

注意：

允許學生個人、非營利性的圖書館或公立學校合理使用本基金會網站所提供之各項試題及其解答。可直接下載而不須申請。

重版、系統地複製或大量重製這些資料的任何部分，必須獲得財團法人臺北市九章數學教育基金會的授權許可。

申請此項授權請電郵 [ccmp@seed.net.tw](mailto:ccmp@seed.net.tw)

**Notice:**

**Individual students, nonprofit libraries, or schools are permitted to make fair use of the papers and its solutions. Republication, systematic copying, or multiple reproduction of any part of this material is permitted only under license from the Chiuchang Mathematics Foundation.**

**Requests for such permission should be made by e-mailing Mr. Wen-Hsien SUN [ccmp@seed.net.tw](mailto:ccmp@seed.net.tw)**

---

# Intermediate Division

---

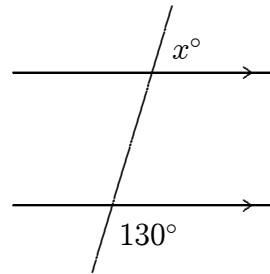
## Questions 1 to 10, 3 marks each

1. The value of  $2005 + 5002$  is

- (A) 3003      (B) 4004      (C) 5555      (D) 2222      (E) 7007
- 

2. In the diagram, the value of  $x$  is

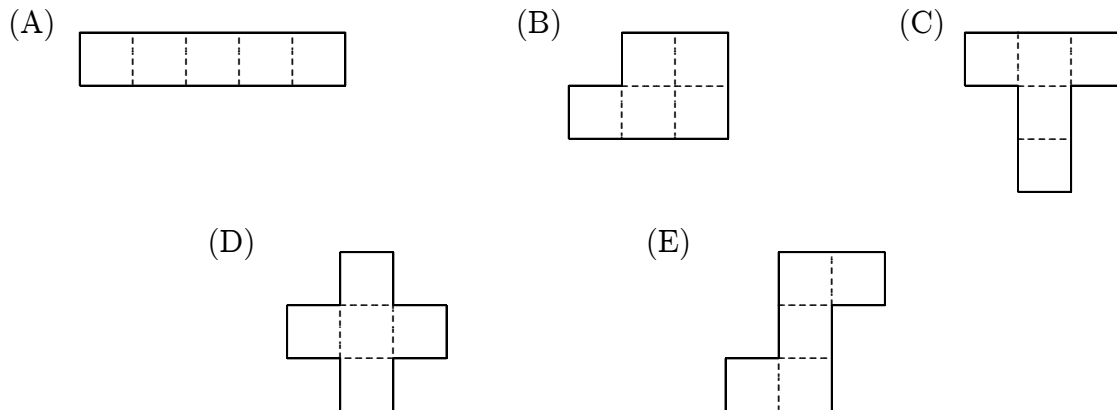
- (A) 130    (B) 50    (C) 80    (D) 70    (E) 100



3. A lesson finished at 10:10 am. If the duration of the lesson was 55 minutes, it started at

- (A) 9:15 am    (B) 9:45 am    (C) 9:00 am    (D) 8:45 am    (E) 8:30 am
- 

4. Which of these shapes has the smallest perimeter?

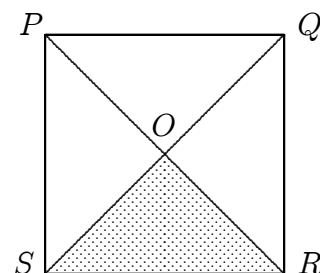


5.  $1200 \div 40$  will have the same result as

- (A)  $600 \div 80$     (B)  $2400 \div 20$     (C)  $240 \div 8$     (D)  $240 \div 5$     (E)  $600 \div 8$
- 

6. The diagonals of the square  $PQRS$  intersect at  $O$ . The shaded region has area 16. What is the perimeter of the square?

- (A) 4    (B) 8    (C) 16    (D) 32    (E) 64



7.  $1 + \frac{1}{3 + \frac{1}{2}}$  equals

- (A)  $\frac{6}{5}$                       (B)  $\frac{7}{6}$                       (C)  $\frac{9}{2}$                       (D)  $\frac{3}{2}$                       (E)  $\frac{9}{7}$

8. A two-digit number has tens digit  $t$  and its units digit  $u$ . If the digit 8 is placed between these digits, the value of the three-digit number is

- (A)  $t + u + 8$                       (B)  $10t + 80 + u$                       (C)  $10t + u + 8$   
 (D)  $100t + 10u + 8$                       (E)  $100t + 80 + u$

9. The average of 6 numbers is 4.5. A further 2 numbers are added and the average is still 4.5. What is the sum of these two numbers?

- (A) 27                      (B) 9                      (C) 36                      (D) 4.5                      (E) 8

10. Different tyres were fitted to a car, increasing the circumference of the wheels from 200 cm to 225 cm. On a journey of 1800 km, the number of revolutions of each wheel was reduced by

- (A) 50 000                      (B) 1000                      (C) 2000                      (D) 100 000                      (E) 7 200 000

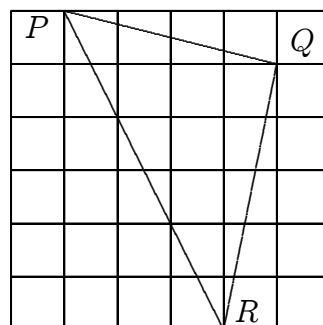
**Questions 11 to 20, 4 marks each**

11. Seven consecutive integers are listed. The sum of the smallest three is 33. What is the sum of the largest three?

- (A) 39                      (B) 37                      (C) 42                      (D) 48                      (E) 45

12. The grid is a 1 cm grid. The area of the triangle  $PQR$  is

- (A)  $15 \text{ cm}^2$                       (B)  $10.5 \text{ cm}^2$                       (C)  $12 \text{ cm}^2$   
 (D)  $13 \text{ cm}^2$                       (E)  $13.5 \text{ cm}^2$



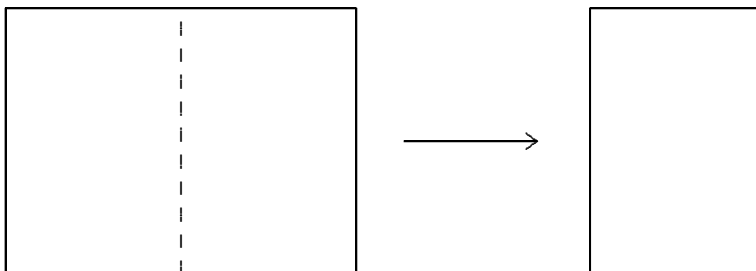
13. When it is 12 noon in Montreal it is 6 pm in Paris. The times of take-off and landing of aircraft are given in local times. A plane leaving Montreal at 7 pm arrives in Paris at 8 am. Assuming that the travel time is the same in both directions, what time would a plane leaving Paris at 11 am arrive in Montreal?

- (A) 12 noon      (B) 6 pm      (C) midnight      (D) 11 am      (E) 3 pm

14. Two dice are thrown at random. The probability that the two numbers obtained are the two digits of a perfect square is

- (A)  $\frac{1}{9}$       (B)  $\frac{2}{9}$       (C)  $\frac{7}{36}$       (D)  $\frac{1}{4}$       (E)  $\frac{1}{3}$

15. A rectangular sheet of cardboard is folded in half to form a smaller rectangle. The smaller rectangle is similar to the original rectangle. What is the ratio of the length to the width of the smaller rectangle?

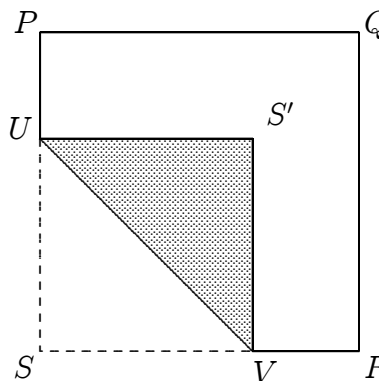


- (A) 2 : 1      (B) 3 : 2      (C)  $\sqrt{3} : 1$       (D)  $(1 + \sqrt{5}) : 2$       (E)  $\sqrt{2} : 1$

16. An aeroplane takes  $2\frac{1}{2}$  hours to fly from Melbourne to Newcastle. If it were to increase its speed by 20%, how long would the trip take?

- (A) 2 hours      (B) 2 hours 5 minutes      (C) 2 hours 10 minutes  
 (D) 2 hours 15 minutes      (E) 2 hours 20 minutes

17. A square piece of paper has area  $12\text{ cm}^2$ . It is coloured white on one side and shaded on the other. One corner of the paper has been folded over so that the sides of the triangle formed are parallel to the sides of the square as shown. The total visible area of the paper is half shaded and half white. What is the length, in centimetres, of the fold line  $UV$ ?



- (A) 4      (B)  $\sqrt{12}$       (C) 3      (D) 6      (E)  $\sqrt{8}$

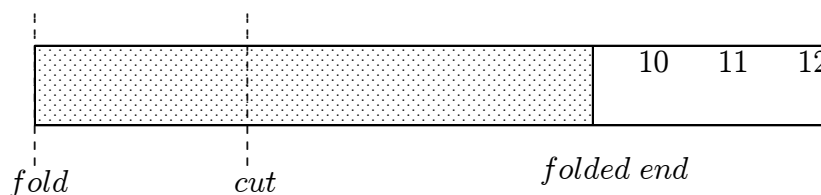
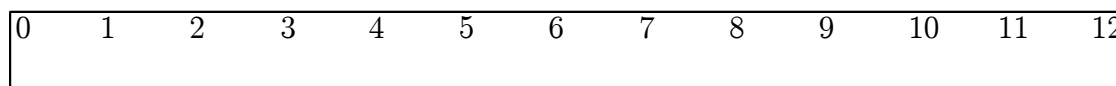
18. In the multiplication

$$\begin{array}{r}
 P \quad Q \quad R \\
 \phantom{P \quad Q} \quad 3 \quad \times \\
 \hline
 Q \quad Q \quad Q
 \end{array}$$

each of  $P$ ,  $Q$  and  $R$  represents a different digit. The sum of  $P$ ,  $Q$  and  $R$  is

- (A) 16                      (B) 14                      (C) 13                      (D) 12                      (E) 10

19. A 12 cm tape measure is folded back once on itself and a single cut is made through the folded tape, cutting it into 3 pieces.



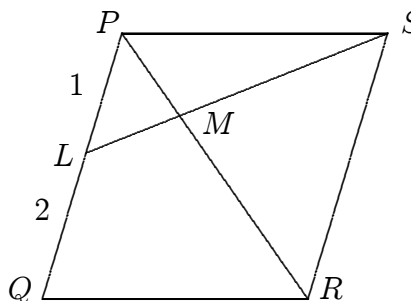
When the 3 resulting pieces are arranged from the shortest to the longest, the lengths are in the ratio 1 : 2 : 3. The number of places where the cut could be made is

- (A) 0                      (B) 1                      (C) 2                      (D) 4                      (E) 6

20.  $PQRS$  is a parallelogram and  $L$  is a point on the side  $PQ$  such that  $PL = 1$  and  $LQ = 2$ .  $M$  is the point of intersection of  $PR$  and  $LS$ .

The ratio  $PM : MR$  is equal to

- (A) 1 : 3                      (B) 1 : 4                      (C) 1 : 2  
 (D) 2 : 5                      (E) 2 : 7



**Questions 21 to 30, 5 marks each**

21. A train leaves Canberra for Sydney at 12 noon, and another train leaves Sydney for Canberra forty minutes later. Both trains follow the same route and travel at the same uniform speed, taking  $3\frac{1}{2}$  hours to complete the journey. At what time will they pass?

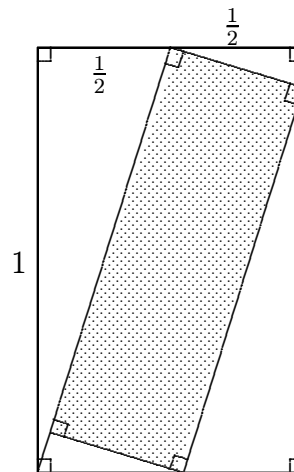
- (A) 1:45 pm                      (B) 2:00 pm                      (C) 2:05 pm                      (D) 2:15 pm                      (E) 2:25 pm

22. The number of 5-digit numbers in which every two neighbouring digits differ by 3 is

- (A) 40                      (B) 41                      (C) 43                      (D) 45                      (E) 50

23. The area of the shaded rectangle is

- (A) between  $\frac{1}{4}$  and  $\frac{5}{16}$   
 (B) between  $\frac{5}{16}$  and  $\frac{3}{8}$   
 (C) between  $\frac{3}{8}$  and  $\frac{7}{16}$   
 (D) between  $\frac{7}{16}$  and  $\frac{1}{2}$   
 (E) more than  $\frac{1}{2}$

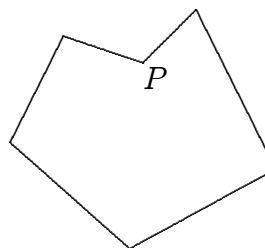


24. A  $3 \times 3$  square is divided into nine  $1 \times 1$  unit squares. Different integers from 1 to 9 are written into these nine unit squares. Consider the pairs of numbers in the squares sharing a common edge. What is the largest number of pairs where one number is a factor of the other number?

- (A) 7                      (B) 8                      (C) 9                      (D) 10                      (E) 12

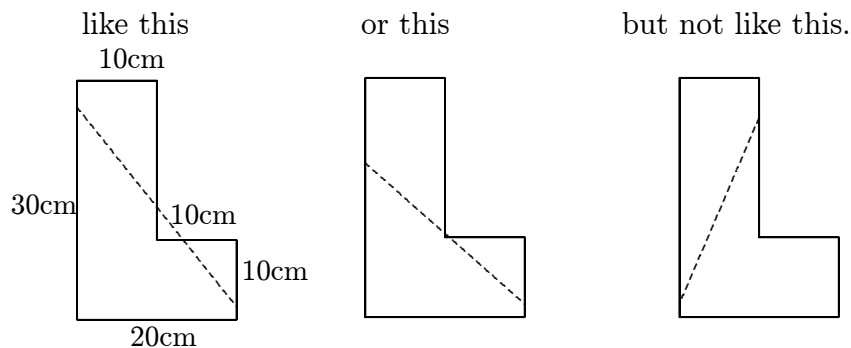
25. The polygon shown has a reflex angle at  $P$ . In a polygon with  $n$  sides, what is the largest possible number of reflex angles?

- (A) 1                      (B) 2                      (C)  $n - 3$   
 (D)  $n - 2$                       (E)  $n - 1$



**For questions 26 to 30, shade the answer as an integer from 0 to 999 in the space provided on the answer sheet.**

- 26.** My name is Louis and my father has cooked me an L-shaped cake for my birthday. He says that I must cut it into three pieces with a single cut, so that my brother and sister can have a piece too. So, I have to cut it



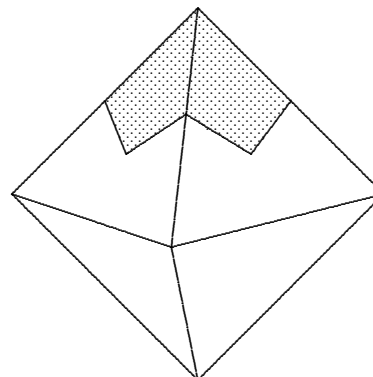
He says that I have to be polite and let them have the first choice of the pieces, but I just know they'll be greedy and leave the smallest possible piece for me. So I want to cut the cake so that my little piece will be as big as possible. If I do this, how big, in square centimetres, will my piece be?

---

- 27.** A supermarket has seven checkout lanes. All seven checkouts accept cash payments but only lanes 1 to 4 allow credit cards. Kath, Kim and Sharon are all shopping and Kim insists on using her credit card while Kath and Sharon intend to pay cash. In how many ways could they choose their checkout lanes? (More than one could choose the same lane).
- 

- 28.** Each point on the four sides of a  $1\text{ m} \times 1\text{ m}$  square is coloured one of  $n$  colours so that no two points that are exactly  $1\text{ m}$  apart are coloured the same. What is the smallest  $n$  for which such a colouring can be made?
- 

- 29.** A regular octahedron has eight triangular faces and all sides the same length. A portion of a regular octahedron of volume  $120\text{ cm}^3$  consists of that part of it which is closer to the top vertex than to any other one. In the diagram, the outside part of this volume is shown shaded, and it extends down to the centre of the octahedron. What is the volume, in cubic centimetres, of this unusually shaped portion?



- 30.** A positive integer is equal to the sum of the squares of its four smallest positive divisors. What is the largest prime that divides this positive integer?
-