ST. PAUL'S COLLEGE
F.4 FINAL EXAMINATION 2018 – 2019

MATHEMATICS – Compulsory Part
PAPER 2

Time allowed**:** 50 minutes

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet and 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. The diagrams in this paper are not necessarily drawn to scale.

7. No marks will be deducted for wrong answers.

1. Simplify $\dfrac{\left(a\sqrt{b}\right)^{-2}}{\left(a^{-1}\sqrt[3]{b^2}\right)^3}$.

A. $\dfrac{a}{b^3}$

B. $\dfrac{a^2}{b^3}$

C. $\dfrac{a}{b^{10}}$

D. $\dfrac{1}{a^5b^{10}}$

2. If $x=5-\dfrac{3}{y-4}$, then $y=$

A. $\dfrac{4x-17}{x-5}$

B. $\dfrac{4x-23}{x-5}$

C. $\dfrac{4x+17}{x+5}$

D. $\dfrac{4x+23}{x+5}$

3. $\dfrac{\frac{1}{x}-\frac{1}{y}}{\frac{y}{x}-\frac{x}{y}}(y-x)=$

A. 0

B. 1

C. $\dfrac{1}{x+y}$

D. $-\dfrac{x-y}{x+y}$

4. The L.C.M. of a^2+3a+2, a^2+4a+4 and a^3+8 is

A. $a+2$

B. $(a+1)(a+2)^3$

C. $(a+1)(a+2)^2(a^2-2a+4)$

D. $(a+1)(a+2)^2(a^2+2a+4)$

5. If $\dfrac{A}{x+1}+\dfrac{B}{x-1}\equiv\dfrac{1-5x}{x^2-1}$, then $A=$

A. 3

B. 2

C. –2

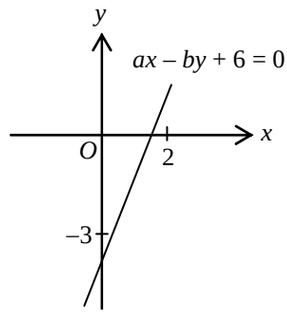
D. –3

6. Let $f(x) = 2x^3 + ax^2 + bx - 3$. If $f\left(\frac{1}{2}\right) = 0$ and $f(-1) = 0$, then $f(x) =$

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

7. The figure shows the graph of the straight line $ax - by + 6 = 0$. Which of the following are true?

I. $a < b$
II. $a > -3$
III. $b > -2$



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

8. If the straight lines $cx + dy = 6$ and $2x - 4y - 3 = 0$ are perpendicular to each other and intersect at a point on the y-axis, then $c =$

A. –16
B. –4
C. 4
D. 16

9. If $\alpha \neq \beta$ and $\begin{cases} 2\alpha^2 + b\alpha - c = 0 \\ 2\beta^2 + b\beta - c = 0 \end{cases}$,

then $\alpha^2 + \alpha\beta + \beta^2 =$

A. $\frac{b^2 + 2c}{4}$
B. $\frac{b^2 - 2c}{4}$
C. $\frac{c^2 - 2b}{4}$
D. $b^2 - c$

10. Let $f(x) = 4x - kx^2 - 3$. If the graph of $y + k = f(x)$ does not cut the x-axis. Which of the following values is a possible value/are possible values of k?

I. –5

II. 1

III. 3

A. I only

B. III only

C. I and III

D. II and III

11. Which of the following statements about the graph of $y = (2 - x)(x - 4) - 8$ is true?

A. The graph cuts the x-axis at two distinct points.

B. The graph opens upwards.

C. The y-intercept of the graph is –8.

D. The coordinates of the vertex of the graph are (3, –7).

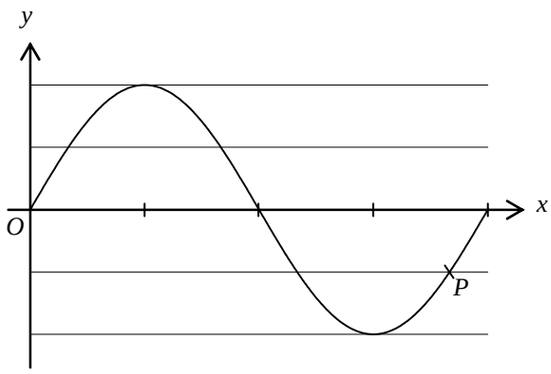
12. The figure shows the graph of $y = \sin(x°)$. Which of the following is most probably the x-coordinate of point P?

A. 135

B. 150

C. 315

D. 330



13. For $0° \le x < 360°$, how many roots does the equation $3\sin^2 x = \cos x + 1$ have?

A. 2

B. 3

C. 4

D. 5

14. Let $f(x) = 3(kx^2 + 1)$ and $g(x) = 27x^3 + 18x - 5$. If both expressions leave the same remainder when divided by $3x - 2$, then k =

A. -21

B. $\frac{-9}{4}$

C. 9

D. $\frac{21}{2}$

15. Let $f(x) = (x-1)(x-3)g(x) + (x-2)$, where $g(x)$ is a cubic polynomial. Which of the following are true?

I. The remainder of $f(x) \div g(x)$ is $x-2$
II. The remainder of $f(x) \div (x-1)(x-3)$ is $x-2$
III. The remainder of $f(x) \div (x-1)$ is $x-2$

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

16. Given that $\frac{a}{5} = \frac{b}{3} = \frac{c}{2}$ and $x : y : z = 2^a : 3^b : 6^c$. Arrange x, y and z in ascending order.

A. $x < y < z$
B. $y < x < z$
C. $y < z < x$
D. $z < y < x$

17. Given that $\tan\theta = \frac{-3}{4}$ and θ lies in the second quadrant. Which of the following quadratic equations has roots $\sin\theta$ and $-2\cos\theta$?

A. $x^2 - 11x + 24 = 0$
B. $x^2 + 11x + 24 = 0$
C. $25x^2 + 55x + 24 = 0$
D. $25x^2 - 55x + 24 = 0$

18. $\frac{1}{\cos(360° - \theta)} + \frac{\sin(180° - \theta)}{\tan(270° + \theta)} =$

A. 0
B. $-\cos\theta$
C. $\cos\theta$
D. $\frac{\sin^2\theta}{\cos\theta}$

19. If a is a real number, then the real part of $\frac{3 - i^3}{a - i} + i^6$ is

A. $\frac{3a+1}{a^2-1}$
B. $\frac{3a-1}{a^2+1}$
C. $\frac{-a^2+3a+2}{a^2-1}$
D. $\frac{-a^2+3a-2}{a^2+1}$

20. A sum of \$100 000 is deposited at an interest rate of 6% per annum for n years compounded monthly. The interest earned correct to the nearest dollar is \$12 716. Find n correct to the nearest $\frac{1}{12}$.

A. $1\frac{8}{12}$

B. 2

C. $2\frac{1}{12}$

D. $2\frac{2}{12}$

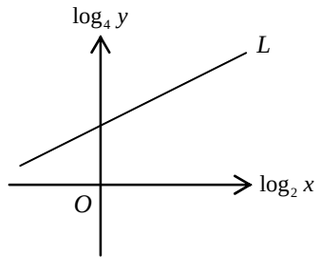
21. In the figure, the straight line L shows the relation between $\log_2 x$ and $\log_4 y$. It is given that L passes through the points (4, 4) and (8, 7). If $y = kx^a$, then k =

A. $\frac{3}{2}$

B. 1

C. 4

D. 8



22. Let a and b be constants. Denote the graph of $y = \log_a x + b$ by G. The x-intercept of G is 4 and G passes through the point (16, 2). Then

A. $x = 2^{8-2y}$

B. $x = 2^{y+2}$

C. $x = 2^y + 2$

D. $x = 2^y + 4$

23. Let O be the origin. The coordinates of the points P and Q are (30, 10) and (–10, –30) respectively. The x-coordinate of the circumcentre of ΔOPQ =

A. –10

B. 0

C. 10

D. 25

24. Find the maximum value of $\cos^2 x - 4\cos x + 7$ for $0° \le x \le 360°$.

A. 12

B. 8

C. 7

D. 4

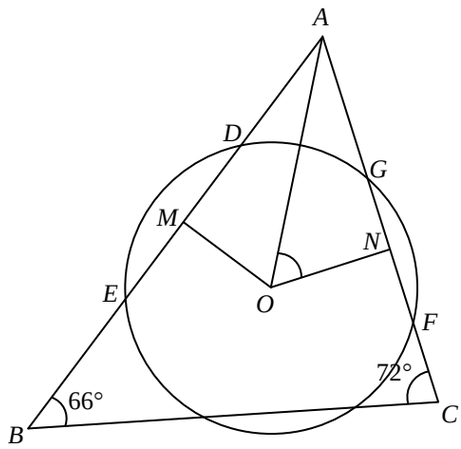
25. In the figure, ΔABC cuts the circle at D, E, F and G. M and N are mid-points of DE and FG respectively and $ME = NF$. O is the centre of the circle, $\angle ABC = 66°$ and $\angle ACB = 72°$. $\angle AON =$

A. 84°

B. 72°

C. 69°

D. 66°



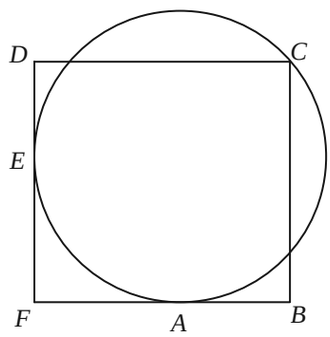
26. In the figure, rectangle $BCDF$ touches the circle at A and E, C is a point on the circumference, $FB = 9$, $FD = 8$, the radius of the circle =

A. $\frac{72}{17}$

B. 5

C. 6

D. cannot be determined



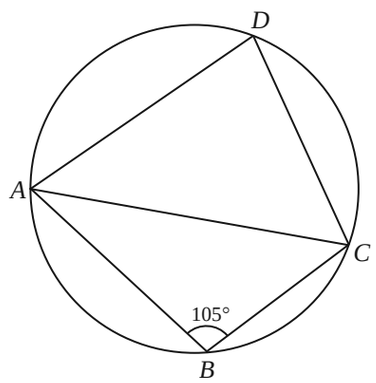
27. In the figure, BD is a diameter, $\overset{\frown}{AB} : \overset{\frown}{BC} = 3 : 2$ and $\angle ABC = 105°$. $\angle DAC =$

A. 42°

B. 54°

C. 60°

D. 63°



28. In the figure, AB is a diameter of the circle $ABCD$. It is given that AC and BD intersect at E and $\angle AED = \theta$. Which of the following are true?

I. $\Delta DCE \sim \Delta ABE$

II. $\frac{CD}{AB} = \cos\theta$

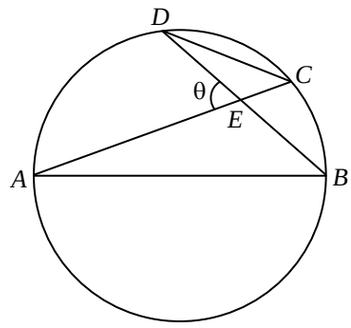
III. $\angle ABD = \frac{\theta}{2}$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



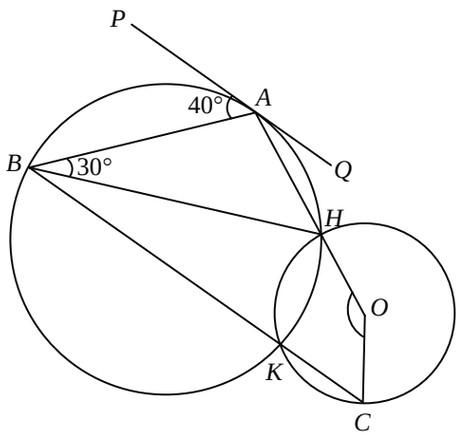
29. In the figure, O is the centre of the smaller circle, the two circles intersect at H and K, OHA and CKB are straight lines. PQ touches the larger circle at A.
$\angle PAB = 40°$ and $\angle ABH = 30°$. $\angle COH =$

A. 220°

B. 140°

C. 110°

D. 70°



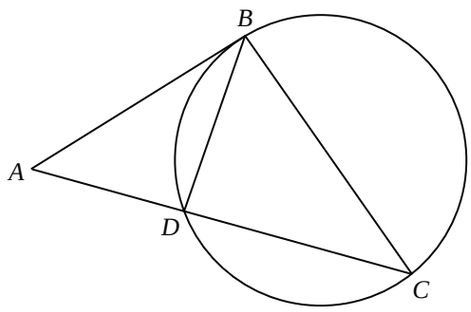
30. In the figure, AB is the tangent to the circle at B and ADC is a straight line. If $AC : AB = 3 : 2$, then the area of ΔABD : the area of ΔBCD =

A. 2 : 3

B. 3 : 5

C. 4 : 5

D. 4 : 9



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