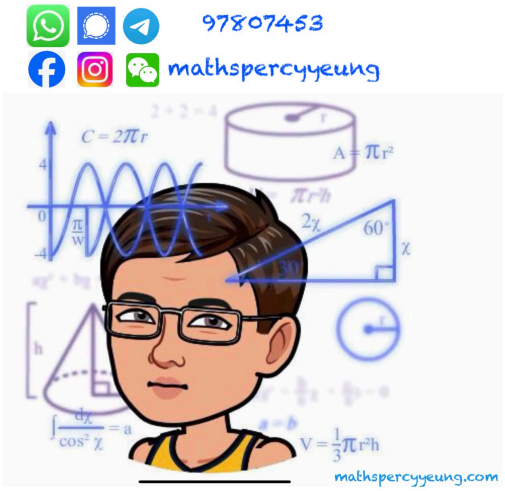
2023-2024 Second Term Examination

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 space 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. Which of the following has the factor $2p - q$?

   A. $2p^2 - 3pq + 2q^2$

   B. $2p^2 - 3pq - 2q^2$

   C. $8p^2 + 14pq - 9q^2$

   D. $8p^2 - 14pq + 9q^2$

2. $\left(\frac{-1}{6}\right)^{2023}\left(6^{2024}\right) =$

   A. $-6$.

   B. 6.

   C. $-\frac{1}{6}$.

   D. 0.

3. $110011001110_2 =$

   A. $2^{11} + 2^{10} + 2^7 + 39$.

   B. $2^{11} + 2^{10} + 2^7 + 78$.

   C. $2^{12} + 2^{11} + 2^8 + 39$.

   D. $2^{12} + 2^{11} + 2^8 + 78$.

4. If $a \geq b$ and $k > 0$, which of the following must be true?

   I. $k^2 a \geq k^2 b$

   II. $-\frac{a}{k} \geq -\frac{b}{k}$

   III. $a^2 + b^2 \geq 0$

   A. I and II only

   B. I and III only

   C. II and III only

   D. I, II and III

5. Solve $\frac{x-2}{3} \leq \frac{x+6}{4}$.

   A. $x \geq \frac{10}{7}$

   B. $x \geq -30$

   C. $x \leq 8$

   D. $x \leq 26$

6. A sum of \$50 000 is deposited in a bank at an interest rate of 2% p.a. for 5 years, compounded quarterly. Find the interest to be obtained correct to the nearest dollar.

   A. \$5122
   B. \$5196
   C. \$5204
   D. \$5245

7. It is given that the circumcentre of $\Delta XYZ$ lies on $XY$. Which of the following is true?

   A. $\angle XYZ$ is a right angle.
   B. $XY$ is the longest side of $\Delta XYZ$.
   C. The centroid of $\Delta XYZ$ lies on the point $Z$.
   D. The orthocenter and the circumcentre of $\Delta XYZ$ coincide.

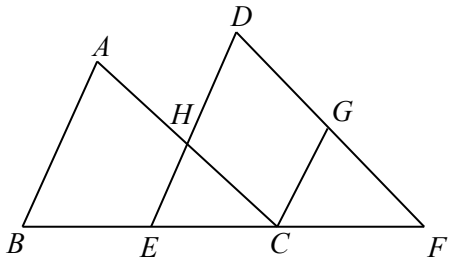
8. $ABCD$ is a rhombus and $ACEF$ is a rectangle where $D$ is the mid-point of $EF$. If $CE = 6$ cm, $EF = 9$ cm, then, correct to 3 significant figures, $\angle ABC =$

   A. 36.9°.
   B. 46.3°.
   C. 53.1°.
   D. 73.7°.

9. In the figure, $AHC$, $DHE$, $DGF$, $BECF$ are straight lines. $BE = EC = CF$, $AH = GF$. $G$ and $H$ are the mid-points of $DF$ and $DE$ respectively, Which of the following must be true?

   I. $CGDH$ is a parallelogram.
   II. $CGDH$ is a rhombus.
   III. $ABEH$ is a trapezium.

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




10. A solid metal hemisphere of radius 18 cm is melted and recast into three identical right circular cylinders each of base radius 12 cm. Find the height of each circular cylinder.

    A. 6 cm
    B. 9 cm
    C. 12 cm
    D. 15 cm

11. If the volume of a spherical balloon increases by 119.7%, find the percentage change in the surface area of the balloon.

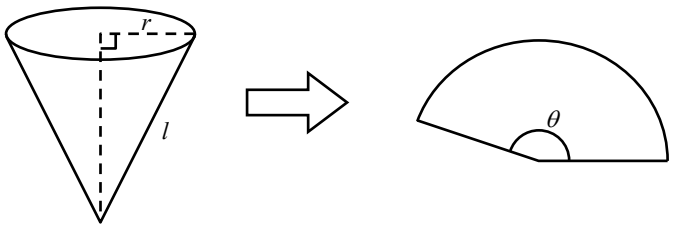
A. +19.7%
B. +30%
C. +69%
D. +119.7%

12. The base of a solid right pyramid is a square. If the perimeter of the base is 64 cm and the length of each slant edge of the pyramid is 17 cm, then the total surface area of the pyramid is

A. 440 $cm^2$.
B. 736 $cm^2$.
C. 800 $cm^2$.
D. 1216 $cm^2$.

13. The figure shows an inverted right circular conical paper cup of base radius $r$ and slant height $l$. The paper cup is then cut along its slant height and flattened to form a sector. The angle of the sector formed is $\theta$. Which of the following must be true?

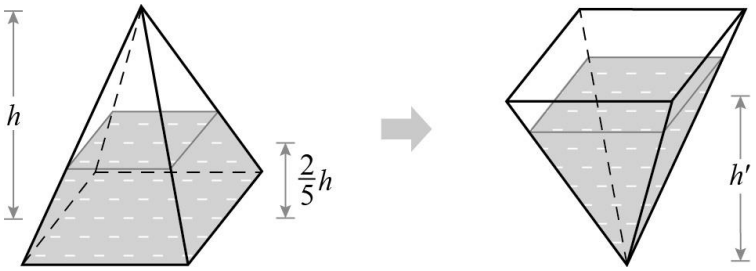
I. If $3r < 2l$, then $\theta > 240°$.
II. If $5r < 3l$, then $\theta < 216°$.
III. If $6r > 5l$, then $\theta > 300°$.




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

14. The figure shows a container in the shape of a regular pyramid with a square base and its height is $h$. There is some water inside the container and the depth of water is $\frac{2}{5}h$. If the container is turned upside down, then the depth of water becomes $h'$. Find $h'$ in terms of $h$.

A. 0.922$h$ (cor. to 3 sig. fig.)
B. 0.514$h$ (cor. to 3 sig. fig.)
C. $\frac{2}{5}h$
D. $\frac{3}{5}h$




15. Let $O$ be the origin. If the coordinates of points $A$ and $B$ are (25, 0) and (10, 30) respectively, then the $y$-coordinate of the orthocentre of $\triangle OAB$ is

A. 5.
B. 15.
C. 25.
D. 45.

16. $A(-2, 1)$, $B(2, 0)$, $C(5, 3)$ and $D(1, 4)$ are the vertices of a quadrilateral. Which of the following is NOT true?

A. $AB = CD$

B. $AC \perp BD$

C. $ABCD$ is a parallelogram

D. The slope of $BC$ is greater than the slope of $AB$.

17. $P(-10, -8)$ and $Q(4, 6)$ are two points. If $R$ is a point on the $x$-axis such that $PR = RQ$, then the coordinates of $R$ are

A. $(-2, 0)$.

B. $(-3, -1)$.

C. $(-3, 0)$.

D. $(-4, 0)$.

18. $P$ is a point on $KL$ produced such that $KL : LP = 2 : 1$. If the coordinates of $K$ and $L$ are $(5, -1)$ and $(-4, 14)$ respectively, find the coordinates of $P$.

A. $(2, 4)$

B. $(-1, 9)$

C. $(-8.5, 21.5)$

D. $(-22, 44)$

19. A map is drawn to the scale of 1 : 85 000. An inclined straight road of length 10.7 km is represented by a line segment of length 12.4 cm on the map. Find the inclination of the road correct to 3 significant figures.

A. 5.63°

B. 5.65°

C. 9.92°

D. 44.6°

20. Let $\theta$ be an acute angle. If $\sin(90° - \theta) = \frac{49}{95}$, find the value of $\frac{\cos(90° - \theta)}{\tan(90° - \theta)} + \cos\theta$.

A. $\frac{49}{95}$

B. $\frac{98}{95}$

C. $\frac{95}{49}$

D. $\frac{475}{49}$

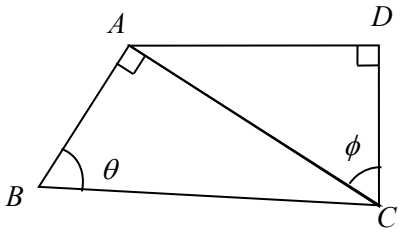
21. In the figure, $\frac{AD}{AB} =$

A. $\cos\phi\tan\theta$.

B. $\sin\phi\tan\theta$.

C. $\frac{1}{\cos\phi\tan\theta}$.

D. $\frac{1}{\sin\phi\tan\theta}$.




22. The bearing of $B$ and $C$ from $A$ are S60°E and S30°W respectively. If $B$ and $C$ are 6 km and 8 km from $A$ respectively, find the bearings of $B$ from $C$ correct to the nearest integer.

A. S71°W

B. N71°E

C. S67°W

D. N67°E

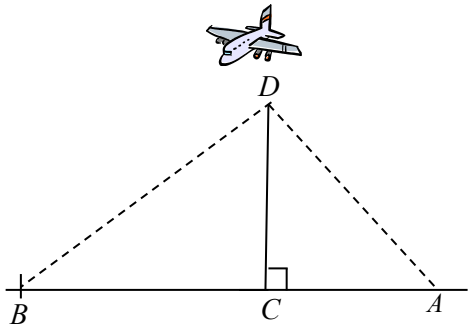
23. In the figure, $BCA$ is a horizontal line. A helicopter $D$ is 160 m vertically above point $C$. The angle of elevation of the helicopter from point $A$ is 48° and the angle of depression of point $B$ from the helicopter is 69°. Find the distance between $A$ and $B$ correct to 3 significant figures.

A. 205 m

B. 387 m

C. 595 m

D. 686 m




24. A box contains seven balls marked with the numbers −3, −2, −1, 1, 2, 3, and 4 respectively. If two balls are drawn at random from the box at the same time, find the probability that the product of the numbers on the balls drawn is positive.

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

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

C. $\frac{2}{7}$

D. $\frac{3}{7}$

25. Christine has one \$1 coin, one \$2 coin, one \$5 coin and one \$10 coin in her pocket. If Christine takes out three coins randomly from her pocket without replacement, find the probability that she gets at least \$13.

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

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

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

D. $\frac{23}{24}$

26. A box contains 2 green balls, 3 blue balls and 5 yellow balls. In a lucky draw, a ball is randomly drawn from the box and a cash coupon will be awarded according to the following table.

| Colour of the ball drawn | Green | Blue | Yellow |
|---|---|---|---|
| Value of the cash coupon awarded | \$50 | \$20 | \$10 |

Find the expected value of the cash coupon awarded.

A. \$21
B. \$27
C. \$33
D. \$50

27. The following table shows the numbers of questions answered correctly by 40 students in a quiz, where $x$ and $y$ are positive integers.

| Number of questions answered correctly | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Frequency | 7 | $x$ | $y$ | 9 |

If the mean number of questions answered correctly is 2.6, find the mode of the numbers of questions answered correctly.

A. 1
B. 2
C. 3
D. 4

28. Consider the following data:

11 12 13 15 17 17 21 $a$ $b$ $c$

If the mean and the mode of the above integers are 15 and 13 respectively, then the median of the above integers is

A. 14.
B. 15.
C. 16.
D. 17.

29. Consider the following integers:

$m$ 2 2 3 4 7 7 7 8 8 8 9 9 9

Let $x$, $y$ and $z$ be the mean, the median and the mode of the above integers. If $7 \leq m \leq 9$, which of the following must be true?

I. $x < y$

II. $x < z$

III. $y \geq z$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

30. A competition is rated in 4 aspects and the corresponding weights are as follows:

| Aspect | I | II | III | IV |
|---|---|---|---|---|
| Weight | 3 | 4 | 6 | 5 |

The scores of Bonnie in aspects I, II and III are 40, 45 and 35 marks respectively. If the weighted mean score of Bonnie is 40 marks, find her score in aspect IV.

A. 39.4 marks (cor. to 3 sig. fig.)

B. 40 marks

C. 42 marks

D. 45 marks

End of Paper