Mathematics

1983-2004

JAMB
## Past
Questions

Mathematics 2000

1. Let P = {1,2,u,v,w,x}
   R = {2,3,u,v,w,5,6,y}
   and R = (2,3,4,v,x,y)

   Determine (P - Q) ∩R.
   A.   {1, x}   B.   {x, y}

   C.   D.

2. If the population of a town was 240000 in January 1998 and it increased by 2% each year, what would be the population of the town in January 2000?
   A.   480 000   B.   249 696
   C.   249 600   D.   244 800

3. If $2\sqrt{3} - \sqrt{2}/\sqrt{3} + 2\sqrt{2} = m + n\sqrt{6}$,
   Find the values of m and n respectively
   A.   1, -2   B.   −2, 1

C.   −2/5, 1   D.   2, 3/5

4. In a youth club with 94 members, 60 like modern music and 50 like like traditional music. The number of members who like both traditional and modern music is three times who do not like any type of music. How many members like only one type of music?
   A.   8   B.   24
   C.   62   D.   86

5. Evaluate $\dfrac{(2.813 \times 10^{-3}) \times 1.063}{5.637 \times 10^{-2}}$
   reducing each number to two significant figures and leaving your answers in two significant figures.
   A.   0.056   B.   0.05
   C.   D.

6. A man wishes to keep some money in a savings deposit at 25% compound interest so that after 3 years he can buy a car for #150,000. how much does

   he need to
   deposit now?
   A. #102,000.5   B.   #96,000.00
      0.

A.

B.
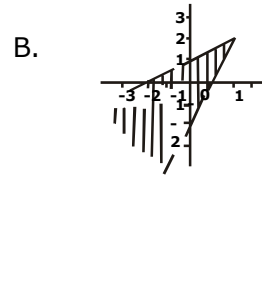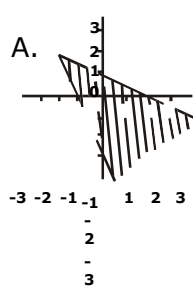
7. If $314_{10} - 256_7 = 340_x$, find x
   A. $2^{n + 1}$ B. $2^{n - 1}$
   C.   4   D.   ¼

C.

D

8. Audu bought an article for #50 000 and sold it to Femi at a loss of x%. Femi later sold the article to Oche at a profit of 40%. If Femi made a profit of #10,000, find the value of x.

   A.   60   B.   50

   C.   40   D.   20

9. Simplify $3(^{2n + 1}) - 4(^{2n - 1})/2(^{n + 1}) - 2^n$
   A. $2^{n + 1}$ B. $2^{n - 1}$
   C.   4   D.   ¼

10. If $P344_6 - 23P2_6 = 2PP2_6$, find the value of digit P.
    A.   2   B.   3
    C.   4   D.   5

    Evaluate $5^{-3\log_5 2} \times 2^{2\log_2 3}$
11.
    A.   8   B. $1\frac{1}{8}$

    C.   2/5   D.   1/8

12. A binary operation * is defined by a * b = a^b. if a * 2 = 2 –a, find the possible values of a.
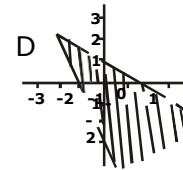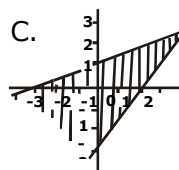   A.   1, -1   B.   1, 2
    C.   2, -2   D.   1, -2

13. The 3rd term of an A. P. is 4x – 2y and the 9th term is 10x - 8y . find the common difference.
    A.   19x - 17y   B.   8x - 4y
    C.   x – y   D.   2x

14. Find the inverse of p under the binary operation * by p * q= p + q – pq, where p and q are real numbers   and zero is the identity.
    A.   p   B.   p – 1

18. Find the values of t for which the determinant of the

    matrix (t -4   0   0)
    x
              (-1   t+t   1) is
                                 zero
              (3   4   t-2)

    A.   0, 2, 3   B.   –4, 2, 3
    C.   –4, -2, -3   D.   4, -2, 3

19. If (x - 1), (x + 1) and (x - 2) are factors of the polynomial $ax^3 + bx^2 + cx - 1$, find a, b, c, respectively
    A.   -1/2, 1, ½   B.   ½, 1, ½
    C.   ½, 1, -1/2   D.   ½, -1, ½

20. A trader realizes $10x - x^2$ naira profit from the sale of
    C.   p/p – 1   D.   p/p+1

          (a, b)

x bags of corn. How many bags will give him the maximum profit?

A. 4   B. 5
C. 6   D. 7

21. Solve the inequality $2 - x > x^2$

A. x < -2 or x > 1   B. x > 2 or x < -1
C. −1 < x > 2   D. −2 < x < 1

15. A matrix P(a,   is such that $P^T = p$,
        b)   where
        (c,
        d)

P^T is the transpose of P, if b = 1, then P is

A.   (0, 1)   B.   (0, 1)
     (1, 0)   (-1, 0)

C.   (0, 1)   D.   (1, 1)
     (1, 1)   (-1,0)

16. Evaluate (1/2 − ¼ + 1/8 − 1/16 + ...) -1

A.   2/3   B.   0
C.   −2/3   D.   1

17. The solution of the simultaneous inequalities 2x − 2
£ y and 2y 2 £ x is represent by

22. If a and b are the roots of the equation $3x^2 + 5x - 2 = 0$, find the value of $1/\alpha + 1/\beta$

A.   -5/2   B.   −2/3
C.   ½   D.   5/2

23. Find the minimum value of the function $f(\theta) = 2/3 - \cos\theta$ for $0 \leq \theta \leq 2\pi$.

A.   ½   B.   2/3
C.   1   D.   2

24. A frustum of a pyramid with square base has its upper and lower sections as squares of sizes 2m and 5m

respectively and the distance between them 6m. find the height of the pyramid from which the frustum was obtained.

A.   8.0m   B.   8.4m
C.   9.0m   D.   10.0 m

25. P is a point on one side of the straight line UV and P moves in the same direction as UV. If the straight line ST is on the locus of P and $\angle VUS = 50^0$, find $\angle UST$.

A. 310^0 B. 130^0
C. 80^0 D. 50^0

26. A ship sails a distance of 50km in the direction S50E and then sails a distance of 50km in the direction N40⁰E. find the bearing of the ship from its original position.
   A.   S90⁰E   B.   N40⁰E
   C.   S95ᵘE   D.   N85ᵘE

27. An equilateral triangle of side √3 cm is inscribed in a circle. Find the radius of the circle.
   A.   2/3cm   B.   2cm
   C.   1cm   D.   3cm

28. 3y = 4x − 1 and Ky = x + 3 are equations of two straight lines. If the two lines are perpendicular to each other, find K
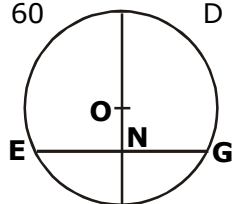   A.   -4/3   B.   −3/4
   C.   4/3
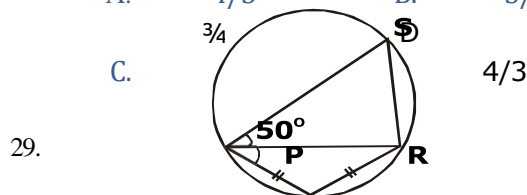
29.

Q

In the diagram above, if ∠RPS = 50⁰, ∠RPQ = 30⁰ and PQ = QR, find the value of ∠PRS

   A.   80⁰   B.   70⁰
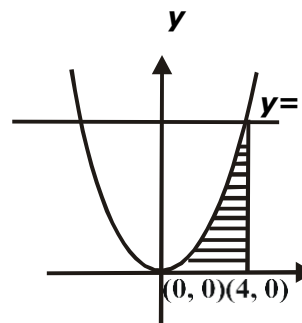   50⁰
   C.   60   D.

30.

In the diagram above, EFGH is a circle center O. FH is a diameter and GE is a chord which meets FH at right angle at the point N. if NH = 8 cm and EG = 24 cm, calculate FH.
   A.   16cm   B.   20cm
   C.   26cm   D.   32cm

31. If P and Q are fixed points and X is a point which moves so that XP = XQ, the locus of X is
   A.   a straight line   B.   a circle

3
4.

If the diagram above is the graph of y=x², the shaded area is
   A.   64 square units   B. 128/3 square units
   C.   64/3 square units D. 32 square units

35. Find the value ∫ of   ᵖ(cos²θ− 1/sin²θ)dθ
   A.   π   B.   ᵖ/₀
   C.   -ᵖ/₆   D.   π

36. If y = 2y cos 2x − sin 2x, find dy/dx when x = ë/4
   A.   π   B.   − π
   C.   π/2   D.   − π/2

37. A bowl is designed by revolving completely the area enclosed by y = x² − 1, y= 0, y = 3 and x ³ 0 around the y-axis. What is the volume of this bowl?
   A.   7 πcubic units.   B.   15 π/2 cubic units
   C.   8 πcubic units   D.   17 π/2 cubic units.

38. If the volume of a hemisphere is increasing at a steady rate of 8 πm³s⁻¹, at what rate is its radius changing when it is 6m?
   A.   2.50ms-1   B.   2.00ms-1
   C.   0.25ms-1   D.   0.20ms-1

39. A function f(x) passes through the origin and its first derivative is 3x + 2. what is f(x)
   A.   y = 3/2x² + 2x   B. y = 3/2 x² + x
   C.   y = 3 x² + x/2   D. y = 3 x² ⁺ ²ˣ

40. The expression ax² + bx + c equals 5 at x = 1. if its derivative is 2x + 1, what are the values of a, b, c, respectively?

   C.   the bisector ∠PXQ D. theperpendicular
                              bisector of PQ

32. In a regular polygon, each interior angle doubles its corresponding exterior angle. Find the number of sides of the polygon.

A. 87   B. 6

C. 4   D. 3

33. A predator moves in a circle of radius $\sqrt{2}$ centre (0, 0), while a prey moves along the line $y = x$. if $0 \leq x \leq 2$, at which point(s) will they meet?

A. (1, 1) only   B. (1, 1) and (1, 2)

A. 1, 3, 1   B. 1, 2, 1

C. 2, 1, 1   D. 1, 1, 3

41. X and Y are two events. The probability of X and Y is 0.7 and the probability of X is 0.4. If X and Y are independent, find the probability of Y.

A. 0.30   B. 0.50

C. 0.57   D. 1.80

42. If the mean of the numbers 0, x + 2, 3x + 6 and 4x + 8 is 4, find their mean deviation.

A. 0   B. 2

A. 31!/9! 2!   B. 41!/9! 2! 2!

43. In how many ways can the word MATHEMATICS be arranged?

44.

No.	1	2	3	4	5	6
Frequency	30	43	54	40	41	32

A dice is rolled 240 times and the result depicted in the table above. If a pie chart is constructed to represent the data, the angle corresponding to 4 is
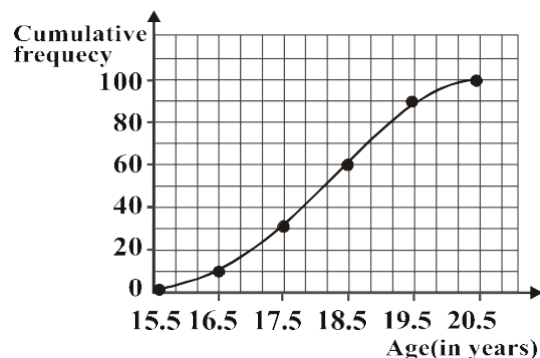
A. 10^0 B. 16^0

C. 40^0 D. 60^0

45. If U = {x : x is an integer and {1 ≤x ≤20} E_1 = {x : x is a multiple of 3}

E_2 = {x : x is a multiple of 4}

And an integer is picked at random from U, find the probability that it is not in E_2

A.   ¾   B.   3/10

C.   ¼   D.   1/20

46.

Cumulative frequecy vs Age(in years)

The cumulative frequency curve above represents the ages of students in a school. Which are group do 70% of the students belong?

A.   15.5 – 18.5   B.   15.5 – 19.5

C.   16.5 – 19.5   D. 17.5 – 20.5

46. The variance of x, 2x, 3x 4x and 5x is

A. $x\sqrt2$ B. $2x^2$

C. x^2 D.   3x

48. Find the sum of the range and the mode of the set of numbers 10, 5, 10, 9, 8, 7, 7, 10, 8, 10, 8, 4, 6, 9, 10, 9, 10, 9, 7, 10, 6, 5

A.   16   B.   14

C.   12   D.   10

49. In how many ways can a delegation of 3 be chosen from among 5 men and 3 women, if at least one man at least one woman must be included?

A.   15   B.   28

C.   30   D.   45

50.

Interval (years)	10-12	13-15	16-18	19-20	21-23
No. Of	6	14	15	10	5

The table above shows the frequency distribution of the ages (in years) of pupils in a certain secondary school. What percentage of the total number of pupils is over 15 years but less than 21 years?

A.   35%   B.   45%

C.   50%   D.   60%

Mathematics 2001

1. Find the principal which amounts to #5,000 at simple interest in 5 years at 2% per annum

A.   #5000   B.   #4900

C.   #4800   D.   #4700

2. A car dealer bought a second-hand car for #250,000.00 and spent #70 000.00 refurbishing it. He then sold the car for #400 000.00. what is the percentage gain?

A.   20%   B.   25%

C.   32%   D.   60%

3. Evaluate 21.05347 – 1.6324 x 0.43, to 3 decimal places.

A.   20.351   B.   20.352

A.   0.033   B.   0.039

C.   0.308   D.   0.358

4. Evaluate $(0.14)^2$ x 0.275)/7(0.02) correct to 3 decimal places

5. Given that p = 1 + √2 and q = 1 - √2, evaluate $(p^2 – q^2)/2pq$

6. If $y/2 = x$, evaluate

   $(x^3/y^3 + 1/2) + (1/2 - x^2/y^2)$

   A. 5/16   B. 5/8

   C. 5/4   D. 5/2

7. Simplify $(3\sqrt{64a^3})^{-3}$

   A. $8a$ B. $4a$

   C. $1/4a$ D. $1/4a$

8. Factorize $4x^2 - 9y^2 + 20x + 25$

   A. $(2x - 3y)(2x + 3y)$ B. $(2x + 5)(2x - 9y + 5)$

   C. $(2x - 3y + 5)(2x - 3y - 5)$

   D. $(2x - 3y)(2x + 3y + 5)$

9. If tow graphs $y = px^2$ and $y = 2x^2 - 1$ intersect at $x = 2$, find the value of p in terms of q

   A. $(7 + q)/8$ B. $(8 - q)/2$

   C. $(q - 8)/7$ D. $7 / (q - 1)$

10. Solve the equations: $m^2 + n^2 = 29; m + n = 7$

    A. $(5, 2)$ and $(5, 3)$ B. $(5, 3)$ and $(3, 5)$

    C. $(2, 3)$ and $(3, 5)$ D. $(2, 5)$ and $(5, 2)$

11. Divide $a^{3x} - 26a^{2x} + 156a^x - 216$ by $a^{2x} - 24a^x + 108$

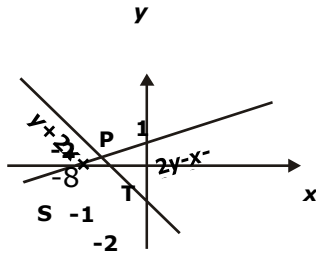A. $a^x - 18$ B. $a^x - 6$
C. $a^x - 2$ D. $a^x + 2$

A. 4   B. −2
C. −4   D. −12

12. Find the integral values of x and y satisfying the inequality 3y + 5x £ 15, given that y > 0, y< 3 and

A. (1, 1), (2, 1),(1, 3)   B. (1, 1), (1, 2),(1, 3)
C. (1, 1), (1, 2), (2, 1)   D. (1, 1), (3, 1), (2, 2)

20. If P $\begin{vmatrix} 3 & -3 & 4 \\ & & \\ 5 & 0 & 6 \end{vmatrix}$ = then -2p is

13.

A. $\begin{vmatrix} -6, & 4, \\ -8 \\ 5, & 0, \\ 6 \\ 7, & 5, \\ -1 \end{vmatrix}$ B. $\begin{vmatrix} -6, & 4, \\ -8 \\ -10, & 0, \\ 6 \\ -14, & 5, \\ -1 \end{vmatrix}$

C. $\begin{vmatrix} -6, & -4, 2 \\ \\ -10, & -2, -12 \\ -14, & 10, & 2 \end{vmatrix}$ D. $\begin{vmatrix} -6, & 4, \\ \\ -10, & 0, -12 \\ -14, & 40, 2 \end{vmatrix}$

Triangle SPT is the solution of the linear inequalities

A. $2y - x - 2 \leq 0$, $y + 2x + 2 \leq 0, \geq 0, x \leq 0$
B. $2y - x - 2 \leq 0$, $y + 2x + 2 \leq 0, \leq 0$
C. $2y - x - 2 \leq 0$, $y + 2x + 2 \leq 0, \leq 0$, x ≤ -1

$k^2 + \bar{k} + 1$, where I is the 2 x 2 identity matrix, is $y + 2x + 2 \leq 0, \leq 0$

A. (9, 8)   B. (10, 7)

14. The sixth term of an arithmetic (21, 24) progression is half of its twelfth term. The first term is equal to (7, 7) D. (6, 3)
A. half of the common difference
B. double of the common difference
C. (12, 21) common difference (13, 20)
          zero

19. Evaluate $\begin{vmatrix} -1 & -1 & -1 \\ 2 & 1 & 1 \end{vmatrix}$

15. A man saves #100.00 in his first year of work and each year saves #20.00 more than in the preceding year. In how many years will he save #580.00
A. 20 years   B. 29 years
C. 58 years   D. 100 years

16. An operation * is defined on the set of real numbers by a*b = a + b + 1. if the identity elements is -1, find the inverse of the element 2 under.
A. -4   B. 2
C. 0   D. 4

A. k   B. l
C. m   D. o

18. Given that matrix k = (2, 1) the matrix
(3, 4)
A. 4cm   B. $4\sqrt{3}$cm
C. 8cm   D. $8\sqrt{3}$cm

27. Find the locus of a point which moves such that its distance from the line y = 4 is a constant, k.
A. y = 4 + k   B. y = k − 4
C. y = k ± 4   D. y = 4 ± k

17

⊗	k	l	m
k	l	m	k
l	m	k	l
m	k	l	m

The identity element with respect to the multiplication shown in the table above is

21. Find the number of sides of a regular polygon whose interior angle is twice the exterior angle
    A.   2   B.   3
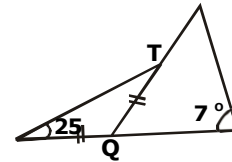   C.   6   D.   8

22.

S

P   R

In the figure above, PQR is a straight line segment, PQ = QT. Triangle PQT is an isosceles triangle, < SRQ is 75^0 and < QPT = 25^0. calculate the value of < RST.
    A.   25^0 B.   45^0
    C.   50^0 D.   55^0

23. A cylindrical tank has a capacity of 3080m^3. what is the depth of the tank if the diameter of its base is 14m?
    A.   20m   B.   22m
    C.   23m   D.   25m

24. A sector of a circle of radius 7.2 cm which subtends an angle 300^0 at the centre is used to form a cone. What is the radius of the base of the cone?
    A.   6cm   B.   7cm
    C.   8cm   D.   9cm

25. The chord ST of a circle is equal to the radius, r of the circle. Find the length of arc ST.
    A. $\pi r/2$ B. $\pi r/3$
    C. $\pi r/6$ D. $\pi r/12$

26. A point P moves such that it is equidistant from the points Q and R. find QR when PR = 8cm and < PRQ = 30^0

A. $\sqrt{3}y = x + 5y\sqrt{3}$ B. $\sqrt{3}y = -x + 5\sqrt{3}$

C. $y = x + 5$ D. $y = 1/10x + 5$

29. P(-6, 1) and Q(6, 6) are the two ends of the diameter of a given circle. Calculate the radius
A. 3.5 units   B. 6.5 units
C. 7.0 units   D. 13.0

30. Find the value of p if the line joining (p, 4) and (6, - 2) is perpendicular to the line joining (2, p) and (-1, 3)
A. 0   B. 3
C. 4   D. 6

31. The bearing of P and Q from a common point N are 020^0 and 300^0 respectively. If P and Q are also equidistant from N, find the bearing of P from Q.
A. 320^0 B. 280^0
C. 070^0 D. 040^0

32.
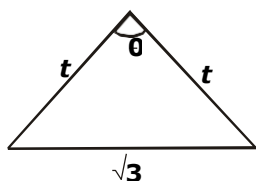
Find the value of q in the diagram above.

A. 30^0 B. 60^0
C. 100^0 D. 120^0

33. Differentiate $(2x + 5)^2(x - 4)$ with respect to x
A. $(2x + 5)(6x - 11)$ B. $(2x + 5)(2x - 13)$

34. If $y = x \sin x$, find dy/dx when $x = \pi/2$
A. $\pi/2$ B. 1
C. -1 D. $\pi/-2$

35. If the gradient of the curve $y = 2kx^2 + x + 1$ at $x = 1$ find k
A. 1   B. 2
C. 3   D. 4

36. Find the rate of change of the volume V of a sphere with respect to its radius r when $A = 1$
A. 4π B. 8π
C. 12π D. 24

37. Find the dimensions of the rectangle of greatest area which has a fixed perimeter p.
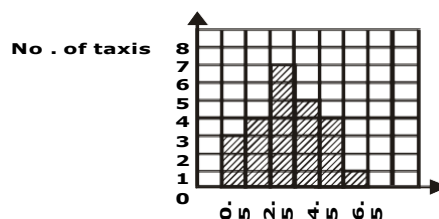A. Square of sides p/4   B. Square of sides

40.

No . of cars
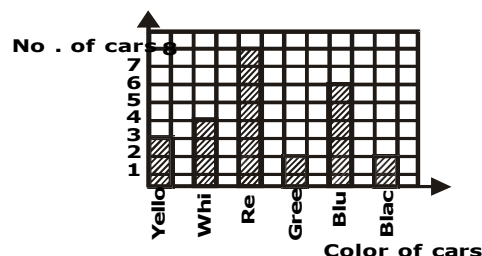
Color of cars

The bar chart above shows different colours of cars passing a particular point of a certain street in two minutes. What fraction of the total number of cars is yellow?
A. 4/15   B. 1/5
C. 3/25   D. 2/25

41

No . of taxis

No . of passengers

The histogram above shows the distribution of passengers in taxis of a certain motor park. How many taxis have more than 4 passenger?
A. 14   B. 15
C. 16   D. 17

Using the table below to answer questions 42 and 43

p/2

C. Square of sides p   D. Square of sides 2p

Score	4		8	11	13	8
Frequen	7		2	7	2	

42. Find the square of the mode
   A.   25   B.   49
   C.   64   D.   121

43. The mean score is
   A.   11.0   B.   9.5

38. Evaluate $\int 2(2x - 3)^{2/3} \, dx$
   A. $2x - 3 + k$ B. $2(2x - 3) + k$
   C. $6/5(2x - 3)^{5/3}$ D. $3/5(2x - 3)^{5/3} + k$
        $+ k$

39. Find the area bounded by the
    curves $y = 4 - x^2$
   A. $10\frac{1}{3}$/ sq. units B. 10^2/ sq.
        units
   C. $20\frac{1}{3}$/ sq. units D. $20\frac{2}{3}$/ sq. units
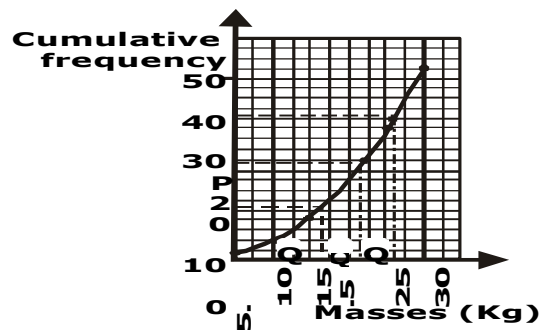
C.   8.7   D.   7.0

44. Find the range of 1/6, 1/3, 3/2, 2/3, 8/9 and 4/3
   A.   4/3   B.   7/6
   C.   5/6   D.   ¾

45. Find the variance of 2, 6, 8, 6, 2 and 6
   A. $\sqrt{5}$ B. $\sqrt{6}$
   C.   5   D.   6

46.

The graph above shows the cumulative frequency of the distribution of masses of fertilizer for 48 workers in one institution. Which of the following gives the interquartile range?

A. $Q_3 - Q_1$ B. $Q_3 - Q_2$
C. $Q_2 - Q_1$ D. $\frac{1}{2}(Q_3 - Q_1)$

47. Find the number of ways of selecting 8 subjects from 12 subjects for an examination.
A. 498   B. 496
C. 495   D. 490

48. If $^6P_r = 6$, find the value of $^6P_{r+1}$
A. 15   B. 30

49.

Colour	Blue	Black	Yellow	White	Brown
No. of beads	1	2	4	5	3

The distribution of colors of beads in a bowl is given above. What is the probability that a bead selected at random will be blue or white?
A. 1/15   B. 1/3
C. 2/5   D. 7/15

50. Teams P and Q are involved in a game of football. What is the probability that the game ends in a draw?
A. ¼   B. 1/3
C. ½   D. 2/3

Mathematics 2002

1. A trader bought goats for #4 000 each. He sold them for #180 000 at a loss of 25%. How many goats did he buy?
A. 36   B. 45
C. 50   D. 60

2. Simplify $(\sqrt{0.7} + \sqrt{70})^2$
top, 8cm in
A. 217.7   B. 168.7
C. 84.7   D. 70.7

$(0.21 \times 0.072 \times 0.0054)/(0.006 \times 1.68 \times 0.063)$
correct to four significant figures.
A. 0.1286   B. 0.1285
C. 0.01286   D. 0.01285

4. In a school, 220 students offer Biology or Mathematics or both. 125 offer Biology and 110 Mathematics. How many offer Biology but not Mathematics?
A. 125   B. 110
C. 95   D. 80

5. Simplify 52.4 − 5.7 − 3.45 − 1.75
A. 42.2   B. 42.1
C. 41.5   D. 41.4

6. Without using tables, evaluate $(343)^{1/3} \times (0.14)^{-1} \times (25)^{1/2}$
A. 7   B. 8

8. Find the value of & if the line 2y − &x + 4 = 0 is perpendicular to the line $y + \frac{1}{4}x - 7 = 0$
A. -8   B. −4
C. 4   D. 8

9. A bucket is 12cm in diameter at the top, 8cm in diameter at the bottom and 4cm deep. Calculates its volume.
A. $144\pi cm^3$ B. $304\pi cm^3/3$
C. 10   D. 12

7. In the diagram below are two concentric circles of radii r and R respectively with centre O. if r = 2/5 R, express the area of the shaded portion in terms of π and R.

10.

X   Z

Y

In the diagram below, XZ is the diameter of the circle XYZW, with centre O and radius 15/2cm. If XY = 12cm, find the area of the triangle XYZ.

A.   75cm²   B.   54cm²
C.   45cm²   D.   27cm²

11.   Find the coordinate of the midpoint of x and y intercepts of the line 2y = 4x - 8

A. $^9/_2\,\pi R^2$ B. $^5/_9\,\pi R^2$
C. $_{21}{}^2\,\pi R^2$ D $^{21}/_2\,\pi R_2$

/

A.   (-1, -2)   B.   (1, 2)
C.   (2, 0)   D.   (1, -2)

12.   A chord of a circle subtends an angle of 120⁰ at the centre of a circle of diameter 4Ö3cm. Calculate the area of the major sector.

A. $32\pi cm^2$ B. $16\pi cm^2$
C. $8\pi cm^2$ D. $4\pi cm^2$

13.   If tan q = 4/3, calculate $\sin^2\theta - \cos^2\theta$.

A.   7/25   B.   9/25
C.   16/25   SD. 24/25

14.
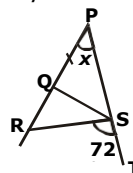
In the diagram above, PST is a straight line, PQ = QS = RS. If < RSRT = 72^0, find x.

A. 72^0 B. 36^0
C. 24^0 D. 18^0

15. The locus of a point P which is equidistant from two given points S and T is
A. a perpendicular to ST
B. a line parallel to ST
C. the angle bisector of PS and ST
D. the perpendicular bisector ST

16. A solid hemisphere has radius 7cm. Find the total surface area.
A. $462cm^2$ B. $400cm^2$
C. $308cm^2$ D. $66cm^2$

17.
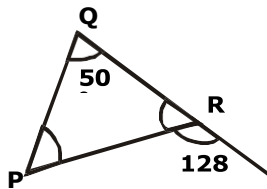
The angle PGR below is
A. a scalene triangle
B. an isosceles triangle
C. an equilateral triangle
D. an obtuse – angled triangle

18. The sum of the interior angles of a polygon is 20 right angles. How many sides does the polygon have?
A. 10   B. 12
C. 20   D. 40

19. Find the equation of the set of points which are equidistant from the parallel lines x = 1 and x = 7
A. y = 4   B. y = 3
C. x = 3   D. x = 4

20.
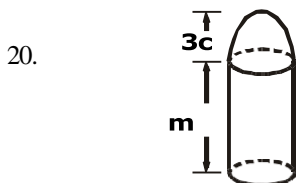
In the diagram below, a cylinder is surrounded by a hemispherical bowl. Calculate the volume of the solid.
A. $216\pi cm^3$ B. $198\pi cm^3$
C. $180\pi cm^3$ D. $162\pi cm^3$

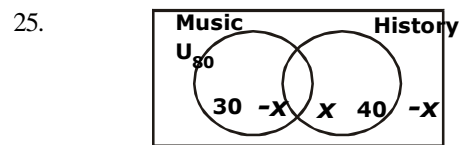21. A hunter 1.6m tall, views a bird on top of a tree at an

23. The range of the data k + 2, k – 3, k + 4, k – 2, k, k – 5, k + 3, k – 1 and k + 6 is.
A. 6   B. 8
C. 10   D. 11

24.

No . of days	1	2	3	4	5	6
No . of students	20	x	50	40	2x	60

The distribution above shows the number of days a group of 260 students were absent from school in a particular term. How many students were absent for at least four days in the term?
A. 40   B. 120
C. 160   D. 210

25.

The venn diagram below shows the number of students offering Music and History in a class of 80 students. If a student is picked at random from the class, what is the probability that he offers Music only?
A. 0.13   B. 0.25
C. 0.38   D. 0.50

26. Find the mean of the data 7,-3,4,-2,5,-9,4,8,-6,12
A. 1   B. 2
C. 3   D. 4

27. The probability of a student passing any examination is 2/3. if the student takes three examination, what is the probability that he will not pass any of them?
A. 1/27   B. 8/27
C. 4/9   D. 2/3

28. How many three-digit numbers can be formed from 32564 without digit being repeated?
A. 10   B. 20
C. 60   D. 12

29. The acres for rice, principle, cassava, cocoa and palm oil, in a certain district are given respectively as 2,5,3, 11 and 9. what is the angle of the sector for cassava in a pie chart?
A. 36^0 B. 60^0
C. 108^0 D. 180^0

30. Calculate the mean deviation of the angle of 45⁰. If the distance between the hunter and the tree is 10.4m, find the height of the tree.

   A.   8.8m   B.   9.0m

   C.   10.4m   D.   12.0m

22. The mean of a set of six numbers is 60. if the mean of the first five is 50, Find the sixth number in the set.

   A.   110   B.   105
   C.   100   D.   95

set of numbers 7,3,14,9,7 and 8

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

31. Find the maximum value of y in the equation
$$y = 1 - 2x - 3x^2$$

   A.   5/3   B.   4/3
   C.   5/4   D.   ¾

32. If the 9th term of an A. P is five times the 5th term, find the relationship between a and d.

A.   a + 2d = 0   B.   a + 3d = 0

C.   3a + 5d = 0   D.   2a + d = 0

C. [-3, 0)
(0 -3)

D. (9, 4)
(12, 1)

33. The time taken to do a piece of work is inversely proportional to the number of men employed. If it takes 45men to do a piece of work in 5 days, how long will take 25 men?
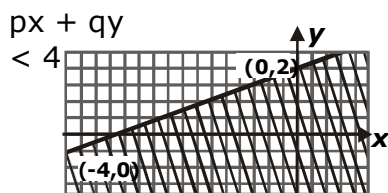
A.   5 days   B.   9 days

C.   12 days   D.   15 days

41. Find the range of values of x for which x + 2/4 − 2x − 3/3 <4

A.   x > -3   B.   x < 4

C.   x > -6   D.   x < 8

$\sqrt{n}$

42. If x varies directly as when n = 17/9 and x = 9 when n = 9, find x

34. The binary operation is defined on the set of integers p and q by $p*q = pq + p + q$. find 2 (3*4)

B.   38

C.   59   D.   67

A.   27   B. $\sqrt{1}$

C.   4   D. $\sqrt{7}$

43. The sum of infinity of the series
1 + 1/3 + 1/9 + 1/27 +………is

A.   3/2   B.   5/2

C.   10/3   D.   11/3

35. If −2 is the solution of the equation 2x + 1 − 3c = 2c + 3x − 7, find the value of c.

A.   1   B.   2

C.   3   D.   4

44. Make r the subject formula of the
x/r + a = a/r

A.   a/(x − a)   B.   (a/x + a

C. a^2/(x − a)   D. a^2/(x + a)

36. If N = $\begin{vmatrix} 3 & 5 & -4 \\ 6 & -3 & -5 \\ -2 & 2 & 1 \end{vmatrix}$, find /N/

A.   91   B.   65

C.   23   D.   17

45. If y = x^2 − 1/x, find dy/dx

A.   2x + x^2 B.   2x − x^2

C.   2x − 1/x^2 D.   2x − 1/x^2

37. Use the graph below to find the values of p and q if

px + qy < 4

46. Evaluate $\int \sin 3x \, dx$

A.   -2/3 cos 3x + c   B.   −1/3 cos 3x + c

C.   1/3 cos 3x + c   D.   2/3 cos 3x + c

A.   p = 1, q = 2   B.   p = 2, q = 1

C.   p = -1, q = 2   D.   p = 2, q = -1

47. A circle with a radius 5cm has its radius increasing at the rate of 0.2cms-1. what will be the corresponding increase in the area?

38. The inverse of the function f(x) = 3x + 4 is

A.   1/3(x + 4)   B.   1/4(x + 3)

C.   1/5(x - 5)   D.   1/3(x - 4)

39. Solve for x in the equation
x^3 − 5x^2 - x + 5 = 0

A. 5p   B. 4p
C. 2p   D. p

48. If dy/dx = 2x – 3 and y = 3
    When x = 0, find y in terms of x.
    A. 1 or 5   B. 1 or –5
    C. 1, 1 or –5   D. 1, -1 or 5

49. Find the derivative of $y = \sin^2(5x)$ with
    respect to x
    A. $2 \sin 5x \cos 5x$ B. $5 \sin 5x \cos$
    A. $x^2 – 3x$ B. $x^2 5x3x + 3$
    C. $2x^2 – 5x$ D. $x^2 – 3x – 3$

40. If $P = \begin{pmatrix} 2, & 1 \\ (-3, & 0) \end{pmatrix}$ and I is a 2 x 2 unit
    matrix, evaluate

    $p^2 – 2p + 41$

    A. $\begin{pmatrix} 2, & 1 \\ 4, & 1 \end{pmatrix}$ B. $\begin{pmatrix} 1, & 0 \\ 0, & 1 \end{pmatrix}$

50. The slope of the tangent to the curve $y = 3x^2 – 2x + 5$
    at the point (1, 6) is
    A. 1   B. 4
    C. 5   D. 61.

Mathematics 2003

1. Simplify $1 – (2\frac{1}{3} \times \frac{3}{4} + \frac{3}{5})$
   A.   B.
   C. $-1\frac{19}{6}$ D. $\frac{1}{1\frac{1}{7}}$

2. A cinema hall contains a certain number of people.
   If 22½ % are children, 47½ % are men and 84 are
   women, find the number of men in the hall.

   A. 133   B. 113
   C. 63   D. 84

3. Simplify $\times 23_4$
   13_4 13211_4 B. 10311_4
   C. 10321 D. 12231

4. A woman buys 270 oranges for #1800.00 and sells at 5 for #40.00. what is her profit?
A. #630.00   B.   #360.00
C. #1620.00   D.   #2160

5. Simplify $\dfrac{(\sqrt{98} - \sqrt{50})}{\sqrt{32}}$
A. ½   B.   ¼
C. 1   D.   3

6. The sum of four numbers is 1214_5. what is the average expressed in base five?
A. 411   B.   401
C. 141   D.   114

7. Evaluate $\log_{\sqrt{2}}4 + \log_{1/2}16 - \log_4 32$
A. -2.5   B.   5.5
C. −5.5   D.   2.5

8. Given:
U = {Even numbers between 0 and 30}
P = {Multiples of 6 between 0 and 30}
Q = {Multiples of 4 between 0 and 30}

Find $(PUQ)^c$.
A. {0,2,6,22,26}   B. {2,4,14,18,26}
C. {2, 10, 14, 22, 26} D. {0, 10, 14, 22, 26}

9. In a class of 40 students, 32 offer Mathematics, 24 offer Physics and 4 offer neither Mathematics nor Physics. How many offer both Mathematics and Physics?
A. 16   B.   4
C. 20   D.   8

10. Find $(1/0.06 \div 1/0.042)^{-1}$, correct to two decimal places
A. 4.42   B.   3.14
C. 1.53   D.   1.43

11. If $9^{2x-1}/27^{x+1} = 1$, find the value of x

12. Factorize completely
$4abx - 2axy - 12b^2x +6bxy$
A. 2x(3b - a)(2b - y)   B. 2x(a − 3b)(b - 2y)
C. 2x(2b - a)(3b - y)   D. 2x(a − 3b)(2b - y)

13. The sum of the first n terms of an

A. (1 3)   B   (1 -3)
    (0 1)   (0 -1)

C. (1 3)   D.   (-1 3)
    (0 -1)   (0 -1)

arithmetic progression is 252. if the first term is −16 and the last term is 72, find the number of terms in the series.

14. The graphs of the function $y = x^2 + 4$ and a straight line PQ are drawn to solve the equation $x^2 - 3x + 2 = 0$. what is the equation of PQ?
A. y = 3x + 2 B.   y = 3x − 4
C. y = 3x + 4 D.   y = 3x − 2

15. A matrix P has an inverse $P^{-1} = $ (1 -3)
                                        (0, 1) Find P.

16. Find the values of x and y respectively if
3x − 5y + 5
= 0 and 4x − 7y + 8 = 0
A. -4, -5   B. −5, -4
C. 5, 4   D. 4, 5

17. If −(x, 2) = (3, 3x)
(4x, 1) (4, −5) find the value of x
A. -2   B. −5
C. 2   D. 5

18. Find the range of values of x satisfying the inequalities $5 + x \leq 8$ and $13 + ^3 7$.

19. x varies directly as the product of U and V and inversely as their sum. If x = 3 when U = 3 and V = 1, what is the value of x if U = 3 and V = 3?
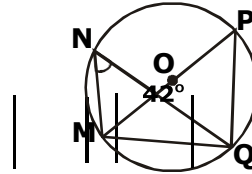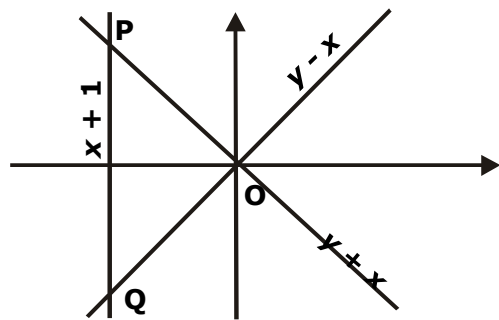A. 4   B. 9
C. 6   D. 3

20.

Triangle OPQ above is the solution of the inequalities.
A. $x − 1 \leq 0$, $y + x \leq 0$, $y, - x \leq 0$
B. $x + 1 \geq 0$, $y + x \leq 0$, $y, - x \geq 0$
C. $y + x \leq 0$, $y − x \geq 0$, $x − 1 \geq 0$
D. $x − 1 \leq 0$, $y − x \geq 0$, $y + x \geq 0$

21. Three consecutive terms of a geometric progression are given as n − 2, n and n + 3. find the common ratio.

22. The length a person can jump is inversely proportional to his weigth.

If a 20kg person can jump 1.5 m, find the constant of proportionality.
A. 30   B. 60
C. 15   D. 20

23.

A. $-6 \leq x \leq 3$ B. $-6 \leq x \leq -3$
C. $3 \leq x \leq 6$ D. $−3 \leq x \leq 3$

A. 2/3   B. 3/2

In the diagram above, O is the centre of the circle, POM is a diameter and ∠ MNQ = 42⁰. calculate ∠QMP.

A. 138⁰   B. 132⁰
C. 42⁰   D. 48⁰

24. The locus of a point P which moves on one side only of a straight line XY so that ∠XPY = 90⁰ is.
A. the perpendicular bisector of XY
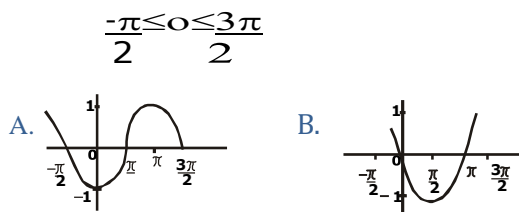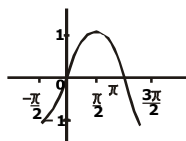B. a circle   C. a semicircle
D. an arc of a circle through X,Y

25.

P   **R**

β

α

γ

Q   **S**
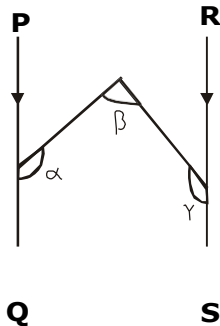
In the diagram above, PQ is parallel to RS. What is the value of α + β + y?

A. 180⁰   B. 90⁰
C. 200⁰   D. 360⁰

26. Whicch of the following is the graph of sinθfor

$$\frac{-\pi \le 0 \le 3\pi}{2 \qquad 2}$$

A.   B.

C.   D

27.

R
O
Q
40
P   **S**
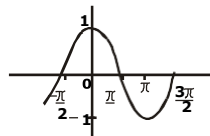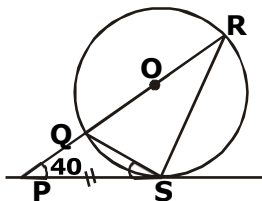
In the diagram above, PQR is a straight

29. An aeroplane flies due north from airports P to Q and then flies due east to R. if Q is equidistant from P and R, find the bearing of P and R.

A. 270⁰   B. 090⁰
C. 135⁰   D. 225⁰

30. Find the value of p, if the line of which passes through (-1, -p) and (-2, 2) is parallel to the line 2y + 8x − 17 = 0.

A. −2/7   B. 7/6
C. −6/7   D. 6/7

31. Find the equation of the locus of a point P(x, y) which is equidistant form Q(0,0)
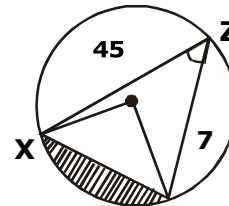A. and R(2,x1). y = 5   B. 2x + 2y = 5

32. An arc of a circle subtends an angle of 30⁰ on the circumference of a circle of a radius 21cm. Find the length of the arc
A. 66cm   B. 44cm
C. 22cm   D. 11cm

33. A trapezium has two parallel sides of length 5cm and 9cm. If the area is 121cm², find the distance between the parallel sides.
A. 7cm   B. 3cm
C. 4cm   D. 6cm

34.

45   **Z**
7
X

line and PS is a tangent to the circle QRS with /PS/ = ∠/SR/ and SPR = 40⁰. find ∠PSQ.

X Y Z i s a c i

Y

rcle centre O and radius 7cm. Find the area of the shaded region.

A. 14cm² B. 38cm²
C. 77cm² D. 84cm²

35. A triangle has vertices P(-1, 6), Q(-3, -4) and R(1, - 4). Find the midpoints of PQ and QR respectively.

A. 20⁰ B. 10⁰
C. 40ᵁ D. 30ᵁ

28. If $\pi/_2 \leq 2\pi$, find the maximum value of $f(\theta) = 4/6 + 2\cos\Theta$

A. 1 B. ½
C. 4 D. 2/3

A. (-1, 0) and (-1, -1) B. (-2, 1) and (-1, -4)
C. (0, -1) and (-1, -4) D. (-2, 1) and (0, 1)

$$\int$$

36. Evaluate $\int_{2}^{3}(x^2 - 2x)dx$

A. 4/3 B. 1/3
C. 2 D. 4

37. If y = 3 sin (-4x), dy/ dx is
A. -12 cos (-4x) B. 12 sin (-4x)
C. 12x cos (4x) D. 12x cos (

38. Determine the maximum value of $y = 3x^2 + 5x - 3$ at
A. 6 B. 0
C. 2. D. 4
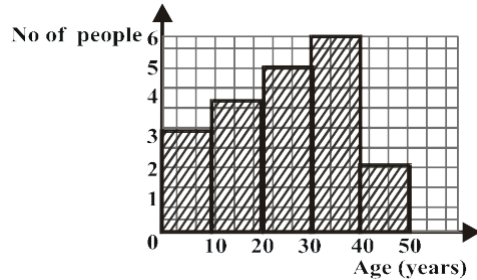
39. Find the slope of the curve $y = 2x^2 + 5x - 3$ at (1, 4).

A.	7	B.	9
C.	4	D.	6

40.

No of people

Age (years)

The histogram above shows the ages of the victims of a pollution. How many people were involved in the pollution?

A. 18 B. 21
C. 15 D. 20

41.

Value	0	1	2	3	4
Frequency	1	2	2	1	9

Find the mean of the distribution above.
A. 4 B. 3
C. 1 D. 2

42. The mean of the numbers 3, 6, 4, x and 7 is 5. find the standard deviation
A. 2 B. 3
C. √3 D. √2

43. A bag contains 5 blsck ball and 3 red balls. Two balls are picked at random without replacement. What is the probability that a black and a red balls are picked?
A. 5/14 B. 13/28
C. 3/14 D. 15/28

44. On a pie chart, there are four sectors of which three angles are 45⁰, 90⁰ and 135⁰. if the smallest sector represents #28.00, how much is the largest sector?

A.	#48.00	B.	#96.00
C.	#42.00	D.	#84.00

45. The range of 4, 3, 11, 9, 6, 15, 19, 23, 27, 24, 21 and
16 is
A. 23 B. 24
C. 21 D. 16

46.

Number	1	2	3	4	5	6
Frequency	12	2	x	21	x -	28

The result of tossing a fair die 120 times is summarized above. Find the value of x.
A. 21 B. 19
C. 22 D. 20

47. If $^nP_3 - 6\ (^nC_4) = 0$, find the value of n
A. 6 B. 5
C. 8 D. 7

48. Two dice are thrown. What is the probability that the sum of the numbers is divisible by 3.
A. ½ B. 1/3
C. ¼ D. 2/3

49. Find the number of committees of three that can be formed consisting of two men and one woman from four men and three women?
A. 24 B. 1
      8

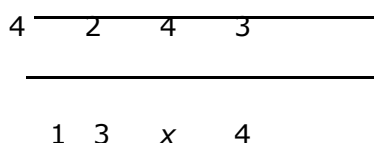50. By how much is the mean of 30, 56, 31, 55, 43 and 44 less than the median.
A. 0.50 B. 0.75
C. 0.17 D. 0.33

Mathematics 2004

C.	(0, 0) and (1, 1)	D.	(√2, √2) only

1

4 ― 2   4   3
―――――――――
―
    1   3   x   4

A	$2\frac{25}{}$	B.	$^{19}/_{60}$
C	$7\frac{12}{}$	D.	$^{19}/_{35}$

4. A farmer planted 5000 grains of maize and harvested 5000 cobs, each bearing 500 grains. What is the ratio of the number of grains sowed to the number

Find x and y respectively in the subtraction above c arried out in base 5

A.	2, 4	B.	3, 2
C.	4, 2	D.	4, 3

2. Find p, if $-p_7 =$
451_6 305_6

A.	$61\ 1_7$	B.	142_7
C.	116_7	D.	62_7

3. $\frac{1}{1} \times \frac{2}{3}_4$
$+ \frac{1}{1}$

$\frac{1}{2} \div \frac{3}{5} - \frac{1}{4}$

5. Three teachers shared a packet of chalk. The first teacher got 2/5 of the chalk and the second teacher received 2/15 of the remainder. What fraction did the third teacher receive?

A.	$^{11}/_2$	B.	$^{12}/$
C.	$^{13}/_2$	D.	$^{8}/_1$

6. Given that $3\sqrt{4^{2x}}$, find the value of x

A.	2	B.	3
C.	4	D.	6

7. Simplify $1/\sqrt{3} + 2$ in the form $a + b\sqrt{3}$

    A. $-2 - \sqrt{3}$ B. $-2 + \sqrt{3}$
    C. $2 - \sqrt{3}$ D. $2 + \sqrt{3}$

8. If $6\log 2 - 3\log 3 = 3\log 0.2$, find x.

    A. $3/8^x$ B. $3/8^5$
    C. 8^x D. 8^x

9.
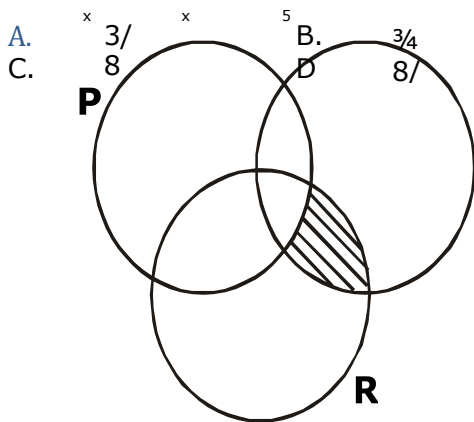
The shaded region in the venn diagram above

    A. $P^c \cap (QR)$ B. $P \cap Q$
    C. $P^c \cup (Q \cap R)$ D. $P^c \cap (Q \cup R)$

10. In a class of 40 students, each student offers at least one of Physics and Chemistry. If the number of

    students that offer Physics is three times the number that offer both subjects and the number that offers Chemistry is twice the number that offer Physics, find the number of students that offer Physics only.

    A.   25   B.   15
    C.   10   D.   5

11. Find the values of x where the curve $y = x^3 + 2x^2 - 5x - 6$ crosses the x-axis.

    A.   -2, -1 and 3   B.   -2, 1 and -3
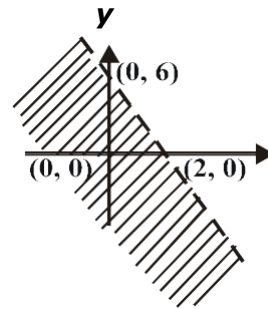   C.   2, -1 and -3   D.   2, 1 and 3

12. Find the remainder when $3x^3 + 5x^2 - 11x +$ is divided by $x + 3$

    A.   4   B.   1
    C. -1 D.   4

13. Factorize completely $ac - 2bc - a^2 + 4b^2$

    A. $(a - 2b)(c + a - 2b)$
    B. $(a - 2b)(c - a - 2b)$

16.

The shaded area in the diagram above is represented by

    A. $\{(x, y) : y + 3x < 6\}$
    B. $\{(x, y) : y + 3x < -6\}$
    C. $\{(x, y) : y - 3x < 6\}$
    D. $\{(x, y) : y - 3x < -6\}$

17. What are the integral values of x which satisfy the inequality $-1 < 3 - 2x \leq 5$?

    A.   -2, 1, 0, -1   B.   -1, 0, 1, 2
    C.   -1, 0, 1,   D.   0, 1, 2

18. The nth terms of two sequences are $Q_n = 3.2^{n-2}$ and $U_m = 3.2^{2m - 3}$. find the product of Q_2 and U_2

    C. $(a - 2b)(c + a + 2b)$
    D. $(a - 2b)(c - a + 2b)$

A. 3   B. 6
C. 12   D. 18

19. Given that the first and fourth terms of a G.P are 6 and 162 respectively, find the sum of the first three terms of the progression.

20. Find the sum to infinity of the series ½, 1/6, 1/ 18,……………

14. y is inversely proportional to x and y = 4 when x = 1/ 2 . find x when y = 10
   A. 1/10   B. 1/5

15. The length L of a simple pendulum varies directly as the square of its period T. if a pendulum with period 4 secs is 64cm long, find the length of a pendulum whose period is 9 sec.
   A. 36cm   B. 96ccm
   C. 144cm   D. 324cm

21. If the operation * on the set of integers is defined by p*q = "pq, find the value of 4*(8*32).
   A. 4   B. 8
   A. 8   B. 27
   C. 48   D. 78

22. The inverse of the matrix $\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$
   A. 1   B. ¾
   C. 2/3   D. 1/3
   A. $\begin{pmatrix} 1 & 1 \\ -1 & 2 \end{pmatrix}$ B. $\begin{pmatrix} 1 & -1 \\ 1 & 2 \end{pmatrix}$
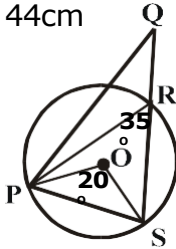   C. $\begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$ D. $\begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$

23. If P = $\begin{pmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ -1 & 0 & 1 \end{pmatrix}$ then /P/ is
   A. 8   B. 0
   C. 4   D. 8

24. The sum of the interior angles of a pentagon is 6x + 6y. find y in terms of x

A. $y = 60 - x$ B. $y = 90 - x$

C. $y = 120 - x$ D. $y = 150 - x$

A. (4, -4)   B. (4, 4)

C. (2, 2)   D. (1,1)

25. PQRSTV is a regular polygon of side 7cm inscribed in a circle. Find the circumference of the circle PQRSTV.
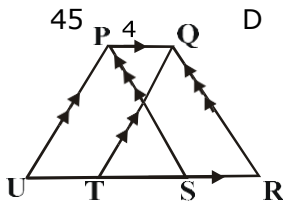   A. 22cm   B. 42cm
   C. 44cm   D. 56cm

26.

P, R and S lie on a circle centre O as shown above
while Q lies outside the circle. Find ÐPSO.
A. 35^0 B. 40^0
C. 55^0

27.

In the diagram above, PQ =4cm and TS = 6cm, if the area of parallelogram PQTU is 32cm², find the area

of the trapezium PQRU
A. 24cm²   B. 48cm²
C. 60cm²   D. 72cm²

28. An arc of a circle of length 22cm subtends an angle of $3x^0$ at the centre of the circle. Find the value of x if the diameter of the circle is 14cm.
   A. 30^0 B. 60^0
   C. 120^0 D. 180^0

Det mine the   of a
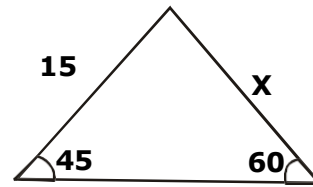
29.

which is equidistant from PQ and QR
A. The diagonal PR.   B. The diagonal QS
C. Side SR
D. The perpendicular bisector of PQ.

28.

Find the value of x in the figure above.
A. $20\sqrt{6}$ B. $15\sqrt{6}$

29. The shadow of a pole $5\sqrt{3}$ m high is 5m. find the angle of elevation of the sun.
   A. 30^0 B. 45^0
   C. 60^0 D. 75^0

35. Find derivative of with x
   A. $6x - 1$ B. $1 - 6x$
   C. 6   D. 3

36. Find the derivative of the function $y = 2x^2(2x - 1)$ at the point x= -1
   A. -6   B. 4
   C. 16   D. 18

37. If $y - 3 \cos (^x/_3)$, find $^{dy}/_{dx}$ when $x = ^{3\pi}/_2$
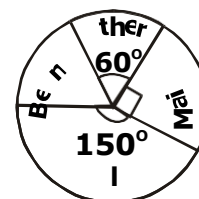   A. 2   B. 1
   C. -1 D. 3

38. What is the rate of change of the volume v of hemisphere with respect to its radius r when r = 2?
   A. 2π B. 4π
   C. 8π D. 16π

$$\int$$

A. $6^2/_3$ B. $^2/_3$
C. $^{-2}/_3$ D. $-6^2/_3$

40.

30. The locus of a point which is 5cm from the line LM is a
A. pair of lines on opposite sides of LM and parallel to it, each distances 5cm form LM
B. line parallel to LM and 5cm from LM
C. pair of parallel lines on one side of LM and parallel to LM
D. line distance 10cm from LM and parallel to LM.

31. Find the value of $\alpha^2 + \beta^2$ if a + b = and the distance between the points $(1, \alpha)$ ands $(\beta, 1)$ is 3 units.
A. 3   B. 5
C. 11   D. 14

32. Find the midpoint of the line joining P(-3, 5) and Q (5, -3).

Mi let

The pie chart above shows the distribution of the crops harvested from a farmland in a year. If 3000 tonnes of millet is harvested, what amount of beans is harvested?
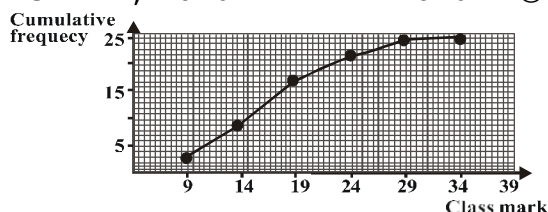A. 9000 tonnes   B. 6000 tonnes
C. 1500 tonnes   D. 1200 tonnes

41. I. Rectangular bars of equal width
II. The height of each rectangular bar is proportional to the frequency of the3 corresponding class interval.
III. Rectangular bars have common

sides with no gaps in between.

A histogram is described by
A.   I and II   B.   I and III
C.   I,II and III D.   II and III®

42.

The graph above shows the cumulative frequency curve of the distribution of marks in a class test. What percentage of the students scored more than 20 marks?
A.   68%   B.   28%

43.   The mean age of a group of students is 15 years. When the age of a teacher, 45 years old, is added to the ages of the students, the mean of their ages becomes 18 years. Find the number of students in the group.
A.   7   B.   9
C.   15   D.   42

44.   The weights of 10 pupils in a class are 15kg, 16kg, 17kg, 18kg, 16kg, 17kg, 17kg, 17kg, 18kg and 16kg.

What is the range of this distribution?
A.   1   B.   2

¼

C.   3   D.   4

45.   Find the mean deviation of 1, 2, 3 and 4
A.   1.0   B.   1.5
C.   2.0   D.   2.5

46.   In how many ways can 2 students be selected from a group of 5 students in a debating competition?
A.   10 ways.   B.   15 ways.
C.   20 ways   D.   25 ways.

47.   A committee of six is to be formed by a state governor from nine state commissioners and three members of the state house of assembly. In how many ways can the members of the committee be chosen so as to include one member of the house of assembly?
A.   924 ways   B.   840 ways
C.   462 ways   D.   378 ways

48.   Some white balls were put in a basket containing twelve red balls and sixteen black balls. If the probability of picking a white ball from the basket is $3/7$, how many white balls were introduced?
A.   32   B.   28
C.   21   D.   12

49.   An unbiased die is rolled 100 times and the outcome is tabulated as follows:

No . of days	1	2	3	4	5	6
No . of students	20	x	50	40	2x	60

What is the probability of obtaining 5?
A. $1/6$ B. $1/$
C.
D. $1\tfrac{5}{2}$

50.   A container has 30 gold medals, 22 silver medals and 18 bronze medals. If one medal is selected at random from the container, what is the probability that it is not a gold medal?
A. $4/7$ B. $3/7$
C. $11/3$ D. $9/3$