CARMEL DIVINE GRACE FOUNDATION SECONDARY SCHOOL

SECOND TERM EXAMINATION 2020 – 2021

SECONDARY VI MATHEMATICS Compulsory Part

PAPER 2

Name : ________________________ (   ) **Date : 23 – 2 – 2021**

Time : $1\frac{1}{4}$ hours

Class : S. 6 ____ **No. of pages : 12**

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first insert the information required in the spaces provided.
2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF PAPER**' after the last question.
3. All questions carry equal marks.
4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. No marks will be deducted for wrong answers.

There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. $3pq-3+pqr-r=$

   A. $(pq+1)(r-3)$. B. $(pq-1)(r+3)$.
   C. $(p-1)(qr+3)$. D. $(p+1)(qr-3)$.

2. $\dfrac{3^{2n}\cdot 49^{n}}{7^{n}}=$

   A. 21^{n} . B. 21^{2n} . C. 21^{3n} . D. 63^{n} .

3. If $z=\sqrt{\dfrac{1-xy}{1+xy}}$, then $x=$

   A. $\dfrac{1-z^{2}}{y(1+z^{2})}$. B. $\dfrac{y(1+z^{2})}{1-z^{2}}$. C. $\dfrac{1+yz^{2}}{1-yz^{2}}$. D. $\dfrac{1-yz^{2}}{1+yz^{2}}$.

4. $\dfrac{1}{\sin^{2}50^\circ}=$

   A. 1.70 (cor. to 2 sig. fig.). B. 1.7041 (cor. to 5 sig. fig.).
   C. 1.7040 (cor. to 4 d.p.). D. 1.70410 (cor. to 5 d.p.).

5. If $1<m<4$ and $2<n<5$, then

   A. $\dfrac{1}{2}<\dfrac{n}{m}<\dfrac{4}{5}$. B. $\dfrac{1}{2}<\dfrac{n}{m}<5$.
   C. $\dfrac{4}{5}<\dfrac{n}{m}<2$. D. $1<\dfrac{n}{m}<\dfrac{5}{4}$.

6. If $f(x)=x^{2}+x-1$, then $f(x)-f(x-1)=$

   A. 0. B. 1. C. $2x$. D. $4x$.

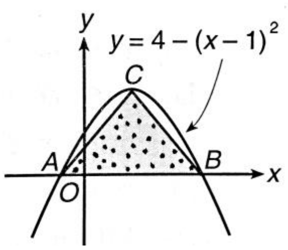
7. If $F(x)=(2x-1)Q(x)+R$, where $F(x)$ and $Q(x)$ are polynomials in x and R is a real constant, find the remainder when $F(x)$ is divided by $1-2x$.

   A. R B. $-R$
   C. $\dfrac{R}{2}$ D. It cannot be determined.

8. If $(x+1)(x-2)+(x+2)^2 \equiv A(x^2+1)+Bx$, find the values of A and B.

A. $A=2,\ B=3$
B. $A=2,\ B=1$
C. $A=1,\ B=1$
D. $A=1,\ B=-1$

9. The figure shows the graph of $y=4-(x-1)^2$ which cuts the x-axis at A and B. If C is the vertex of the graph, find the area of ΔABC.



A. 4 sq. units
B. 6 sq. units
C. 8 sq. units
D. 16 sq. units

10. A sum of \$$P$ is deposited at an interest rate of 8% per annum for 4 years, compounded half-yearly. Find the interest.

A. $\$P(1+8\%)^4$
B. $\$P\left[(1+4\%)^4-1\right]$
C. $\$P\left[(1+4\%)^8-1\right]$
D. $\$P\left[(1+8\%)^4-1\right]$

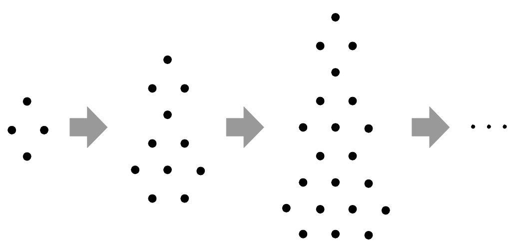
11. The daily wages of a skilled worker and an unskilled worker are in the ratio of 3 : 2. In a day, a skilled worker has to work for 8 hours while an unskilled worker has to work for 10 hours. Their hourly wages are in the ratio

A. 3 : 2.
B. 5 : 6.
C. 6 : 5.
D. 15 : 8.

12. If $x \propto y^2$ and $x \propto \frac{1}{z}$, where $y>0$, find the percentage change in y when z is increased by 44%.

A. Decreased by 20%
B. Increased by 20%
C. Decreased by $16\frac{2}{3}\%$
D. Increased by $16\frac{2}{3}\%$

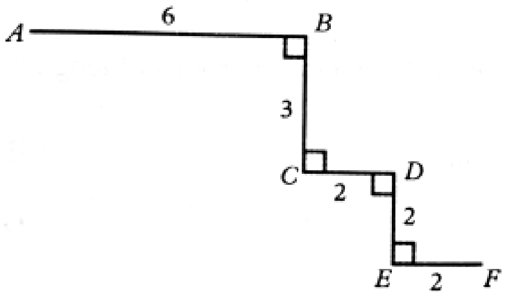
13.



In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(3n+4)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 50
B. 69
C. 87
D. 91

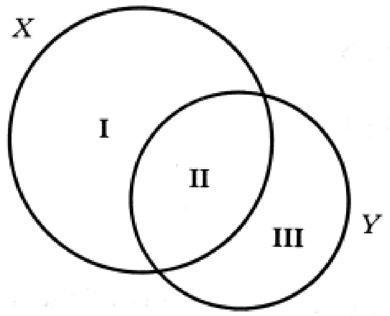
14.



In the figure, the length of the line segment joining A and F is

A. 8.　　B. 10.　　C. $\sqrt{125}$.　　D. 12.

15. In the figure, X and Y are two circles.

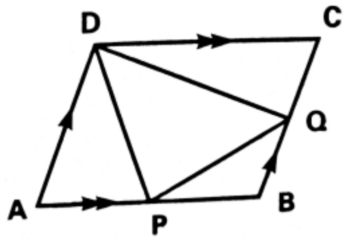


If (area of region I) : (area of region II) : (area of region III) $= 6:3:3$, then (radius of X) : (radius of Y) =

A. 3 : 1.　　B. 3 : 2.

C. $2:\sqrt{6}$.　　D. $3:\sqrt{6}$.

16. In the figure, P and Q are the mid-points of AB and BC respectively of parallelogram $ABCD$.



$\dfrac{\text{Area of } \Delta DPQ}{\text{Area of } ABCD} =$

A. $\dfrac{3}{8}$.　　B. $\dfrac{1}{2}$.　　C. $\dfrac{5}{8}$.　　D. $\dfrac{3}{4}$.

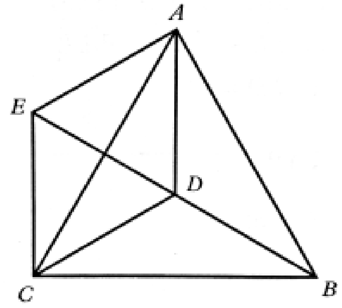
17. In the figure, ΔABC and ΔCDE are equilateral triangles. D lies inside ΔABC. Which of the following triangles must be congruent?

I. ΔADB

II. ΔACE

III. ΔBCD

IV. ΔACD



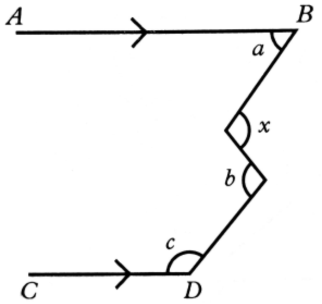
A. I and II

B. I and III

C. II and III

D. II, III and IV

18. In the figure, AB // CD.



Find x.

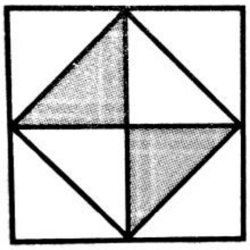
A. $a+b-c$

B. $a-b+c$

C. $180°-a-b-c$

D. $a+b+c-180°$

19.



The number of axes of reflectional symmetry of the above figure is

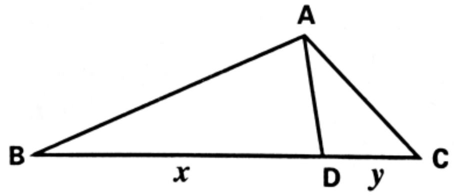
A. 1.

B. 2.

C. 4.

D. 8.

20. In the figure, $BD = x$ and $DC = y$.



Given the area of ΔADC is S, the area of ΔABC is

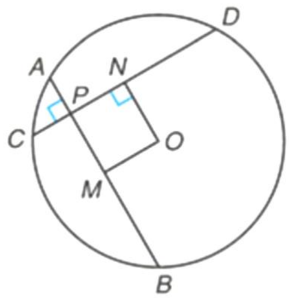
A. $\frac{S(x+y)}{x}$.

B. $\frac{S(x+y)}{y}$.

C. $\frac{S(x^2+y^2)}{x^2}$.

D. $\frac{S(x^2+y^2)}{y^2}$.

21.



In the figure, O is the centre of the circle. AB and CD are equal chords intersecting at P where $\angle APC = 90°$. M and N are two points on AB and CD respectively, where M is the midpoint of AB and $ON \perp CD$.

If $ON = 4$ and $PD = 11$, then $CP =$

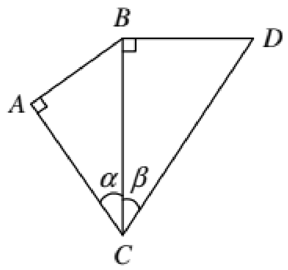
A. 3.

B. 3.125.

C. 4.

D. 4.5.

22. In the figure, $BA \perp AC$ and $DB \perp BC$. $BC = 2$.



The area of quadrilateral $ACDB =$

A. $2(\tan\alpha + \sin\beta\cos\beta)$.

B. $2(\sin\alpha\cos\alpha + \tan\beta)$.

C. $2(\tan\alpha + \tan\beta)$.

D. $2\sin(\alpha+\beta)$.

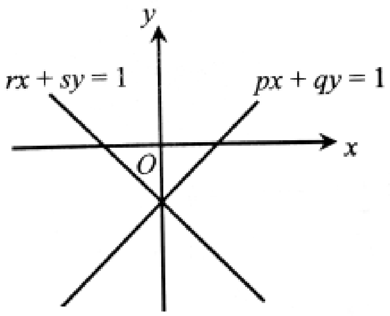
23. In the figure, the two straight lines intersect at a point on the y-axis.

Which of the following must be true?

I. $p > 0$

II. $s < 0$

III. $q + r = 0$



A. I and II only
B. I and III only
C. II and III only
D. I, II and III

24. A line L passing through a point M(3, 2) cuts the x-axis at A and y-axis at B. If $AM = MB$, find the equation of L.

A. $x + 2y - 7 = 0$
B. $x + 3y - 9 = 0$
C. $2x + 3y - 12 = 0$
D. $3x + 2y - 13 = 0$

25. The rectangular coordinates of the point P are $(-6,\ 2\sqrt{3})$. If P is rotated anticlockwise about the origin through $270°$, then the polar coordinates of its image are

A. $(\sqrt{3},\ 60°)$.
B. $(\sqrt{3},\ 240°)$.
C. $(4\sqrt{3},\ 60°)$.
D. $(4\sqrt{3},\ 240°)$.

26. The equations of the circles C_1 and C_2 are $x^2 + y^2 - 6x + 4y - 23 = 0$ and $3x^2 + 3y^2 - 12x - 18y - 23 = 0$ respectively. Let G_1 and G_2 be the centres of C_1 and C_2 respectively. Denote the origin by O. Which of the following is/are true?

I. The radii of C_1 and C_2 are equal.

II. O is equidistant from G_1 and G_2.

III. $OG_1 \perp OG_2$

A. II only
B. I and II only
C. I and III only
D. II and III only

27. The coordinates of the points M and N are $(4,\ -2)$ and $(-2,\ 1)$ respectively. Let P be a moving point in the rectangular coordinate plane such that $2MP = NP$. Find the equation of the locus of P.

A. $x^2 + y^2 - 12x + 6y + 25 = 0$
B. $x^2 + y^2 - 12x - 3y + 20 = 0$
C. $x^2 + y^2 + 6x + 3y - 15 = 0$
D. $x^2 + y^2 + 6x - 3y + 25 = 0$

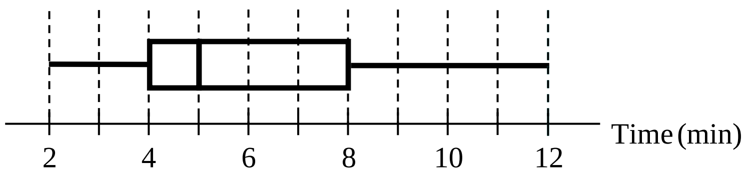
28. The stem-and-leaf diagram below shows the distribution of time (in hours) spent on exercise by a group of people in a month.

Stem (tens)	Leaf (units)
0	5 7
1	1 3 3 5 8 9 9 9
2	x 1 4 4 7 8 y
3	0 5 6

A man is randomly selected from the group. Find the probability that the time spent on exercise by the selected man is not less than 20 hours and not more than 30 hours.

A. $\frac{9}{20}$ B. $\frac{2}{5}$ C. $\frac{7}{20}$ D. $\frac{3}{10}$

29. The box-and-whisker diagram below shows the distribution of the waiting times (in min) of a group of passengers of a certain bus route.



Which of the following must be true?

A. The minimum waiting times is 4 min.

B. The mean of the waiting times is 5 min.

C. The range of the distribution is 10 min.

D. Exactly half of the passengers have waiting times less than 7 min.

30. Let a, b, c and d be the mean, the median, the mode and the range of the set of numbers $\{x-8,\ x-6,\ x-4,\ x-2,\ x,\ x,\ x,\ x,\ x,\ x+2\}$ respectively. Which of the following must be true?

I. $a < b$

II. $b < c$

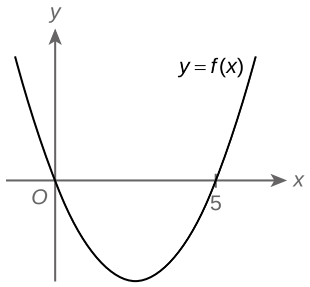
III. $c < d$

A. I only B. II only

C. I and III only D. II and III only

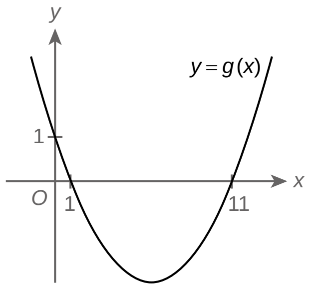
Section B

31.

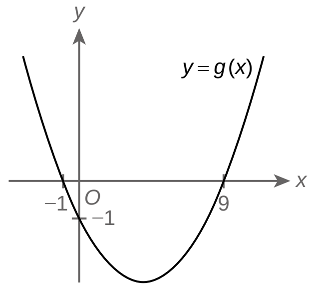


The figure above shows the graph of $y = f(x)$. If $g(x) = f\left(\dfrac{x-1}{2}\right)$, which of the following may represent the graph of $y = g(x)$?

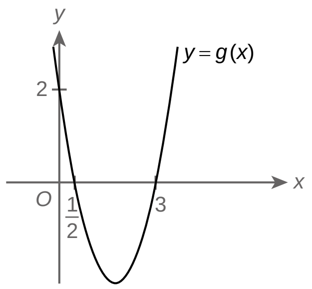
A.



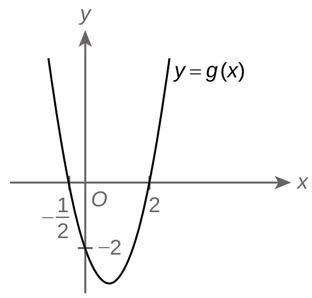
B.



C.



D.



32. Each of the numerals 2, 3, 4, 5, 6, 7, 8, 9 is used once to form an 8-digit number. How many 8-digit numbers can be formed if multiples of 4 are not placed next to each other?

A. 1440 B. 10080 C. 30240 D. 35280

33. $14 \times 16^{12} + 12 \times 16^{8} + 2^{4} - 15 =$

A. $E000C0000001F_{16}$.
B. $E000C00000001_{16}$.
C. $D000B0000001F_{16}$.
D. $D000B00000001_{16}$.

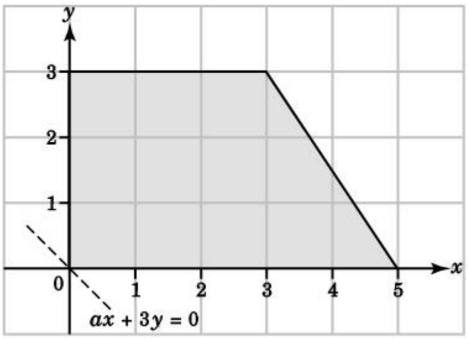
34. If $\log_3 (5x-2)^2 = 4$, then $x =$

A. $\dfrac{102}{5}$.
B. $-\dfrac{98}{5}$ or $\dfrac{102}{5}$.
C. $\dfrac{11}{5}$.
D. $-\dfrac{7}{5}$ or $\dfrac{11}{5}$.

35. The imaginary part of $\dfrac{i(i-\sqrt{3})}{1+\sqrt{3}}$ is

A. $\dfrac{-3+\sqrt{3}}{2}$.   B. $\dfrac{-3+\sqrt{3}}{2}i$.   C. $\dfrac{-1-\sqrt{3}}{2}$.   D. $\dfrac{-1-\sqrt{3}}{2}i$.

36.



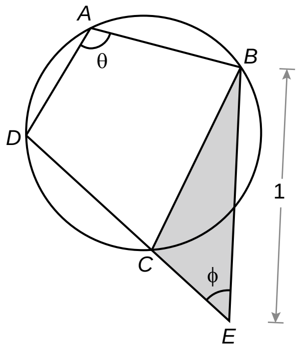
In the figure, the shaded region is the feasible region of the linear function $P=ax+3y$, where $a>0$. The coordinates of the vertices of the feasible region are integers. If P attains its maximum value 30 at one point in the feasible region, then $a=$

A. 6.   B. 7.   C. 8.   D. 9.

37. $5\sqrt{5\sqrt{5\sqrt{5...}}}=$

A. 1.   B. $\sqrt{5}$.   C. 5.   D. 25.

38. In the figure, *DCE* is a straight line.



Find the area of ΔBCE.

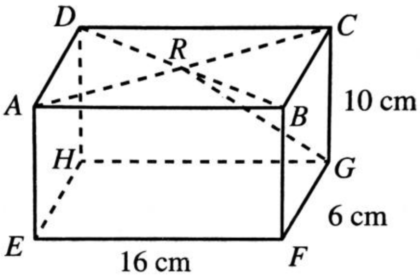
A. $\dfrac{\sin\phi}{2\sin(\theta+\phi)\sin\theta}$ B. $\dfrac{\sin(\theta+\phi)\sin\phi}{2\sin\theta}$

C. $\dfrac{\sin\theta\ \sin\phi}{2\sin(\theta+\phi)}$ D. $\dfrac{\sin(\theta+\phi)}{2\sin\theta\ \sin\phi}$

39. For $0° \le x \le 360°$, how many roots does the equation $\sin x \cos x = \cos x$ have?

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

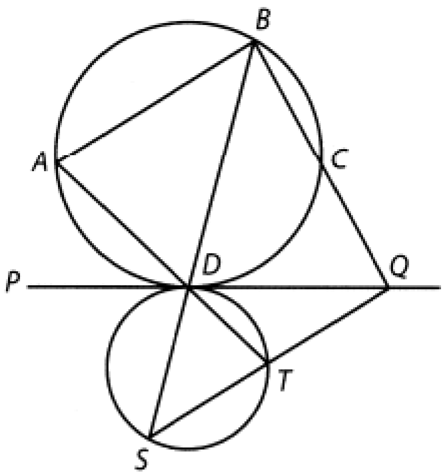
40. In the figure, *ABCDHEFG* is a rectangular block. *AC* and *BD* meet at a point *R*.



If θ is the angle between the line *RG* and the plane *BCGF*, then $\tan\theta =$

A. $\frac{10}{\sqrt{73}}$. B. $\frac{\sqrt{73}}{10}$. C. $\frac{8}{\sqrt{109}}$. D. $\frac{\sqrt{173}}{\sqrt{109}}$.

41. In the figure, *PDQ* is a common tangent to the circles *ABCD* and *DTS*, where *D* is the point of contact. *ADT*, *BCQ* and *STQ* are straight lines. *BDS* is the angle bisector of $\angle ABQ$.



Which of the following must be true?

I. $AB \parallel SQ$

II. ΔBQS is isosceles.

III. $\Delta DST \sim \Delta QBD$

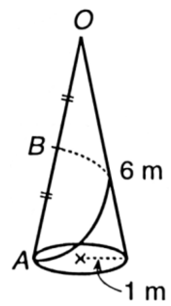
A. I and II only B. I and III only

C. II and III only D. I, II and III

42. Let O be the origin. The coordinates of the points A and B are (30, 0) and (0, 40) respectively. If P is the in-centre of ΔOAB, which of the following straight lines does P lie on?

A. $x+y-30=0$
B. $3x-y-20=0$
C. $4x-y-40=0$
D. $5x+4y-160=0$

43. The figure shows a right circular cone with base radius 1 m and slant height 6 m. A curve is drawn on the curved surface of the cone from A to B as shown, where OBA is a slant height and B is the midpoint of OA. Find the shortest length of the curve.



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

44. It is given that if Sharon studies medicine, the probability that she can win a scholarship is 0.8. If Sharon studies another course, the probability that she can win the scholarship is 0.1. There are 200 applicants competing for 40 places for the medicine course. Suppose all of the applicants have equal chances to be accepted, what is the probability that Sharon wins the scholarship?

A. 0.08
B. 0.16
C. 0.2
D. 0.24

45. Let $\overline{x_1}$, m_1 and σ_1 be the mean, the median and the standard deviation of a group of 99 numbers $\{n_1, n_2, n_3, ..., n_{99}\}$ respectively while $\overline{x_2}$, m_2 and σ_2 be the mean, the median and the standard deviation of a group of 100 numbers $\{n_1, n_2, n_3, ..., n_{99}, \overline{x_1}\}$ respectively.

Which of the following must be true?

I. $\overline{x_1} = \overline{x_2}$
II. $m_1 \le m_2$
III. $\sigma_1 \ge \sigma_2$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

END OF PAPER

CARMEL DIVINE GRACE FOUNDATION SECONDARY SCHOOL

SECOND TERM EXAMINATION 2020 – 2021

SECONDARY VI MATHEMATICS Compulsory Part

PAPER 2

1.	B	11.	D	21.	A	31.	A	41.	D
2.	D	12.	C	22.	B	32.	C	42.	B
3.	A	13.	D	23.	A	33.	B	43.	D
4.	B	14.	C	24.	C	34.	D	44.	D
5.	B	15.	D	25.	C	35.	A	45.	B
6.	C	16.	A	26.	D	36.	A		
7.	A	17.	C	27.	A	37.	D		
8.	A	18.	D	28.	B	38.	B		
9.	C	19.	B	29.	C	39.	C		
10.	C	20.	B	30.	A	40.	C		