.142 \times 25 \times 25 &= 1963.75 \text{ cm}^2 \\ \text{Total} &= \underline{4611.14 \text{ cm}^2} \end{aligned}$$

22 a

$$\text{(i)} \quad 3x + 4y = 12$$

$$\frac{4y}{4} = \frac{-3x + 12}{4}$$

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

$$\text{Gradient} = -\frac{3}{4}$$

(ii) Cuts the X-axis at $y=0$

$$3x + 4y = 12$$

$$3x = 12$$

$$x = 4$$

$$P(4,0) \checkmark \textcircled{2}$$

Cuts the Y-axis at $x=0$

$$4y = 12$$

$$y = 3$$

$$Q(0,3) \checkmark \textcircled{2}$$

$$\frac{y-2}{x} = -1 \quad y-2 = -x$$

$$x+y = 2 \checkmark \textcircled{1}$$

$$3 > 2$$

$$x+y > 2 \checkmark \textcircled{1}$$

$$L_3 (0,4) (4,0)$$

$$\frac{0-4}{4-0} = \frac{-4}{4} = -1 \checkmark \textcircled{1}$$

$$\frac{y-4}{x} = -1 \quad y-4 = -x$$

$$x+y = 4 \checkmark \textcircled{1}$$

$$3 \leq 4$$

$$x+y \leq 4 \checkmark \textcircled{1}$$

(iii) Gradient of $L_2 =$

$$-\frac{3}{4}x = -1 \quad x = \frac{4}{3} \checkmark \textcircled{1}$$

$$\frac{y-5}{x+4} = \frac{4}{3} \checkmark \textcircled{1}$$

$$3y-15 = 4x+16 \checkmark \textcircled{1}$$

$$3y-4x = 31$$

$$\frac{3y}{3} = \frac{4x+31}{3}$$

$$y = \frac{4}{3}x + \frac{31}{3} \checkmark \textcircled{1}$$

$$L_4 \quad y=4 \checkmark \textcircled{1} \quad y \leq 4 \checkmark \textcircled{1}$$

$$1 \leq 4$$

23. $L_1 (-2,0) (0,4) \checkmark \textcircled{1} \quad \frac{x}{2} = \frac{y}{4}$

$$\frac{4-0}{0-2} = \frac{4}{2} = 2 \checkmark \textcircled{1}$$

$$\frac{y}{x+2} = 2$$

$$y = 2x+4$$

$$y-2x = 4 \checkmark \textcircled{1}$$

$$1-4 = -3 \leq 4$$

$$y-2x \leq 4 \checkmark \textcircled{1}$$

$$L_2 = (0,2) (2,0) \checkmark \textcircled{1}$$

$$\frac{0-2}{2-0} = \frac{-2}{2} = -1$$

24. Distance = $72 + 78$

(a) = $150M \checkmark \textcircled{1}$

Relative speed = $108 + 72 = 180 \text{ km/hr}$

$$= \frac{10}{36} \times 180 = 50 \text{ m/s} \checkmark \textcircled{1}$$

$$T = \frac{D}{S} = \frac{150}{50} = 3 \text{ seconds} \checkmark \textcircled{1}$$

(b) $D = 120 \times \frac{8}{3} = 320 \text{ km} \checkmark \textcircled{1}$

$$\frac{320}{4} = 80 \text{ litres} \times 64 = \text{Shs } 5120 \textcircled{1}$$

(c) $\frac{1}{2} \times 16 \text{ km/hr} = 8 \text{ km} \checkmark \textcircled{1}$

$$40 - 8 = 32 \text{ km}$$

$$\frac{32}{16+8} = \frac{32}{24} = 1 \text{ hr } 20 \text{ minutes} \checkmark \textcircled{1}$$

$$\begin{array}{r} 8.00 \\ 1.20 \\ \hline 9.20 \text{ am} \end{array} \checkmark \textcircled{1}$$