

June 1995

Paper 2

1.  $\frac{3+\sqrt{3}}{2.9} = 1.63174 = 1.632$  (3 d.p)
2. (a)  $12\,000\,000$  miles per minute  $= \frac{12\,000\,000}{60}$  miles per sec.  
 $= 200\,000$  miles per sec.  
 error  $= 200\,000 - 186\,000 = 14\,000$  miles per sec.  
 (b) percentage error  $= \frac{14\,000}{186\,000} \times 100 = 7.53\%$
3.  $300 \times 4\frac{1}{2} \times 60 = 81\,000$   
 $= 8.1 \times 10^4$
4. interior angle  $= 156^\circ$   
 exterior angle  $= 180^\circ - 156^\circ = 24^\circ$   
 number of sides  $= \frac{360}{24} = 15$  sides
5.
 

1994	increase	1995	
100	5	105	
?		840	

Answer  $= \frac{100 \times 840}{105} = 800$
6. (a) 3 divisions out of 20  $= \frac{3}{20}$   
 (b)  $\frac{3}{4} \times 40 = 30$  Litres  
 $\frac{3}{20} \times 40 = 6$  Litres  
 Litres to be added  $= 30 - 6 = 24$  Litres

7. (a)  $\angle ADB = \frac{114}{2} = 57^\circ$   
 (b)  $\angle OAC = \angle OBC = 90^\circ$   
 $\therefore \angle ACB = 360 - (114 + 90 + 90) = 66^\circ$   
 (c)  $\angle BAC = \angle ADB = 57^\circ$   
 or  $\angle BAC = \frac{180 - 66}{2} = 57^\circ$

8. (a)  $\frac{1}{2}(p+q) = \frac{1}{2}\overline{OR} = \overline{OM}$

(b)  $q - p = \overline{PQ}$

(c)  $\frac{1}{2}(p - q) = \frac{1}{2}(\overline{QP}) = \overline{QM}$

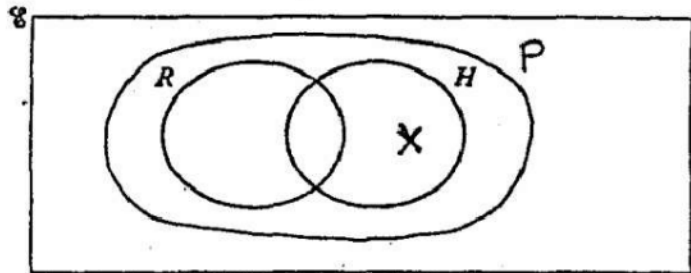
9. (a)  $\left(\frac{8}{3}\right)^{-2} = \left(\frac{3}{8}\right)^2 = \frac{9}{64}$

(b)  $(27x^{27})^{\frac{1}{3}} = \sqrt[3]{27} x^{\frac{27}{3}} = 3x^9$

10. (a) Squares.

(b)

(c)



11. (a)  $2.5 \leq c < 3.5$

(b) Maximum number =  $\frac{100}{2.5} = 40$

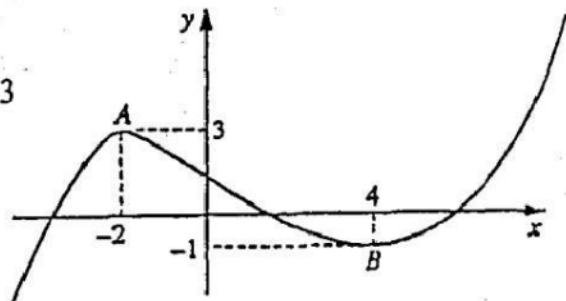
Minimum number =  $\frac{100}{3.5} = 28.57$

Minimum number of complete revolutions = 28

12. (a)  $-2 < x < 4$

(b) K less than -1 or more than 3

i.e.  $K < -1$  or  $K > 3$



$$13. (a) \frac{1000}{1.48} = \text{£ } 675.68 \quad (2 \text{ d.p.})$$

$$(b) 675.68 - 400 = \text{£ } 275.68$$

$$275.68 \times 1.56 = \$ 430.06$$

$$\text{Percentage Left} = \frac{430.06}{1000} = 43 \%$$

14. (a) Prism

(b) Volume = Cross sectional area  $\times$  Length

$$= \left(\frac{1}{2} \times 3 \times 4\right) \times 10$$

$$= 60 \text{ cm}^3$$

$$15. (a) \quad a = \frac{k}{r}$$

$$(b) \quad a = \frac{k}{r} \quad 2 = \frac{k}{24} \Rightarrow k = 48$$

$$a = \frac{48}{r}$$

$$10 = \frac{48}{r} \Rightarrow r = 4.8$$

or  $a_1 r_1 = a_2 r_2$  inversely proportional

$$2 \times 24 = 10 \times r$$

$$r = \frac{48}{10} = 4.8$$

$$16. \quad V = 2K + \frac{h^2}{5}$$

$$V - 2K = \frac{h^2}{5}$$

$$h^2 = 5(V - 2K) \quad \text{or} \quad 5V - 10K$$

$$h = \sqrt{5(V - 2K)} \quad \text{or} \quad \sqrt{5V - 10K}$$

OR

h	square	+ 5	→	add 2k
← h	sq. root	x 5	←	Subt 2k

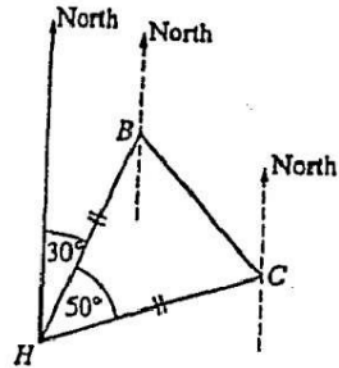
$$h = \sqrt{5(V - 2K)}$$

17. (a) Bearing of C from H  
 $= 30 + 50 = 80$

Bearing of H from C  
 $= 180 + 80 = 260^\circ$

(b)  $\angle HBC = \frac{180 - 50}{2} = 65^\circ$

Bearing of C from B  $= 360 - (180 - 30) - 65 = 145^\circ$



18. (a) AC

(b)  $(1 \ 2) \begin{pmatrix} -3 \\ 4 \end{pmatrix} = (5)$

(c)  $C^{-1} = \frac{1}{-2 \times 6 + 3 \times 5} \begin{pmatrix} 6 & -5 \\ 3 & -2 \end{pmatrix} = \frac{1}{3} \begin{pmatrix} 6 & -5 \\ 3 & -2 \end{pmatrix}$

19.  $\angle ABC = 80 - 59 = 21^\circ$

Using sine rule

$$\frac{24}{\sin 21^\circ} = \frac{AB}{\sin 100^\circ}$$

$$AB = 65.95 = 66.0 \text{ m}$$

20. (a)  $\angle ACB = 90^\circ$

(b) (i)  $\angle BCF = 180 - x$

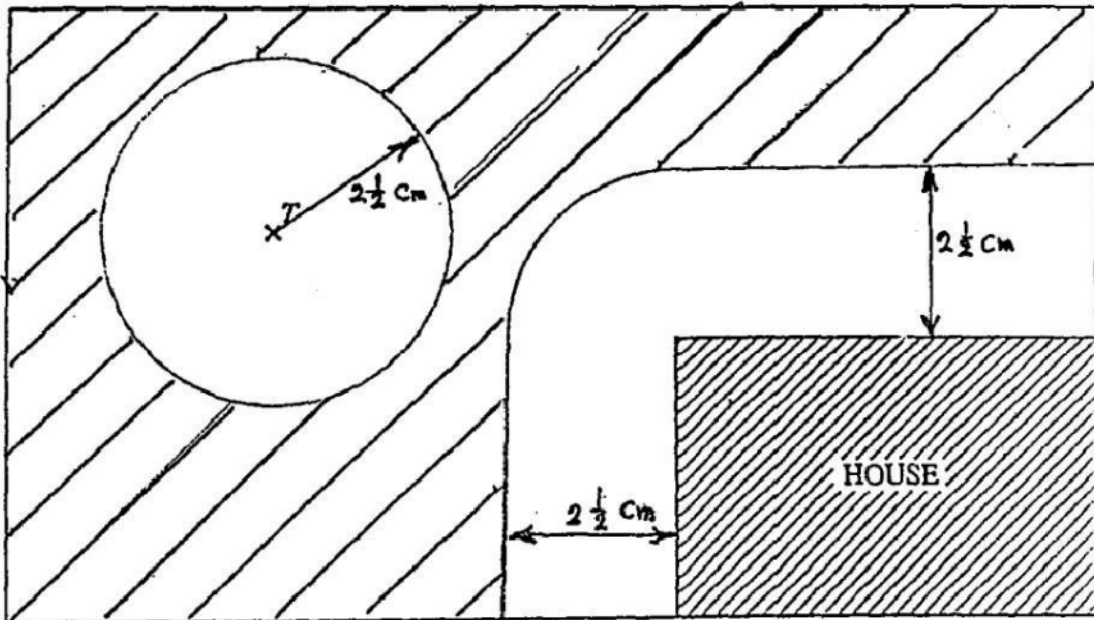
(ii)  $\angle ACF = 180 - y$

(c)  $180 - x + 180 - y + 90 = 360$

$$180 + 180 + 90 - 360 = x + y$$

$$x + y = 90$$

21.



22. (i)  $x \geq 2$   
 (ii)  $x + y < 6$   
 (iii)  $y \geq \frac{1}{2}x$

23.  $f(x) = \sqrt{3x+1}$

(a)  $f\left(3\frac{3}{4}\right) = 3.5$

(b)  $f(x) = 5$

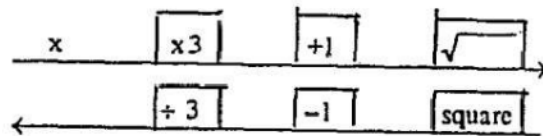
$$\sqrt{3x+1} = 5$$

$$3x+1 = 5^2 = 25$$

$$3x = 24$$

$$x = 8$$

(c)  $f^{-1}(x)$



$$f^{-1}(x) = \frac{x^2 - 1}{3}$$

OR  $y = \sqrt{3x+1}$

$$3x = y^2 - 1$$

$$f^{-1}(x) = \frac{x^2 - 1}{3}$$

$$y^2 = 3x + 1$$

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

Nov. 1995

Paper 2

1.  $\text{Average} = \frac{1-2-4-5+0+2+1}{7} = -1$

Answer :  $-1^{\circ}\text{C}$ .

2. Answer (a) Prism  
Answer (b) 9

3.  $3x^2 - 7x + 2 = (3x - 1)(x - 2)$

Answer  $(3x - 1)(x - 2)$

4.  $6 : 5$   
 $? : 4.5$

$\frac{4.5 \times 6}{5} = 5.4$

Answer 5.4 kg

5.  $01\ 10 = 25\ 10$

$25\ 10 - 7.5$  is done by the calculator as follows :

$25 \boxed{...} 10 \boxed{...} \boxed{-} 7.5 \boxed{=} \boxed{\text{SHIFT}} \boxed{...} 17\ 40\ 0$

Answer is 17 40

6. (a)  $(0.2)^2 = 4 \times 10^{-2}$ ,

(b)  $\frac{37}{73} < 0.507$ .

7.  $\frac{5}{6} \left( \frac{1}{4} + \frac{1}{8} \right) = \frac{5}{6} \left( \frac{2}{8} + \frac{1}{8} \right) = \frac{5}{6} \times \frac{3}{8} = \frac{5}{16}$

Answer  $\frac{5}{16}$

8. The three sides of the triangle  $a$ ,  $b$  and  $c$

$$\begin{array}{l} 10.5 \leq a < 11.5 \\ 12.5 \leq b < 13.5 \\ 13.5 \leq c < 14.5 \end{array} \quad \begin{array}{l} \text{perimeter } P \\ 10.5 + 12.5 + 13.5 \leq P < 11.5 + 13.5 + 14.5 \\ 26.5 \leq P < 29.5 \end{array}$$

Answer  $36.5 \leq p < 39.5$

9.  $3x + 4y = 0 \quad (x - 3)$   
 $-9x - 12y = 0$   
 $\underline{9x + 10y = -1}$   
 $-2y = -1$   
 $y = \frac{1}{2}$

$$\begin{array}{l} 3x + 4x \left(\frac{1}{2}\right) = 0 \\ 3x = -2 \\ x = -\frac{2}{3} \end{array}$$

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

10. 

Dutch Guilders	Swiss Francs
100	81.20
9.80	?
$\frac{81.20 \times 9.80}{100}$	= 7.9576 = 7.95
	to the nearest 0.05

Answer 7.95 Swiss Francs

11. 

Cost price	Profit	Selling price
100	20	120
?		684

  
 Cost price = 570

Answer \$ 570

12. (a)  $(81)^{\frac{3}{4}} = (3^4)^{\frac{3}{4}} = 3^3 = 27$

$$(b) \quad \frac{3x^{-\frac{2}{3}}}{6x^{\frac{1}{3}}} = \frac{1}{2}x^{-\frac{2}{3}-\frac{1}{3}} = \frac{1}{2}x^{-1} = \frac{1}{2x}$$

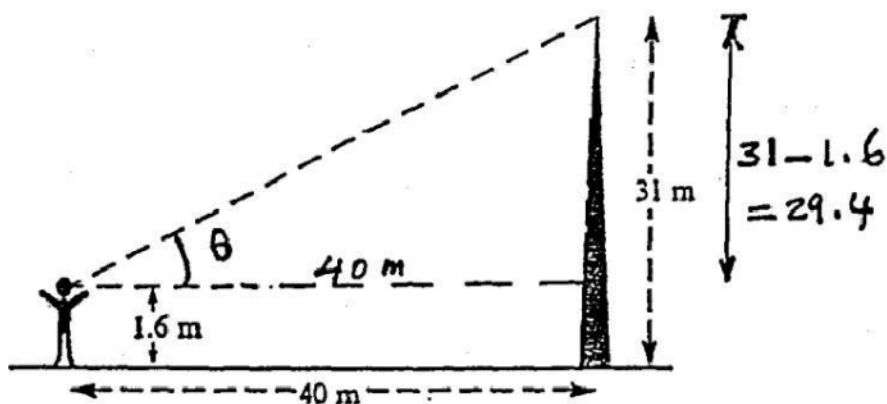
$$\text{Answer } \frac{1}{2x}$$

13. *Answer (a)* Isosceles  
*Answer (b)* Rhombus  
*Answer (c)* Parallelogram

14.  $\mathcal{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$   
 $A = \{3, 6, 9\}$   
 $B = \{2, 3, 5, 7\}$   
 $A \cap B = \{3\}$   
 $A \cup B = \{2, 3, 5, 6, 7, 9\}$   
 $(A \cup B)' = \{4, 8, 10\}$

*Answer (a)*  $A \cap B = \{3\}$   
*Answer (b)*  $A \cup B = \{2, 3, 5, 6, 7, 9\}$   
*Answer (c)*  $(A \cup B)' = \{4, 8, 10\}$

15.



$$\tan \theta = \frac{29.4}{40} = 0.735$$

$$\theta = 36.3^\circ$$

$$\text{Answer } 36.3^\circ$$



$$16. (a) \quad f(x) = \frac{x-2}{3}$$

$$f(-4) = \frac{-4-2}{3} = \frac{-6}{3} = -2$$

*Answer (a)* -2

(b) Two possible methods

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

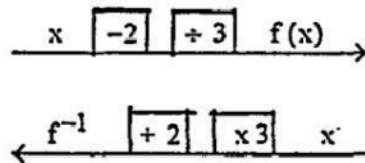
$$3y = x - 2$$

$$3y + 2 = x$$

$$x = 3y + 2$$

$$\therefore f^{-1}(x) = 3x + 2$$

(2) Using flow diagram



$$f^{-1}(x) = 3x + 2$$

*Answer (b)*  $f^{-1}: x \mapsto 3x + 2$

17. Since the mode is 2 therefore, the largest frequency corresponds to Mark 2.

$\therefore x$  must be less than 10.

Since the median mark is 3, then  $x + 6 + 3$  must be at least one more than  $1 + 3 + 10 (= 14)$ .

$$9 + x \geq 15$$

$$x \geq 6$$

possible values of  $x$  are 6, 7, 8, 9.

*Answer* 6, 7, 8, 9.

$$18. (a) \quad x^2 y = k$$

$$x = 3, y = 10$$

$$3^2 \times 10 = k$$

$$k = 90$$

$$\text{When } x = 2 \quad 2^2 \times y = 90 \Rightarrow y = \frac{90}{4} = 22.5 \quad \text{Answer (a)} \quad y = 22.5$$

(b)  $x = 3$  decreased by 50% .  
 new value of  $x = \frac{50}{100} \times 3 = 1.5$   
 using  $x^2 y = 90$   
 $(1.5)^2 y = 90 \Rightarrow y = 40$   
 increase in value of  $y$  is  $40 - 10 = 30$   
 percentage increase =  $\frac{30}{10} \times 100 = 300\%$

OR Let  $x = 100$  and  $y = 100$   
 $\therefore k = x^2 y = 1000\ 000$   
 now  $x$  is 50 find  $y$   
 $(50)^2 \times y = 1000\ 000 \Rightarrow y = 400$   
 i.e.  $y$  increased by 300%

*Answer (b)* increased by 300%.

19. (a) Scheme A Cost =  $15 + 0.60 \times 80 = \$ 63$   
 Scheme B Cost =  $2 + 0.80 \times 80 = \$ 66$   
 Difference =  $66 - 63 = \$ 3$

*Answer (a)* \$ 3

(b) (i) Scheme A  $15 + 0.6x$   
 Scheme B  $2 + 0.8x$   
 $15 + 0.6x = 2 + 0.8x$

*Answer (b) (i)*  $15 + 0.6x = 2 + 0.8x$

(ii)  $15 + 0.6x = 2 + 0.8x$   
 $15 - 2 = 0.8x - 0.6x$   
 $13 = 0.2x$   
 $x = \frac{13}{0.2} = 65$  units

*Answer (b) (ii)*  $x = 65$  units

20. (a)  $L_1 : x = 7$

$L_2 :$  through the origin gradient  $= \frac{3}{6} = \frac{1}{2}$   
equation is  $y = \frac{1}{2}x$

$L_3 :$  Through points  $(0, 5)$ ,  $(10, 0)$   
gradient  $= \frac{5-0}{0-10} = -\frac{1}{2}$  and  $C=5$   
equation is  $y = -\frac{1}{2}x + 5$

*Answer (a)*  $L_1 : x = 7$

$L_2 : y = \frac{1}{2}x$

$L_3 : y = -\frac{1}{2}x + 5$

(b) *Answer (b)*  $x \leq 7$

$y \leq \frac{1}{2}x$

or  $2y \leq x$

$y + \frac{1}{2}x \geq 5$

or  $2y + x \geq 10$

21. *Answer (a)* With constant speed.

*Answer (b) (i)* A straight line graph.

(b) (ii) Deceleration = gradient.

$$= \frac{10-0}{13-5} = \frac{10}{8}$$

$$= 1.25 \text{ m/s}^2$$

*Answer (b) (ii)*  $1.25 \text{ m/s}^2$

(c) Distance = area

$$= \frac{5+13}{2} \times 10$$

$$= 90 \text{ m}$$

*Answer (c)* 90 m

22.

