

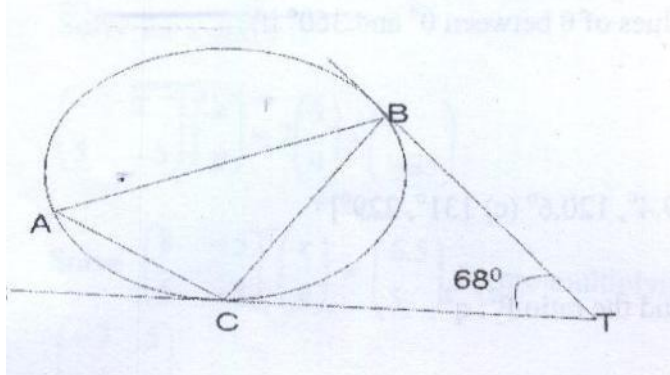
PRACTICE MAKES PERFECT S.4

**OBJECTIVES:**

- i. To encourage and steer individual intensive revision geared towards practice for perfection
  - ii. To enable students self evaluate and to get exposed to a wide range of questions.
  - iii. To use these questions to guide/couch students on how to answer questions.
1. Express each of the following numbers in terms of prime factors. 150, 180 and 168  
Hence find their LCM and GCD. [12600, 6]
  2. Without using tables or calculator, find the exact value of  $\frac{5.1 \times 570}{0.68 \times 095}$  giving the answers in standard form.
  3. Three children, Anita, Benny and Charlie, share a gift of sh 180000. Anita gets shs 600 more than twice Benny's share. Charlie gets one and a half times as much as Anita. How much does each receive? [60, 100, 29, 750, 90, 150 resp]
  4. Make V the subject of the formula:  $\frac{1}{v^2} + \frac{1}{u^2} = \frac{1}{F^2}$  Find V when U = 5 and F = 3.
  5.  $\mathbf{P} = \mathbf{OP} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$  and  $\mathbf{Q} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$   
Express the following as column vectors  
(i)  $1\mathbf{p} - \mathbf{q}$  (ii)  $3\mathbf{q} - 2\mathbf{p}$   
(ii) Evaluate  $\mathbf{PQ}$ , hence find the magnitude of  $\mathbf{PQ}$
  6. OAB is a triangle with  $\mathbf{OA} = \mathbf{a}$  and  $\mathbf{OB} = \mathbf{b}$ . R is the point on AB such that R divides AB internally in the ratio 13:12. Express  $\mathbf{OR}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .  
$$\mathbf{OR} = \left[ \frac{12\mathbf{a} + 13\mathbf{b}}{25} \right]$$
  7. Solve for n:  $\frac{1}{x} + \frac{1}{x+3} = \frac{11}{28}$  [ x = 4 or  $-\frac{21}{11}$  ]
  8. Solve for n:  $3^{2n+3} = 2187$  [ n = 2 ]
  9. ABC is a triangular field with AB = 70m, BC = 65m and AC = 85m. Find the area of the field [26277.8m<sup>2</sup>]
  10. Make x the subject of the formula:  
 $\frac{a}{bx+c} = \frac{d}{ex+f}$ . Hence find x if af = 5, bd = 18, ae = 9 and dc = 13.  $\left[ x = \frac{dc - af}{ae - bd}, x = \frac{2}{3} \right]$
  11. Find the compound interest on shs 40,000 invested for 3 years at 8½% per annum. [Sh 11,090]

12. Simplify:  $\frac{1}{p+q} + \frac{1}{p-q}$   $\frac{P(x-1)}{1-x}$
13. Solve the equation:  $3(2x + 3) - 15(1 - x) = 5$ .  $[x = \frac{11}{21}]$
14. (i) Using ruler and compasses only, draw a triangle ABC such that AB = 5cm, BC = 7cm and angle BAC = 60°  
(ii) Draw the inscribed circle of the triangle ABC. Measure AC and state the radius of the circle. [7.9cm: 1.75cm resp.]
15. Find the volume of a cone with base circumference 154cm and vertical height 10cm. [6288cm<sup>3</sup>]
16. Write down the equations of the lines passing through the following points:  
(a) 2,9)(1,6),(4,3) and (10,-3) (b) (-7,0)(0,3)(7,6) and (14,9). [(a)x+y=7 (b)  $y = \frac{3}{7}x + 3$ ]
17. Factorize completely: (a)  $6x^2 - 5x - 6$  (b)  $\frac{3}{9}y^2 - 75x^2$

18. In the figure below, AB is a diameter and TB and TC are tangents.



- If angle BTC = 68°, calculate angle CAB, ABC and ACS [56°, 34°, 34° resp]
19. In triangle ABC, angle A = 115°, AC = 7cm and BC = 11cm, Calculate AB and angle ACB. [6.03, 30.9°]
20. Solve the equations:  $3x - 5y = 21$  and  $7x - 3y = 23$  [x = 2, y = -3]
21. Simplify:  $\frac{ax^3}{b} \div \frac{b^{-3}}{a^3x^5}$  [a<sup>2</sup>bx<sup>4</sup>]
22. A school garden has an area of 2.24ha. What would be the area of the garden, in cm<sup>2</sup>, on a map of scale 1:20000? [0.56cm<sup>2</sup>]
23. Factorize completely:  $p^2x + q^2y - q^2x - p^2y$  [(P + q) (P - q) (x + y)]

24. Water flows into a rectangular tank measuring 3m by 2m by  $2\frac{1}{2}$ m at a rate of 30 litres per minute. How long will it take to fill the tank? [500min]
25. The bearing of P from Q is  $289^\circ$ . What is the bearing of Q from P? If P is 3km from Q and R is east of Q, What is the distance and bearing of R from P? [109°, 7.9km, 98°]
26. Find all possible values of  $\theta$  between  $0^\circ$  and  $360^\circ$  if: (a)  $\tan \theta = 0.456$  (b)  $\sin \theta = 0.861$   
 $\cos \theta = -0.656$  [(a)  $24.5^\circ, 204.5^\circ$  (b)  $59.4^\circ, 120.6^\circ$  (c)  $131^\circ, 229^\circ$ ]
27. If  $\frac{5p+2q}{5p+6q} = \frac{5}{9}$ , find the ratio  $P^2 : q^2$  [9 : 25]
28. OAB is a triangle  $\mathbf{OA} = \mathbf{a}$  and  $\mathbf{OB} = \mathbf{b}$ . P is a point on AB such that  $4\mathbf{PB} = \mathbf{AB}$ . Express  $\mathbf{OP}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .
29. Find the value of x if  
 $\text{Det} \begin{pmatrix} 1 & 3 \\ -2 & x \end{pmatrix} = \text{det} \begin{pmatrix} x & 4 \\ 1 & 3 \end{pmatrix}$  [ $-\frac{5}{3}$  or 2 ]
30. A room is 8m long and 5m wide. The length of a tight string from one corner of the ceiling to the opposite corner of the floor is  $\sqrt{105}$ . Find the height of the walls of the room. [4m]
31. Find to 2 decimal places the radius of a sphere whose volume is  $4890\text{cm}^3$ . (Take  $\pi$  to be  $\frac{22}{7}$ ) [10.53cm]
32. Solve the inequality:  
 $\frac{y-3}{2} + \frac{y+5}{3} \leq \frac{4y+6}{4} - 2$  [ $y \geq 4$ ]
33. Solve for x and y if  $\begin{pmatrix} -3 & 4 \\ 5 & -6 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = 2 \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 7 \\ -25 \end{pmatrix}$
34. Solve  $\begin{pmatrix} 8 & -5 \\ 5 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 6.5 \\ 5 \end{pmatrix}$  by pre-multiplying each side by the matrix  $\begin{pmatrix} -3 & 5 \\ -5 & 8 \end{pmatrix}$   
[ $x = 5.5, y = 7.5$ ]
35. Solve the equations:  
(a)  $\frac{5}{x-3} = \frac{4}{x+2}$  (b)  $\frac{1}{4}(x+3) - \frac{3}{4}(4-2x) = 3\frac{7}{10}$  [(a)  $x=22$  (b)  $=3.4$ ]
36. Using a ruler and compasses only, construct a parallelogram ABCD with  $AB = 5\text{cm}$ ,  $BC = 4\text{cm}$  and  $\angle BAD = 60^\circ$ . measure AC and BD. (AC = 7.8cm, BD = 4.6cm)
37. Find the perimeter of the triangle formed by joining the mid-points of the sides of a triangle whose vertices are: A (-1, 6) B(-5,0) and C (3, -2) [12.201]

38. If  $\mathbf{a} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$ , find (i)  $2\mathbf{a} - 3\mathbf{b}$  hence  $|2\mathbf{a} - 3\mathbf{b}|$  (ii)  $12\mathbf{a} - 3\mathbf{b}$   
 [ (i)  $\begin{pmatrix} 32 \\ -2 \end{pmatrix}$ , 32.06 (ii) 50.01 ]

39. In triangle PQR, PR = 4cm QR = 3cm and angle PRQ = 75°. Find PQ and the area of the triangle PQR.  
 [4.33cm, 5.795cm<sup>2</sup>]

40. If  $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$   $B = \begin{bmatrix} -2 & 6 \\ 3 & -1 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$  Find det (AB + BC) [-590]

41. Convert the recurring decimals into fractions: (a)  $0.\overline{18}$  (b) 0.07 [(a)  $\frac{2}{11}$  (b)  $\frac{7}{10}$ ]

42. A trader buys 345 sweets at shs 41400. Sixteen eggs break but he sells all that remain, making a profit of sh 7950. What was the selling price of each egg? [Sh 150]

43. The price of 2 shirts and 3 pairs of shorts is sh 30,000. The price of 5 similar shirts and 5 pairs of shorts is sh 62500. Find the cost of: (i) One shirt and one pair of shorts, (ii) 10 shirts and 10 pairs of shorts. [(i) Sh 7500, sh 5000 (ii) sh 75,000 and sh 50,000]

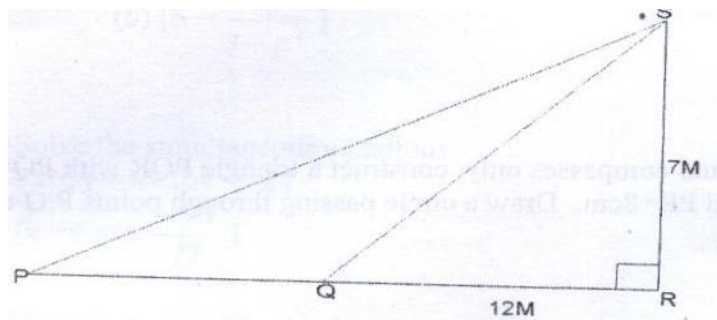
44. Without using tables or calculator evaluate the following:

(a)  $\frac{\cos 60^\circ \sin 30^\circ}{\tan 45^\circ}$  (b)  $\frac{\sin 45^\circ \cos 45^\circ}{\tan 60^\circ}$  [(a)  $\frac{1}{4}$  (b)  $\frac{1}{6}\sqrt{3}$  ]

45. Find to one decimal place the lengths of the lines joining the following points:

(a) (4,5,3) and (6,3.5) (b) (-8,5) and (3,-6.5) [(a) 1.6 (b) 15.9]

46.



In the figure above, angle PRS = 90°, SR = 7m, QR = 12m and angle SQR is two times angle SPR. Calculate: (a) Angle SPQ (b) Length PQ [(a) 15.1°, (b) 13.9m]

47. An article which costs shs 4500 depreciates by 20% of its value every year. Find how much it is worth after 4 years. [Sh 1843.20]

48. The base of a conical tent is 4.6m in diameter and its height is 2.8m Find

(a) The volume of the tent and (b) The area of the canvas used to make it.  
 [15.52m<sup>3</sup> (b) 26.2m<sup>2</sup>]

49. Represent the following inequalities on a graph, taking 1cm to represent 1 unit on each axis:  
 $x + y > 3$ ,  $3y + 7x < 21$  and  $2y + 7x > 14$ .

Shade out the unwanted regions and state the two points , (x, y), with integers values of x and y, which satisfy all the three inequalities. [(1, 4) and (2, 2)]

50. The scale of a map is 1:20000. What is the area in km<sup>2</sup> of land represented by 8cm<sup>2</sup> on the map? [0.32km<sup>2</sup>]

51. Use tables of logarithms to evaluate:  $\sqrt{\frac{0.45 \times 6.5}{475}}$  [0.07847]

52. Using ruler and compasses only, construct a triangle PQR with PQ=6cm, QR=7cm and PR=8cm. Draw a circle passing through points P,Q and R, measure the radius [4.1cm]

53. ABCD is a cyclic quadrilateral. AD and BC are produced to meet at E. Angle BAD=72° and angle DEC =30°. Find angles:(i) ABC (ii)BCD (iii) ADC [(i)78° (ii) 108° (iii) 102°]

54. Solve: (a)  $7x^2 - 9x + 2 = 0$  (b)  $\frac{t+7}{5} = \frac{5}{t}$  [(a) 1 or  $\frac{2}{7}$  (b) 2.6 or -9.6 ]

55. (a) Make m the subject of the formula:  $P = \frac{50(m^2 + n)}{m^2 + 1}$

(b) Express S in terms of P and t given the formula:  $P = \sqrt{\frac{ts}{16+s}}$

(a)  $[m = \sqrt{\frac{50n - p}{p - 50}}]$  (b)  $[S = \frac{16p^2}{t - p^2}]$

56. Solve the simultaneous equations:  $5 + 3y = x + 16y = 24$ .  $[x = 8, y = \frac{-96}{77}]$

57. Given that  $P = \begin{pmatrix} 5 & 3 \\ 4 & 2 \end{pmatrix}$ , evaluate  $P^2 - 2P + 4P^{-1}$  Ans.  $\begin{bmatrix} 23 & 23 \\ 28 & 2 \end{bmatrix}$

58. Given that  $A = \begin{pmatrix} 3 & 4 \\ 2 & 1 \end{pmatrix}$  find a matrix B such that  $A^2B = I$  where I is an identity matrix

Ans  $\begin{bmatrix} \frac{9}{25} & \frac{-16}{25} \\ \frac{-8}{25} & \frac{17}{25} \end{bmatrix}$

59. The length of a rectangle is 5cm more than twice its width. If the area of the rectangle is 45cm<sup>2</sup>, find its length and width. [12.31cm, 3.655cm]

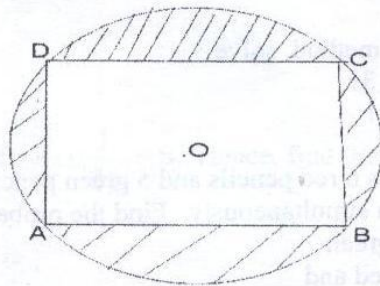
60. A circle of radius 9cm has a chord of length 7cm. Find the area of the minor segment. 3.35cm<sup>2</sup>

61. Find how much less interest a man will get at the end of 4 years if he invests shs 15 millions at simple interest instead of compound interest at an annual rate of 12% [1.4 millions]

62. Without using a set square or protractor, construct a triangle ABC in which AB= 3.2cm, BC =4cm and ABC=120°. Find a point D outside the triangle such that angle BAD =90° and BD=CD. Measure BD and AC. BD =5.3cm, AC= 6.2cm

63. Make S the subject of the formula:  $4 = y\sqrt{S - 6}$ . Hence, find the value of S when y = -1. [22]

64. Find the coordinates of two points on the curve  $y = 3x^2 - 6 + 2$  where  $y = 3$ .  
 (-0.155, 3) or (2.15, 3)
65. The height of a triangle is 5cm greater than its base. The area of the triangle is  $23\text{cm}^2$ . If the base is  $x$  cm, form an equation and solve for  $x$ . Hence find the perimeter of the triangle.
66. In a right angled triangle, the two sides enclosing the right angle measure  $(3x - 2)$  cm and  $(x + 2)$ cm. If the area of the triangle is  $36\text{cm}^2$ , find the length of these two sides.  
 [6.41cm and 11.2cm]
67. Find the quadratic equation in  $x$  of which the roots are  $-5$  and  $\frac{1}{2}$ .  
 [ $2x^2 + 9x - 5 = 0$ ]
68. Find the surface area of a closed cylindrical drum 1.5m long with a circular end of radius  $\frac{3}{4}$ m. Give the answer to 4 significant figures. (Take  $\pi$  as 3.142)  
 [ $10.60\text{m}^2$ ]
69. Find (a) Mode (b) the median and (c) the mean of the following numbers.  
 4, 4, 0, 7, 3, 5, 3, 2, 4, 1, 6, 5, 4, 8, 3, 7, 1, 6, 4, 5
70.  $P$  is inversely proportional to the square of  $q$ . When  $P = 8$ ,  $q=3$ . Find the equation relating  $p$  and  $q$ . Hence find the value of  $p$  when  $q =12$ .  
 [ $\frac{1}{2}$ ]
71. Find the length of a space diagonal of a cube whose side is 15cm.  
 [25.98cm]
72. The height in meters  $S$ , of a missile above the point of projection is given by  $S = 60t - 5t^2$ , where  $t$  is the time of flight. By taking values of  $t$  from 0 to 10 seconds, plot a graph of  $S$  against  $t$ .  
 (a) After how many seconds is the missile 120m above the ground?  
 (b) At what rate is the missile ascending or descending when it is 155m above the ground?  
 (c) What is the maximum height reached by the missile?  
 [(a) 2.25 and 9.75 seconds (b) 22m/s and -22m/s (c) 180m]
73. The volume of a cubical fish tank is  $3560\text{cm}^3$ . Find the dimensions of the tank to the nearest tenth of a centimeter.  
 [15.3cm]
74. The interior angle of a regular polygon is  $157.5^\circ$ . How many sides has the polygon?  
 [16]
75. (a) Add  $1101_2$  to  $110101_2$  (b) Subtract  $1101001_{\text{two}}$  from  $11010011_{\text{two}}$   
 (c) Convert  $101.11_{\text{two}}$  to base ten
76. The diagram shows a square of side 7cm inscribed in a

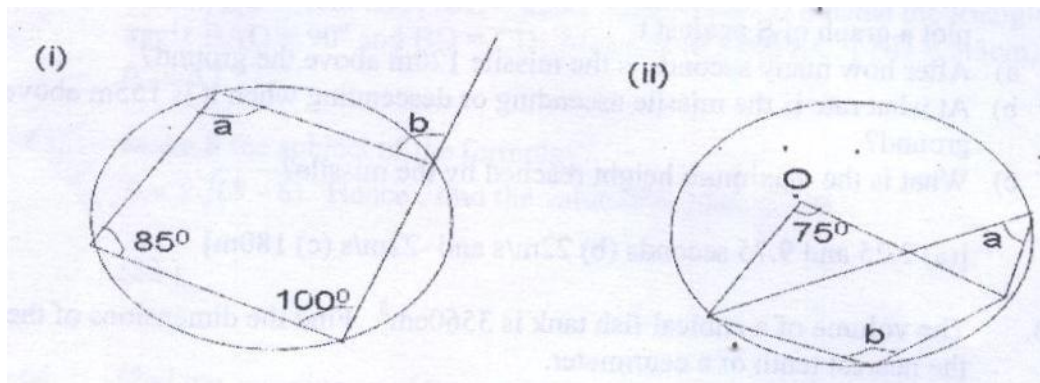


circle:  
 shaded portion.

$O$  is the centre of the circle. Find the area of the  
 [28cm<sup>2</sup>]

77. If  $x = 2 + \sqrt{7}$  and  $y = 7 + 2\sqrt{7}$ ,  
 (a)  $\frac{x^2}{y-x}$  and (b)  $\frac{y}{x-y}$ , giving your answers with rational denominators.

78. Find the values of a and b in each of the figures below.



[(i)  $a = 80^\circ$ ,  $b = 85^\circ$  (ii)  $a = 37.5^\circ$ ,  $b = 142.5^\circ$ ]

79. A bucket of abase radius 20cm has a volume of 8 litres. What is the volume of a similar bucket of radius 25cm?

[15.625L]

80. The inverse of  $\begin{bmatrix} a & 14 \\ 1 & b \end{bmatrix}$  is  $\begin{bmatrix} 1 & -7 \\ -\frac{1}{2} & 4 \end{bmatrix}$ . Find the values of a and b.

[ $a = 8$   $b = 2$  ]

81. Using matrix method, solve  
 $2.5m + 3.5n = 31$   
 $4.5n - 4m = 11$

82. A bag contains 6 red pencils and 5 green pencils . Two pencils are drawn from the bag at random simultaneously. Find the probability that the pencils drawn are

- i. Both green
- ii. Both red and
- iii. One red and one green

[(i)  $\frac{2}{11}$  (ii)  $\frac{3}{11}$  (iii)  $\frac{6}{11}$ ]

83. The following table gives the distribution of marks scored by students in a mathematics examination.

Marks	40-43	44-47	48-51	52-55	56-59	60-63
Frequency	12	18	28	20	13	9

Use the above table to find:

a) The mean of the distribution,

- b) The modal class, hence the mode
- c) The median class, hence the median

[Mean=50.7, median =50.36]

84. OPQ is a triangle with  $\mathbf{OP}=p$ ,  $\mathbf{OQ}=q$ . R is the point on PQ such that  $2\mathbf{PR} = \mathbf{RQ}$  and Z is the point on OQ such that  $3\mathbf{OZ} = 2\mathbf{ZQ}$ . Y is the point of intersection between OR and PZ.

If  $\mathbf{OY} = m\mathbf{OR}$  and  $\mathbf{PY} = n\mathbf{PZ}$ :

- (a) Express  $\mathbf{OR}$  and  $\mathbf{PZ}$  in terms of  $\mathbf{p}$  and  $\mathbf{q}$ .
- (b) Find the values of m and n.

[(a)  $\mathbf{OR} = \frac{2}{3}p + \frac{1}{3}q$   $\mathbf{PZ} = \frac{2}{5}q - p$  (b)  $m = \frac{2}{3}, n = \frac{5}{9}$ ]

85. Draw the graph of  $y=5x-x^2$  for values of x from -4 to 5 and use the graph to solve the equation  $2x^2-5x-10=0$   
[-1.3,3.8]

86. Solve the equation  $:7x = 9 - \frac{2}{x}$   
[1 or  $\frac{2}{7}$ ]

87. Make x the subject of  $\frac{1}{x} - \frac{1}{2x} = S$ . Hence, find the value of x when  $S = \frac{3}{4}$   
[ $\frac{2}{3}$ ]

88. Factorise completely:  $8x^3 + y^3$

89. Given that E is asset of whole numbers less than 11.

A is a set of composite numbers less than 11 and B is a set of triangle numbers less than 11, where is the universal set

- (a) Represent this information on a Venn diagram
- (b) Find
  - (i)  $n(A \cap B)$
  - (ii)  $n(A \cup B)$

[(i) 2 (ii) 4]

90. If  $P = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ , find x and y such that  $P^2 = xP + yI$ , where I is a 2 x 2 identity matrix  
[x=7,y=2.]



91. A man who was earning sh. 1.8 million a month had had his salary increased first in the ratio 5:4 and then by 20%. What was the overall percentage increase?

[50%]

92. Simplify: (a)  $\left(3\frac{3}{4} + 2\frac{3}{8}\right) - \left(4\frac{7}{16} - 5\frac{1}{4}\right)$

(b)  $\frac{5 - \sqrt{5}}{5\sqrt{5} - \sqrt{5}}$

93. Solve  $\frac{1}{4}p^2 = \frac{16}{p}$

[p = 4]

94. Given that  $\cos A = \frac{-40}{41}$  and A is obtuse, find  $\frac{1}{\tan A} + \frac{1}{\sin A}$

$\left[\frac{-1}{9}\right]$

95. Solve the equation:  $5^{2x-5} = 125^{x^2-2}$

[x=1, x= -1/3]

96. (a) Express  $2\sqrt{50 - 3\sqrt{800 - 2\sqrt{72}}}$  in the form  $a\sqrt{b}$ , hence evaluate the expression given that  $\sqrt{2} = 1.414$

(b) Evaluate:  $\log_2 32 - \log_2 128 + \log_2 4^3$

97. Without using tables or calculator

(i) Simplify  $8^{-2/3}$

(ii) Solve:  $4^x = 0.25$  [x = -1]

(iii) Solve  $2^{4(x-1)} = (4x8^x)^3$  [x = -2]

Show that  $x = \frac{\sqrt{3}}{9}$  if  $\log_2 8^x = \frac{1}{\sqrt{3}}$

98. (a) Simplify:  $4^{-n/2} x 2^{n+3} x 16^{1/2}$  [2]

(b) Simplify:  $\frac{9^{x+1} x 6^{x-1}}{3^{3x-1} x 2^x}$   $\left[\frac{9}{2}\right]$

(c) Without using tables or calculator, evaluate  $250(3830^2 - 170^2)$ , give your answer in standard form.

- (d) Solve:  $3^x \times 9^{\frac{-2}{x}} = 1$  [x = ± 2]
99. (a) Simplify:  $\left(\frac{16}{81}\right)^{\frac{-1}{4}} + \left(\frac{36}{64}\right)^{\frac{3}{2}}$
- (b) Given that  $\log_{10} a = 1.699$  and  $\log_{10} b = 1.913$  find  $ab$  (ii)  $\frac{a}{b}$  leaving your answers in powers of 10.
100. (a) Simplify:  $\frac{1}{p+1} - \frac{1}{3-p}$  Hence find the value of P for which the expression is zero.
- (c) A function is defined by  $f(x) = \frac{1}{x+1}$  Find:
- (i)  $ff(x)$ , hence  $ff(0)$
  - (ii) value of  $x$  for which  $f(x)$  is not defined
  - (iii)  $f^{-1}(x)$ , hence  $f^{-1}(1)$

**END.**