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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2018

MATHEMATICS Compulsory Part
PAPER 2

11:30 am – 12:45 pm (1¼ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

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.

Not to be taken away before the end of the examination session

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. $\dfrac{8^{2n+1}}{4^{3n+1}} =$

A. 1.

B. 2.

C. 2^n.

D. 2^{-n}.

2. If $\dfrac{\alpha}{1-x} = \dfrac{\beta}{x}$, then $x =$

A. $\dfrac{\alpha}{\alpha-\beta}$.

B. $\dfrac{\alpha}{\alpha+\beta}$.

C. $\dfrac{\beta}{\alpha-\beta}$.

D. $\dfrac{\beta}{\alpha+\beta}$.

3. $h^2 - 6h - 4k^2 - 12k =$

A. $(h-2k)(h-2k+6)$.

B. $(h-2k)(h+2k+6)$.

C. $(h+2k)(h-2k-6)$.

D. $(h+2k)(h+2k-6)$.

4. $\dfrac{1}{3x+7}-\dfrac{1}{3x-7}=$

A. $\dfrac{14}{49-9x^2}$.

B. $\dfrac{14}{9x^2-49}$.

C. $\dfrac{6x}{49-9x^2}$.

D. $\dfrac{6x}{9x^2-49}$.

5. Which of the following statements about the graph of $y=16-(x-6)^2$ is true?

A. The graph cuts the x-axis.

B. The graph opens upwards.

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

D. The graph passes through the origin.

6. In the figure, the equations of the straight lines L_1 and L_2 are $3x+ay=b$ and $cx+y=d$ respectively. Which of the following is/are true?

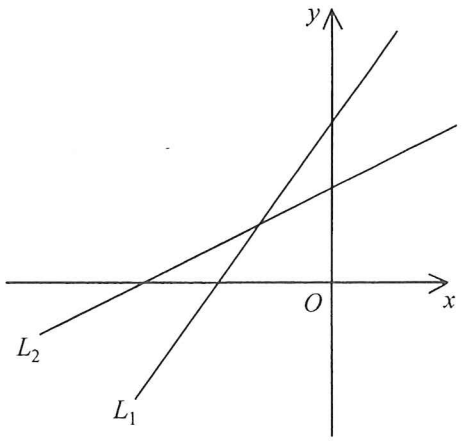
I. $ac<3$
II. $ad<b$
III. $bc<3d$

A. II only

B. III only

C. I and II only

D. I and III only



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7. If $f(x)=3x^2-2x+1$, then $f(2m-1)=$

A. $6m^2-4m+2$.

B. $6m^2-4m+6$.

C. $12m^2-16m+2$.

D. $12m^2-16m+6$.

8. Let $g(x)=x^8+ax^7+b$, where a and b are constants. If $g(x)$ is divisible by $x-1$, find the remainder when $g(x)$ is divided by $x+1$.

A. 0

B. $2a$

C. $-2a$

D. $-2a+2$

9. A sum of \$100 000 is deposited at an interest rate of 2% per annum for 3 years, compounded monthly. Find the interest correct to the nearest dollar.

A. \$6 000

B. \$6 121

C. \$6 176

D. \$6 178

10. Let a, b and c be non-zero numbers. If $3a=4b$ and $a:c=2:5$, then $\dfrac{a+3b}{b+3c}=$

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

B. $\dfrac{13}{33}$.

C. $\dfrac{30}{53}$.

D. $\dfrac{75}{38}$.

11. If w varies directly as the square root of u and inversely as the square of v, which of the following must be constant?

A. u^4vw^2

B. uv^4w^2

C. $\dfrac{vw^2}{u^4}$

D. $\dfrac{v^4w^2}{u}$

12. Let a_n be the nth term of a sequence. If $a_3 = 21$, $a_6 = 89$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, then $a_1 =$

A. 8.

B. 13.

C. 34.

D. 55.

13. The solution of $\dfrac{1-2x}{3} \geq x-3$ or $4x+9<1$ is

A. $x<-2$.

B. $x>-2$.

C. $x \leq 2$.

D. $x \geq 2$.

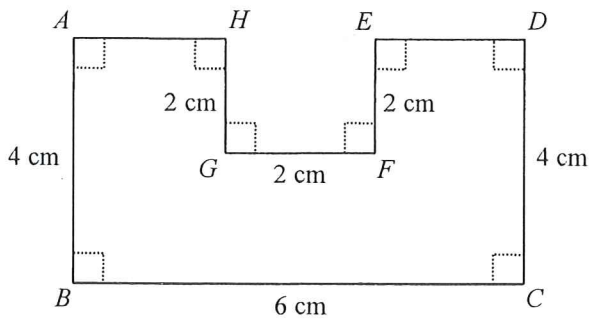
14. In the figure, $ABCDEFGH$ is an octagon, where all the measurements are correct to the nearest cm. Let $x\ \text{cm}^2$ be the actual area of the octagon. Find the range of values of x.

A. $13<x<23$

B. $13<x<27$

C. $17<x<23$

D. $17<x<27$



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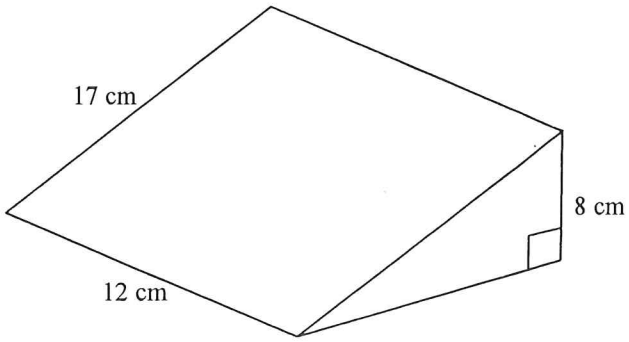
15. In the figure, the volume of the solid right triangular prism is

A. $544\ \text{cm}^3$.

B. $600\ \text{cm}^3$.

C. $660\ \text{cm}^3$.

D. $720\ \text{cm}^3$.



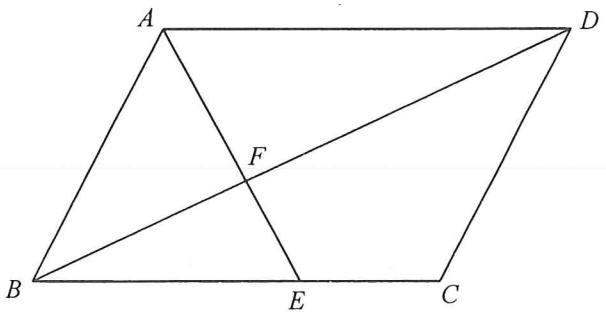
16. In the figure, $ABCD$ is a parallelogram. E is a point lying on BC such that $BE : EC = 5 : 3$. AE and BD intersect at the point F. If the area of ΔABF is $120\ \text{cm}^2$, then the area of the quadrilateral $CDFE$ is

A. $237\ \text{cm}^2$.

B. $307\ \text{cm}^2$.

C. $312\ \text{cm}^2$.

D. $429\ \text{cm}^2$.



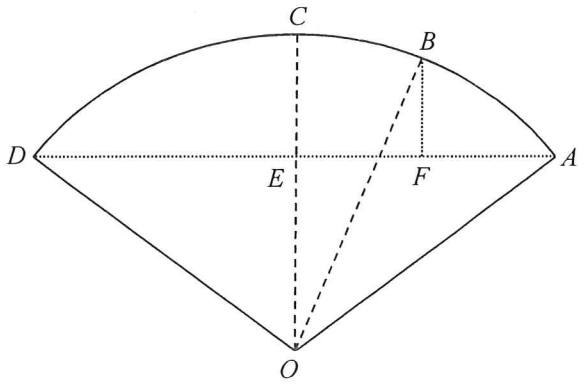
17. In the figure, O is the centre of the sector $OABCD$. AD and OC are perpendicular to each other and intersect at the point E . F is a point lying on AD such that BF is perpendicular to AD . If $AF = 9\ \text{cm}$, $DF = 39\ \text{cm}$ and $OE = 18\ \text{cm}$, then the area of the sector OBC is

A. $48\pi\ \text{cm}^2$.

B. $75\pi\ \text{cm}^2$.

C. $96\pi\ \text{cm}^2$.

D. $150\pi\ \text{cm}^2$.



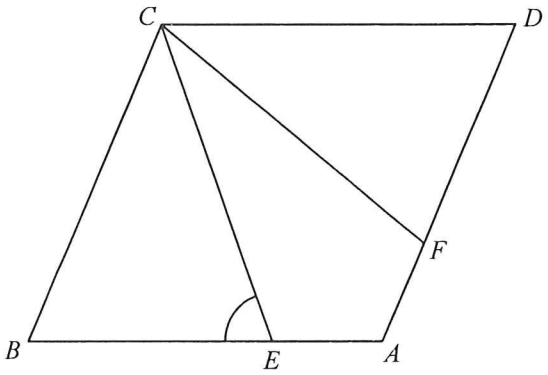
18. In the figure, $ABCD$ is a rhombus. E and F are points lying on AB and AD respectively such that $AE = AF$ and $\angle ECF = 42°$. If $\angle BAD = 110°$, then $\angle BEC =$

A. $70°$.

B. $76°$.

C. $80°$.

D. $84°$.



19. In the figure, $ABCDE$ is a regular pentagon. AD and CE intersect at the point F. Which of the following are true?

I. $CD = CF$

II. $\Delta ABF \cong \Delta CBF$

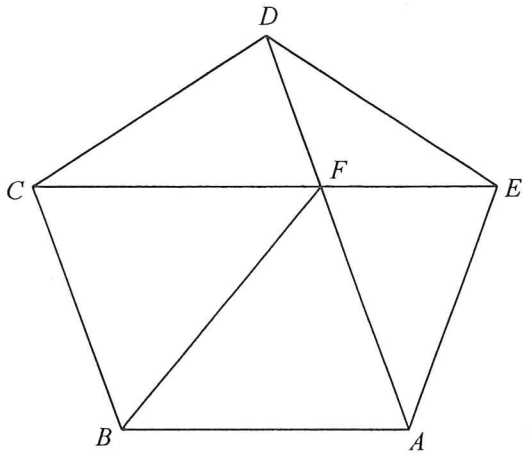
III. $\angle AFB + \angle EAF = 90°$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



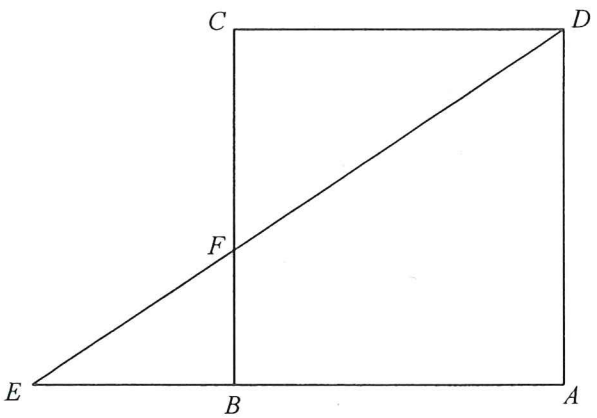
20. In the figure, $ABCD$ is a square. E is a point lying on AB produced such that $BE = 4$ cm. BC and DE intersect at the point F. If $EF = 5$ cm, then $DF =$

A. 12 cm.

B. 15 cm.

C. 16 cm.

D. 20 cm.



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21. In the figure, $ABCD$ is a trapezium with $\angle ABC = \angle BAD = 90°$. E and F are points lying on AB such that E and F divide AB into three equal parts. Which of the following must be true?

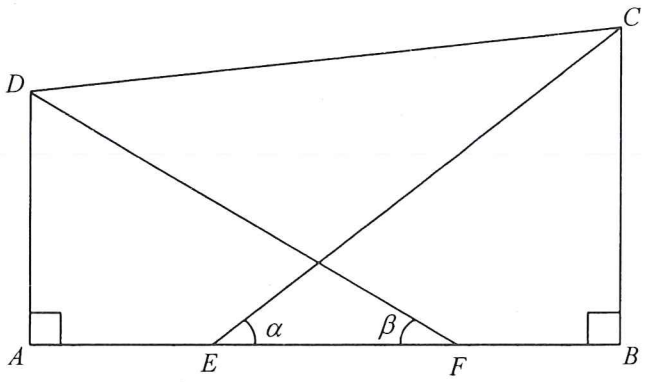
I. $AF \sin\alpha = BE \sin\beta$
II. $CE \cos\alpha = DF \cos\beta$
III. $AD \tan\alpha = BC \tan\beta$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



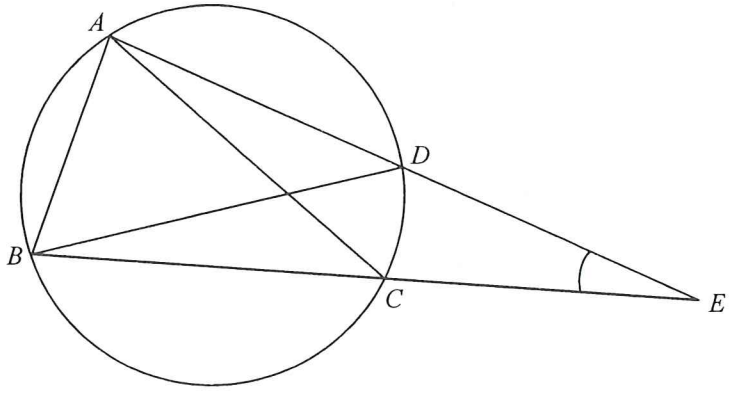
22. In the figure, $ABCD$ is a circle. AD produced and BC produced meet at the point E . It is given that $BD = DE$, $\angle BAC = 66°$ and $\angle ABD = 30°$. Find $\angle CED$.

A. 20°

B. 28°

C. 36°

D. 42°



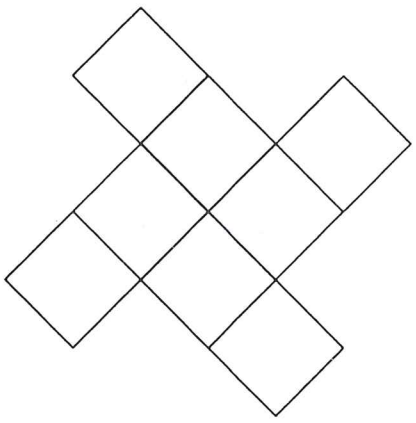
23. The figure below consists of eight identical squares. The number of folds of rotational symmetry of the figure is

A. 2 .

B. 4 .

C. 6 .

D. 8 .



24. The polar coordinates of the points C, D and E are $(16, 127°)$, $(12, 217°)$ and $(5, 307°)$ respectively. Find the perimeter of ΔCDE.

A. 54

B. 78

C. 126

D. 130

25. The equations of the straight lines L_1 and L_2 are $3x - y + 7 = 0$ and $12x - 4y - 11 = 0$ respectively. Let P be a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2. Find the equation of the locus of P.

A. $8x - 24y - 17 = 0$

B. $8x - 24y + 17 = 0$

C. $24x - 8y - 17 = 0$

D. $24x - 8y + 17 = 0$

26. The equation of the straight line L_1 is $4x + 3y - 36 = 0$. The straight line L_2 is perpendicular to L_1 and intersects L_1 at a point lying on the y-axis. Find the area of the region bounded by L_1, L_2 and the x-axis.

A. 96

B. 108

C. 150

D. 192

27. The equation of the circle C is $5x^2 + 5y^2 - 30x + 10y + 6 = 0$. Which of the following is true?

A. The origin lies inside C.

B. C lies in the second quadrant.

C. The circumference of C is less than 20.

D. The coordinates of the centre of C are $(15, -5)$.

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28. Two numbers are randomly drawn at the same time from seven cards numbered 1 , 1 , 1 , 2 , 2 , 3 and 4 respectively. Find the probability that the sum of the numbers drawn is 5 .

A. $\frac{5}{21}$

B. $\frac{5}{42}$

C. $\frac{5}{49}$

D. $\frac{10}{49}$

29. The mean of the numbers of pages of 10 magazines is 132 . If the mean of the numbers of pages of 6 of these 10 magazines is 108 , then the mean of the numbers of pages of the remaining 4 magazines is

A. 148 .

B. 156 .

C. 168 .

D. 176 .

30. The stem-and-leaf diagram below shows the distribution of the numbers of books read by 20 students in a year.

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

If the inter-quartile range of the above distribution is at most 25 , which of the following must be true?

I. $5 \le a \le 9$
II. $0 \le b \le 4$
III. $1 \le a - b \le 6$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

Section B

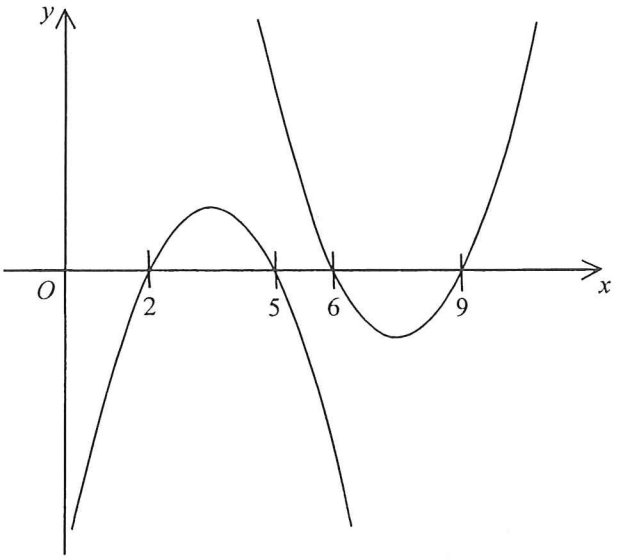
31. Let $f(x)$ be a quadratic function. The figure below may represent the graph of $y = f(x)$ and

A. the graph of $y = -3f(x)$.

B. the graph of $y = f(-3x)$.

C. the graph of $y = -f(x+4)$.

D. the graph of $y = f(-x+11)$.



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 graph of $y = \log_a x$, the graph of $y = \log_b x$ and the x-axis at the points A , B and C respectively, which of the following is/are true?

I. $a > 1$

II. $a > b$

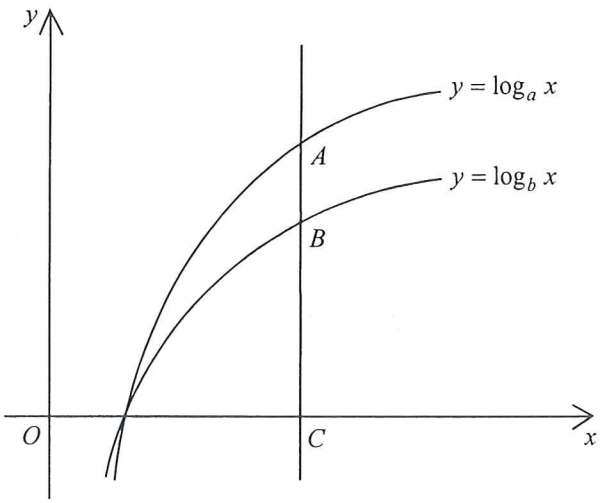
III. $\dfrac{AB}{BC} = \log_a \dfrac{b}{a}$

A. I only

B. II only

C. I and III only

D. II and III only



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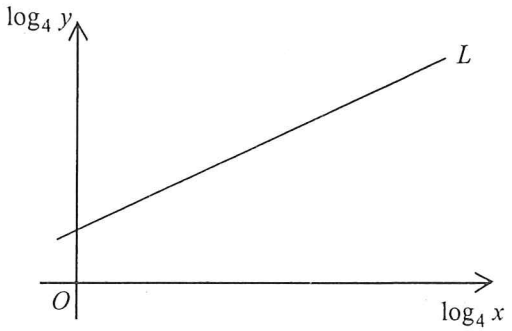
33. In the figure, the straight line L shows the relation between $\log_4 x$ and $\log_4 y$. It is given that L passes through the points $(1, 2)$ and $(9, 6)$. If $y = kx^a$, then $k =$

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

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

C. 2.

D. 8.



34. Consider the following system of inequalities:

$$\begin{cases} x - 21 \le 0 \\ x - y - 35 \le 0 \\ x + 5y - 91 \le 0 \\ 3x + 2y \ge 0 \end{cases}$$

Let D be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in D, then the least value of $5x + 6y + 234$ is

A. 45.

B. 150.

C. 178.

D. 423.

35. If the sum of the first n terms of a sequence is $6n^2 - n$, which of the following is/are true?

I. 22 is a term of the sequence.
II. The 1st term of the sequence is 5.
III. The sequence is a geometric sequence.

A. I only

B. II only

C. I and III only

D. II and III only

36. If $m \neq n$ and $2m^2 + 5m = 2n^2 + 5n = 14$, then $(m+2)(n+2) =$

A. -8.

B. 2.

C. 6.

D. 16.

37. The real part of $\dfrac{2i^{12} + 3i^{13} + 4i^{14} + 5i^{15} + 6i^{16}}{1 - i}$ is

A. -3.

B. -1.

C. 1.

D. 3.

38. For $0° \leq x < 360°$, how many roots does the equation $6\cos^2 x = \cos x + 5$ have?

A. 2

B. 3

C. 4

D. 5

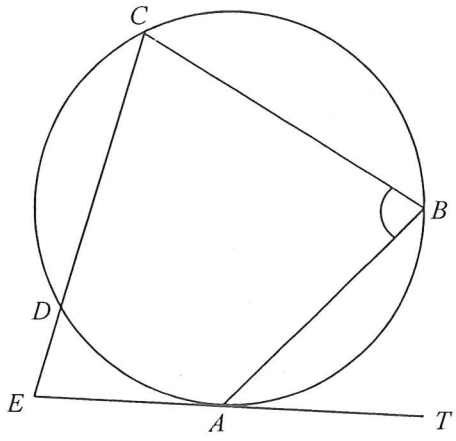
39. In the figure, TA is the tangent to the circle $ABCD$ at the point A. CD produced and TA produced meet at the point E. It is given that $AB = CD$, $\angle BAT = 24°$ and $\angle AED = 72°$. Find $\angle ABC$.

A. $60°$

B. $66°$

C. $72°$

D. $78°$



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40. It is given that a is a positive constant. The straight line $2x+5y=a$ cuts the x-axis and the y-axis at the points P and Q respectively. Let R be a point lying on the y-axis such that the x-coordinate of the orthocentre of ΔPQR is 10. Find the y-coordinate of R.

A. -25

B. -4

C. 4

D. 25

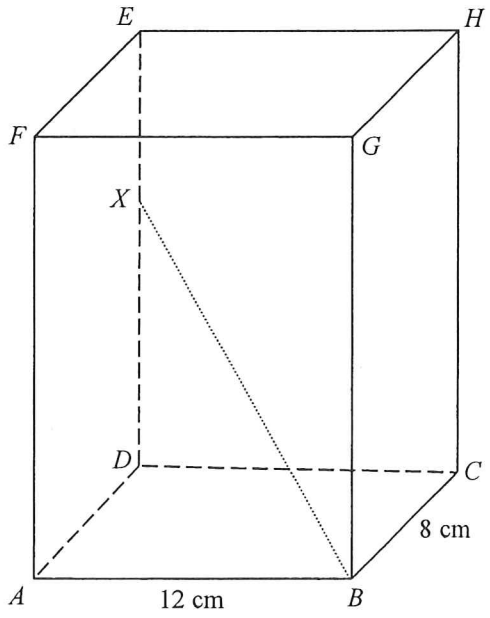
41. In the figure, $ABCDEFGH$ is a rectangular block. Let X be a point lying on DE such that $DX=9$ cm and $EX=4$ cm. Denote the angle between BX and the plane $ABGF$ by θ. Find $\cos\theta$.

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

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

C. $\frac{8}{17}$

D. $\frac{15}{17}$



42. In a class, there are 14 boys and 15 girls. If 3 students of the same gender are selected from the class to form a team, how many different teams can be formed?

A. 819

B. 3 654

C. 4 914

D. 165 620

43. John and Mary take turns to throw a fair die until one of them gets a number '1' or '6'. John throws the die first. Find the probability that John gets a number '6'.

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

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

C. $\frac{3}{10}$

D. $\frac{7}{10}$

44. In a test, the mean of the test scores is 68 marks. Peter gets 46 marks in the test and his standard score is -2.2. If Susan gets 52 marks in the test, then her standard score is

A. -2.5.

B. -1.6.

C. -0.6.

D. 1.6.

45. There are 49 terms in an arithmetic sequence. If the variance of the first 7 terms of the sequence is 9, then the variance of the last 7 terms of the sequence is

A. 9.

B. 18.

C. 49.

D. 81.

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