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. Simplify $\frac{3^{n+2} - 6(3^n)}{3^{n+1}}$.

   A. 0

   B. 1

   C. 3^n

   D. $2(3^2 - 1)$

2. Factorize $ab - cd + ac - bd$.

   A. $(a - b)(c + d)$

   B. $(a - c)(b - d)$

   C. $(a - d)(b - c)$

   D. $(a - d)(b + c)$

3. If $s = ut + \frac{1}{2}at^2$, then $a =$

   A. $\frac{s - ut}{2t^2}$.

   B. $\frac{s + ut}{2t^2}$.

   C. $\frac{2(s - ut)}{t^2}$.

   D. $\frac{2(s + ut)}{t^2}$.

4. If $ax(1 - x) - b(x + x^2) \equiv 3x^2 - 5x$, find the values of a and b.

   A. $a = -5, b = 3$

   B. $a = -4, b = 1$

   C. $a = 3, b = 5$

   D. $a = 4, b = -1$

5. Given $f(x) = ax^2 - 2x$, where a is a constant. If $f(-x) = -f(x)$, find $f(-2)$.

   A. 2

   B. 4

   C. –2

   D. –4

6. If x and y are non-zero numbers such that $\frac{4x+3y}{7y-2x} = 5$, then $x : y =$

A. 7 : 16.

B. 7 : 19.

C. 16 : 7.

D. 19 : 7.

7. \$10 000 is deposit in a bank at an interest rate of 12% p.a. for 3 years, compounded half-yearly. Find the interest and correct the answer to the nearest dollar.

A. \$3600

B. \$4049

C. \$4185

D. \$9738

8. If x varies inversely as y^2, what is the percentage change in x when y is increased by 50%? Correct the answer to 3 significant figures.

A. –100%

B. –55.6%

C. –50.0%

D. 44.4%

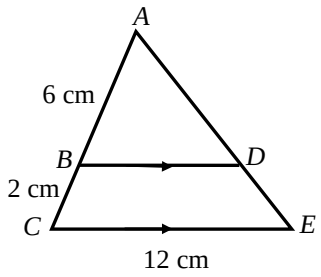
9. In the figure, ABC and ADE are straight lines. Find BD.

A. 4 cm

B. 6 cm

C. 8 cm

D. 9 cm



10. Consider the equation $x^2 + kx - 2k^2 = 0$, where k is a non-zero constant. Which of following is/are true?

I. k is a root of the equation.

II. The product of roots is positive.

III. The equation has two distinct real roots.

A. I only

B. II only

C. I and III only

D. II and III only

11. Solve the inequality $x - 1 < 2x \leq 6 - x$.

A. $1 < x \leq 2$

B. $x < -1$ or $x \geq 2$

C. $-1 < x \leq 2$

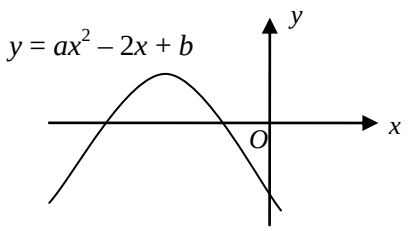
D. No solutions

12. The figure shows the graph of $y = ax^2 - 2x + b$, where a and b are constants. Which of the following is/are true?

I. $a > 0$

II. $b < 0$

III. $ab < 1$



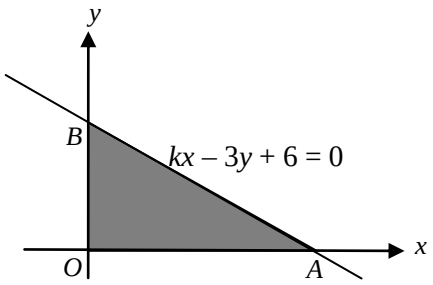
A. I only

B. II only

C. I and III only

D. II and III only

13. In the figure, the line $kx - 3y + 6 = 0$ cuts the positive x-axis at A and the positive y-axis at B. If the area of ΔOAB is 6 square units, then k =



A. –1.

B. –0.5.

C. 1.

D. 2.

14. The equation of straight line L is $2x + 3y - 6 = 0$. Which of the following statements is/are **CORRECT**?

I. L is parallel to the line $2x + 3y - 12 = 0$.

II. L is perpendicular to the line $2x - 3y - 6 = 0$.

III. L is perpendicular to the line $3x + 2y - 6 = 0$.

A. I only

B. I and II only

C. I and III only

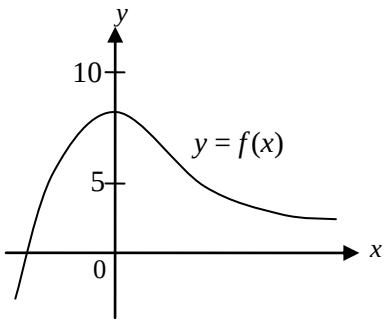
D. II and III only

15. The figure below shows the graph of the function $y = f(x)$. Which of the following equations must has/have solution(s)?

I. $f(x) = 0$

II. $f(x) = 5$

III. $f(x) = 10$



A. I only

B. II only

C. I and II only

D. II and III only

16. If the point (–2, –1) is reflected about the straight line $y = –5$, then the coordinates of its image are

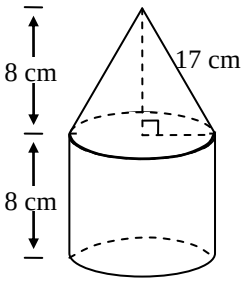
A. (–8, –1).

B. (–2, –9).

C. (–2, 11).

D. (12, –1).

17. The figure shows a solid which is formed by a right circular cone of height 8 cm and slant height 17 cm on a circular cylinder with same base and height as the circular cone. Find the curved surface area of the solid.



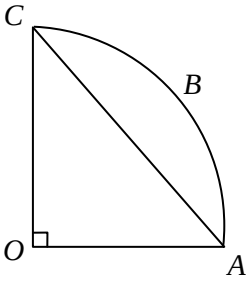
A. 240π cm^2

B. 255π cm^2

C. 495π cm^2

D. 735π cm^2

18. In the figure, O is the centre of the sector $OABC$. If the area of ΔOAC is 12 cm^2, find the area of the segment ABC.



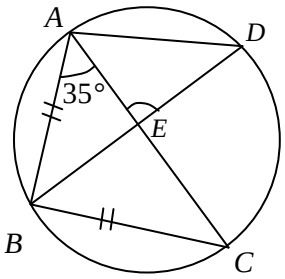
A. $3(\pi – 2)$ cm^2

B. $3(\pi – 1)$ cm^2

C. $6(\pi – 1)$ cm^2

D. $6(\pi – 2)$ cm^2

19. In the figure below, BD is a diameter of the circle $ABCD$. AC and BD intersect at E. If $AB = BC$ and $\angle BAC = 35°$, then $\angle AED =$



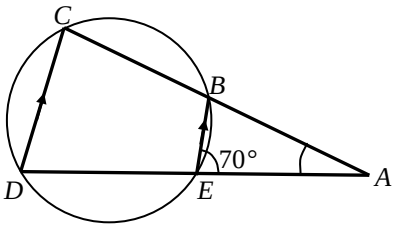
A. 70°.

B. 85°.

C. 90°.

D. 100°.

20. In the figure, $BCDE$ is a circle. ABC and AED are straight lines, CD // BE. If $\angle BEA = 70°$, find $\angle BAE$.



A. 40°

B. 60°

C. 70°

D. 80°

21. The equation of a circle is $2x^2 + 2y^2 + 8x - 12y + 3 = 0$. Which of the following are true?

I. The coordinates of the centre of the circle are (–2, 3).

II. The radius of the circle is 7.

III. The point (2, 3) lies outside the circle.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

22. Let A be the point (7, 4) and O be the origin in a rectangular coordinate plane. A point P moves in the plane such that $PA = PO$. Find the equation of its locus.

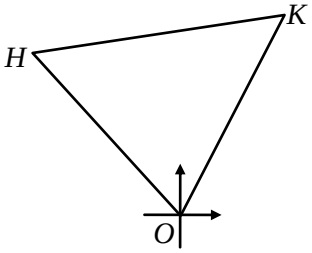
A. $14x + 8y + 65 = 0$

B. $14x + 8y - 65 = 0$

C. $14x - 8y + 65 = 0$

D. $14x - 8y - 65 = 0$

23. In the figure, the bearings of islands H and K from pier O are N40°W and N17°E respectively. If $OH = HK$, find the bearing of K from H.



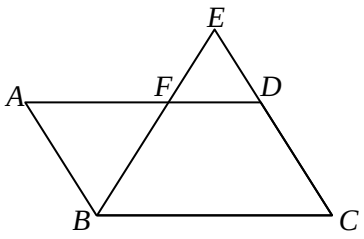
A. N16°W

B. S24°W

C. N66°E

D. N74°E

24. In the figure, *ABCD* is parallelogram, *F* is a point lying on *AD*. *BF* produced and *CD* produced meet at *E*. If *CD* : *DE* = 2 : 1, then *AF* : *BC* =



A. 1 : 2.

B. 2 : 3.

C. 3 : 4.

D. 8 : 9.

25. Let $f(x) = x^3 + ax^2 - x + b$. If $f(x)$ is divisible by $x^2 - 3x + 2$, find the values of a and b.

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

26. $\dfrac{\sin(90° - \theta)}{\cos(180° + \theta)} \times \dfrac{\cos(90° + \theta)}{\sin(360° - \theta)} =$

A. –1.

B. 1.

C. $\tan\theta$.

D. $-\dfrac{1}{\tan\theta}$.

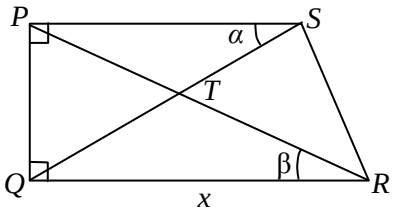
27. In the figure, *PR* and *QS* intersect at *T*. If *QR* = *x*, *PS* =

A. $\dfrac{x\sin\beta}{\sin\alpha}$.

B. $\dfrac{\cos\beta}{x\cos\alpha}$.

C. $\dfrac{x\tan\alpha}{\tan\beta}$.

D. $\dfrac{x\tan\beta}{\tan\alpha}$.



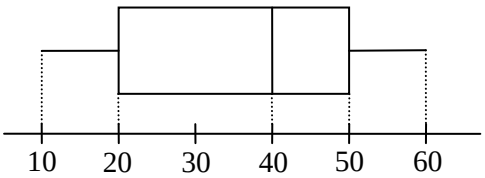
28. The figure shows the box-and-whisker diagram for the scores of a group of students in a test. The inter-quartile range of the scores is

A. 30.

B. 35.

C. 45.

D. 55.



29. The median of the group of numbers $\{a + 1, a + 2, a + 19, a – 3, a – 4\}$ is twice the mean. Find the value of a.

A. –5

B. –4

C. 1

D. 2

30. There are 4 different cards marked with "2", "3", "5", and "7" respectively. Two cards are randomly drawn from them at the same time, find the probability that the sum of the numbers drawn is a multiple of 4.

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{6}$

D. $\frac{5}{16}$

Section B

31. $\frac{1}{2-x}+\frac{x-1}{(x-2)^2}=$

A. $\frac{-3}{(2-x)^2}$.

B. $\frac{1}{(2-x)^2}$.

C. $\frac{-2x+3}{(2-x)^2}$.

D. $\frac{2x-3}{(2-x)^2}$.

32. If α and β are roots of $4x^2 + 5x – 3 = 0$, find the value of $\frac{1}{2\alpha}+\frac{1}{2\beta}$.

A. $-\frac{3}{5}$

B. $-\frac{2}{5}$

C. $\frac{5}{8}$

D. $\frac{5}{6}$

33. If x is a real number, then the real part of $(x + 3i)(3 + i)$ is

A. $3x$.

B. $x + 3$.

C. $3x + 3$.

D. $3x - 3$.

34. Solve $16^x + 2^{2x-1} - \frac{15}{2} = 0$.

A. $\frac{5}{2}$

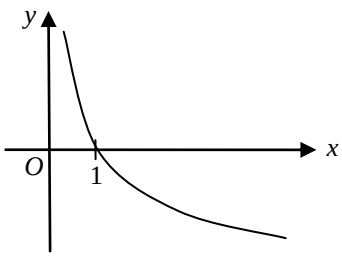
B. $\frac{5}{2}$ or -3

C. $\log\frac{5}{8}$

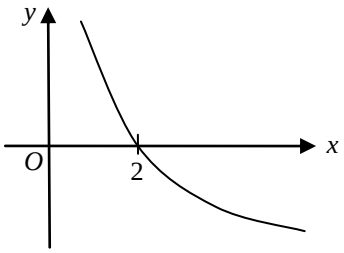
D. $\frac{\log 5 - \log 2}{\log 4}$

35. Which of the following graphs best represent the graph of $y = 2\log_3 x$?

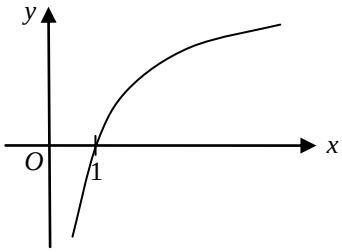
A.



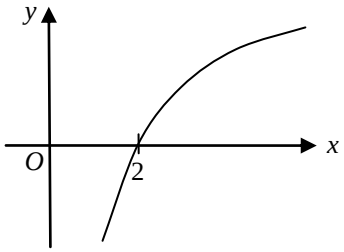
B.



C.



D.



36. Which region in the figure represents the solution to the following system of inequalities?

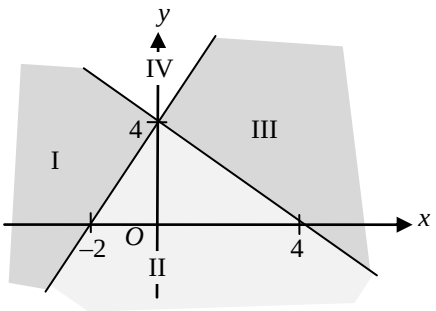
$$\begin{cases} x + y \le 4 \\ 2x - y \ge -4 \end{cases}$$

A. Region I

B. Region II

C. Region III

D. Region IV



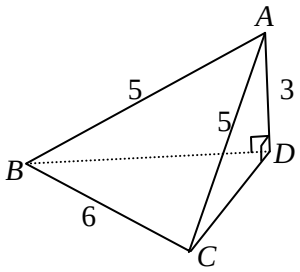
37. In the figure, *ABCD* is a triangular pyramid and *AD* is perpendicular to the plane *BCD*. It is given that *AB* = *AC* = 5, *BC* = 6 and *AD* = 3. Find the angle between planes *ABC* and *BCD*.

A. 36.9°

B. 39.8°

C. 41.4°

D. 48.6°



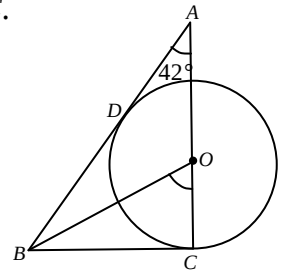
38. The figure shows a circle with centre *O*. The lines *BC* and *ADB* are tangents to the circle at *C* and *D* respectively. *AOC* is a straight line and ∠*BAC* = 42°, find ∠*BOC*.

A. 24°

B. 66°

C. 72°

D. 84°



39. If the straight line $x - y = 0$ and the circle $x^2 + y^2 + 6x + ky - k = 0$ do not intersect with each other, find the range of values of *k*.

A. $2 < k < 18$

B. $-18 < k < -2$

C. $k < -2$ or $k > 18$

D. $k < -18$ or $k > -2$

40. If the 3rd term and the 6th term of an arithmetic sequence are 18 and –6 respectively, then the 2nd term of the sequence is

A. –8.

B. 10.

C. 26.

D. 34.

41. If $0 < x < 1$, then $1 - x^2 + x^4 - x^6 + \cdots =$

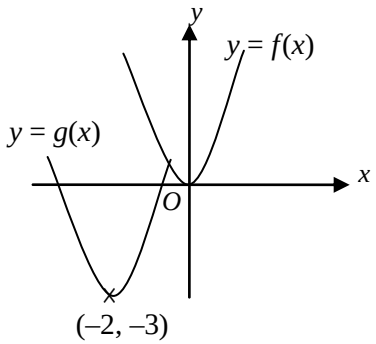
A. $\frac{1}{1+x}$.

B. $\frac{1}{1-x}$.

C. $\frac{1}{1+x^2}$.

D. $\frac{1}{1-x^2}$.

42. The figure shows the graph of $y = f(x)$ and the graph $y = g(x)$ on the same rectangular coordinate system. Which of the following may be $g(x)$?



A. $f(x - 2) - 3$

B. $f(x - 2) + 3$

C. $f(x + 2) - 3$

D. $f(x + 2) + 3$

43. Bag *A* contains 2 red balls, 3 green balls and 4 white balls while bag *B* contains 2 red balls, 3 green balls and 4 yellow balls. If one ball is drawn randomly from each bag, then the probability that the two balls drawn are of different colours is

A. $\frac{13}{81}$.

B. $\frac{29}{81}$.

C. $\frac{52}{81}$.

D. $\frac{68}{81}$.

44. In a Chinses test, the standard scores of the marks obtained by John and Mary are –1.05 and 0.8 respectively. Which of the following must be **CORRECT**?

I Mary performs better than John in the test.

II Compared with John, the mark obtained by Mary is closer to the mean mark of the test.

III The mark obtained by John is below the 16^{th} percentile of the marks in the test.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

45. A set of data has a mode of 52, an inter-quartile range of 33 and a standard deviation of 6. If each datum is doubled and then 10 is added to each datum to form a new set of data, find the mode, the inter-quartile range and the standard deviation of the new set of numbers.

	Mode	**Inter-quartile range**	**Standard deviation**
A.	104	66	12
B.	114	66	12
C.	114	66	22
D.	114	76	22

The End