MOCK EXAM 8
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. $\dfrac{27^{2n-1}}{9^{3n-1}} =$

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

   B. 1.

   C. 3^{-n}.

   D. 3^{n}.

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

   A. $-\dfrac{7b}{5}$.

   B. $-\dfrac{5b}{7}$.

   C. $\dfrac{3b}{5}$.

   D. $\dfrac{5b}{3}$.

3. $m^2 - 3m + 9n - 9n^2 =$

   A. $(m - 3n)(m + 3n - 3)$.

   B. $(m - 3n)(m - 3n - 3)$.

   C. $(m + 3n)(m + 3n + 3)$.

   D. $(m + 3n)(m - 3n + 3)$.

4. $\dfrac{1}{4x+3} - \dfrac{1}{4x-3} =$

    A. $\dfrac{6}{16x^2-9}.$

    B. $\dfrac{6}{9-16x^2}.$

    C. $\dfrac{8x}{16x^2-9}..$

    D. $\dfrac{8x}{9-16x^2}.$

5. The solution of $5 + x < 3x - 3$ or $5 - 3x > 2$ is

    A. $x < 1.$

    B. $x > 4.$

    C. $1 < x < 4.$

    D. $x < 1$ or $x > 4.$

6. Let $f(x) = 2x^2 - 7x + k$, where k is a constant. If $f(x)$ is divisible by $x - 5$, find the remainder when $f(x)$ is divided by $2x - 1$.

    A. -18

    B. -11

    C. 12

    D. 19

7. Which of the following statements about the graph of $y = -16 + (x - 4)^2$ is true?

    A. The graph does not cut the x-axis.

    B. The graph opens downwards..

    C. The y-intercept of the graph is -16.

    D. The graph passes through the origin.

8. If $f(x) = 2x^2 - 4x + 2$. Then $f(2k - 3) =$
    A. $4k^2 - 8k + 8$.
    B. $4k^2 - 8k + 32$.
    C. $8k^2 - 32k + 8$.
    D. $8k^2 - 32k + 32$.

9. A sum of $5 000 is deposited at an interest rate of 3% per annum for 2 years, compounded quarterly. Find the interest correct to the nearest dollar.
    A. $300
    B. $304
    C. $307
    D. $308

10. The scale of a map is 1 : 5000. If the area of a park on the map is 12 cm^2, then the actual area of the park is
    A. 3×10^4 m^2.
    B. 6×10^4 m^2.
    C. 7.2×10^5 m^2.
    D. 3×10^8 m^2.

11. Let x, y and z are non-zero numbers. If $2x = 3y$ and $y : z = 4 : 5$, then $\dfrac{x+4y}{y+2z} =$
    A. $\dfrac{11}{7}$.
    B. $\dfrac{4}{3}$.
    C. $\dfrac{55}{26}$.
    D. $\dfrac{70}{39}$.

12. It is given that z varies directly as x and inversely as y^2. If x is decreased by 20% and z is increased by 25%, then y

    A.   is increased by 25%.

    B.   is increased by 75%.

    C.   is decreased by 20%.

    D.   is decreased by 80%.

13. There are packets of salt. The weight of salt in a packet is measured as 100 g correct to the nearest g. If n packets of salt are packed into a bag such that the weight of salt in each bag is measured as 15 kg correct to the nearest kg, find the least possible value of n.

    A.   144

    B.   145

    C.   150

    D.   155

14. Let a_n be the nth term of a sequence. If $a_4 = 19$, $a_7 = 81$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, Then $a_2 =$

    A.   5

    B.   7

    C.   12

    D.   31

15. The base radius of a right circular cylinder is 3 times the base radius of a right circular cone while the height of the circular cone is 2 times the height of the circular cylinder. If the volume of the circular cylinder is 324π cm^3, then the volume of the circular cone is

    A. 12π cm^3.

    B. 24π cm^3.

    C. 27π cm^3.

    D. 486π cm^3.

16. In the figure, *ABC* and *CDE* are equilateral triangles of side 100 cm and 90 cm respectively. *F* is the intersection of *BC* and *DE*. Find *FB*.
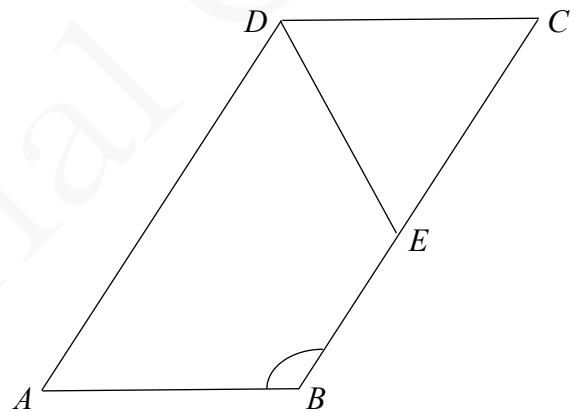
    A. 10 cm.

    B. 15 cm.

    C. 19 cm.

    D. 20 cm.
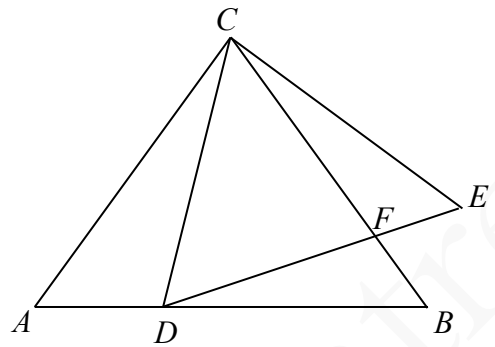
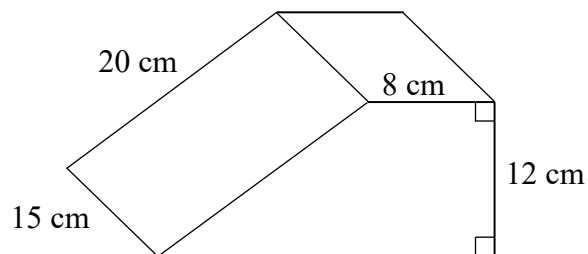17. In the figure, *ABCD* is a parallelogram. *E* is a point lying on *BC* such that *DC* = *DE*. If $\angle CDE = 68°$, then $\angle ABE =$

    A. 112º

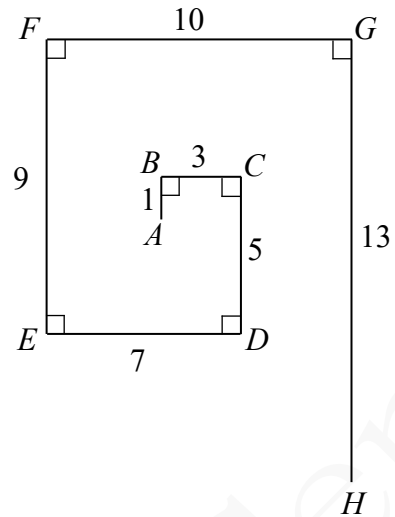   B. 124º

    C. 136º

    D. 148º

18. The figure shows a right prism. Find the volume of the prism.

    A. 1152 cm^3.

    B. 1440 cm^3.

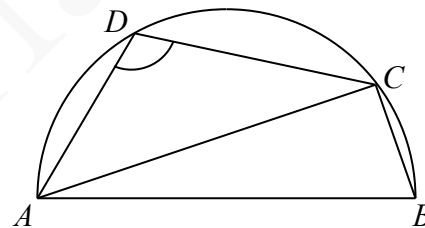   C. 1800 cm^3.

    D. 2880 cm^3.

19. In the figure, the length of the line segment joining *A* and *H* is

    A. 6.

    B. 8.

    C. 9.

    D. 10.

20. In the figure, *ABCD* is a semicircle. If $\angle DAC = 34^\circ$ and $\overset{\frown}{DC} : \overset{\frown}{CB} = 2 : 1$, then $\angle ADC =$

    A. 107°.

    B. 112°.

    C. 124°.

    D. 129°.

21. In the figure, *ABCD* is a parallelogram. *E* is a point lying on *BC* such that *BE* : *EC* = 2 : 3. *F* is a point lying on *CD* such that *CF* : *FD* = 3 : 5. *AE* and *BF* intersect at the point *G* such that *EG* : *GA* = 1 : 3. If the area of △*ABG* is 12 cm², then the area of the quadrilateral *CEGF* is

    A. 11 cm²

    B. 12 cm²

    C. 15 cm²

    D. 24 cm²

Go on to the next page
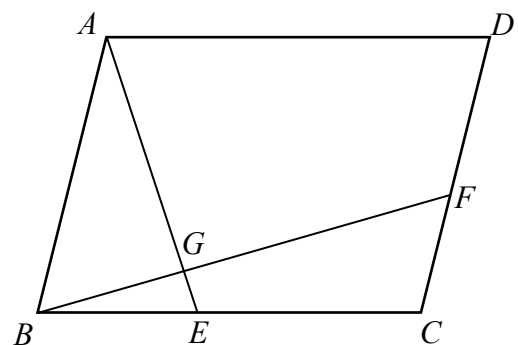
22. If an interior angle of a regular *n*-sided polygon is 8 times an exterior angle of the polygon, which of the following is/are true?

   I.   The value of *n* is 18.

   II.   Each interior angle of the polygon is 160º.

   III. The number of folds of rotational symmetry is 18.

     A.   I and II only

     B.   I and III only

     C.   II and III only

     D.   I, II and III

23. In the figure, *ABCD* is a rectangle. If *E* is a point lying on *AB* such that $\angle ADE = 30º$, find $\angle BCE$ correct to the nearest degree.

     A.   33º

   B.   43º

     C.   47º

     D.   57º
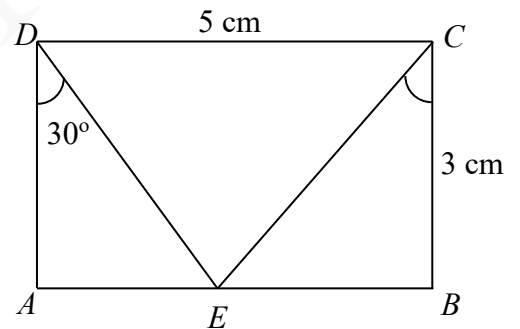
24. The straight line *L* is perpendicular to the straight line $3x + 4y - 10 = 0$. If the *y*-intercept of *L* is 6, then the equation of *L* is

     A. $3x + 4y + 18 = 0$.

     B. $3x + 4y - 24 = 0$.

     C. $4x - 3y + 18 = 0$.

     D. $4x - 3y - 24 = 0$.

25. The rectangular coordinates of the point P are $(-\sqrt{3}, 5)$. If P is reflected with respect to the straight line $y = 2$, then the polar coordinates of its image are

    A. $(2, 210°)$.

    B. $(2, 240°)$.

    C. $(4, 210°)$.

    D. $(4, 240°)$.

26. The equation of the circle C is $3x^2 + 3y^2 - 18x - 24y + 10 = 0$. Which of the following is true?

    A. The area of C is more than 40.

    B. The coordinates of the centre of C are $(9, 12)$.

    C. The origin lies inside C.

    D. C does not cut the x-axis.

27. If a diameter of the circle $x^2 + y^2 + kx - 14y + 45 = 0$ passes through the points $(-3, 9)$ and $(5, 5)$, then $k =$

    A. -5.

    B. -2.

    C. 1.

    D. 7.

28. The bar chart below shows the distribution of the number of children in some families of a building. If a family is randomly selected from the families, find the probability that the selected family has more than one child.

    A. $\dfrac{11}{24}$

    B. $\dfrac{19}{24}$

    C. $\dfrac{3}{5}$

    D. $\dfrac{9}{10}$
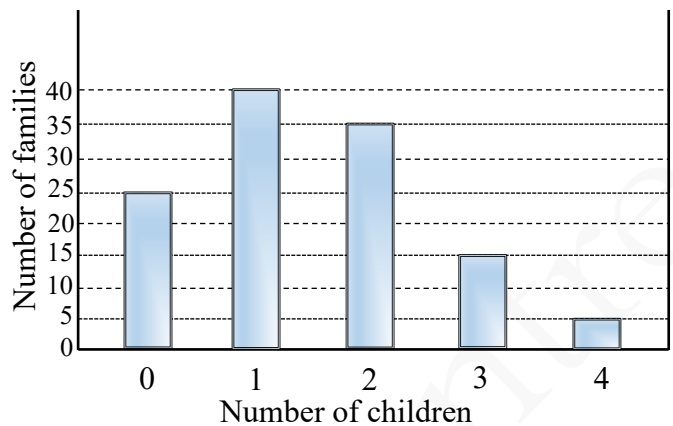
29. The box-and-whisker diagram below shows the distribution of the marks of a test got by a class of students. Find the inter-quartile range of the distribution.
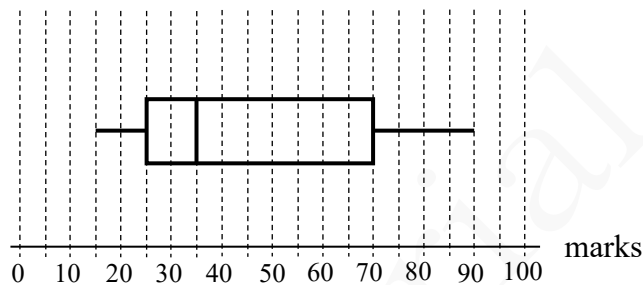

    A. 15

    B. 25

    C. 35

    D. 45

30. Consider the following positive integers:

    2 4 5 8 9 10 11 *m* *n*

    Let a, b and c be the mode, the median and the range of the above positive integers respectively. If the mean of the above positive integers is 6, which of the following must be true?

    I. $a = 4$

    II. $b = 5$

    III. $c = 9$

    A. I only

    B. II only

    C. I and II only

    D. II and III only

Section B

31. Let k be a positive constant and $-90° < \theta < 90°$. If the figure shows the graph of $y = \cos(kx° + \theta)$, then
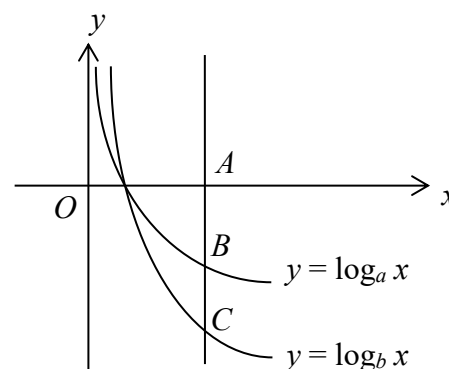
    A. $k = 2$, $\theta = 65°$.

    B. $k = 2$, $\theta = -65°$.

    C. $k = \dfrac{1}{2}$, $\theta = 65°$.

    D. $k = \dfrac{1}{2}$, $\theta = -65°$.
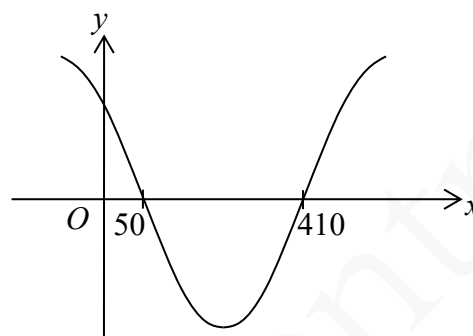
32. The figure shows the graph of $y = \log_a x$ and the graph of $y = \log_b x$ on the same rectangular coordinate system where a and b are positive constants. If a vertical line cuts the x-axis, the graph of $y = \log_a x$ and the graph of $y = \log_b x$ at the points A, B and C respectively, which of the following is/are true?

    I. $b > 1$

    II. $a < b$

    III. $\dfrac{AB}{AC} = \log_b a$

    A. I only

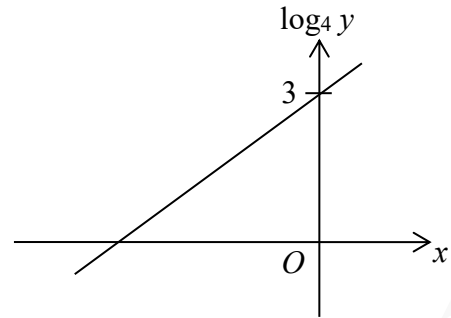   B. II only

    C. I and III only

    D. II and III only

33. $8^5 + 8^{21} =$

    A. 100000000000100_{16}.

    B. 800000000000800_{16}.

    C. 1000000000001000_{16}.

    D. 8000000000008000_{16}.

Go on to the next page

34. The graph in the figure shows the linear relation between $\log_4 y$ and x. If $y = mn^x$, then $m =$

    A. 3.

    B. 4.

    C. 12.

    D. 64.

$\log_4 y$

3

O

x

35. Consider the following system of inequalities:

$$\begin{cases} y + 10 \geq 0 \\ 3x - 5y \geq 0 \\ 4x - y - 34 \leq 0 \\ x + y + 16 \geq 0 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R, then the greatest value of $6x - 5y + 60$ is

    A. 30.

    B. 126.

    C. 146.

    D. 150.

36. The nth term of a sequence is $3n - 28$. Which of the following is/are true?

    I. -16 is a term of the sequence.

    II. The sequence has 8 negative terms.

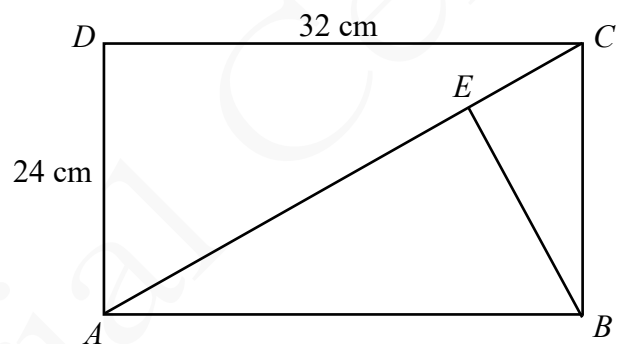   III. The sum of the first n terms of the sequence is $\dfrac{3n^2 - 53n}{2}$.

    A. I only

    B. II only

    C. I and III only

    D. II and III only

37. If k is a real number, then $5k - \dfrac{4 + ki}{i} =$

    A. $4k + 4i$.

    B. $4k - 4i$.

    C. $6k + 4i$.
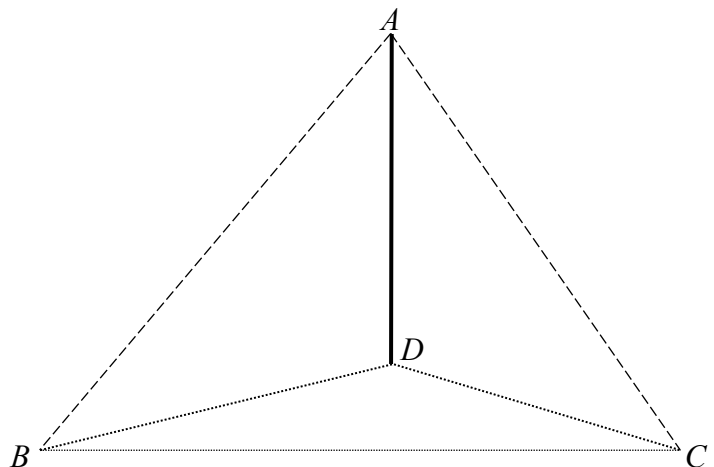
    D. $6k - 4i$.

38. In the figure, $ABCD$ is a rectangle. If E is a point lying on AC such that $CE = 10$ cm, then $BE =$

    A. $2\sqrt{73}$ cm.

    B. $2\sqrt{97}$ cm.

    C. $2\sqrt{119}$ cm.
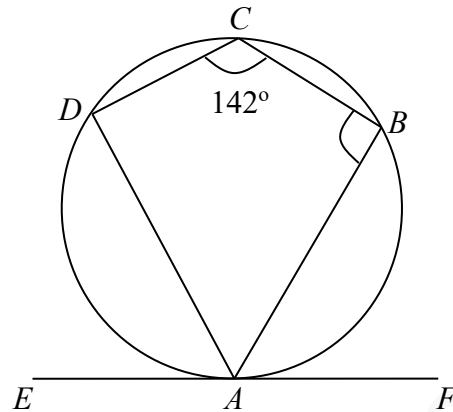
    D. $2\sqrt{193}$ cm.

39. In the figure, AD is a vertical pole standing on a horizontal ground BCD. If $AD = 12$ cm, $AC = 20$ cm, $BC = 34$ cm and $BD = 30$ cm, find the angle between AC and the plane ABD correct to the nearest degree.

    A. 22°

    B. 37°

    C. 53°

    D. 68°

Go on to the next page

40. In the figure, *EF* is the tangent to the circle at *A*. If *AB* is the angle bisector of ∠*DAF* and *CB* = *CD*, then ∠*ABC* =

    A. 142º.
    B. 123º.
    C. 114º.
    D. 104º.

41. Let *O* be the origin. The coordinates of the points *P* and *Q* are (*p*, 0) and (0, *q*) respectively, where *p* and *q* are positive numbers. If the circumcentre of △*OPQ* lies on the straight line $2x + 3y = 3p$, then *p* : *q* =

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

42. 0, 2, 4, 6 and 8 are known as even digits while 1, 3, 5, 7 and 9 are known as odd digits. The first digit of an eight-digit phone number is either 6 or 9. If the remaining digits are formed by a permutation of all digits (including 6 and 9), how many different eight-digit phone numbers with at least 3 even digits can be formed?

    A. 1 108 800
    B. 1 159 200
    C. 1 209 600
    D. 20 000 000

43. Bag A contains 4 red balls, 4 green balls and 3 blue balls while bag B contains 2 red balls, 5 green balls and 4 brown balls. If one ball is drawn from each bag, then the probability that the two balls drawn are of different colours is

    A. $\dfrac{28}{121}$.

    B. $\dfrac{40}{121}$.

    C. $\dfrac{61}{121}$.

    D. $\dfrac{93}{121}$.

44. In a test, the mean of the test is 66 marks. Amy gets 86 marks in the test and her standard score is 2.5. If Billy gets 78 marks in the test, then his standard score is

    A. –1.5.

    B. 1.

    C. 1.5.

    D. 2.

45. If the variance of the four numbers x_1, x_2, x_3, and x_4 is 18, then the variance of the four numbers $4x_1 + 5$, $4x_2 + 5$, $4x_3 + 5$ and $4x_4 + 5$ is

    A. 72.

    B. 77.

    C. 288.

    D. 293.

END OF PAPER