2021-2022 Second Term Examination

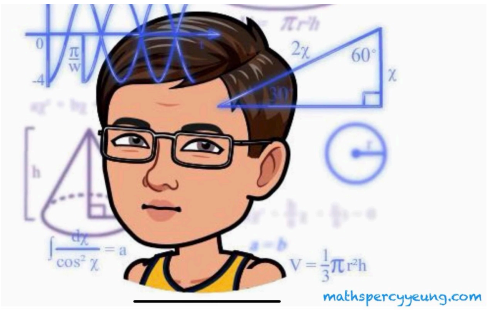
F. 3 Mathematics

Paper 2

Time allowed : 50 minutes

Full mark : 30

This question book consists of 8 printed pages.



Instructions to candidates:

1. Write your name, class and class number in the spaces provided on this cover.

2. This paper consists of 30 multiple-choice questions. All questions carry equal marks.

3. Answer ALL questions. Mark your answers on the MC Answer Sheet provided with an HB pencil.

4. Choose the best answer for each question.

5. Read carefully the instructions on the MC Answer Sheet and insert the information required in the spaces provided.

6. When told to check the question paper, you should check that all the questions are there. Look for the words 'End of Paper' after the last question.

7. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.

8. No marks will be deducted for wrong answers.

9. The diagrams in this paper are not necessarily drawn to scale.

10. Calculator pad printed with the "HKEA Approved" / "HKEAA Approved" label is allowed. Remove the calculator cover / jacket.

1. $a^3-(a-3)^3=$

   A. $3(a^2+3a-3)$.

   B. $9(a^2-3a+3)$.

   C. $3a(a^2+3a-3)$.

   D. $9a(a^2-3a+3)$.

2. Factorize $2x^4+16x^2-18$.

   A. $(x+1)(x-1)(x^2+9)$

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

   C. $2(x+1)(x-1)(x^2+9)$

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

3. Miss Lee borrows \$5 000 from a bank at an interest rate of 3.6% p.a. and the interest is compounded monthly. Find the amount that Miss Lee owes the bank, correct to the nearest ten dollars, after 3 years.

   A. \$5 540

   B. \$5 560

   C. \$5 570

   D. \$5 600

4. The number of crimes in a city is 56 000 this year. If the number of crimes increases steadily at a rate of 5% per year, find the increase in the number of crimes, correct to the nearest hundred, after 4 years.

   A. 2 800

   B. 11 200

   C. 12 100

   D. 68 100

5. Last year, the price of a stock was increased by 90%. But the price is decreased by 45% this year. Find the overall percentage change in the price of this stock.

   A. –30.5%

   B. –4.5%

   C. +4.5%

   D. +30.5%

6. If $0 < x < y$ and z is a negative number, then

   A. $xz < yz$.

   B. $xz^2 < yz^2$.

   C. $x(z-4) < y(z-4)$.

   D. $\frac{z}{x} > \frac{z}{y}$.

7. Which of the following inequalities is/are having 4 as a solution?

   I. $3x - 2 \geq 2x + 1$

   II. $x + 3 \geq 3x - 11$

   III. $2x + 1 > x + 5$

   A. I only

   B. I and II only

   C. I and III only

   D. I, II and III

8. Which of the following centres of triangles lie(s) outside the triangles?

   I. The incentre of an acute-angled triangle

   II. The orthocentre of an obtuse-angled triangle

   III. The circumcentre of a right-angled triangle

   A. I only

   B. II only

   C. II and III only

   D. I, II and III

9. In the figure, O is the circumcentre of ΔABC. P, R and T are the mid-points of AB, AC and BC respectively. If $AB = 6$, $BC = 8$ and $CA = 10$, which of the following is a /are right-angled triangle(s)?

   I. ΔARU

   II. ΔQTC

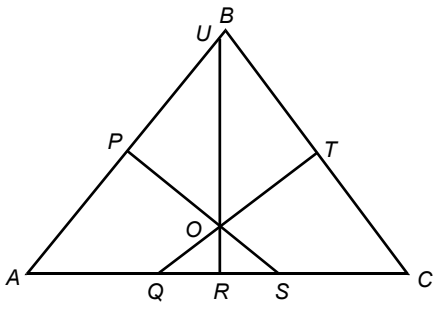
   III. ΔABC

   A. I only

   B. II only

   C. I and II only

   D. I, II and III



10. In the figure, $VABCD$ is a right pyramid with a square base. VE is the height of the pyramid and M is the mid-point of BC. Which of the following are right-angled triangles?

    I. ΔVME

    II. ΔVMB

    III. ΔVCB

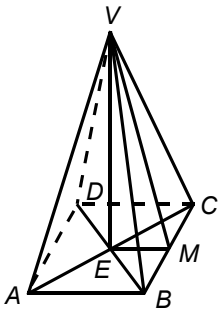
    IV. ΔBME

    A. I and II only

    B. II and IV only

    C. I, II and III only

    D. I, II and IV only



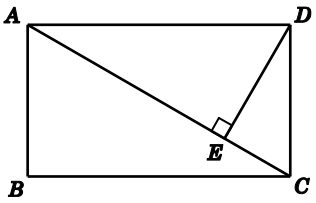
11. In the figure, AC is a diagonal of rectangle $ABCD$ and $DE \perp AC$. If $AC = 4$ cm, $DC = 2$ cm, then $DE =$

A. $\frac{\sqrt{12}}{2}$ cm.

B. $\sqrt{12}$ cm.

C. 1 cm.

D. 2 cm.



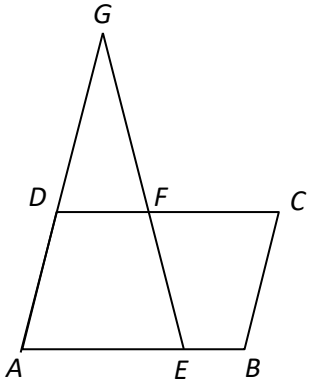
12. In the figure, $ABCD$ is a parallelogram. E and F are points lying on AB and CD respectively. AD produced and EF produced meet at G. It is given that $DF : FC = 3 : 4$ and $AD : DG = 1 : 1$. If the area of ΔDFG is 3cm^2, then the area of parallelogram $ABCD$ is

A. 12 cm^2.

B. 14 cm^2.

C. 18 cm^2.

D. 21 cm^2.



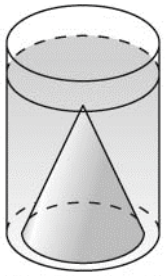
13. In the figure, a cylindrical vessel of base diameter 24 cm is filled with water. After a right circular cone of base radius 8 cm is completely immersed in the water, the water level is risen by 3 cm. Find the height of the cone.

A. 6.75 cm

B. 13.5 cm

C. 18.75 cm

D. 20.25 cm



14. A solid sphere of radius 9 cm is melted and recast into a solid hemisphere. Find the radius of the hemisphere.

A. 9.91 cm

B. 11.3 cm

C. 12.7 cm

D. 18 cm

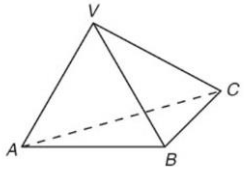
15. In the figure, $VABC$ is a regular tetrahedron and $VA = 10\,\text{cm}$, find the total surface area of $VABC$.

A. $25\sqrt{3}$ cm^2

B. $50\sqrt{3}$ cm^2

C. $100\sqrt{3}$ cm^2

D. $200\sqrt{3}$ cm^2



16. Four points $A(a\ ,\ 8)$, $B(3\ ,\ 2)$, $C(12\ ,\ -16)$ and $D(0\ ,\ -7)$ are given. If AB // CD, find the value of a.

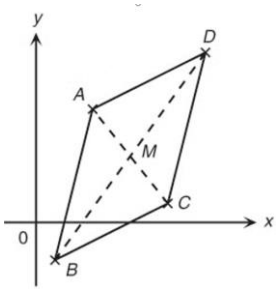
A. -5

B. -1.5

C. 7.5

D. 11

17. In the figure, $ABCD$ is a parallelogram on the rectangular coordinate plane with vertices $A(3,\ 6)$, $B(1,\ -2)$ and $C(7,\ 1)$. Find the coordinates of D.



A. $(9,\ 9)$

B. $(9,\ 8)$

C. $(8,\ 8)$

D. $(5, \frac{7}{2})$

18. Line segment AB with A $(-1,\ 1)$ and B $(3,\ 5)$ is produced to point C such that $AC = 3AB$. Find the coordinates of C.

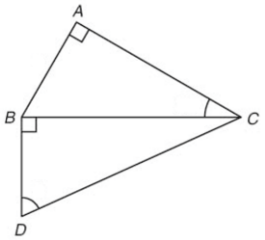
A. $(5,\ 7)$

B. $(11,\ 13)$

C. $(15,\ 17)$

D. $(19,\ 21)$

19. In the figure, $\angle ACB = 30°$, $\angle BDC = \theta$ and $AB = a$. Find the length of BD in terms of a and θ.



A. $\frac{a\tan\theta}{2}$

B. $\frac{a}{2\sin\theta}$

C. $2a\cos\theta$

D. $\frac{2a}{\tan\theta}$

20. Which of the following expressions is/are an identity/identities?

I. $\sin^2(90° - \theta) + \cos^2\theta \equiv 1$

II. $\tan(90° - \theta)\sin\theta \equiv \cos\theta$

III. $\frac{1 - \cos^2\theta}{\cos(90° - \theta)} \equiv \tan\theta$

IV. $(\cos\theta + \sin\theta)^2 - \tan\theta\cos^2\theta \equiv 1 + \sin\theta\cos\theta$

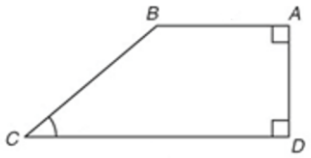
A. II only

B. I and III only

C. II and III only

D. II and IV only

21. In the figure, $ABCD$ is a trapezium. If $\angle BCD = 30°$, $BA = x$ and $CD = y$, find the area of $ABCD$ in terms of x and y.



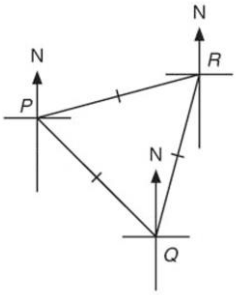
A. $\frac{\sqrt{3}(y^2 - x^2)}{2}$

B. $\frac{\sqrt{3}(y - x)^2}{2}$

C. $\frac{\sqrt{3}(y^2 - x^2)}{6}$

D. $\frac{\sqrt{3}(y - x)^2}{6}$

22. In the figure, P, Q and R are three vertices of an equilateral triangle. If the compass bearing of Q from P is S45°E, find the compass bearing of P from R.



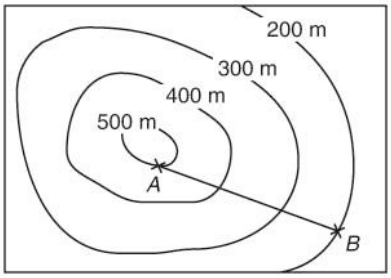
A. N75°E

B. S75°W

C. N15°W

D. S15°W

23. In the figure, the contour map is drawn to the scale 1 : 10 000 and the length of AB is measured to be 2.5 cm on the map. Find the gradient of AB.



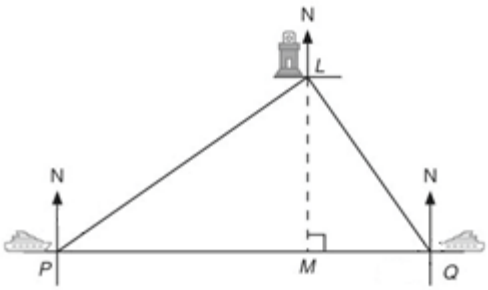
A. $\frac{4}{5}$

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

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

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

24. In the figure, P and Q are two ships on the sea; ship Q is due east of ship P. The true bearings of a lighthouse L from P and Q are $055°$ and $325°$ respectively. Find the distance LM where M is a point on PQ such that $LM \perp PQ$.



A. $PQ\sin 55°\cos 55°$

B. $PQ\sin^2 35°$

C. $PQ\cos^2 35°$

D. $PQ\tan^2 55°$

25. The following table shows the number of children in 50 families.

Number of children	Number of families
0	10
1	20
2	14
3	6

Find the mean number of children in these 50 families.

A. 1

B. 1.32

C. 1.5

D. 1.65

26. The following back-to-back stem-and-leaf diagram shows the intelligence quotients (IQs) of two groups of students.

Group A		*Group B*
Leaf (1)	***Stem (10)***	*Leaf (1)*
6 4	**9**	7
9 9 4	**10**	9 9 9
7 6	**11**	0 3 8
7 3 2	**12**	0 6 6

Which of the following must be true?

A. The mean of group A < the mean of group B

B. The median of group A > the median of group B

C. The mode of group A = the mode of group B

D. All of the above

27. The following table shows the marks that Jason got in three papers of a Chinese examination.

	Paper I	Paper II	Paper III
Marks	83	75	x
Weight	5	3	2

If the weighted mean mark of Jason is 80, find the value of x.

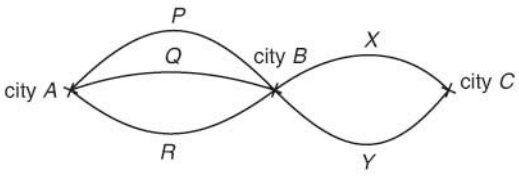
A. 80

B. 81

C. 82

D. 83

28. The figure shows the roads connecting cities A, B and C. John leaves city A and goes to city C. At each junction, he selects a road randomly. What is the probability that he travels via road Y?



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

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

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

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

29. A bag contains one \$1-coin, two \$5-coins and two \$10-coins. A coin is drawn at random, find the expected value of the coin.

A. \$3.8

B. \$4.4

C. \$5.5

D. \$6.2

30. A bag contains 2 red balls, 1 black ball and 1 white ball. A ball is drawn at random from the bag. The ball drawn is put back into the bag. A second ball is then drawn from the bag at random. Find the probability that both balls are red.

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

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

C. $\frac{1}{7}$

D. $\frac{1}{8}$

End of Paper