ST. STEPHEN'S GIRLS' COLLEGE
Final Examination 2017 – 2018

FORM 6
126 students **LC, WMC, KAL, SCHL, CYN**

MATHEMATICS
PAPER II
Time allowed : 1¼ hours

Class	
Class Number	
Division	
Name	

Please read the following <u>instructions</u> very carefully.

1. **Attempt ALL questions.** All answers should be put on the "Multiple Choice Answer Sheet".
2. Note that you may only mark **ONE** answer for each question. Two or more answers will score **NO MARKS**.
3. All questions carry equal marks. No marks will be deducted for wrong answers.

Section A

1. $7y^2 + 6xy - x^2 - 7y + x =$

   A. $(7y - x)(y + x - 1)$.
   B. $(7y - x)(y - x + 1)$.
   C. $(7y + x)(y + x - 1)$.
   D. $(7y + x)(y - x + 1)$.

2. $\dfrac{27^x}{9^y} =$

   A. 3^{x-y}.
   B. $3^{\frac{x}{y}}$.
   C. 3^{3x-2y}.
   D. $3^{\frac{3x}{2y}}$.

3. If $\dfrac{a+b}{2a} - 1 = \dfrac{b-1}{a}$, then $b =$

   A. $2 - a$.
   B. $a - 2$.
   C. $2a + 1$.
   D. $2 - 2a$.

4. Evaluate $(1.23)^2 - \dfrac{1}{5.38}$ correct to 3 significant figures.

   A. 1.327
   B. 1.328
   C. 1.32
   D. 1.33

5. Solve $\dfrac{3x-10}{4} > 1 - x$.

   A. $x > -\dfrac{6}{7}$
   B. $x > 2$
   C. $x > \dfrac{7}{2}$
   D. $x > 4$

6. Let $f(x) = 9 + 2x + 3x^2$. $f(1) - f(-1) =$

   A. 4.
   B. 2.
   C. –2.
   D. –4.

7. If $x^2 + mx + n$ is divisible by $x + 1$, then $m - n + 5 =$

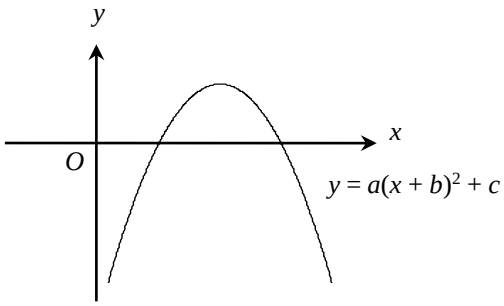
   A. – 4.
   B. 1.
   C. 4.
   D. 6.

8. If $2(x + a)(x - 1) - 2x \equiv 2x^2 + bx - 6$, then $b =$

   A. 10.
   B. 5.
   C. 3.
   D. 2.

9. The figure shows the graph of $y = a(x + b)^2 + c$. Which of the following must be true?

I. $c > 0$
II. $b < 0$
III. $a^2 - bc < 0$



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

10. The cost price of a shirt is \$80. If the shirt is sold at a discount of 20% on the marked price, the profit will be 20% of the cost price. Find the marked price.

A. \$80
B. \$96
C. \$100
D. \$120

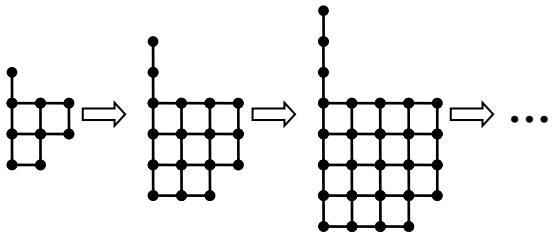
11. The actual area of a swimming pool is 6000 m^2. If the area of the pool on a map is 15 cm^2, then the scale of the map is

A. 1 : 2 000.
B. 1 : 400.
C. 1 : 200.
D. 1 : 20.

12. It is given that y is the sum of two parts, one part is a constant and the other part varies inversely as x^2 where $x \neq 0$. When $x = -1$, $y = -5$; when $x = 2$, $y = 1$. If $x = 1$, then $y =$

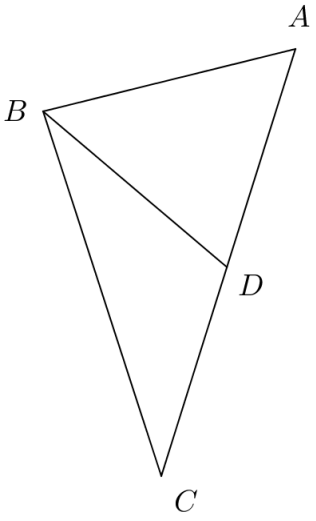
A. -11.
B. -5.
C. 5.
D. 11.

13. In the figure, the 1st pattern consists of 11 matches. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(4n + 9)$ matches to the nth pattern. Find the number of matches in the 6th pattern.



A. 87
B. 103
C. 116
D. 136

14. In the figure, D is a point lying on AC such that $BD = DC$ and ΔABD is an equilateral triangle. If the area of ΔABD is $\sqrt{3}$ cm^2, then the perimeter of ΔABC is



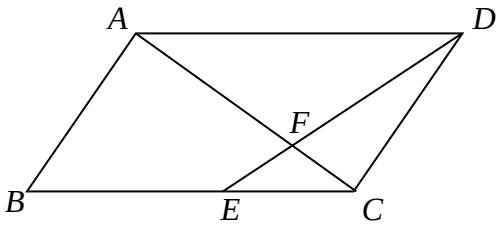
A. $(3+3\sqrt{3})$ cm.
B. $(6+\sqrt{3})$ cm.
C. $(6+2\sqrt{3})$ cm.
D. $(6+3\sqrt{3})$ cm.

15. A right circular cylinder and a hemisphere have the same base radius. The curved surface area of the cylinder is 4 times that of the hemisphere. If the volume of the hemisphere is 6π cm^3, then the volume of the cylinder is

A. 24π cm^3.
B. 30π cm^3.
C. 36π cm^3.
D. 42π cm^3.

16. In the figure, *ABCD* is a parallelogram and *BE* : *EC* = 2 : 1. *AC* intersects *DE* at *F*. If the area of *ABCD* is 48 cm^2 , then the area of *ABEF* is

A. 16 cm^2.
B. 18 cm^2.
C. 20 cm^2.
D. 22 cm^2.

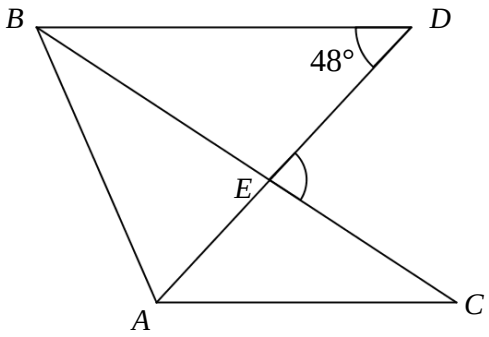


17. In a rectangle *ABCD*, *E* is a point on *AC* such that $BE \perp AC$. If *AB* = 12 cm and $\angle CAB = 30°$, find the area of ΔADE.

A. 18 cm^2
B. $18\sqrt{3}$ cm^2
C. $24\sqrt{3}$ cm^2
D. 54 cm^2

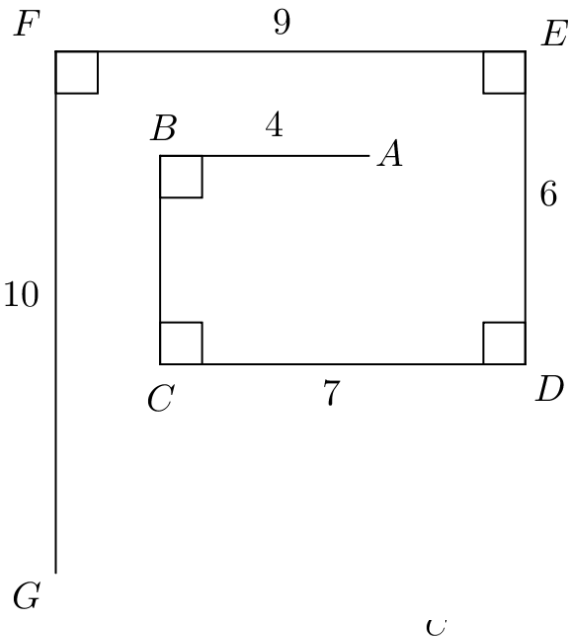
18. In the figure, *AD* and *BC* intersect at *E*. If *AB* = *AC*, *AD* = *DB* and *BD* // *AC*, then $\angle DEC$ =

A. 68°.
B. 73°.
C. 81°.
D. 86°.



19. In the figure, the length of the line segment joining *A* and *G* is 10. Find the length of *BC*.

A. 3
B. 4
C. 5
D. 6



C

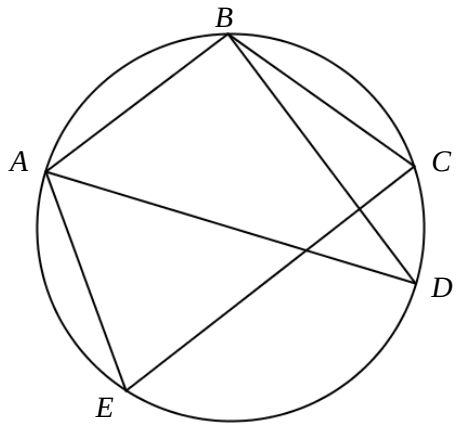
20. $ABCD$ is a parallelogram. If AC and BD intersect at E and $AB = BC$, which of the following must be true?

I. $\angle DAC = \angle DCA$
II. $AE \perp BD$
III. $AD = AC$

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

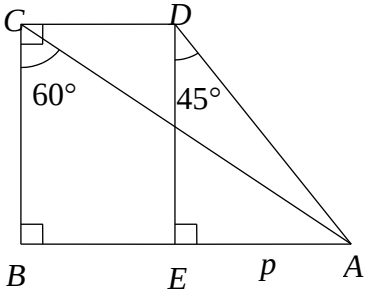
21. In the figure, AD is a diameter of the circle and $AB = BC$. If $AD = 10$ and $BD = 8$, find $\angle AEC$ correct to the nearest degree.

A. 53°
B. 66°
C. 72°
D. 74°



22. In the figure, $ABCD$ is a quadrilateral such that $\angle DCB = \angle CBA = 90°$. E is a point on AB such that $DE \perp AB$. If $\angle ACB = 60°$, $\angle EDA = 45°$ and $AE = p$, then $CD =$

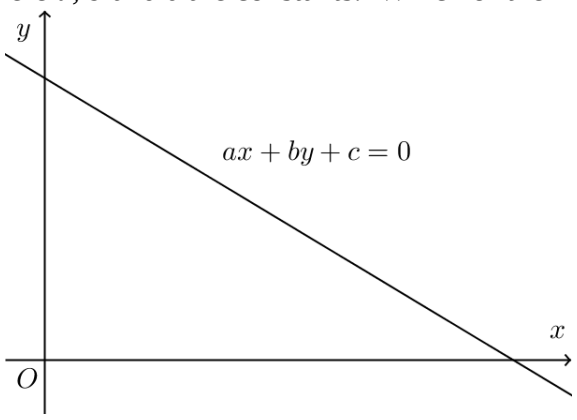
A. $(\sqrt{3}-1)p$.
B. p.
C. $\sqrt{3}p$.
D. $(\sqrt{3}+1)p$.



23. The figure shows the graph of $ax + by + c = 0$, where a, b and c are constants. Which of the following must be true?

I. $c > 0$
II. $a > 0$
III. $ac < 0$

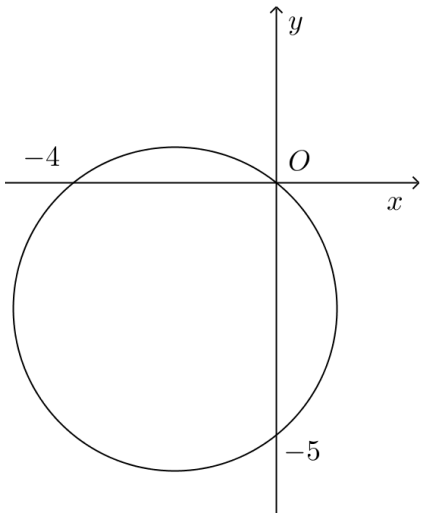
A. I only
B. I and II only
C. III only
D. I and III only



24. $A(-4, 2)$ and $B(1, -3)$ are two points. C is a point on the x-axis such that $AC = CB$. Find the coordinates of C.
A. $(-1.5, -0.5)$ B. $(-1, 0)$
C. $(1, 0)$ D. $(0, 1)$

25. The polar coordinates of the points A, B and C are $(12, 75°)$, $(6, 195°)$ and $(12, 255°)$ respectively. The perpendicular distance from B to AC is
A. 2. B. 3.
C. $2\sqrt{3}$. D. $3\sqrt{3}$.

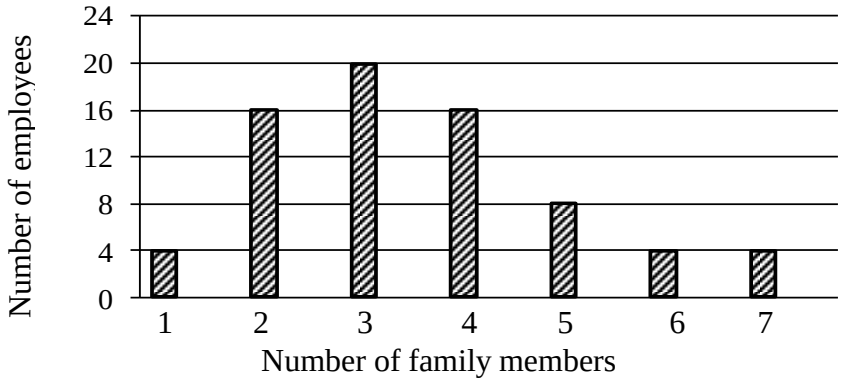
26. Find the equation of the circle shown in the figure.
A. $x^2 + y^2 - 4x - 5y = 0$
B. $x^2 + y^2 + 4x + 5y = 0$
C. $x^2 + y^2 - 8x - 10y = 0$
D. $x^2 + y^2 + 8x + 10y = 0$



27. It is given that A and B are two distinct points lying on the circle $x^2 + y^2 - 8x + ky - 2018 = 0$, where k is a constant. Let P be a moving point in the rectangular coordinate plane such that $AP = BP$. The equation of the locus of P is $3x + y = 0$. Find the value of k.
A. -24 B. -12
C. 12 D. 24

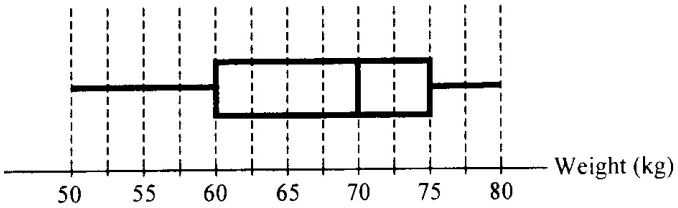
28. The bar chart below shows the distribution of the numbers of family members of the employees of company *D*. If an employee is randomly selected from the group, find the probability that the number of family members of the selected employee is more than 4.

Distribution of the numbers of family members of the employees of company *D*



A. $\frac{1}{2}$
B. $\frac{2}{9}$
C. $\frac{5}{9}$
D. $\frac{7}{9}$

29. The box-and-whisker diagram below shows the distribution of the weights (in kg) of some students. Find the inter-quartile range of their weights.



A. 5 kg
B. 10 kg
C. 15 kg
D. 30 kg

30. Let a, b, c and d be the mean, the median, the mode and the range of the group of numbers $\{x, x, x, x, x, x, x+1, x+1, x+2, x+3\}$ respectively. Which of the following must be true?

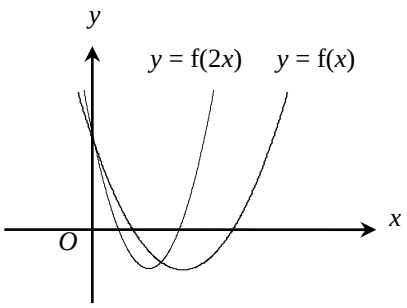
I. $a > b$
II. $b > c$
III. $c > d$

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

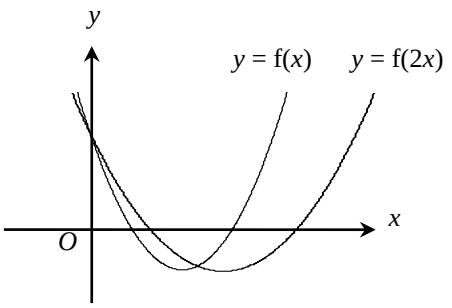
Section B

31. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(2x)$ on the same rectangular coordinate system?

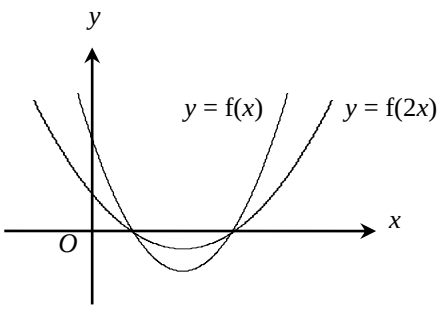
A.



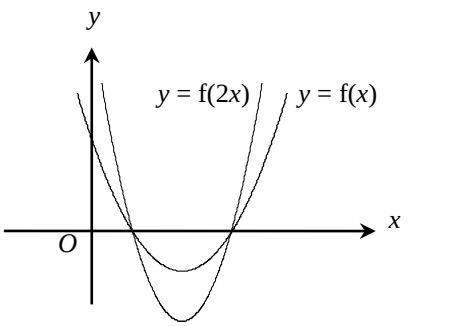
B.



C.



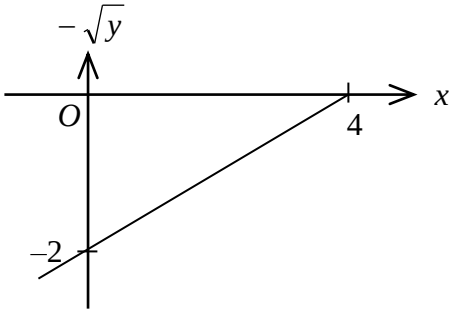
D.



32. $32^2 + 32^{11} =$

A. 1000000000010_{16}
B. 8000000000040_{16}
C. 10000000000100_{16}
D. 80000000000400_{16}

33. The graph in the figure shows the linear relation between x and $-\sqrt{y}$. Which of the following must be true?



A. $y = x^2 + 4x + 4$
B. $y = x^2 - 4x + 4$
C. $y = \frac{x^2}{4} + 2x + 4$
D. $y = \frac{x^2}{4} - 2x + 4$

34. If $\begin{cases} \log_3 x = 2y + 2 \\ \log_9 x = (y+1)^2 \end{cases}$, then $x =$

A. 0 or –1.
B. 1 or 3.
C. 1 or 9.
D. 9 or 81.

35. If a is a real number and the real part of $\frac{-i}{a-3i}$ is 0.3, then $a =$

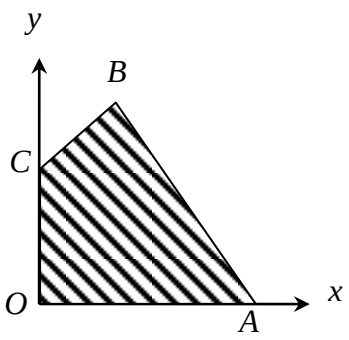
A. 1.
B. 3.
C. 1 or –1.
D. 3 or –3.

36. In a geometric sequence, the sum of the first two terms is 486 and the sum of the third term and the fourth term is 54. Find the sum of the fifth term and the sixth term.

A. 4 B. 6
C. 8 D. 10

37. In the figure, the equations of AB and BC are $3x + y - 9 = 0$ and $x - y + 5 = 0$ respectively. If (x, y) is a point lying in the shaded region $OABC$ (including the boundary), then the greatest value of $30 + x + y$ is

A. 33. B. 35.
C. 37. D 39.

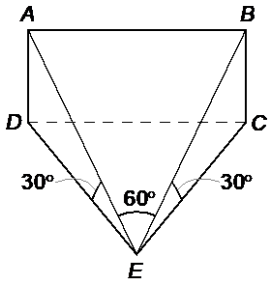


38. For $0° \le x \le 360°$, how many roots does the equation $\tan^2 x = 2\tan x$ have?

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

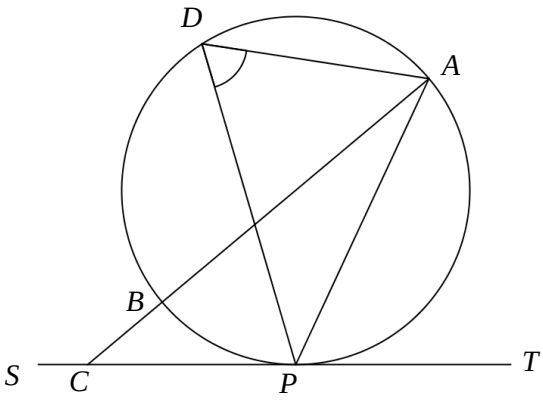
39. In the figure, AD and BC are perpendicular to the plane CDE. It is given that $\angle AED = \angle BEC = 30°$, $AE = BE$ and $\angle AEB = 60°$. Find $\angle CED$ correct to the nearest degree.

A. 71°
B. 73°
C. 75°
D. 120°



40. In the figure, ST is the tangent to the circle at P. AB is a diameter of the circle and AB produced meets ST at C. If $\angle BCP = 40°$, then $\angle ADP =$

A. 60°.
B. 65°.
C. 70°.
D. 75°.



41. The line $x - 3y + 5 = 0$ touches the circle $x^2 + y^2 - 4x + 2y - 5 = 0$ at A. If the centre of the circle is B, find the equation of AB.

A. $x - 3y - 5 = 0$
B. $3x + y - 10 = 0$
C. $3x + y - 5 = 0$
D. $3x + y + 5 = 0$

42. There are 15 boys and 19 girls in a class. If a team of 2 boys and 3 girls is selected from the class to participate in a voluntary service, how many different teams can be formed?

A. 77 805
B. 101 745
C. 278 256
D. 1 220 940

43. Peter and May each throws a dart. The probability that Peter hits the target is 0.2. The probability that May hits the target is 0.3. Find the probability that at least one of them hits the target.

A. 0.38
B. 0.44
C. 0.5
D. 0.56

44. In a Mathematics examination, Mary gets 63 marks and the corresponding standard score is -0.25. Kathy gets 71 marks and the corresponding standard score is 1.75. Find the mean of the scores of the examination.

A. 62
B. 63
C. 64
D 65

45. Let m_1, r_1 and v_1 be the mean, the range and the variance of a group of numbers $\{x_1, x_2, x_3, ..., x_{100}\}$ respectively. If m_2, r_2 and v_2 are the mean, the range and the variance of the group of numbers $\{6x_1, 6x_2, 6x_3, ..., 6x_{100}, 6m_1\}$ respectively, which of the following must be true?

I. $m_2 = 6m_1$
II. $r_2 = 6r_1$
III. $v_2 = 36v_1$

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

***** END OF PAPER *****

Answer Key

1 . A (84)	16 . D (43)	31 . A (50)
2 . C (98)	17 . B (65)	32 . D (65)
3 . A (78)	18 . C (97)	33 . D (66)
4 . D (98)	19 . B (78)	34 . C (54)
5 . B (96)	20 . A (58)	35 . C (66)
6 . A (99)	21 . D (47)	36 . B (69)
7 . D (80)	22 . A (72)	37 . C (70)
8 . D (80)	23 . C (41)	38 . D (47)
9 . A (67)	24 . B (72)	39 . A (39)
10 . D (89)	25 . D (63)	40 . B (63)
11 . A (48)	26 . B (81)	41 . C (54)
12 . B (90)	27 . D (46)	42 . B (94)
13 . C (74)	28 . B (94)	43 . B (66)
14 . C (70)	29 . C (98)	44 . C (84)
15 . C (42)	30 . A (86)	45 . A (35)

A: 11
B: 11
C: 12
D: 11