19-20 Mock Exam
MATH CP
PAPER 2
F.6C, D & E

SING YIN SECONDARY SCHOOL
MOCK EXAMINATION 2019 – 2020

F.6 MATHEMATICS Compulsory Part
PAPER 2

Time allowed: 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 in the spaces provided. No extra time will be given for filling the information after the 'Time is up' announcement.

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 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.

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. $8q^3 + 4pq^2 - 2p^2q - p^3 =$

   A. $(p-2q)(p+2q)^2$.
   B. $(2q-p)(p+2q)^2$.
   C. $(p-2q)^2(p+2q)$.
   D. $(2q-p)^3$.

2. If $Y = \dfrac{1-X}{1+2X}$, then $X =$

   A. $\dfrac{1-2Y}{1+Y}$.
   B. $\dfrac{1+2Y}{1-Y}$.
   C. $\dfrac{1-Y}{1+2Y}$.
   D. $\dfrac{1+Y}{1-2Y}$.

3. $\dfrac{(x^{3n})(x^{4n})}{(x^n)^2} =$

   A. x^5.
   B. x^6.
   C. x^{5n}.
   D. x^{6n}.

4. $\sqrt{\pi + 25} =$

   A. 5.31 (correct to 2 decimal places) .
   B. 5.31 (correct to 3 significant figures) .
   C. 5.305 (correct to 4 decimal places) .
   D. 5.305 (correct to 4 significant figures) .

5. How many integral solutions are there for the compound inequality $\dfrac{2x-1}{5} \le 1$ and $3 - 2x \le 4$?

   A. 2
   B. 3
   C. 4
   D. Infinity many

6. Let k be a non-zero constant. If $\mathrm{f}(x) = x^2 - 3kx + k^2$, then $\dfrac{\mathrm{f}(-k)}{\mathrm{f}(k)} =$

A. -5 .
B. -3 .
C. -1 .
D. 3 .

7. Let $\mathrm{g}(x) = x^6 + ax^3 + 1$, where a is a constant. If $\mathrm{g}(x)$ is divisible by $2x - 1$, find the remainder when $\mathrm{g}(x)$ is divided by $x + 2$.

A. -130
B. 0
C. 65
D. 130

8. Let a and b be positive numbers. Which of the following statements about the graph of $y = b - (ax + 1)^2$ is/are true?

I. The graph opens downwards.
II. The graph is symmetric about the y-axis.
III. The graph cuts the x-axis at two points.

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

9. If m and n are constants such that $(2x + m)(x + 3) + 6 \equiv (2x + n)(x + 1)$, then $n =$

A. -1 .
B. 3 .
C. 6 .
D. 9 .

10. A sum of \$ x is deposited at an interest rate of 8% per annum for 2 years, compounded half-yearly. If the interest is \$ 66 351 , then $x =$

A. 184 058 .
B. 390 625 .
C. 414 694 .
D. 813 125 .

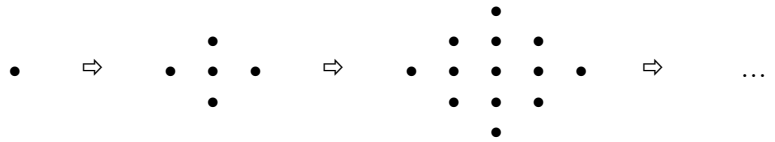
11. It is given that r varies directly as the square root of p and inversely as q . If q is decreased by 75% and r remains constant, then p

A. is decreased by 50% .
B. is decreased by 93.75% .
C. is increased by 93.75% .
D. is increased by 50% .

12. Pipe A can fill a pool in 60 minutes, while pipe B can fill the same pool in 84 minutes. If both pipe A and pipe B are used at the same time, then the time needed to fill the pool is

A. 32 minutes .
B. 33 minutes.
C. 35 minutes.
D. 36 minutes.

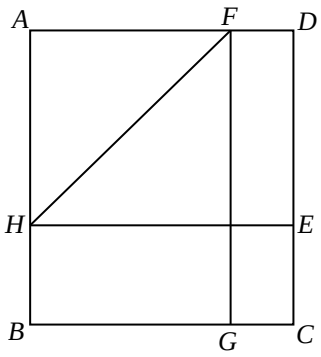
13. In the figure, the 1st pattern consists of 1 dot. For any positive integer n , the $(n + 1)$th pattern is formed by adding $4n$ dots to the n^{th} pattern. Find the number of dots in the 8^{th} pattern.



A. 113
B. 121
C. 145
D. 173

14. In the figure, $ABCD$, $BCEH$ and $CDFG$ are rectangles. It is given that the areas of $BCEH$ and $CDFG$ are equal, $CE = 4$ cm and $CG = 3$ cm . If the area of $ABCD$ is 300 cm^2, then the length of FH is

A. 15 cm .
B. 20 cm .
C. 25 cm .
D. 30 cm .

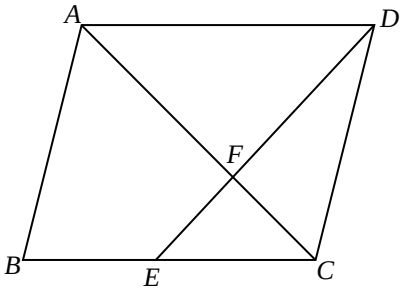


15. The radius of a sphere is two times the base radius of a right circular cylinder. If the total surface area of the sphere is 6 times the total surface area of the circular cylinder, then $\frac{\text{The volume of the sphere}}{\text{The volume of the circular cylinder}} =$

A. 1 .
B. 4 .
C. 8 .
D. 32 .

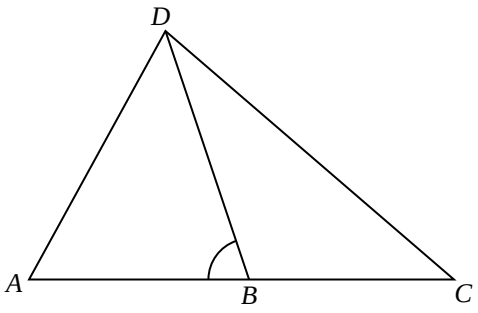
16. In the figure, $ABCD$ is a parallelogram. E is a point lying on BC . AC and DE intersect at the point F . If the area of ΔCDF and $ABEF$ are 100 cm^2 and 145 cm^2 respectively, then $BE : EC =$

A. 4 : 5 .
B. 2 : 3 .
C. 1 : 2 .
D. 1 : 4 .



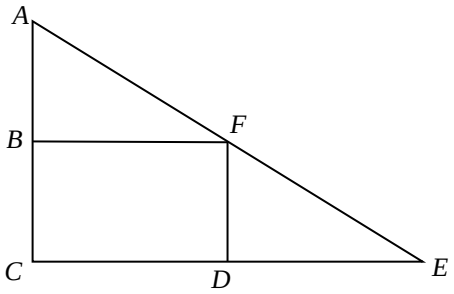
17. In the figure, ABC is a straight line. It is given that $AC = CD$ and $BC = BD$. If $\angle ADB = 42°$, then $\angle ABD =$

A. $48°$.
B. $64°$.
C. $74°$.
D. $84°$.



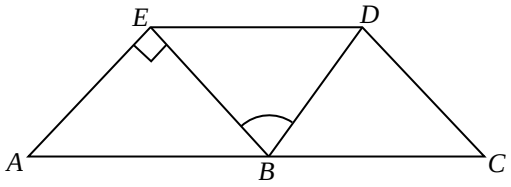
18. In the figure, B, D and F are points lying on AC , CE and AE respectively while $BCDF$ is a rectangle. If $BC = 9$ cm and $AB = EF = 15$ cm , then $CD =$

A. 12 cm .
B. 15 cm .
C. 18 cm .
D. 20 cm .



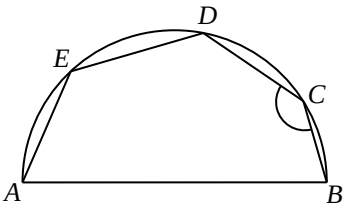
19. In the figure, $BCDE$ is a rhombus. A is a point lying on CB produced such that $\angle AEB = 90°$. If $\angle BAE = 40°$, then $\angle DBE =$

A. $40°$.
B. $50°$.
C. $65°$.
D. $70°$.



20. In the figure, $ABCDE$ is a semi-circle. If $\angle AED = 144°$, then $\angle BCD =$

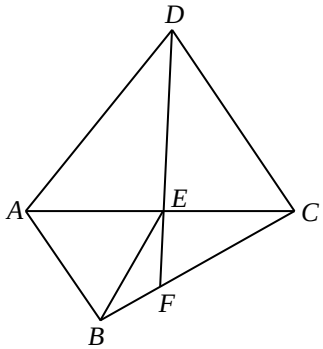
A. $120°$.
B. $126°$.
C. $136°$.
D. $144°$.



21. In the figure, AEC is a straight line, ACD and ABE are equilateral triangles. If DE produced intersects BC at F , which of the following must be true?

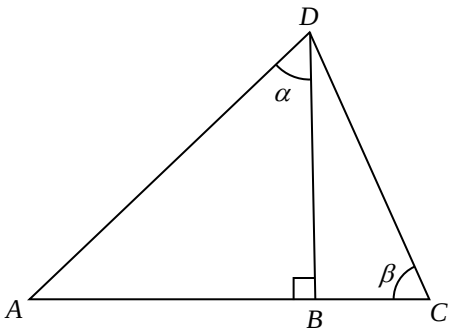
I. $DE = BC$
II. $\angle CFE = 60°$
III. $\Delta CDF \sim \Delta ECF$

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



22. In the figure, ABC is a straight line and $AC \perp DB$. Find $AB : BC$.

A. $\tan\alpha \tan\beta : 1$
B. $1 : \tan\alpha \tan\beta$
C. $\tan\alpha : \tan\beta$
D. $\tan\beta : \tan\alpha$



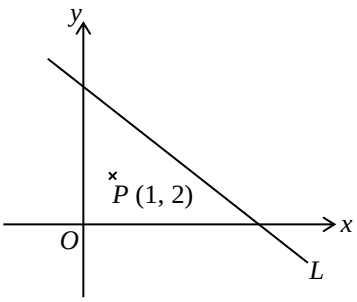
23. The straight line $4x + 6y + 1 = 0$ is parallel to

A. $3x - 2y + 4 = 0$.
B. $3x + 2y - 4 = 0$.
C. $2x + 3y - 6 = 0$.
D. $2x - 3y + 6 = 0$.

24. In the figure, the equation of the straight line L is $x + ay + b = 0$. Which of the following is/are true?

I. $a > 0$
II. $b > -1$
III. $2a + b > -1$

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



25. Let a and b be constants. The equations of the straight lines L_1 and L_2 are $x - y + a = 0$ and $x - y + b = 0$ respectively. Let P be a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2. The x-intercept of the locus of P is

A. $a + b$.
B. $-a - b$.
C. $\frac{a+b}{2}$.
D. $-\frac{a+b}{2}$.

26. If a figure repeats itself after rotating about its centre of rotation through 108°, then the least possible order of rotational symmetry of the figure is

A. 3.
B. 5.
C. 6.
D. 10.

27. Denote the circle $3 + 4x + 6y - x^2 - y^2 = 0$ by C . Which of the following is/are true?

I. The diameter of C equals 4 .
II. The coordinates of the centre of C are $(2, 3)$.
III. Part of C lies in the third quadrant.

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

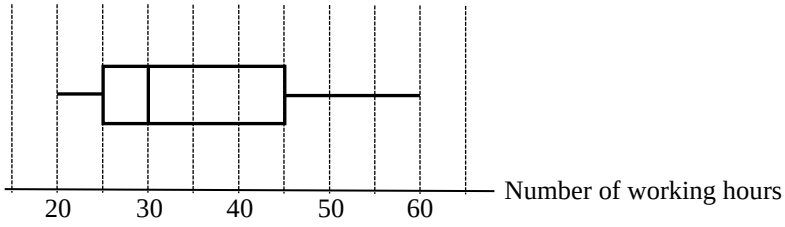
28. The table below shows the distribution of the number of activities joined by a group of students in a year.

Number of activities joined	3	4	5
Number of students	2	3	4

Two students are randomly selected from the group. Find the probability that the number of activities joined by the selected students are the same.

A. $\frac{5}{18}$
B. $\frac{19}{66}$
C. $\frac{1}{3}$
D. $\frac{29}{81}$

29. The box-and-whisker diagram below shows the distribution of the number of working hours of the employees in a company in a certain week. Find the 75^{th} percentile of the distribution.



A. 25 hours
B. 30 hours
C. 45 hours
D. 50 hours

30. Consider the following positive integers:

12 14 15 16 17 18 20 n

Let a , b and c be the inter-quartile range, the median and the mean of the above positive integers respectively. If the range of the distribution is greater than 8, which of the following must be true?

I. $a = 4.5$
II. $b = 16.5$
III. $c > 16$

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

Section B

31. It is given that $\frac{1}{y}$ is a linear function of x. The x-intercept of the graph of the linear function is 2 . Which of the following must be true?

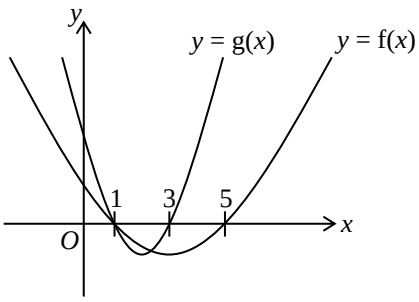
A. xy is a constant.
B. $x(y-2)$ is a constant.
C. $(x-2)y$ is a constant.
D. $(x+2)y$ is a constant.

32. $\mathrm{FFF\ FFF\ FFF\ FFF\ FFF\ FFF}_{16}$ =

A. $2^{72}-1$.
B. $2^{73}-1$.
C. $2^{96}-1$.
D. $2^{97}-1$.

33. The figure shows the graphs of $y=\mathrm{f}(x)$ and $y=\mathrm{g}(x)$. Which of the following may be true?

A. $\mathrm{g}(x)=2\mathrm{f}(x)-1$
B. $\mathrm{g}(x)=\mathrm{f}(2x-1)$
C. $\mathrm{g}(x)=2\mathrm{f}(x-1)$
D. $\mathrm{g}(x)=\mathrm{f}(2x)-1$



34. Consider the system of inequalities:

$$\begin{cases} 3 \le x \le 8 \\ x-2y \le 10 \\ x+2y \le 10 \end{cases}.$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R where x and y are positive integers, then the greatest value of $2x+6y-1$ is

A. 21 .
B. 25 .
C. 26 .
D. 27 .

35. Let a and b be real numbers. If $\frac{i+a}{bi+2}$ is a purely imaginary number, then

A. $2a+b=0$.
B. $a+2b=0$.
C. $2a-b=0$.
D. $a-2b=0$.

36. If the sum of the first n terms of a sequence is $\frac{9^n - 3}{8}$, which of the following is/are true?

I. All terms of the sequence are rational.
II. The sequence is a geometric sequence.
III. The 10th term of the sequence is less than 4×10^8.

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

37. If $\begin{cases} \log_4 y = 3x - 1 \\ \log_8 y^3 = 3x^2 + 1 \end{cases}$, then $y =$

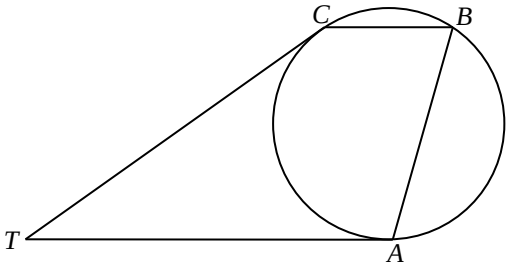
A. 1 .
B. 2 .
C. 8 .
D. 16 .

38. In ΔABC, $AB = 9$, $BC = 10$ and $CA = 17$. If P is the in-centre of ΔABC, then the area of ΔBCP is

A. 10 .
B. 12 .
C. 13 .
D. 18 .

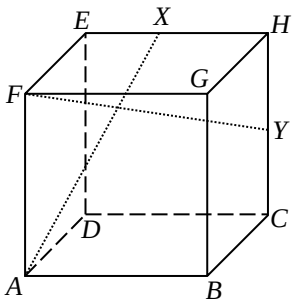
39. In the figure, AT and CT are tangents to the circle ABC. If $\angle ATC = 42°$ and $\angle BAT = 100°$, then $\angle BCT =$

A. 122° .
B. 138° .
C. 142° .
D. 149° .



40. In the figure, $ABCDEFGH$ is a cube. Let X and Y be the mid-points of EH and CH respectively. Find the angle between AX and FY correct to the nearest degree.

A. 53°
B. 56°
C. 60°
D. 64°



41. Find the range of values of k such that the circle $x^2 + y^2 - 2x - 6y + 8 = 0$ and the straight line $y = kx$ intersect.

A. $-7 \le k \le 1$
B. $-1 \le k \le 7$
C. $k \le -7$ or $k \ge 1$
D. $k \le -1$ or $k \ge 7$

42. Four-digit numbers are formed with the digits {1, 2, 3, 4, 5, 6, 7, 8, 9} in which each digit is used at most once only in the number. If the number is even, how many different numbers can be formed?

A. 1344
B. 1512
C. 2520
D. 2916

43. Tom and Mary plays a shooting game. Each of them will shoot a target twice. Each shot will score 1 point if it hits the target. If the probabilities of hitting the target in one shot for Tom and Mary are 0.7 and 0.6 respectively, find the probability that Tom has a higher score than Mary.

A. 0.0784
B. 0.3472
C. 0.3808
D. 0.6556

44. Peter gets 56 marks in a test and his standard score is –1.5 . John gets 74 marks in the same test and his standard score is –0.6 . Find the mean of the test scores.

A. 69 marks
B. 80 marks
C. 83 marks
D. 86 marks

45. Let m_1, s_1 and v_1 be the mode, the standard deviation and the variance of the group of numbers $\{ x_1 , x_2 , x_3 , x_4 , x_5 , x_6 \}$ respectively while m_2, s_2 and v_2 be the mode, the standard deviation and the variance of the group of numbers $\{ 1 - 2x_1 , 1 - 2x_2 , 1 - 2x_3 , 1 - 2x_4 , 1 - 2x_5 , 1 - 2x_6 \}$ respectively. Which of the following must be true?

I. $m_2 = 1 - 2m_1$
II. $-2s_1 = s_2$
III. $4v_1 = v_2$

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

END OF PAPER