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# Form 3

**Final Examination 2012-2013**

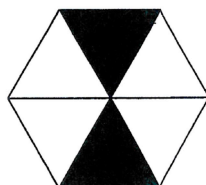
**Mathematics**

**Paper II**

## INSTRUCTIONS

1. Write your examination number in the space provided on this cover page.
2. Write down all required information on the Multiple Choice Answer Sheet.
3. Answer all questions. Answer should be marked on the **Multiple Choice Answer Sheet**.
4. Each question A carries 2 marks. The total mark is 100.
5. You should mark only ONE answer for each multiple choice question. If you mark more than one answer, you will receive No mark for that question.
6. No mark will be deducted for wrong answer.
7. The diagrams in this paper are not necessarily drawn to scale.
8. This paper should be answered in English

- 1  $a \cdot a (a + 1) =$
- A.  $a^4$                       B.  $2a^3$                       C.  $a^2 + a$                       D.  $a^3 + a^2$
- 2 Express  $\pi^2$  as a decimal correct to 3 significant figures.
- A. 9.86                      B. 9.87                      C. 9.88                      D. 9.870
- 3 Let  $m$  be a positive integer. Which of the following must be true?
- I.  $m^2$  is even.  
 II.  $m(m+1)$  is even.  
 III.  $m(m+2)$  is even.
- A. I only                      B. II only                      C. I and II                      D. II and III
- 4 Which of the following is an identity / are identities?
- I.  $x^2 - 9 = 0$   
 II.  $(2x+3)^2 = 4x^2 + 12x + 9$   
 III.  $x^2 - 49 = (x+7)(x-7)$
- A. II only                      B. I and II only                      C. II and III only                      D. I and III only
- 5 The scale of a map is 1 : 8 000. If the area of a park on the map is  $2 \text{ cm}^2$ , then the actual area of the park is
- A.  $400 \text{ m}^2$                       B.  $6400 \text{ m}^2$                       C.  $12800 \text{ m}^2$                       D.  $4000 \text{ m}^2$
- 6 In the figure, the regular hexagon is divided into six equilateral triangles and two of them are shaded. The number of folds of rotational symmetry of the hexagon is



- A. 6                      B. 4                      C. 3                      D. 2
- 7 Which of the following could be the probability of an event?
- A.  $\frac{\pi}{3}$                       B.  $\frac{2012}{2013}$                       C.  $-0.2006$                       D. 1.2006
- 8 Two fair dice are thrown. Find the probability that at least one “3” occurs.
- A.  $\frac{1}{3}$                       B.  $\frac{1}{6}$                       C.  $\frac{11}{36}$                       D.  $\frac{7}{36}$
- 9 If  $(x+1)^2 + P(x+1) = x^2 + Q$ , then
- A.  $P = -2, Q = -1$                       B.  $P = -2, Q = 1$                       C.  $P = 2, Q = -1$                       D.  $P = 2, Q = 1$

10 The mean weight of 36 boys and 32 girls is 46 kg. If the mean weight of the boys is 52 kg, then the mean weight of the girls is

- A. 39.25 kg                      B. 40 kg                      C. 40.67 kg                      D. 49 kg

11 If the mode of the eight numbers 5, 8, 5, 1, 3, 7,  $a$  and  $b$  is 8, then the median of the eight numbers is

- A. 3                      B. 6                      C. 7                      D. 8

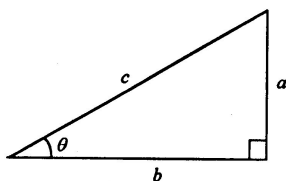
12  $-0.125^{2012} \times 8^{2013} =$

- A. 8                      B.  $\frac{1}{8}$                       C.  $-\frac{1}{8}$                       D.  $-8$

13 In each of the following, the number of edges (E), the number of vertices (V) and the number of faces (F) are given. According to Euler's formula, which group cannot form a polyhedron?

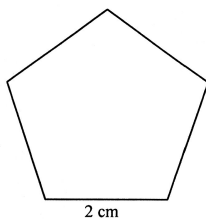
- A.  $E = 12, V = 8, F = 6$                       B.  $E = 12, V = 6, F = 8$   
 C.  $E = 7, V = 10, F = 15$                       D.  $E = 21, V = 13, F = 10$

14 In the figure,  $\cos \theta + \tan \theta =$



- A.  $\frac{a}{c} + \frac{a}{b}$                       B.  $\frac{a}{c} + \frac{b}{a}$                       C.  $\frac{b}{c} + \frac{a}{b}$                       D.  $\frac{b}{c} + \frac{b}{a}$

15 The figure shows a regular pentagon. Find its area correct to the nearest  $0.01 \text{ cm}^2$ .

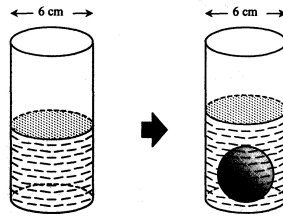


- A.  $6.88 \text{ cm}^2$                       B.  $6.18 \text{ cm}^2$                       C.  $5.88 \text{ cm}^2$                       D.  $3.63 \text{ cm}^2$

16 Peter sold two flats for \$999 999 each. He lost 10% on one and gained 10% on the other. After the two transactions, Peter

- A. gained \$20 202                      B. gained \$10 101                      C. lost \$20 202                      D. lost \$10 101

- 17 In the figure, a cylindrical vessel of internal diameter 6 cm contains some water. A steel ball of radius 2 cm is completely submerged in the water. Find the rise in the water level.

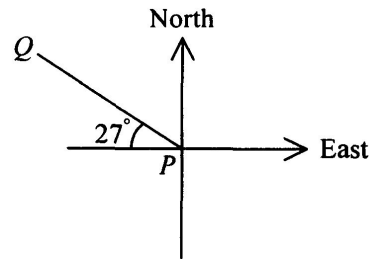


- A.  $\frac{4}{9}$  cm      B.  $\frac{16}{9}$  cm      C.  $\frac{8}{27}$  cm      D.  $\frac{32}{27}$  cm

- 18 Solve  $3x^2 = 15x$ .

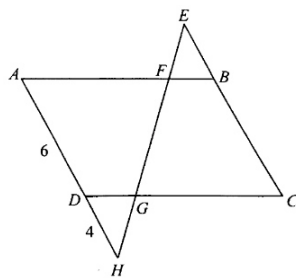
- A.  $x = 5$       B.  $x = 0$       C.  $x = 0$  or  $x = 3$       D.  $x = 0$  or  $x = 5$

- 19 In the figure, the bearing of  $P$  from  $Q$  is



- A.  $S63^\circ E$       B.  $S27^\circ E$       C.  $N63^\circ W$       D.  $N27^\circ W$

- 20 In the figure,  $ABCD$  is a parallelogram and  $ADH$ ,  $EBC$  and  $EFGH$  are straight lines. If  $AD = 6$ ,  $DH = 4$  and  $EB : BC = 3 : 4$ , then  $EF : GH =$



- A.  $1 : 1$       B.  $9 : 8$       C.  $5 : 4$       D.  $3 : 4$

- 21 The manager of a restaurant conducted a survey on the number of customers in each table at the dinner time. The results are listed as follows.

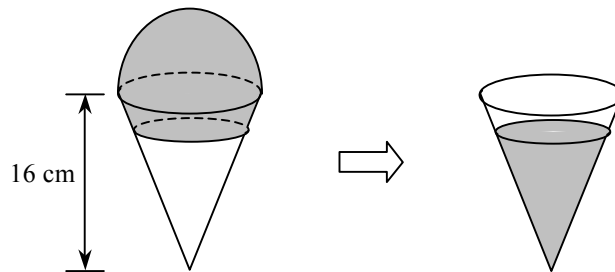
Number of customers	1 – 4	5 – 8	9 – 12	13 – 16
Frequency	20	30	30	20

If a table is selected randomly, what is the probability that there are less than 13 customers?

- A.  $\frac{1}{4}$       B.  $\frac{1}{2}$       C.  $\frac{4}{5}$       D.  $\frac{19}{20}$

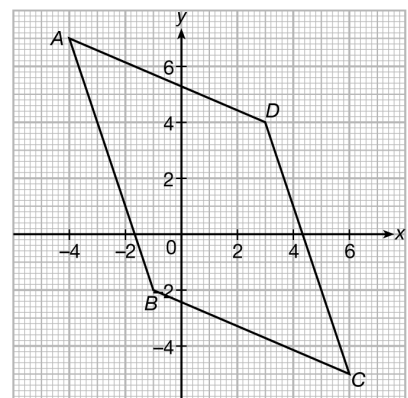
- 22 In a shooting game, the probability that Calvin will hit the target is 0.6. Suppose Calvin shoots three times. What is the probability that he will hit the target at least once?
- A. 0.064                      B. 0.216                      C. 0.288                      D. 0.936
- 23 A bag contains 5 cards numbered 5, 6, 9, 9 and 10. If two cards are drawn at random without replacement. Find the probability that the sum is an even number.
- A.  $\frac{2}{5}$                               B.  $\frac{3}{5}$                               C.  $\frac{3}{10}$                               D.  $\frac{7}{10}$

- 24 A cone holds some ice-cream. The ice-cream above the cone takes the shape of a hemisphere, while the ice-cream inside the cone occupies  $\frac{1}{5}$  of the cone's capacity as shown in the figure. Suppose all the ice-cream melts and, volume of ice-cream is decreased by 15%, its now occupies  $\frac{2}{5}$  of the cone. Find the radius of the cone. (*Give the answer correct to 3 significant figures.*)



- A. 2.57 cm                      B. 2.48 cm                      C. 2.35 cm                      D. 2.16 cm
- 25 If the  $x$ -intercept of the straight line  $2x - 3y + k = 0$  is 6, then the  $y$ -intercept is
- A. -3.                              B. -4.                              C. 3.                              D. 4.

- 26 The figure shows a parallelogram  $ABCD$ . The slope of  $BD$  is

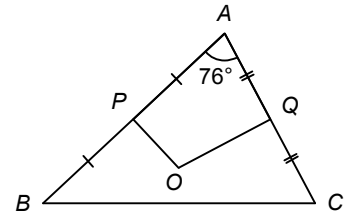


- A.  $\frac{1}{2}$ .                              B.  $\frac{2}{3}$ .                              C.  $\frac{3}{2}$ .                              D.  $\frac{5}{3}$ .
- 27 Given that the coordinates of  $A$  and  $B$  are  $(-9, 0)$  and  $(0, 6)$  respectively. If  $AP : PB = 1 : 2$ , then  $P =$
- A.  $(-6, 2)$ .                      B.  $(-6, 3)$ .                      C.  $(-4, 4)$ .                      D.  $(-4, 2)$ .

- 28 Which of the following lines does not intersect the line  $y + 4 = 0$ ?
- A.  $y = x + 4$       B.  $x = 4$       C.  $y = 2$       D.  $y = x$
- 29 Which of the following straight lines is perpendicular to  $y - 3 = \frac{1}{2}(x + 3)$ ?
- A.  $2x + y = 3$       B.  $x + 2y = 3$       C.  $2x - y = 3$       D.  $x - 2y = 3$
- 30 If  $\frac{x}{y} > 4$ , then which of the following must be true?
- A.  $x > 4$  and  $y < 1$       B.  $x > 4y$       C.  $xy > 4y^2$       D.  $(x + 4y)(x - 4y) < 0$
- 31 If  $a < 0 < b$ , which of the following must be true?
- I.  $ab < 0$   
 II.  $a^2 < b^2$   
 III.  $b - a > 0$
- A. I and II only      B. I and III only      C. II and III only      D. I, II and III
- 32 Solve  $x(x + 3) < \frac{2}{3}(x - 1)(x + 3)$ .
- A.  $-3 < x < -2$       B.  $-3 < x < 2$       C.  $x < -3$  or  $x > -2$       D.  $x < -2$  or  $x > 3$
- 33 How many integral values of  $x$  satisfy the inequality  $2x^2 - 3x - 14 < 0$ ?
- A. 4      B. 5      C. 6      D. 7
- 34 Suppose the salaries tax rates are as follows.
- | Net chargeable income | Rate |
|-----------------------|------|
| On the first \$30 000 | 2%   |
| On the next \$30 000  | 8%   |
| On the next \$30 000  | 14%  |
| On the remaining      | 20%  |
- Paul has to pay \$7 200 of salaries tax. If the net chargeable income of John is \$20 000 more than that of Paul, find John's salaries tax payable.
- A. \$4 000      B. \$10 000      C. \$11 200      D. \$12 100
- 35 Mr Wong deposits \$150 000 in a bank at an interest rate of 6% p.a. compounded monthly. Find the compound interest he will receive 2 years later. (Give your answer correct to the nearest \$10.)
- A. \$18 000      B. \$18 540      C. \$18 970      D. \$19 070

- 36 A solution of volume 500 mL contains 80% alcohol. What volume of water should be added to the solution so that the new solution contains 20% alcohol?
- A. 1000 mL                      B. 1500 mL                      C. 2000 mL                      D. 2500 mL

- 37 In the figure,  $O$  is the circumcentre of  $\triangle ABC$ . Find  $\angle POQ$ .



- A.  $104^\circ$                       B.  $120^\circ$                       C.  $142^\circ$                       D.  $152^\circ$

- 38 If the lengths of two sides of an isosceles triangle are 6 cm and 14 cm, what is the perimeter of the triangle?

- A. 20 cm                      B. 26 cm                      C. 30 cm                      D. 34 cm

- 39 The stem-and-leaf diagram shows the results of a test.

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

The median is

- A. 51.                      B. 56.                      C. 59.                      D. 68.

- 40 The following shows the lengths of eight pencils (correct to the nearest 0.1 cm):

6.4, 5.2, 18.1, 7.2, 8.0, 8.6, 7.5, 7.5

Which of the following measures is/are suitable to describe the central tendency of the lengths of the pencils?

- I. Arithmetic mean  
 II. Median  
 III. Mode

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

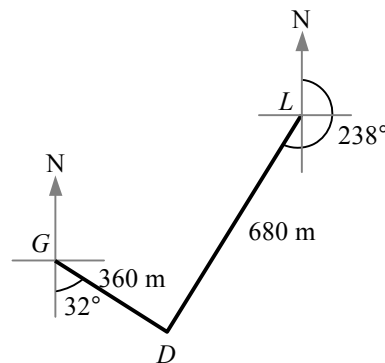
41  $\frac{\cos\theta}{\sin 30^\circ} + \frac{\sin(90^\circ - \theta)}{\tan 45^\circ} =$

- A.  $2\cos\theta$                       B.  $3\cos\theta$                       C.  $3\sin\theta$                       D.  $2\cos\theta + \sin\theta$

42  $\sin^3\theta + \sin\theta \sin^2(90^\circ - \theta) =$

- A.  $\sin\theta$                       B.  $\cos\theta$                       C.  $\sin^2\theta$                       D.  $\cos^2\theta$

43 The bearing and the distance of a buoy  $D$  from a boat  $G$  are  $S32^\circ E$  and 360 m respectively. The bearing and the distance of buoy  $D$  from a lighthouse  $L$  are  $238^\circ$  and 680 m respectively. Find the compass bearing of the boat from the lighthouse. (*Give the answer correct to 3 significant figures.*)



- A.  $S4.1^\circ W$                       B.  $S85.9^\circ W$                       C.  $N4.1^\circ E$                       D.  $N85.9^\circ E$

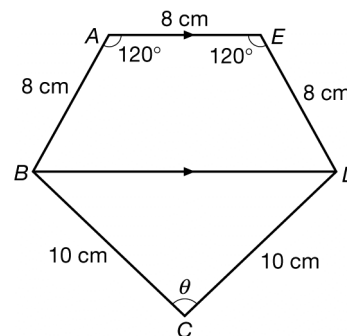
44 In  $\triangle ABC$ ,  $\sin\left(\frac{A+B}{2}\right) =$

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

45 For  $45^\circ < \theta < 90^\circ$ , which of the following is not true?

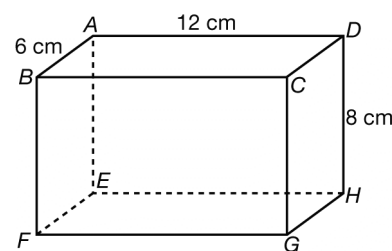
- A.  $\sin\theta < \cos\theta$                       B.  $\cos\theta < \sin\theta$                       C.  $\sin\theta < \tan\theta$                       D.  $\cos\theta < \tan\theta$

46 In the figure,  $AE \parallel BD$ . Find  $\theta$  correct to nearest degree.



- A.  $92^\circ$                       B.  $98^\circ$                       C.  $106^\circ$                       D.  $112^\circ$

47 The figure shows a rectangular block with  $AB = 6$  cm,  $AD = 12$  cm and  $DH = 8$  cm. Find the area of  $\triangle AGD$ .



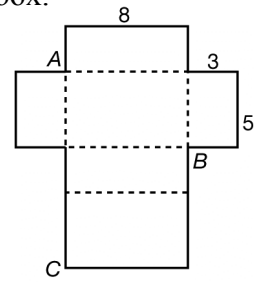
- A.  $60\text{cm}^2$                       B.  $72\text{cm}^2$                       C.  $78\text{cm}^2$                       D.  $84\text{cm}^2$



48

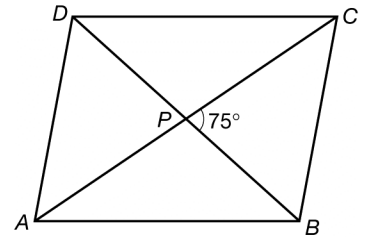
A piece of paper, as shown in the figure, can be folded to form a rectangular box.

Find  $\angle ABC$  in the box. (Give the answer correct to 3 significant figures.)



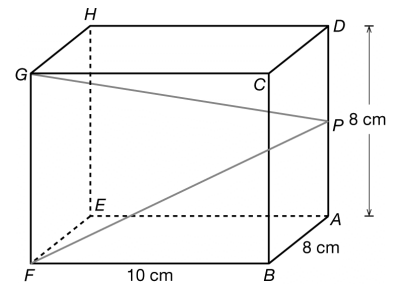
- A.  $17.6^\circ$                       B.  $19.7^\circ$                       C.  $21.8^\circ$                       D.  $23.6^\circ$

- 49 The figure shows a parallelogram  $ABCD$  with  $AC = 12$  cm and  $BD = 10$  cm. Find the area of  $ABCD$  correct to 3 significant figures.



- A.  $29.0 \text{ cm}^2$                       B.  $52.4 \text{ cm}^2$                       C.  $58.0 \text{ cm}^2$                       D.  $61.5 \text{ cm}^2$

- 50 The figure shows a rectangular block with  $AB = AD = 8$  cm and  $BF = 10$  cm. If  $P$  is the mid-point of  $AD$ , then  $\angle GPF =$



- A.  $39.6^\circ$  (corr. to 3 sig. fig.).                      B.  $34.7^\circ$  (corr. to 3 sig. fig.).  
 C.  $41.3^\circ$  (corr. to 3 sig. fig.).                      D.  $48.6^\circ$  (corr. to 3 sig. fig.).

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