2020/21 FORM 6 FINAL EXAMINATION

MATHEMATICS Compulsory Part
Paper 2

Date: 27 Jan 2021 (WED)
10:45 am – 12:00 nn (1 hour 15 minutes)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should insert the information required (including Name, Class and Class Number) in the spaces provided.

2. When told to open this question paper, 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 answer 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.

Not to be taken away before the end of the examination

Final Examination 2020 – 2021
Mathematics Compulsory Part
Paper 2

Form Six

Name: _____
Class: _____( )

- **Time allowed : 1 hour and 15 minutes**
- **Answer ALL questions. All the answers must be marked on the MC answer sheet with pencil or marks will be deducted.**
- **The diagrams are not necessarily drawn to scale.**

Section A

1. $\dfrac{(-4)^{2020}}{-8^{2046}} =$

   A. $\dfrac{-1}{2^{26}}$.
   B. -2^{1994}.
   C. $\dfrac{-1}{2^{2098}}$.
   D. $\dfrac{1}{2}$.

2. $x^2 - 4 - 9y^2 - 12y =$

   A. $(x + 3y + 2)(x - 3y - 2)$.
   B. $(x + 3y + 2)(x - 3y + 2)$.
   C. $(x + 3y - 2)(x - 3y - 2)$.
   D. $(x + 3y - 2)(x - 3y + 2)$.

3. Let a, b and c be constants.
   If $ax^2 + b(x - 1) + c \equiv x^2 - 2x + 3$,
   then $a - b + c =$

   A. –2.
   B. 0.
   C. 1.
   D. 4.

4. Let $f(x)$ be a polynomial. If $f(x)$ is divided by $2x - 1$, the quotient and the remainder are $4x^2 + 1$ and 1 respectively. When $f(x)$ is divided by $2x + 1$, the remainder is

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

5. $\dfrac{1}{\pi^5} =$

   A. 0.003 27
      (correct to 3 decimal places).
   B. 0.0033
      (correct to 4 significant figures).
   C. 0.003 27
      (correct to 5 decimal places).
   D. 0.003 267 7
      (correct to 5 significant figures).

6. The solution of
   $\dfrac{1}{2} - \dfrac{x}{3} < \dfrac{1}{4}$ or $1 + \dfrac{x}{2} > \dfrac{x}{3}$ is

   A. $x > \dfrac{3}{4}$.
   B. $x > -6$.
   C. $x < \dfrac{3}{4}$.
   D. $x < -6$.

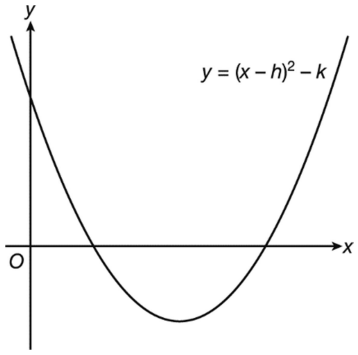
7. Let x, y and z be non-zero numbers.
   If $5x = 2y$ and $x : z = 3 : 4$, then $\dfrac{x + z}{y - x} =$

   A. $\dfrac{2}{3}$.
   B. $\dfrac{14}{9}$.
   C. $\dfrac{7}{6}$.
   D. $\dfrac{7}{3}$.

8. If the price of a correction pen is 25% higher than the price of a blue ball pen, then the price of the blue ball pen is

A. 10% lower than the price of the correction pen.
B. 12.5% lower than the price of the correction pen.
C. 20% lower than the price of the correction pen.
D. 25% lower than the price of the correction pen.

9. The figure shows the graph of $y = (x - h)^2 - k$. Which of the following must be true?



A. $h > 0$ and $k > 0$
B. $h > 0$ and $k < 0$
C. $h < 0$ and $k > 0$
D. $h < 0$ and $k < 0$

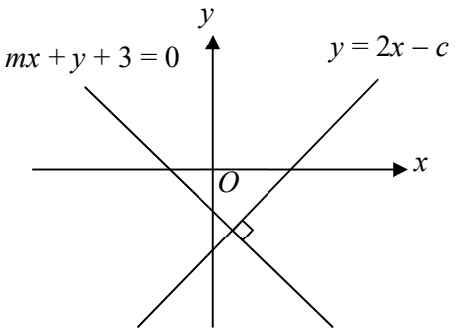
10. It is given that z varies directly as x and inversely as y. If x is increased by 20% and y is decreased by 20%, then z

A. is increased by 50%.
B. is increased by 40%.
C. is decreased by 25%.
D. is decreased by 60%.

11. A sum of \$17 000 is deposited at an interest rate of 3% per annum for 4 years, compounded yearly. Find the difference in interest if the same amount is deposited at the same interest rate and same duration with simple interest, correct to the nearest dollar.

A. \$94
B. \$119
C. \$125
D. \$130

12. The figure shows the graphs of $y = 2x - c$ and $mx + y + 3 = 0$. Which of the following must be true?



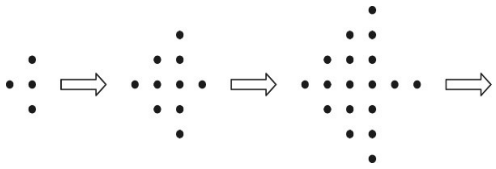
I. $m < 0$
II. $m < c$
III $c > 3$

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

13. A square is made of a piece of wire. If the wire is bent again to form a rectangle with length 20% more than that of the square, find the percentage change of the areas of the two figures.

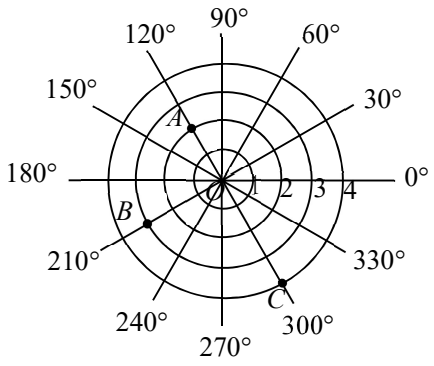
A. 4% decreased
B. 4% increased
C. 20% decreased
D. 20% increased

14. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(2n + 4)$ dots to the nth pattern. Find the number of dots in the 7th pattern.



A. 40
B. 54
C. 64
D. 70

15. The figure shows a polar coordinate plane. The polar coordinates of A, B and C are (2, 120°), (3, 210°) and (4, 300°) respectively. Which of the following is/are true?



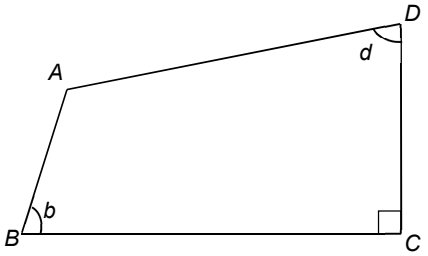
I. $\angle ABC = 90°$
II. $AB = 3\sqrt{2}$ units
III Area of $\Delta ABC = 9$ sq. units

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

16. Given two points $A(1, -2)$ and $B(-3, 4)$. P is a point on the locus with $AP = BP$. Find the equation of the locus.

A. $2x - 3y + 5 = 0$
B. $2x + 3y - 1 = 0$
C. $3x - 2y - 5 = 0$
D. $3x + 2y + 1 = 0$

17. In the figure, BC =

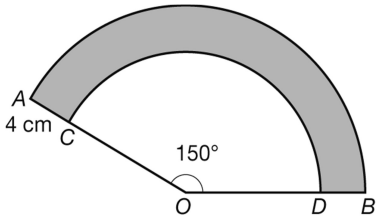


A. $AB\sin b + AD\sin d$.
B. $AB\sin b + AD\cos d$.
C. $AB\cos b + AD\sin d$.
D. $AB\cos b + AD\cos d$.

18. $\dfrac{\cos(180° + \theta)}{\sin(180° - \theta)} \times \dfrac{1}{\tan(90° - \theta)} =$

A. $\tan^2\theta$.
B. $\tan\theta$.
C. 1.
D. –1.

19. In the figure, OAB and OCD are sectors with centre O. It is given that the area of the shaded region $ABDC$ is 40π cm^2. If $AC = 4$ cm, then OC =



A. 8 cm.
B. 10 cm.
C. 14 cm.
D. 18 cm.

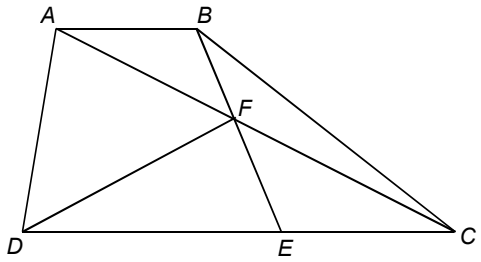
20. If the sum of the interior angles of a regular n-sided polygon is 3960°, which of the following is true?

A. The value of n is 20.
B. Each interior angle of the polygon is 198°.
C. The number of diagonals of the polygon is 48.
D. Each exterior angle of the polygon is 15°.

21. The equation of a circle C is $2x^2 + 2y^2 - 8x - 6y - 11 = 0$. Which of the following is true?

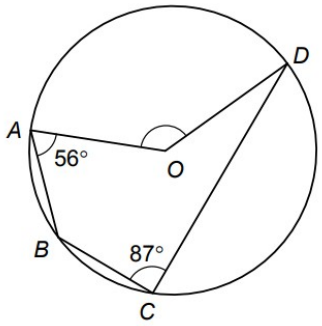
A. The origin lies outside C.
B. C does not intersect the y-axis.
C. The coordinates of the centre of C are (4, 3).
D. The circumference of C is less than 30.

22. In the figure, $ABCD$ is a trapezium, where $AB : DC = 2 : 7$ and $AB \parallel DC$. E is a point lying on CD such that $DE : EC = 4 : 3$. AC and BE intersect at F. If the area of ΔABF is 8 cm^2, then the area of ΔDEF is



A. 18 cm^2.
B. 24 cm^2.
C. 32 cm^2.
D. 40 cm^2.

23. In the figure, O is the centre of the circle $ABCD$. If $\angle BCD = 87°$ and $\angle OAB = 56°$, then $\angle AOD =$

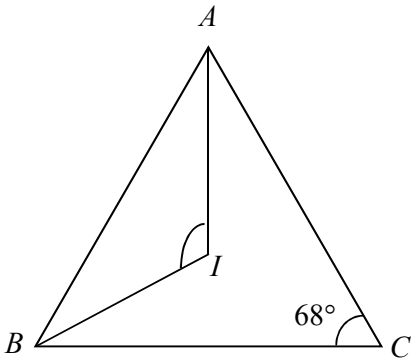


A. 106°.
B. 118°.
C. 161°.
D. 174°.

24. Find the positive constant k such that the straight lines $kx - 3y - 2k = 0$ and $(k-1)x + 2y - 18 = 0$ are perpendicular to each other.

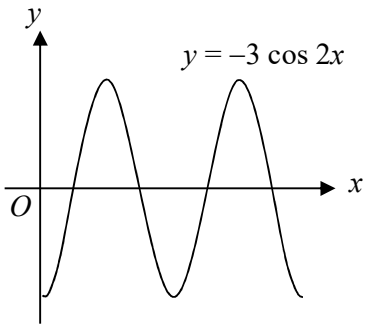
A. 1
B. 3
C. 6
D. 10

25. In the figure, I is the incentre of ΔABC. If $\angle ACB = 68°$, then $\angle AIB =$



A. 120°.
B. 124°.
C. 130°.
D. 136°.

26 The figure shows the graph of $y = -3\cos 2x$. Find the period and the minimum value of y.



	Period	Minimum value
A.	180°	–6
B.	720°	–3
C.	720°	–6
D.	180°	–3

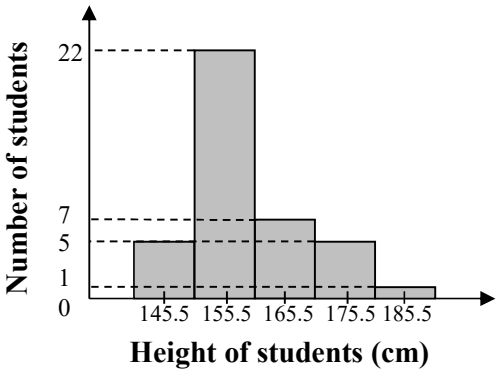
27. Consider the following integers.

12 14 20 21 26 26 28
30 30 x y z

If the median and the mode of the above integers are 23 and 14 respectively, then the inter-quartile range is

A. 12 .
B. 13 .
C. 14 .
D. 16 .

28 The histogram below shows the distribution of the heights (in cm) of the students of a class



If heights between 150.5 cm and 170.5 cm are regarded as normal, then the percentage of students with normal heights in the class is

A. 15%.
B. 27.5%.
C. 72.5%.
D. 85%.

29. If α and β are the roots of the quadratic equation $3x^2 - 3x + 4 = 0$, which of the following must be true?

I. $\alpha + \beta > 0$
II. $\alpha\beta > 0$
III $\alpha^2 + \beta^2 > 0$

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

30. Two fair dice are thrown once. What is the probability of getting a sum of 4 or 6?

A. $\frac{1}{6}$
B. $\frac{2}{9}$
C. $\frac{5}{9}$
D. $\frac{5}{36}$

Section B

31. The L.C.M. of $9x^2 - 6x + 1$, $18x^2 - 2$ and $27x^3 - 1$ is

A. $3x - 1$.
B. $(3x+1)(3x-1)^2(9x^2 - 3x + 1)$.
C. $2(3x+1)(3x-1)^2(9x^2 + 3x + 1)$.
D. $2(3x+1)(3x-1)^2(9x^2 - 3x + 1)$.

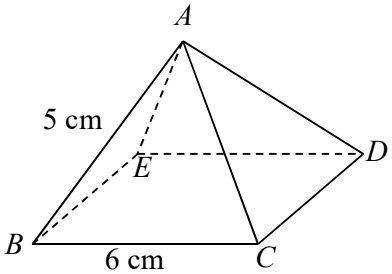
32. If $\frac{3}{2\log x - 1} + 4 = \frac{2}{\log x + 2}$, then $\log\frac{1}{x} =$

A. 0 or $\frac{-11}{8}$.
B. 1 or $\frac{8}{11}$.
C. 0 or $\frac{11}{8}$.
D. 1 or $\frac{-8}{11}$.

33. $F6AB_{16} + CDE_{16} =$

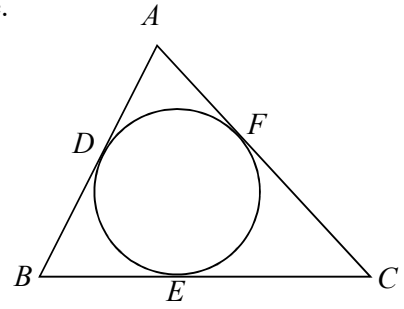
A. $15 \times 2^{11} + 9 \times 2^8 + 392$.
B. $15 \times 2^{12} + 9 \times 2^9 + 392$.
C. $15 \times 2^{11} + 9 \times 2^8 + 393$.
D. $15 \times 2^{12} + 9 \times 2^9 + 393$.

34. The figure shows a right pyramid *ABCDE* with a square base *BCDE* of side 6 cm. If *AB* = 5 cm, find the angle between planes *ABC* and *ACD*, correct to the nearest degree.



A. 90°
B. 107°
C. 120°
D. 124°

35. In the figure, AB, BC and CA are tangents to the circle at D, E and F respectively. If $AB = 7$ cm, $BC = 8$ cm and $CA = 9$ cm, find the radius of the circle.



A. 2 cm
B. $\sqrt{5}$ cm
C. $\sqrt{6}$ cm
D. $\sqrt{7}$ cm

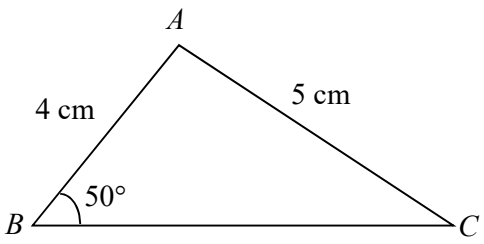
36. Consider the following system of inequalities:

$$\begin{cases} x - 2y \geq -5 \\ 5x - 4y \leq -1 \\ 2x - y \geq -4 \end{cases}$$

Let R be the region which represents the solutions of the above system of linear inequalities. If (x, y) is a point lying in R, then the difference between the greatest value and the least value of $7x - 8y + 9$ is

A. 36 .
B. 24 .
C. –36 .
D. –24 .

37. In the figure, which of the following statements about ΔABC must be true?



A. $\angle ACB = 40°$.
B. $BC = 6$ cm.
C. ΔABC is acute-angled.
D. ΔABC is obtuse-angled.

38. Let $u = \dfrac{a+i}{3}$ and $v = \dfrac{3}{a-i}$, where a is a real number. Which of the following must be true?

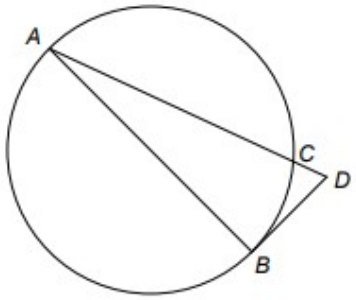
I. $\dfrac{u}{v}$ is a rational number.
II. The imaginary part of u is equal to that of $\dfrac{1}{v}$.
III. The real part of $\dfrac{1}{u}$ is equal to that of v.

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

39. For $0° \leq \theta < 360°$, how many roots does the equation $5\sin^2\theta + 3\sin\theta - 2 = 0$ have?

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

40. In the figure, A, B and C are points lying on the circle. AB is a diameter of the circle. DB is the tangent to the circle at B. If ACD is a straight line with $AC = 6$ and $CD = 2$, then $AB =$



A. $4\sqrt{3}$.
B. $4\sqrt{6}$.
C. $8\sqrt{3}$.
D $8\sqrt{6}$.

41. An urn contains 3 red balls, 2 yellow balls and 1 white ball. Three balls are drawn randomly from the urn without replacement. Find the probability that at least two of the balls drawn are of the same colour.

A. $\frac{1}{3}$
B. $\frac{1}{5}$
C. $\frac{7}{10}$
D. $\frac{43}{60}$

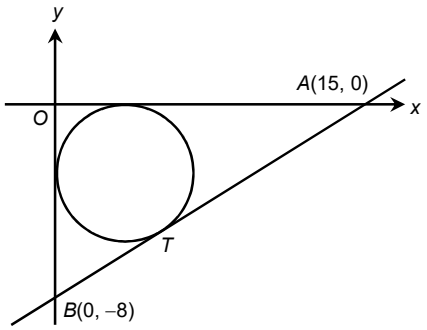
42. Six boys and four girls want to take a photo in two rows of 5. If the girls must stand next to each other, find the number of possible arrangements.

A. 34 560
B. 69 120
C. 86 400
D. 3 628 800

43. In an examination, the standard deviation of the examination scores is 5 marks. The examination score of Daniel is 72 marks and his standard score is 2. If the standard score of Chris in the examination is –0.6, then his examination score is

A. 53 marks.
B. 56 marks.
C. 59 marks.
D. 62 marks.

44. In the figure, the inscribed circle of ΔOAB touches AB at T. Find the coordinates of T.



A. $\left(\frac{960}{289}, -\frac{1800}{289}\right)$
B. $\left(\frac{75}{17}, -\frac{96}{17}\right)$
C. $\left(\frac{120}{23}, -\frac{120}{23}\right)$
D. $\left(\frac{15}{2}, -4\right)$

45. A teacher enters test scores of a class into a spreadsheet. The full mark of the test is 49. The mean, the inter-quartile range and the variance of the test scores are 28, 15 and 13 respectively. In order to convert the full mark of the test scores to 100, the teacher decides to add 1 mark to each score and each resulting score is then doubled to form the daily marks of students. Find the mean, the inter-quartile range and the variance of the daily marks of students.

	Mean	**IQR**	**Variance**
A.	56	32	26
B.	56	32	52
C.	58	30	26
D.	58	30	52

END OF PAPER