MOCK EXAM 2

MATHEMATICS Compulsory Part

PAPER 2

(1 $\frac{1}{4}$ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet.

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. 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. $\frac{(3^n)(27^{2n})}{243^n}$ =

   A. 9^{2n}.

   B. 9^n.

   C. 9^{-n}.

   D. 9^{-2n}.

2. $25 - (3x - 4y)^2$ =

   A. $(5 - 3x - 4y)(5 + 3x + 4y)$.

   B. $(5 - 3x - 4y)(5 + 3x - 4y)$.

   C. $(5 - 3x + 4y)(5 + 3x + 4y)$.

   D. $(5 - 3x + 4y)(5 + 3x - 4y)$.

3. If α and β are constants such that $(x + \alpha)(x + 5) + 60 \equiv (x - 3)^2 + \beta$, then β =

   A. –1.

   B. –4.

   C. –5.

   D. –11

4. Let k be a constant such that $9x^4 - k^2x^2 + 6x + 18$ is divisible by $3x + k$. Find k.

   A. –3.

   B. 3.

   C. 6.

   D. 9.

5. Let k be a constant. Solve the equation $(2x + k)^2 = 9k^2$.

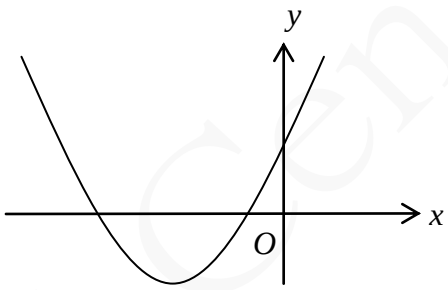
   A. $x = k$

   B. $x = 2k$

   C. $x = -2k$ or $x = k$

   D. $x = -2k$ or $x = 4k$

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



   A. $a < 0$ and $b < 0$

   B. $a < 0$ and $b > 0$

   C. $a > 0$ and $b < 0$

   D. $a > 0$ and $b > 0$

7. The solution of $x - \frac{3 - x}{4} > 8$ or $2 < x - 8$ is

   A. $x > 7$.

   B. $x > 8$.

   C. $x > 9$.

   D. $x > 10$.

8. Shop X sells two digital cameras for \$4 950 each. The shop gains 10% on one and loses 10% on the other. After the two transactions, the shop

   A. loses \$55.

   B. loses \$100.

   C. has no gain or no loss.

   D. gains \$55.

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9. In a school, 45% of students are boys. If 60% of the girls wear glasses and 70% of the boys wear glasses, then the percentage of students wearing glasses in the school is

   A. 35.5%

   B. 46.5%

   C. 53.5%

   D. 64.5%

10. It is given that $\frac{2}{3a} = \frac{3}{5b} = \frac{5}{6c}$, where a, b and c are positive numbers. Which of the following is true?

   A. $b < a < c$

   B. $b < c < a$

   C. $c < a < b$

   D. $c < b < a$

11. The height and base of a triangle are measured as 4.4 cm and 5.2 cm correct to the nearest 0.2 cm respectively. Let x cm^2 be the actual area of the triangle. Find the range of values of x.

   A. $10.965 < x \leq 11.925$

   B. $10.965 \leq x < 11.925$

   C. $11.34 < x \leq 11.54$

   D. $11.34 \leq x < 11.54$

12. The area of a park on a map is 50 cm^2. If the actual area of the park is 0.08 km^2, then the scale of the map is

   A. 1 : 1 600.

   B. 1 : 3 200.

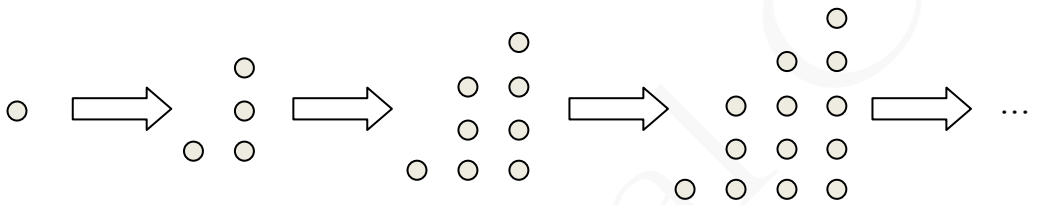
   C. 1 : 4 000.

   D. 1 : 16 000 000.

13. It is given that z varies directly as x and inversely as $\sqrt{y}$. If x is decreased by 10% and y is increased by 44%, then z

    A. is decreased by 25%.
    B. is decreased by 34%.
    C. is increased by 8%.
    D. is increased by 34%.

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

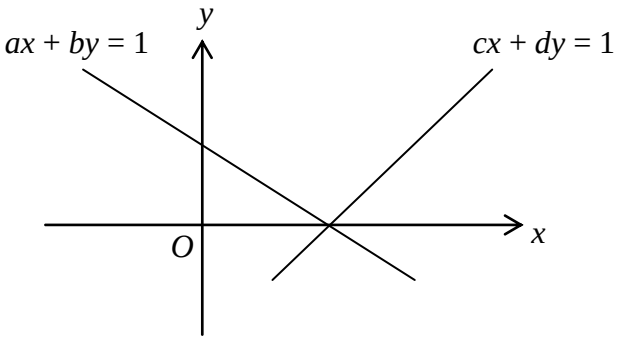


    A. 26
    B. 31
    C. 33
    D. 34

15. In the figure, the two straight lines intersect at a point on the positive x-axis. Which of the following are true?

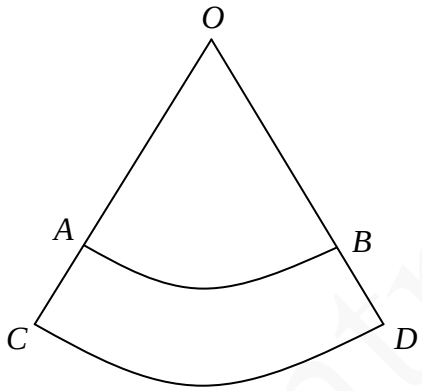
    I. $b > 0$
    II. $d > 0$
    III. $a = c$

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



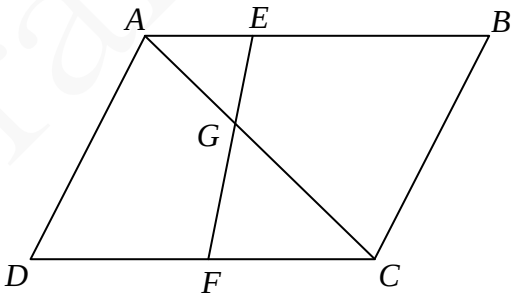
16. In the figure, *OAB* and *OCD* are sectors with centre *O*. If $\overset{\frown}{AB} = \frac{3}{4}\overset{\frown}{CD}$ and *AC* = 4 cm, then *OC* =

A. 8 cm.
B. 12 cm.
C. 16 cm.
D. 20 cm.



17. In the figure, *ABCD* is a parallelogram. *E* and *F* are points lying on *AB* and *DC* respectively such that *AE* : *EB* = 1 : 2 and *DF* : *FC* = 1 : 1. If the area of Δ *AGE* is 4 cm^2, then the area of quadrilateral *ADFG* is

A. 26 cm^2.
B. 21 cm^2.
C. 18 cm^2.
D. 16 cm^2.

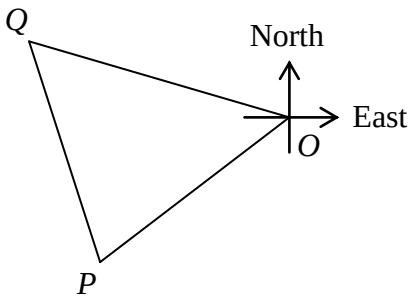


18. The base of a solid right prism is a regular hexagon. If the height of the prism is $2\sqrt{3}$ cm and its volume is 324 cm^3, find the total surface area of the prism correct to the nearest cm^2.

A. 94 cm^2
B. 218 cm^2
C. 312 cm^2
D. 405 cm^2

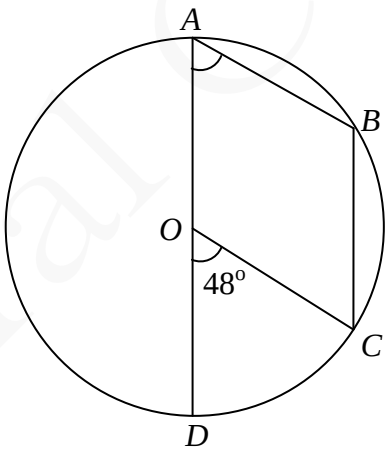
19. In the figure, the bearing of P from O is S40°W and the bearing of Q from O is N78°W. If O and Q are equidistant from P, then the bearing of Q from P is

A. N16°W.
B. N19°W.
C. S16°E.
D. S19°E.



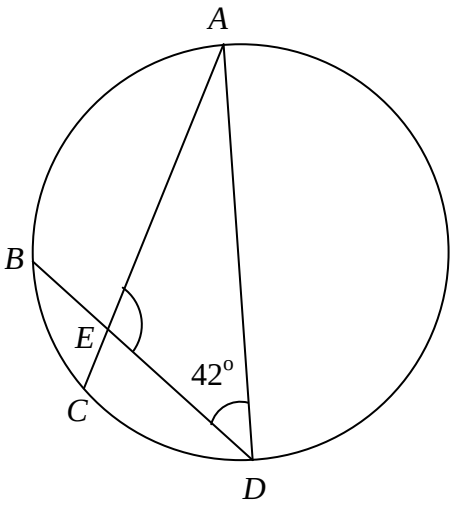
20. In the figure, O is the centre of the circle $ABCD$. AOD is a diameter of the circle. If AD // BC and $\angle COD = 48°$, then $\angle OAB =$

A. 24°.
B. 42°.
C. 48°.
D. 66°.



21. In the figure, AD is a diameter of the circle $ABCD$. If $\overset{\frown}{BC} : \overset{\frown}{CD} = 1 : 2$ and $\angle ADB = 42°$, $\angle AED =$

A. 84°.
B. 96°.
C. 106°.
D. 122°.



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22. If an interior angle of a regular n-sided polygon is greater than an exterior angle by 100^o, which of the following is/are true?

    I. The value of n is 9.

    II. The number of diagonals of the polygon is 9.

    III. The number of folds of rotational symmetry of the polygon is 9.

    A. I only

    B. II only

    C. I and III only

    D. II and III only

23. If $90^o < x < 180^o$, which of the following must be true?

    I. $\sin x - \sin(90^o - x) > 0$

    II. $\cos x + \cos(90^o - x) < 0$

    III. $\tan x \tan(90^o - x) = 1$

    A. I and II only

    B. I and III only

    C. II and III only

    D. I, II and III

24. Find the constant k such that the straight lines $5x - 4y + k = 0$ and $20x + ky + 12 = 0$ are perpendicular to each other.

    A. 25.

    B. 20.

    C. –20.

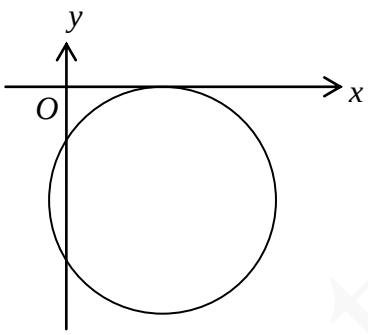
    D. –25.

25. In the figure, the radius of the circle and the coordinates of the centre are r and (h, k) respectively. Which of the following are true?

I. $h + k < 0$

II. $r + h > 0$

III. $r + k = 0$



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

26. ★7●◆ is a 4-digit number, where ★, ● and ◆ are integers from 0 to 9 inclusive. Find the probability that the 4-digit number is divisible by 5.

A. $\frac{1}{5}$

B. $\frac{11}{15}$

C. $\frac{10}{333}$

D. $\frac{29}{1000}$

27. Consider the following data:

16 33 35 37 41 41 43 a b c

The range of the above data is larger than 30. If the median and the inter-quartile range of the above data are 36 and 6 respectively, then the mode of the above data is

A. 16.

B. 33.

C. 35.

D. 41.

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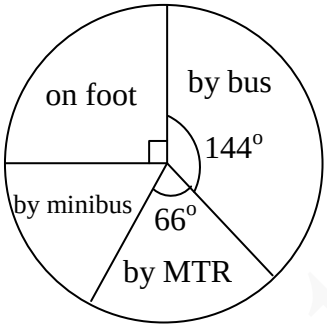
28. The pie chart below shows the distribution of transportation taken by students in a school. There are 360 students taking bus. Find the number of students taking minibus.

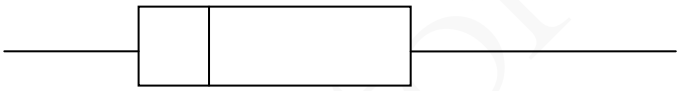
A. 60
B. 150
C. 165
D. 225

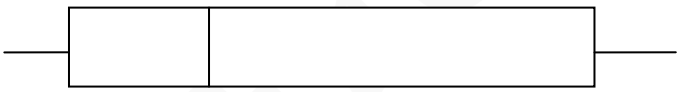


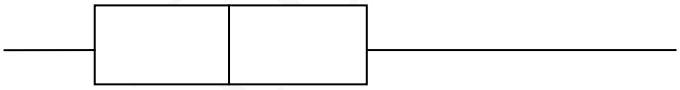
29. The stem-and-leaf diagram below shows the distribution of the number of monthly reading hours of a class of students.

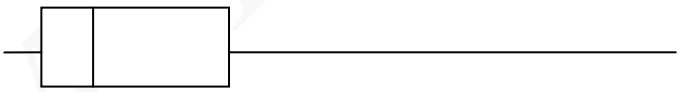
Stem (tens)	Leaf (units)
0	6 6 7 8 9 9
1	0 1 2 4 4 8
2	0 1 1 2 2 3 8
3	0 2 2 3
4	1 1 3 3 5 6 8

Which of the following box-and-whisker diagrams may represent the distribution of the reading hours?

A.


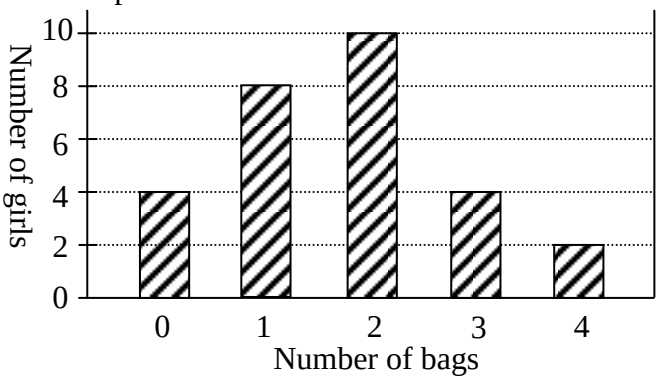
B.


C.


D.


30. The bar chart below shows the distribution of the number of bags owned by a group of girls. Find the standard deviation of the distribution correct to 2 decimal places.

A. 3.12
B. 1.10
C. 1.09
D. 0.91



Section B

31. The H.C.F. and the L.C.M. of three expressions are $2xz$ and $8x^2y^2z^3$ respectively. If the first expression and the second expression are $2x^2yz$ and $4x^2z^2$ respectively, then the third expression is

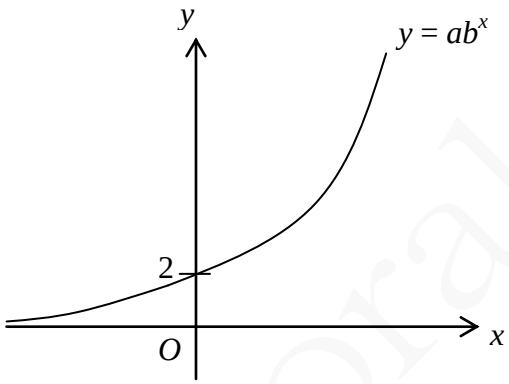
    A. $2xyz$.

    B. $8xyz^3$.

    C. $2xy^2z$.

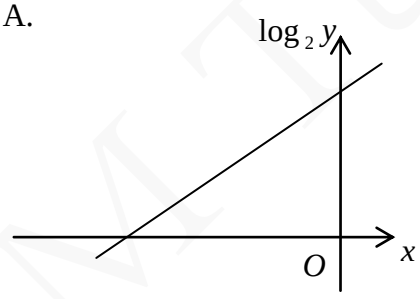
    D. $8xy^2z^3$.

32.

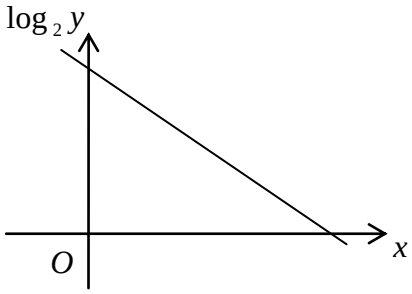


The figure above shows the graph of $y = ab^x$, where a and b are constants. Which of the following graphs may represent the relation between $\log_2 y$ and x?

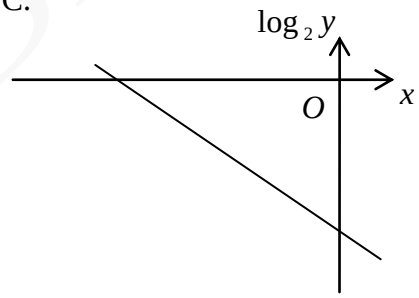
A.



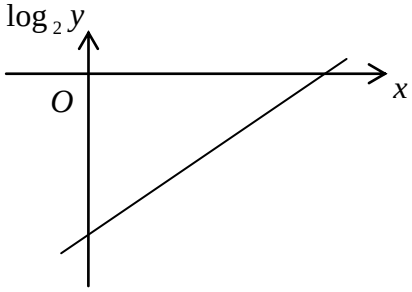
B.



C.



D.



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33. Which of the following is the greatest?

A. 126^{261}

B. 216^{216}

C. 612^{162}

D. 621^{126}

34. $A0000D02016_{16}$ =

A. $11 \times 16^{10} + 14 \times 16^5 + 8214.$

B. $10 \times 16^{10} + 13 \times 16^5 + 8214.$

C. $11 \times 16^{11} + 14 \times 16^6 + 131424.$

D. $10 \times 16^{11} + 13 \times 16^6 + 131424.$

35. $i^5(5 - \beta i)$ =

A. $-\beta - 5i.$

B. $-\beta + 5i.$

C. $\beta + 5i.$

D. $\beta - 5i.$

36. If $\alpha \neq \beta$ and $\begin{cases} 7\alpha = \alpha^2 + 6 \\ 7\beta = \beta^2 + 6 \end{cases}$, then $\frac{1}{\alpha} + \frac{1}{\beta} =$

A. $\frac{7}{6}$.

B. $-\frac{7}{6}$.

C. $\frac{6}{7}$.

D. $-\frac{6}{7}$.

37. If $m > 1$, which of the following are geometric sequences?

I. $1.1m^2$, $2.2m^4$, $4.4m^6$, $8.8m^8$

II. 3^m, 3^{4m}, 3^{7m}, 3^{10m}

III. $\log 2m$, $\log 4m$, $\log 8m$, $\log 16m$

A. I and II only

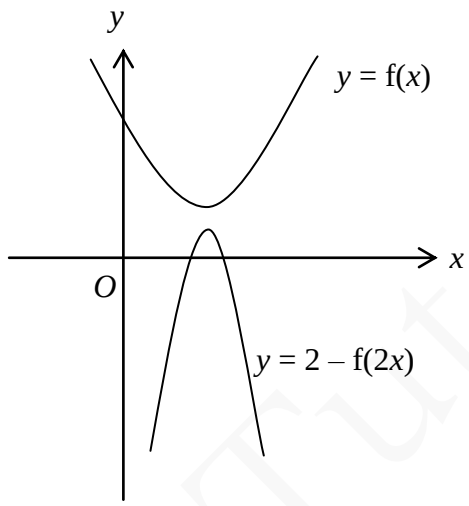
B. I and III only

C. II and III only

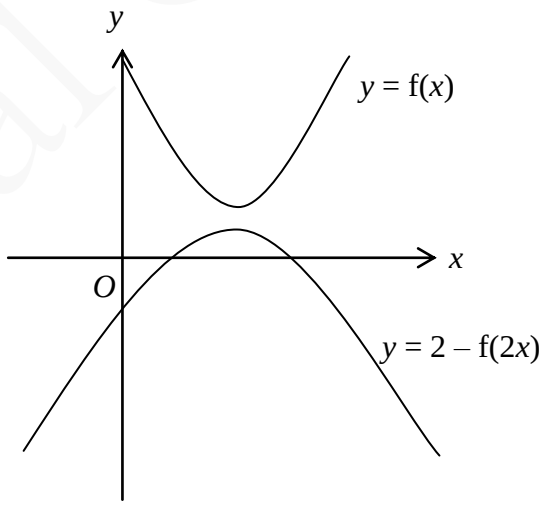
D. I, II and III

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

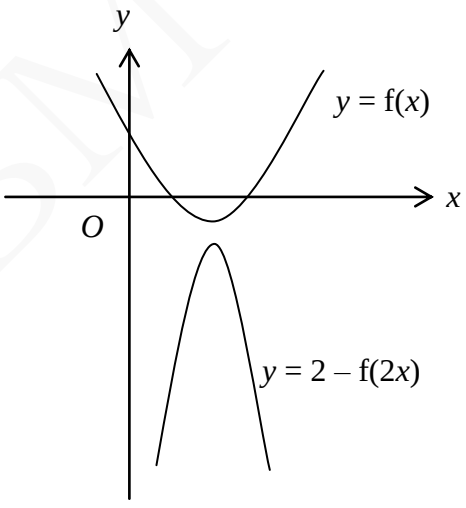
A.



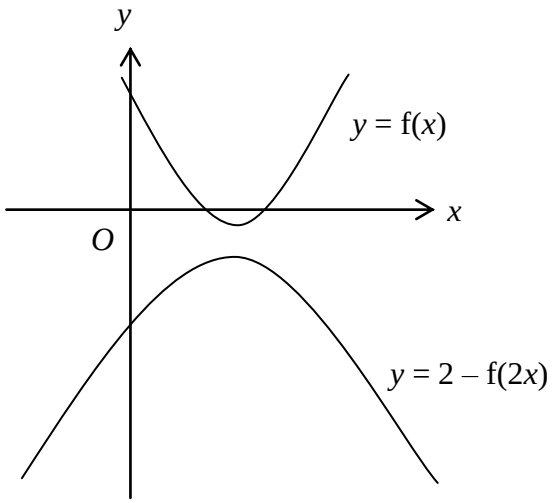
B.



C.



D.



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

A. 6

B. 5

C. 4

D. 3

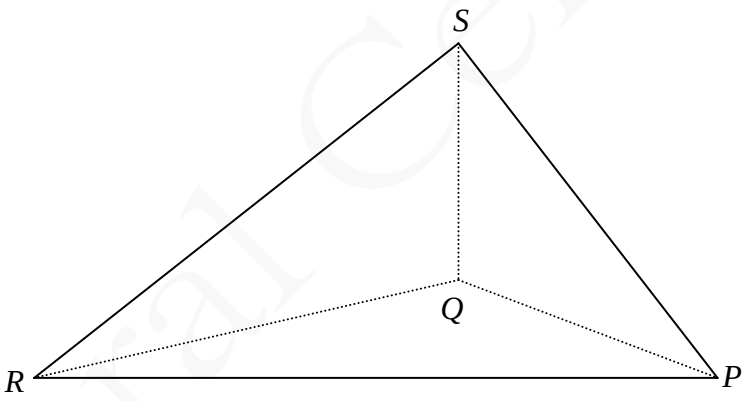
40. If the figure, the base PQR of the tetrahedron $PQRS$ lies on the horizontal ground. It is given that Q is vertically below S. If $\angle PQR = 90^o$, $\angle QPS = 45^o$ and $\angle QRS = 30^o$, then $\cos\angle PRS =$

A. $\frac{\sqrt{3}}{6}$.

B. $\frac{\sqrt{2}}{4}$.

C. $\frac{3}{4}$.

D. $\frac{1}{2}$.



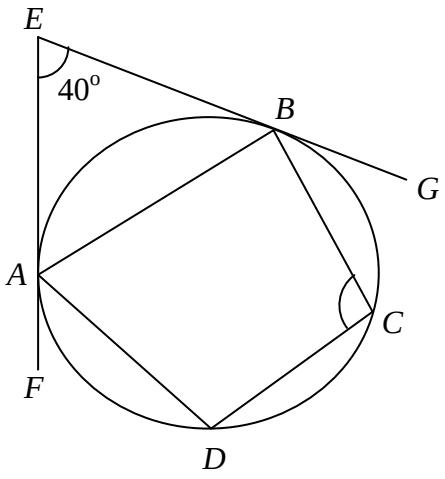
41. In the figure, EF and EG are the tangents to the circle $ABCD$ at A and B respectively. If $\angle AEB = 40^o$ and $AB = AD$, then $\angle BCD =$

A. 70^o.

B. 90^o.

C. 110^o.

D. 140^o.



42. If the straight line $x + y = k$ intersects with the circle $x^2 + y^2 - 4ky + 2 = 0$ at A and B, then the y-coordinate of the mid-point of AB is

A. $-3k$.

B. $3k$.

C. $-\frac{3k}{2}$.

D. $\frac{3k}{2}$.

43. A queue is formed by 3 girls and 6 boys. If no girls are next to each other, how many different queues can be formed?

A. 60 480

B. 75 600

C. 151 200

D. 362 880

44. A bag contains 1 red ball, 2 yellow balls and 3 blue balls. Peter repeats drawing one ball at a time randomly from the bag without replacement until a blue ball is drawn. Find the probability that he needs no more than three draws.

A. $\frac{3}{20}$

B. $\frac{1}{2}$

C. $\frac{4}{5}$

D. $\frac{19}{20}$

45. If the variance of the six numbers x_1, x_2, x_3, x_4, x_5 and x_6 is 6, then the variance of the six numbers $10 - 2x_1$, $10 - 2x_2$, $10 - 2x_3$, $10 - 2x_4$, $10 - 2x_5$ and $10 - 2x_6$ is

A. 12.

B. 22.

C. 24.

D. 34.

END OF PAPER

