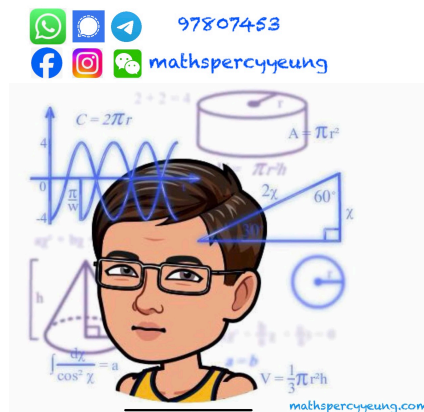




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Full Marks: 42

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Time Allowed: 75 min

INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on both the question paper and the Multiple-Choice Answer Sheet.
2. This paper consists of TWO sections: Section A and Section B.
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.
7. The diagrams in this paper are not necessarily drawn to scale.
8. Only calculators with the “**H.K.E.A. APPROVED**” or “**H.K.E.A.A. APPROVED**” label are allowed in the examination,

SECTION A

1. $\frac{(3^{3n})(9^{2n})}{243^n} =$

A. 9^n .

B. 9^{2n} .

C. 9^{3n} .

D. 9^{4n} .

2. $\frac{1}{3x+7} - \frac{1}{3x-7} =$

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

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

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

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

3. $(3x+2y)(3x-5y) + y(18x+12y) =$

A. $(3x-2y)(3x+11y)$.

B. $(3x-2y)(3x-11y)$.

C. $(3x+2y)(3x+y)$.

D. $(3x+2y)(3x-11y)$.

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4. If $k(h + 3k) = h(3 + k)$, then $h =$

A. k .

B. k^2 .

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

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

5. If a and b are constants such that $(y + 5)(y + a) \equiv (y + 6)^2 + b$, then $b =$

A. -1 .

B. 7 .

C. 35 .

D. 49 .

6. Let a , b and c be non-zero numbers. If $a : b = 2 : 5$ and $17a = 5b + 13c$, then $a : c =$

A. $9 : 26$.

B. $13 : 15$.

C. $15 : 13$.

D. $26 : 9$.

7. If $f(x) = ax^2 + c$, $2f(1) = f(2) = 12$, then
- A. $a = 2, c = 3$.
 - B. $a = 6, c = 4$.
 - C. $a = 2, c = 4$.
 - D. $a = 6, c = 3$.
8. A sum of \$91 020 is deposited at an interest rate of 6.5% per annum for 4 years, compounded quarterly. Find the amount correct to the nearest dollar.
- A. \$114 685
 - B. \$117 094
 - C. \$117 559
 - D. \$117 800
9. The total price of 5 shirts and 3 pairs of trousers is \$870. If the price of 3 shirts and the price of 4 pairs of trousers are the same, then the price of a shirt is
- A. \$90.
 - B. \$120.
 - C. \$130.
 - D. \$140.

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10. Simplify $\frac{g}{3-g} - \frac{3}{g-3}$.

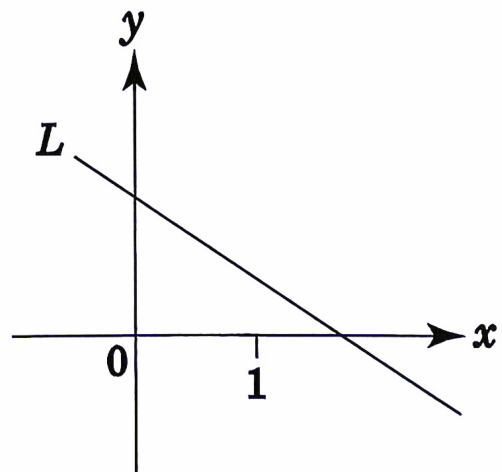
- A. 3
- B. -1
- C. $\frac{g+3}{3-g}$
- D. $\frac{g^2+9}{9-g^2}$

11. The straight lines L_1 and L_2 intersect at $(-3, 1)$. L_1 is perpendicular to L_2 and the y -intercept of L_1 is 5. Find the equation of L_2 .

- A. $3x + 4y + 5 = 0$
- B. $3x - 4y + 13 = 0$
- C. $4x + 3y + 9 = 0$
- D. $4x - 3y + 15 = 0$

12. The figure shows the graph of the straight line $L: ax + y + b = 0$. Which of the following are true?

- I. $a > 0$
 - II. $b < 0$
 - III. $a + b > 0$
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III



13. If the equation $2x^2 + 6x - 5 = -2k$ has two distinct real roots, find the range of values of k .

A. $k > -\frac{19}{4}$

B. $k < -\frac{19}{4}$

C. $k > \frac{19}{4}$

D. $k < \frac{19}{4}$

14. Let c be a constant. Solve the equation $(x - c)^2 = 9c^2$.

A. $x = 4c$

B. $x = 2c$

C. $x = -2c$ or $x = 4c$

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

15. If $F(2x - 1) = 4x^2 - 8x$, then $F(x) =$

A. $4x^2 - 12x + 5$.

B. $4x^2 - 4x - 3$.

C. $x^2 - 6x + 5$.

D. $x^2 - 2x - 3$.

16. $\sin^2(180^\circ - \theta) \left[1 + \frac{\sin(90^\circ + \theta)}{1 + \sin(270^\circ + \theta)} \right] =$

A. $1 + \cos \theta$.

B. $1 - \cos \theta$.

C. $(1 + \cos \theta)(1 - 2 \cos \theta)$.

D. $(1 - \cos \theta)(1 + 2 \cos \theta)$.

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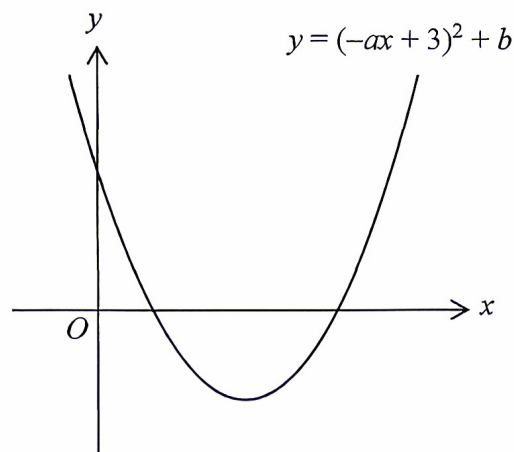
17. Which of the following statements about the graph of $y = (1 - x)(-2 - x) - 3$ is/are true?

- I. The graph opens upwards.
- II. The graph passes through the point $(-1, -1)$.
- III. The x -intercepts of the graph are 1 and -2 .

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

18. The figure shows the graph of $y = (-ax + 3)^2 + b$, where a and b are constants. Which of the following is true?

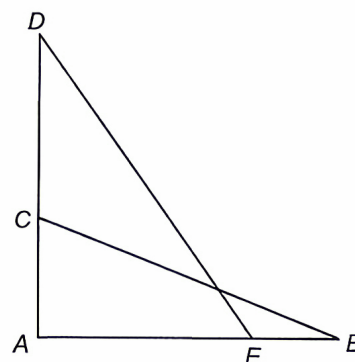
- A. $a > 0$ and $b > 0$
- B. $a > 0$ and $b < 0$
- C. $a < 0$ and $b < 0$
- D. $a < 0$ and $b > 0$



19. In the figure, ACD and AEB are straight lines. If $AB = 24$ cm, $AC = 10$ cm, $BC = 26$ cm,

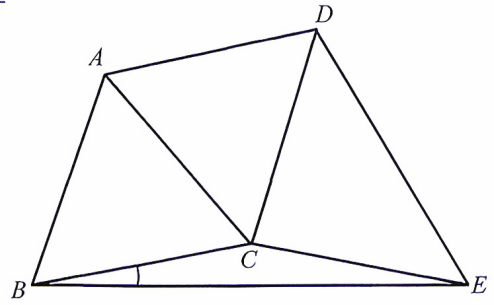
$DE = 34$ cm and $AE : AB = 2 : 3$, then $AD =$

- A. 28 cm.
- B. 30 cm.
- C. 31 cm.
- D. 38 cm.



20. In the figure, ABC is an equilateral triangle and CDE is an isosceles triangle with $CD = CE$. If $\angle DCE = 84^\circ$ and $\angle ADC = \angle CAD = 61^\circ$, then $\angle CBE =$

- A. 11° .
- B. 16° .
- C. 22° .
- D. 32° .



21. Given that $f(x) = 9x^2 + 3x + k$ where k is a constant, and when $f(x)$ is divided by $3x + k$, the remainder is k , find k .

- A. 1
- B. 0
- C. 0 or -1
- D. 0 or 1

22. Let $f(x) = ax^3 + 3x^2 - bx + 3$, where a and b are constants. If $f(x)$ is divisible by $x + 3$ and $x - 1$, then $f(x)$ can be factorized as

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

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23. If $a > 1$, arrange $\sqrt{a^3}$, $\sqrt[3]{a}$ and $\frac{1}{\sqrt[3]{a}}$ in ascending order.

A. $\sqrt{a^3} < \sqrt[3]{a} < \frac{1}{\sqrt[3]{a}}$

B. $\sqrt[3]{a} < \frac{1}{\sqrt[3]{a}} < \sqrt{a^3}$

C. $\frac{1}{\sqrt[3]{a}} < \sqrt{a^3} < \sqrt[3]{a}$

D. $\frac{1}{\sqrt[3]{a}} < \sqrt[3]{a} < \sqrt{a^3}$

24. The sum of the total surface areas of two solid hemispheres is $492\pi \text{ cm}^2$. If the ratio of the radius of the smaller hemisphere to the radius of the larger hemisphere is $4 : 5$, then the difference of the volumes of the two hemispheres is

A. $192\pi \text{ cm}^3$.

B. $\frac{976\pi}{3} \text{ cm}^3$.

C. $\frac{1024\pi}{3} \text{ cm}^3$.

D. $\frac{2000\pi}{3} \text{ cm}^3$.

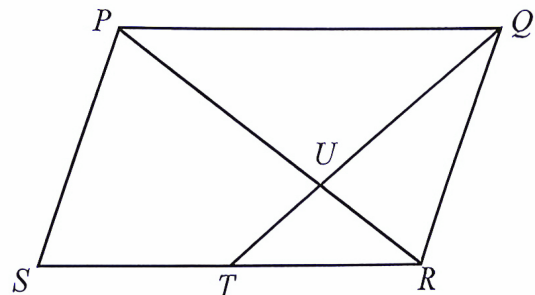
25. In the figure, $PQRS$ is a parallelogram. T is the mid-point of SR . PR and QT intersect at the point U . If the area of $\triangle TUR$ is 5 cm^2 , then the area of the quadrilateral $PUTS$ is

A. 25 cm^2 .

B. 15 cm^2 .

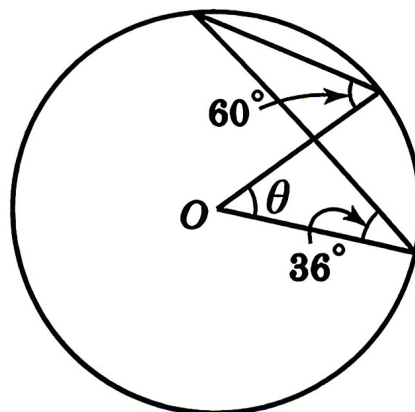
C. 10 cm^2 .

D. 5 cm^2 .



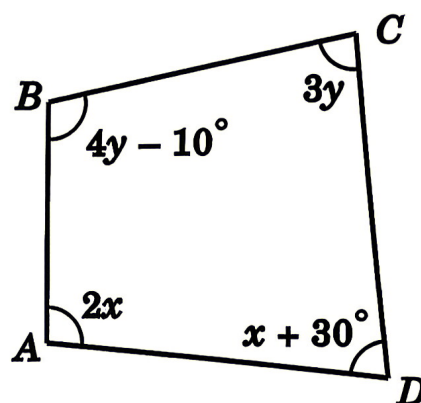
26. In the figure, O is the centre. Find θ .

- A. 28°
- B. 32°
- C. 48°
- D. 52°



27. In the figure, if $ABCD$ is a cyclic quadrilateral, then $x =$

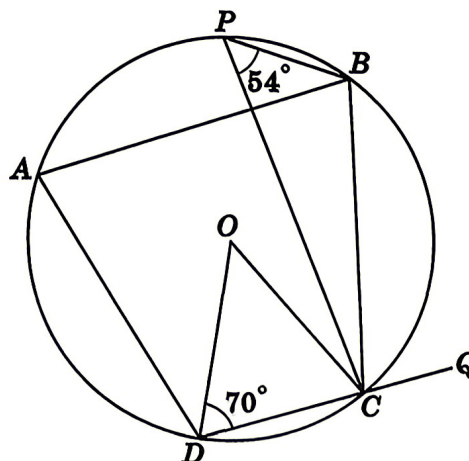
- A. 24° .
- B. 28° .
- C. 48° .
- D. 56° .



28. In the figure, O is the centre and DCQ is a straight line. $\angle ODC = 70^\circ$ and $\angle BPC = 54^\circ$.

Find $\angle BCQ$.

- A. 54°
- B. 74°
- C. 106°
- D. 108°



32. Let α and β be the roots of the quadratic equation $x^2 + mx - 35 = 0$, where m is a constant. If $\alpha^2 - m\beta = 39$, then $m =$
- A. 2.
- B. 4.
- C. -2 or 2.
- D. -4 or 4.
33. $(i + a)i^5 =$
- A. $1 + a$
- B. $-1 + ai$
- C. $1 + ai$
- D. $-1 - ai$
34. Let α be a real number. Define $u = \frac{1}{w} - w$ and $v = \frac{1}{w} + w$, where $w = \frac{\alpha - i}{\alpha + i}$. Which of the following must be true?
- I. u is a real number.
- II. The imaginary part of v is equal to 0.
- III. The real part of w is equal to the real part of $\frac{1}{w}$.
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

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35. Two numbers are randomly drawn at the same time from five cards numbered 2, 3, 5, 7 and 9 respectively. Find the probability that the product of the numbers drawn is less than 35.

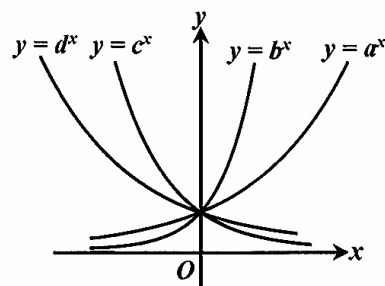
- A. $\frac{1}{5}$
B. $\frac{17}{25}$
C. $\frac{7}{10}$
D. $\frac{4}{5}$

36. If $\log 5 = m$ and $\log 7 = n$, then $\log \frac{28}{5} =$

- A. $\frac{4n}{m}$.
B. $\frac{100n}{m^3}$.
C. $n + 2 - m^3$.
D. $n + 2 - 3m$.

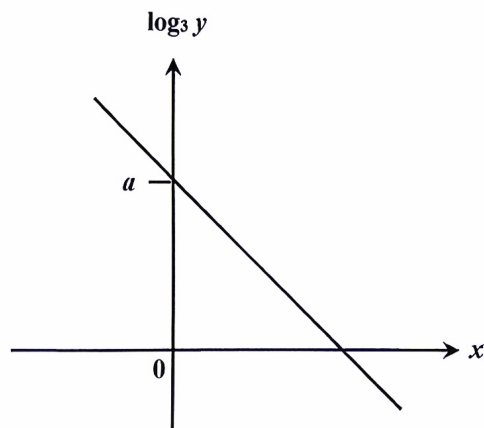
37. The figure shows the graphs of the exponential functions $y = a^x$, $y = b^x$, $y = c^x$ and $y = d^x$, where a , b , c and d are positive constants. Which of the following is true?

- A. $a > b > c > d$
B. $b > a > c > d$
C. $b > a > d > c$
D. $a > b > d > c$



38. The graph in the figure shows the linear relation between x and $\log_3 y$. If $y = 3^{4-2x}$, then $a =$

- A. 3.
- B. 4.
- C. 6.
- D. 81.



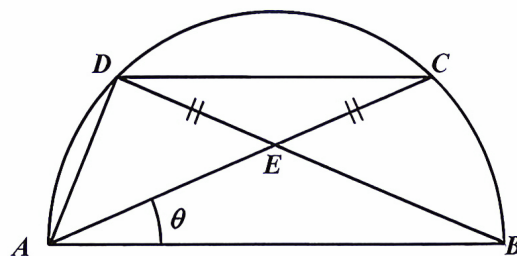
39. If $y + \frac{1}{y} = b$, express $y^2 + \frac{1}{y^2}$ in terms of b .

- A. $b^2 - 1$
- B. $b^2 - 2$
- C. $b^2 - 3$
- D. $b^2 - 4$

40. In the figure, $ADCB$ is a semi-circle. AC and BD intersect at E . If $CE = DE$ and $\angle CAB = \theta$, then

$$\frac{AB}{DC} =$$

- A. $\frac{1}{\sin \theta}$.
- B. $\frac{1}{\cos \theta}$.
- C. $\frac{1}{\sin 2\theta}$.
- D. $\frac{1}{\cos 2\theta}$.



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41. In the figure, O is the centre of the semi-circle $ABCDE$. AC and BD intersect at F .

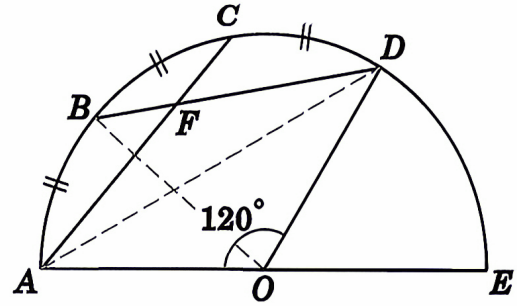
$\widehat{AB} = \widehat{BC} = \widehat{CD}$ and $\angle AOD = 120^\circ$. Find $\angle AFD$.

A. 100°

B. 120°

C. 140°

D. 150°



42. 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 $\triangle OPQ$ lies on the straight line

$8x - 10y = 11q$, then $p : q =$

A. $1 : 4$.

B. $2 : 3$.

C. $3 : 2$.

D. $4 : 1$.

End of Paper