

2019

MATHEMATICS

Full Marks – 80

Pass Marks – 20

Time : Three hours

Attempt **all** questions.

The figures in the right hand margin indicate full marks for the questions.

1. For any natural number n , the digital root of 7^n cannot be: 1

n ට 7^n ඩිජිටල් රූට් වන ස්ථිර සංඛ්‍යාවක් නොවන බව පෙන්වන්න, 7^n හි digital root වන සංඛ්‍යාවක් නොවන බව පෙන්වන්න:

- (A) 1
(B) 4
(C) 6
(D) 7

2. The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is a dependent pair if: 1

සමාන්තර රේඛා සමාසයක්, $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ යන රේඛා සමාසයක් රේඛා සමාසයක් වන්නේ නම්:

- (A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
(B) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$
(C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
(D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Contd.

3. The 15th term of an AP exceeds the 22nd term by 35 ; the common difference of the AP is : 1

AP ພາກພາຍ 15 ລຸ້ນ term ຕ 22 ລຸ້ນ term ສາຍ 35 ຮ່ວມ; AP ພາກພາຍ common difference ສາຍ ມາຍາຍາຍ :

- (A) - 5
(B) 5
(C) - 7
(D) 7

4. The coordinates of the point which divides the line segment joining the points (x_1, y_1) and (x_2, y_2) internally in the ratio of $m : n$ are : 1

(x_1, y_1) ພາກພາຍ (x_2, y_2) ຮ່ວມ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ $m:n$ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ ມາຍາຍາຍ coordinate ມາຍາຍາຍ ມາຍາຍາຍ :

- (A) $(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n})$
(B) $(\frac{mx_1 + ny_1}{m+n}, \frac{mx_2 + ny_2}{m+n})$
(C) $(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m+n})$
(D) $(\frac{mx_1 - ny_1}{m-n}, \frac{mx_2 - ny_1}{m-n})$

5. The circumference of a circle is 168 cm. If the sectorial angle of a sector of the circle is 120° , then the length of arc of the sector in cm is : 1

Circle ພາກພາຍ circumference 168 cm ຕ. Circle ພາກພາຍ sector ພາກພາຍ sectorial angle 120° ພາກພາຍ sector ພາກພາຍ arc ພາກພາຍ ພາກພາຍ cm ສາຍ ມາຍາຍາຍ :

- (A) 55
(B) 56
(C) 54
(D) 57

14. Let $P(x)$ be any polynomial of degree ≥ 1 and let a be any real number. If $P(x)$ is divided by the linear polynomial $x - a$, prove that the remainder is $P(a)$. 2

$P(x)$ වගේ degree ≥ 1 වෙලා polynomial වෙලා a ට real number වෙලා $P(a)$ ටේලා $\parallel P(x)$ $x - a$ වෙලා linear polynomial වගේ $P(a)$ වෙලා වෙලා $P(a)$ වෙලා වෙලා \parallel

15. If $x^2 + px + q$ and $x^2 + rx + s$ are both divisible by $x - a$, show that $a = \frac{s - q}{p - r}$. 2

$x^2 + px + q$ වෙලා $x^2 + rx + s$ වෙලා $x - a$ ට $a = \frac{s - q}{p - r}$ වෙලා \parallel

16. If a be the first term and d be the common difference of an AP. Show that the n^{th} term of the AP is given by $a_n = a + (n - 1)d$. 2

AP වෙලා a වෙලා d වෙලා $a_n = a + (n - 1)d$ වෙලා \parallel

17. If α, β are the roots of $2x^2 - 5x + 1 = 0$, find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$. 2

$2x^2 - 5x + 1 = 0$ වගේ root වගේ α, β වෙලා $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ වගේ \parallel

18. A solid metallic hemisphere of diameter 28 cm. is melted and recast into a number of cones each of radius 7 cm and height 16 cm. Find the number of cones so formed. 2

Diameter 28 cm. වෙලා 7 cm වෙලා 16 cm වෙලා cone වෙලා \parallel

19. Factorise : 3

Factorise କର୍ତ୍ତବ୍ୟ :

$$a^2(b + c) + b^2(c+a) + c^2(a+b) + 2abc$$

20. For any positive integral number n show that $n(n + 1)(n + b)$ is divisible by 6. 3

n ଏକ ଧନାତ୍ମକ positive integer ଏବଂ ଏହାକୁ $n(n + 1)(n + b)$ ଏକ 6 ଦ୍ୱାରା ବିଭାଜ୍ୟ ହେବ ବୋଲି ପ୍ରମାଣ କର ।

21. Solve graphically : 3

Graph ଉପରେ ସମାଧାନ କର :

$$2x + y = 8$$

$$x - 3y + 3 = 0$$

22. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre. 3

Circle ଏବଂ parallel ଏକ tangent ଏକ ଅନ୍ୟ tangent ଏବଂ ଏହାଙ୍କ ମଧ୍ୟରେ ଥିବା ଖଣ୍ଡ (intercept) ଏହା circle କୁ କେନ୍ଦ୍ର ଠାରୁ right angle ଏବଂ ଲମ୍ବ ଭାବରେ ଗଠିତ ହେବ ।

23. Calculate the values of trigonometric ratios of 45° . 3

45° ର trigonometric ratio ରାଶିଗୁଡ଼ିକ ଗଣନା କର ।

24. If three straight lines are drawn on a white board at random with the eyes closed, show that the probability of forming a triangle is $\frac{1}{7}$. 3

White board ଏବଂ ତିନି ଲମ୍ବ ରେଖା ଯଦି ଅକାମରେ ଡାକି ଚିତ୍ରିତ କରାଯାଏ ତେବେ ଏହା ଏକ ତ୍ରିଭୁଜ ଗଠିତ କରିବାର probability ଏକ $\frac{1}{7}$ ହେବ ବୋଲି ପ୍ରମାଣ କର ।

25. If x, y are any real numbers and d , a positive real number prove that $|x - y| < d$ if and only if $y - d < x < y + d$. 4

x, y ට ඒකඛණ්ඩ real number ටිකි වැසලූ d ට positive real number ඒකඛණ්ඩ ගැලපේදී :

$$|x - y| < d \Leftrightarrow y - d < x < y + d$$

26. A motor boat whose speed is 15 km/hr in still water takes 1 hour longer to go 36 km upstream than to return downstream to the same spot. Find the speed of the stream. 4

රැකුණු නලිකා වේගය 15 km/hr වන motor boat වැසලූ නැංවිලි වේගය 36 km ඉහලට, නැංවිලි වේගය 36 km පහලට ඉහලට ගිය විට 1 hour වැඩි වේගයක් ගනී. || නැංවිලි වේගය සොයන්න. ||

OR/ඉවහරණය

In an auditorium, the seats are so arranged that there are 10 seats in the first row, 13 seats in the second, 16 seats in the third etc. thereby increasing the number of seats by 3 every next row. If there are 64 seats in the last row, how many rows of seats are there in the auditorium? Also find the total number of seats in the auditorium.

Auditorium වැසලූ අවස්ථාවේ වේගය 10, වැඩිවන ගණන 10, 13, 16 වැනි වේගය 3 වැඩිවන ගණන 64 වේගය auditorium වැසලූ අවස්ථාවේ ගණන සොයන්න. || Auditorium වැසලූ අවස්ථාවේ ගණන සොයන්න. ||

27. Find the area of a triangle ABC with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$. 4

$A(x_1, y_1)$, $B(x_2, y_2)$ වැසලූ $C(x_3, y_3)$ ට vertex ටිකි වැසලූ triangle ABC ට area සොයන්න. ||

28. State and prove Basic Proportionality Theorem. 5

Basic Proportionality Theorem ටිකි වේගය වැසලූ ගැලපේදී :

OR/උපදෙසුණා

If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, prove that the triangles on each side of the perpendiculars are similar to the whole triangle and to each other.

Right triangle ඔසාත් right angle කුණාත් vertex ජාණ් perpendicular ඔසා hypotenuse ක් රැඹට්ටනි, perpendicular කුණාත් ටෙඹාච ඔඨාසිඹාච ටේණිච triangle ඔඨාසි ඔසාත් ඔසාත් ඔසාත් triangle සභාසමකුණාත් similar ඔච්ච් ටේච ආභාසිච ජේ ||

29. Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{5}{3}$ of the corresponding sides of the triangle ABC. Write the steps of construction. 2+3 = 5

ඔසාත් triangle ABC ක් similar ඔච්ච්, side ලාඹකුඨ ABC ආත් ටේච side ලාඹාත් $\frac{5}{3}$ ඔච්ච් triangle ඔසා construct ජේ || construction ආත් සභාසමකුණාත් කසු ||

OR/උපදෙසුණා

Divide a given line segment AB internally in the ratio 4 : 3. Write the steps of construction.

ඔසාත් ටේච සභාසම AB ටු 4:3 ටේච ratio ක් සභාසම ටේච ක් || construction ආත් සභාසමකුණාත් කසු ||

30. The pilot of an aeroplane observes that the angle of depression of a kilometer stone on a straight road on a horizontal ground is 30° when his aeroplane is at particular altitude. When he increases the altitude by 300m the angle of depression of the next kilometer stone is 60° . Find the altitude of the aeroplane when the first observation is made. 5

Aeroplane ඔසාත් pilot ඔසාත් සොණ් aeroplane ඔසාත් ඔසාත් altitude ඔසාත් ටේණිඹිඹි horizontal ඔච්ච් ටේච කිලෝමීටර් පඤ්ඤා ඔසාත් ඔසාත් ටේච kilometer stone ඔසාත් angle of depression ඔසාත් 30° ටේච ඊඹ || ඔඨා සොණ් altitude ඔසාත් 300m ටේච කිලෝමීටර් stone ඔසාත් angle of depression ඔසාත් 60° ඔච්ච් || ඔච්ච් ටේච ඔසාත් ඔසාත් ටේච aeroplane ඔසාත් altitude ඔසාත් ඔසාත් ||

31. A cone of height H , is divided into two parts by a plane through the mid-point of the axis of the cone and parallel to the base. Find the ratio of curved surface area of the conical part to that of the frustum. 6

H ઝેડ cone ઘઠ, ઠેઠ axis ઠેઠ ઠેઠ ઠેઠ ઠેઠ base ઠેઠ parallel ઠેઠ plane ઠેઠ ઠેઠ ઠેઠ ઠેઠ ઠેઠ \parallel cone ઠેઠ ઠેઠ ઠેઠ ઠેઠ ઠેઠ area ઠેઠ frustum ઠેઠ ઠેઠ ઠેઠ area ઠેઠ ratio ઠેઠ ઠેઠ \parallel

32. Find the mean, median and mode of the following distribution : 6
ઠેઠ ઠેઠ distribution ઠેઠ mean, median ઠેઠ mode ઠેઠ :

Class	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
Frequency	6	9	11	14	22	13	10	8	7