40th

1978-2017

Australian Mathematics Competition

AUSTRALIAN MATHEMATICS TRUST

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AUSTRALIAN MATHEMATICS COMPETITION

AN ACTIVITY OF THE AUSTRALIAN MATHEMATICS TRUST

NAME

YEAR   TEACHER

2017
SIMPLIFIED CHINESE VERSION
MIDDLE PRIMARY DIVISION
AUSTRALIAN SCHOOL YEARS 3 and 4

TIME ALLOWED: 60 MINUTES

INSTRUCTIONS AND INFORMATION

GENERAL

1. Do not open the booklet until told to do so by your teacher.
2. You may use any teaching aids normally available in your classroom, such as MAB blocks, counters, currency, calculators, play money etc. You are allowed to work on scrap paper and teachers may explain the meaning of words in the paper. Mobile phones are not permitted.
3. Diagrams are NOT drawn to scale. They are intended only as aids.
4. There are 25 multiple-choice questions, each requiring a single answer, and 5 questions that require a whole number answer between 0 and 999. The questions generally get harder as you work through the paper. There is no penalty for an incorrect response.
5. This is a competition not a test; do not expect to answer all questions. You are only competing against your own year in your own country/Australian state so different years doing the same paper are not compared.
6. Read the instructions on the answer sheet carefully. Ensure your name, school name and school year are entered. It is your responsibility to correctly code your answer sheet.
7. When your teacher gives the signal, begin working on the problems.

THE ANSWER SHEET

1. Use only lead pencil.
2. Record your answers on the reverse of the answer sheet (not on the question paper) by FULLY colouring the circle matching your answer.
3. Your answer sheet will be scanned. The optical scanner will attempt to read all markings even if they are in the wrong places, so please be careful not to doodle or write anything extra on the answer sheet. If you want to change an answer or remove any marks, use a plastic eraser and be sure to remove all marks and smudges.

INTEGRITY OF THE COMPETITION

The AMT reserves the right to re-examine students before deciding whether to grant official status to their score.

1. 算式 $2+0+1+7$ 之值等于

The value of $2+0+1+7$ is

(A) 10   (B) 19   (C) 37   (D) 208   (E) 2017

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2. 小莲在 2017 年度过她的 9 岁生日。请问她出生于哪一年？

Jillian has her 9th birthday in 2017. In which year was she born?

(A) 2006   (B) 2007   (C) 2008   (D) 2009   (E) 2010

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3. 请问在数 213 中，数码 2 代表的值是多少？

What is the value of the 2 in 213?

(A) 0.02   (B) 0.2   (C) 2   (D) 20   (E) 200

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4. 松鼠所居住的树之位置在小方格 L3。
从小方格 K1 回到这棵树，松鼠必须移动
(A) 往右二格再往下一格   (B) 往左一格再往下二格
(C) 往左三格再往下二格   (D) 往右三格再往下一格
                 (E) 往右一格再往下二格

The squirrel's tree is on square L3.

To get there from square K1, the squirrel must move

(A) two squares right and one square down

(B) one square left and two squares down

(C) three squares left and two squares down

(D) three squares right and one square down

(E) one square right and two squares down

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5. 小林在小卖部购买了一些水果。他购买 4 个苹果，而每个苹果的售价为 30 分钱。请问这 4 个苹果总共多少钱？(注：100 分钱 = 1 元)

(A) 60 分钱   (B) 80 分钱   (C) 1.00 元   (D) 1.20 元   (E) 1.60 元

Lincoln went to buy some fruit at the school canteen. He bought 4 apples which cost 30 cents each. How much did the 4 apples cost?
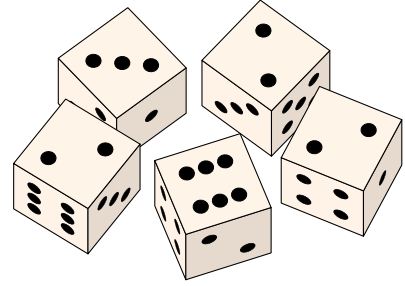
(A) 60c   (B) 80c   (C) \$1.00   (D) \$1.20   (E) \$1.60

6. 投掷五枚骰子后的结果如图所示。
请问有几分之几的骰子顶面之点数为 2？

Five dice were rolled, and the results were as shown.

What fraction of the dice showed a two on top?

(A) $\dfrac{3}{4}$ (B) $\dfrac{1}{2}$ (C) $\dfrac{2}{3}$

     (D) $\dfrac{2}{5}$ (E) $\dfrac{3}{5}$

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7. 小拉骑着自行车。当她骑到一个三叉路口时，看到了如图所示的指标。
通往 S 市的路会经过 M 市。
请问从 M 市到 S 市的距离为多少 km？

28 km	Janesville	J市
Marytown	M市	15 km
Smithton	S市	23 km

Zara was cycling. She came to a T-intersection in the road where she saw this sign.

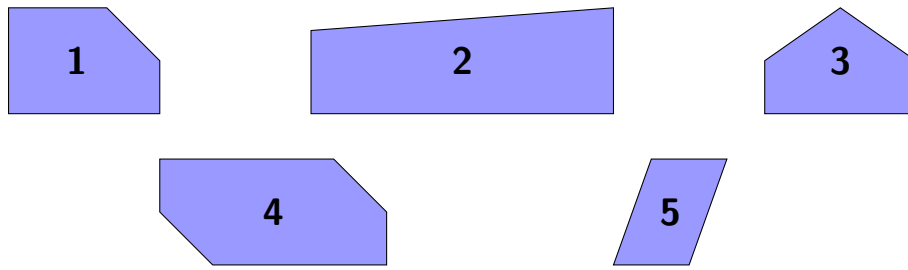The road to Smithton passes through Marytown.

How many kilometres is it from Marytown to Smithton?

(A) 8   (B) 13   (C) 38   (D) 43   (E) 51

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8. 河滨国小的教职员与学生共有 235 位，而每辆校车可搭载 50 位。请问至少需要多少辆校车才能运送全校所有的师生去旅游？

Riverside Primary School has 235 staff and students. Each bus can fit 50 people. What is the least number of buses they need for a whole school excursion?

(A) 2   (B) 3   (C) 5   (D) 6   (E) 7

9. 请问下列哪些图案是五边形？

(A) 全部都是　　　　　(B) 只有图案 3　　　　　(C) 图案 3 与图案 4

　　　　　(D) 图案 1 与图案 3　　　　　(E) 全部都不是

Which of these shapes are pentagons?

(A) all of the shapes　　　(B) shape 3 only　　　(C) shapes 3 and 4

　　　　　(D) shapes 1 and 3　　　　　(E) none of the shapes

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10. 小德将他的苹果颗数之一半给了小贝，接着将剩下的苹果颗数之一半给了小莎，最后他还剩下一颗苹果。请问他原来有多少颗苹果？

Fred gave half of his apples to Beth, and then half of what was left to Sally, leaving him with just one apple. How many did he have to start with?
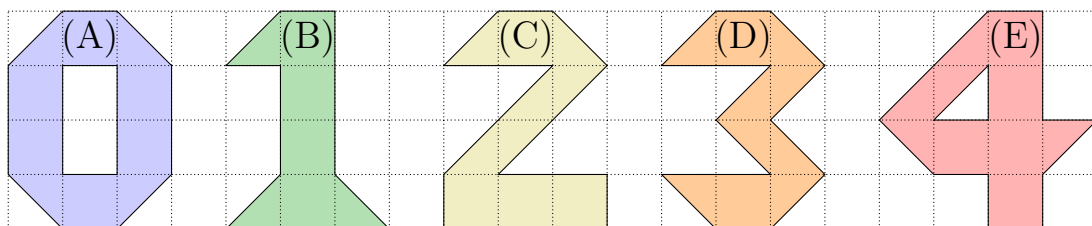
(A) 12　　　　　(B) 8　　　　　(C) 6　　　　　(D) 4　　　　　(E) 2

11-20 题，每题 4 分
Questions 11 to 20, 4 marks each

11. 请问下列哪一个选项中的阴影部分面积最大？

Which of the shaded areas below is the largest?

12. 小伦将一些数相加后所得到的和为 157。她发现她不小心将其中一个数 37 写成 73。请问正确的和应该是多少？

Helen is adding some numbers and gets the total 157. Then she realises that she has written one of the numbers as 73 rather than 37. What should the total be?

(A) 110   (B) 121   (C) 124   (D) 131   (E) 751

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13. 在公元 3017 年，某国造币厂回收所有硬币并发行新的硬币。

新的 50 元硬币被划分成六个三角形、六个正方形与一个六边形。每个三角形价值 3 元、每个正方形价值 4 元。请问这个六边形价值为多少元才能使得此硬币之总价值仍为 50 元？
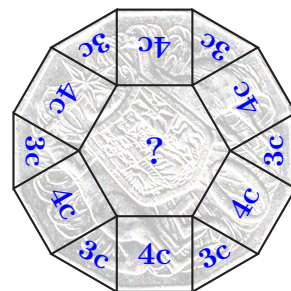
(A) 3 元   (B) 8 元   (C) 18 元   (D) 20 元   (E) 43 元

In the year 3017, the Australian Mint recycled its coins to make new coins.

Each 50c coin was cut into six triangles, six squares, and one hexagon. The triangles were each worth 3c and the squares were each worth 4c.

How much should the value of the hexagon be to make the total still worth 50c?

(A) 3c   (B) 8c   (C) 18c   (D) 20c   (E) 43c

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14. 小山注意到超市里有一种他喜爱的饼干正在特价，每一包里都免费增加正好三分之一的块数。

若每一**特价**包里都有 24 块饼干，请问每一**正常**包里有多少块饼干？

At the supermarket Ashan noticed that her favourite biscuits were on special, with one-third extra for free in the packet.
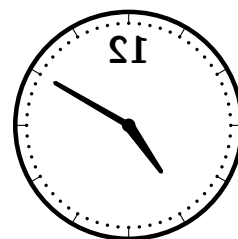
If this *special* packet contained 24 biscuits, how many biscuits would be in the *normal* packet?

(A) 12   (B) 16   (C) 18   (D) 20   (E) 32

15. 小桂在镜子中看到一个时钟的样子如图所示。请问它的准确时间是什么？

Greg sees a clock in the mirror, where it looks like this. What is the actual time?

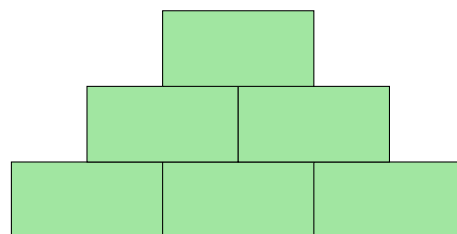(A) 4:10   (B) 4:50   (C) 5:10

(D) 6:50   (E) 7:10

16. 小强将一些长 2 cm、宽 1 cm 的长方形纸牌排成如图所示的图案。请问这个图案的周长是什么？

Jonathan made this shape with rectangular cards 2 cm long and 1 cm wide.

What is the perimeter of the shape?

(A) 6 cm   (B) 12 cm   (C) 18 cm

(D) 24 cm   (E) 36 cm

17. 已知以下两条算式

$$\heartsuit + \heartsuit + \heartsuit + \star = 12$$

$$\star + \star + \star + \heartsuit = 20$$

请问 $\heartsuit$ 所代表的值是多少？

In these two number sentences what is the value of $\heartsuit$?

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

18. 在某年六月，共有四个星期三与五个星期二。请问这年的六月一日是星期几？

(A) 星期一   (B) 星期二   (C) 星期四   (D) 星期五   (E) 星期六

One year in June, there were four Wednesdays and five Tuesdays. On which day was the first of June?

(A) Monday   (B) Tuesday   (C) Thursday   (D) Friday   (E) Saturday

19. 我要在如右图所示 4 × 4 方格表中的 16 个小方格内分别填入数 1、2、3 或 4，使得每一行、每一列都各有一个不同的数。我已填妥一些小方格，如图所示。

请问标记 ∗ 的两个小方格内的数之和是多少？

In the 4 by 4 square shown, I am filling in the 16 small squares with the numbers 1, 2, 3 and 4 so that each row and each column has one of each of these numbers. I have filled in some of the squares as shown.

What do the two squares marked ∗ add to?

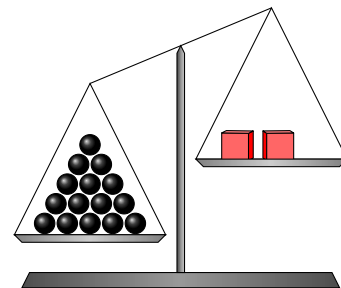| 1		∗	
		∗	4
			2
4	3	2	1

(A) 3   (B) 4   (C) 5

(D) 6   (E) 7

20. 在此天平中，两个正立方体与三颗球平衡。

请问在图中的右秤盘里要再加入多少个正立方体才能使天平平衡？

On these scales, two of the cubes balance with three of the balls.

How many cubes need to be added to the right-hand side to make the scales balance?

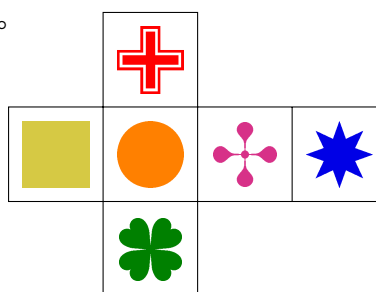(A) 5   (B) 6   (C) 8

(D) 12   (E) 13

21-25 题，每题 5 分
Questions 21 to 25, 5 marks each

21. 可将如右图所示的图案折成一个正立方体。
请问所折出来的正立方体是哪一个？

This shape can be folded up to make a cube.
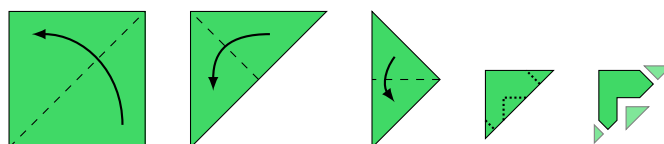
Which cube could it make?

(A)

(B)

(C)

(D)

(E)

22. 请问有多少个不同的三位数只有数码 2 与 3，且这两种数码都至少有一个？

How many three-digit numbers contain only the digits 2 and 3, and each of them at least once?

(A) 2 (B) 4 (C) 6 (D) 8 (E) 32

23. 将一张纸经过如下图所示的方式折迭与剪裁，请问展开后会得到哪一个选项的图案？

Which one of the patterns below would be created with these folds and cuts?
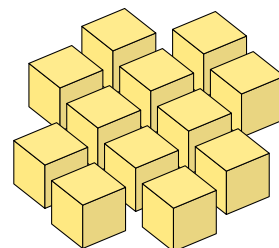
(A) (B) (C) (D) (E)

24. 我有一块长方体的起司，我可以将这一块起司分成 12 块边长为 1 cm 的正立方体而没有剩下。
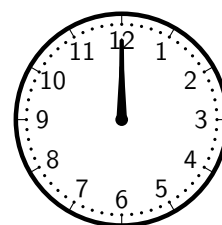
请问我原有的这一块起司可能有多少种不同的形状？

I have a rectangular block of cheese that I can cut into 12 identical 1 cm cubes, with none left over.

How many differently-shaped blocks of cheese could I have started with?

(A) 2　　　(B) 3　　　(C) 4　　　(D) 5　　　(E) 6

25. 将一个时钟的钟面用二条直线分割成三块区域使得每一块区域内的数之和都相等。请问这一个相等的和是什么？

A clockface can be divided with two straight lines into three regions so that the sum of the numbers in each region is the same. What is this sum?

(A) 20　　　　　　　　　(B) 22　　　　　　　　　(C) 24

(D) 26　　　　　　　　　(E) 28

问题 26-30 的答案为 000-999 之间的整数，请将答案填在答案卡上对应的位置。

第 26 题占 6 分，第 27 题占 7 分，第 28 题占 8 分，第 29 题占 9 分，第 30 题占 10 分。

For questions 26 to 30, shade the answer as a whole number from 0 to 999 in the space provided on the answer sheet.

Question 26 is 6 marks, question 27 is 7 marks, question 28 is 8 marks, question 29 is 9 marks and question 30 is 10 marks.

26. 有一个三位数，已知它的其中一个数码为 7 且任意二个数码之差都小于或等于 4。

请问这个三位数的最小可能值是多少？

In a three-digit number, one of the digits is 7 and the difference between any two of the digits is 4 or less.

What is the smallest this number could be?

27. 小茱的教室门口有 5 阶的阶梯，其中第 5 阶的阶梯即为教室的地板。她每一天都要试着用一种不同的爬阶梯方式，每一个阶梯都不一定要被踩到，但她最多只能一次跨 3 阶。

请问她总共有多少种不同的爬阶梯方式？

Julie has 5 steps up to her classroom, where step 5 is the floor of the classroom.

Each day she tries to think of a different way of climbing up these steps. She does not have to touch each step, but the biggest distance she can reach is 3 steps.

How many different ways are there of going up the steps?
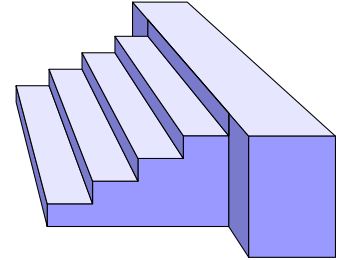
28. 小芝有一些奇异的拼图，它是由几个正方形纸板相连在一起，但这些正方形纸板之间只有一个边的一半相接触，也就是说，一个正方形的顶点与另一正方形的边之中点会重合在一起，如图所示。

利用此方法将三个正方形纸板拼接在一起，请问共有多少种不同的方法？

(若两种拼接的图案经过旋转或翻转之后是相同，则视为是相同的拼接方式)

Zhipu has an unusual construction set, consisting of square tiles which only connect together if they are joined with half a side touching. That is, the corner of one connects with the midpoint of the other, as in the diagram.
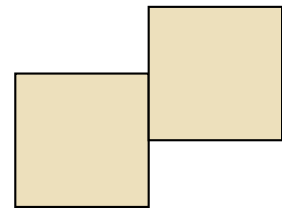
In how many ways can he connect three tiles?

(Two arrangements are not different if they can be rotated or reflected to look the same.)

29. 老王养了三只狗，年纪最大的狗叫老鲍，年纪第二大的叫阿雷，最年轻的狗叫小菲。已知小菲比老鲍年轻 10 岁且狗的年纪互不相同。

当老王把牠们的岁数相加时，得到总和为 28 岁。

请问当老王把牠们的岁数相乘时，所能得到的最小可能的乘积为多少？

Old Clarrie has three dogs. The oldest is Bob, next comes Rex and Fido is the youngest. Fido is 10 years younger than Bob, and none of the dogs are the same age.

When Clarrie adds their ages together they come to 28 years.

When Clarrie multiplies their ages together, he gets a number.

What is the smallest that this number could be?

30. 从 0 到 9 的十个数码都各恰使用一次可构成两个五位数。请问这两个五位数之差的最小可能值是多少？

All of the digits from 0 to 9 are used to form two 5-digit numbers. What is the smallest possible difference between these two numbers?

Solutions – Middle Primary Division

1. (Also J1)
$2 + 0 + 1 + 7 = 10$,

hence (A).

2. $2017 - 9 = 2008$,

hence (C).

3. The 2 is in the 100s column, so it has value 200,

hence (E).

4. From column 1 to column 3 is two squares right. From row K to row L is one square down,

hence (A).

5. $4 \times 30 = 120$ therefore the apples cost \$1.20,

hence (D).

6. (Also UP3)
Three out of the five dice showed a two on top,

hence (E).

7. $23 - 15 = 8$, so it is 8 km from Marytown to Smithton,

hence (A).

8. With 4 buses, only 200 people can fit, whereas with 5 buses, up to 250 fit,

hence (C).

9. (Also UP5)
Only shapes 1 and 3 have five sides and therefore are pentagons,

hence (D).

10. Before giving half of his apples to Sally, he must have had 2 apples, so at the start he must have had 4 apples,

hence (D).

11. Counting squares, $A = 8$, $B = 5\frac{1}{2}$, $C = 7$, $D = 6$ and $E = 7\frac{1}{2}$,

hence (A).

12. (Also UP7)

Subtract the 73 and then add 37 to get the correct answer: $157 - 73 + 37 = 121$,

hence (B).

13. (Also UP8)

The squares and triangles are worth $4 \times 6 + 3 \times 6 = 24 + 18 = 42$ cents. Then the hexagon is worth $50 - 42 = 8$ cents,

hence (B).

14. For every 3 biscuits in the normal packet, the special one contains 4.

The special packet contains $24 = 6 \times 4$, so the normal packet must contain $6 \times 3 = 18$ biscuits,

hence (C).

15. (Also UP11)

Reflect the clock face in a vertical axis so that it is the right way around.
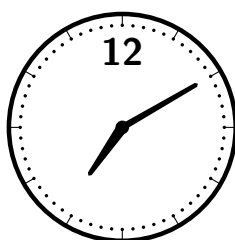
Then the time is 10 minutes past 7,

hence (E).

16. The shape has one side of length 6 cm, one side of length 2 cm and 10 sides of length 1 cm. The perimeter is $6 + 2 + 10 = 18$ cm,

hence (C).

17. (Also UP12)

Alternative 1

Adding both left-hand sides, 4 hearts and 4 stars are equal to 32, so ☆ + ♥ = 8.
Then in the first line, ♥ + ♥ + 8 = 12 so that ♥ + ♥ = 4 and ♥ = 2,

hence (B).

Alternative 2

We can make this pattern.

Each line replaces one ♥ with one ★, so the numbers ☐, 12, ☐, 20, ☐ will be equally spaced.

This means that they are 4 apart: ☐8☐, 12, ☐16☐, 20, ☐24☐. Then ♥ $= 8 \div 4 = 2$,

hence (B).

18. (Also UP16)

June has 30 days, which is 4 weeks and 2 days. So the last two days of June are the same day of the week as the first two. Thus these two days are the only ones that appear 5 times.

Now there are 5 Tuesdays, but not 5 Wednesdays, so there must be 5 Mondays. That is, the first two days and the last two days are Mondays and Tuesdays,

hence (A).

19. The fourth column requires a 3, and the first column requires a 2 and a 3. These can only be done like this:

1			3
2			4
3			2
4	3	2	1

Column 3 requires numbers 1, 3 and 4. The 3 must be in row 2. Then the 1 and the 4 can only be like this:

1		4	3
2		3	4
3		1	2
4	3	2	1

The remaining numbers can be filled in, but we can already see that the two required squares add to $4 + 3 = 7$,

hence (E).

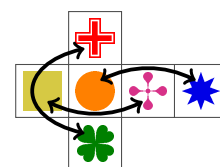**20.** There are 15 balls on the left, which can be arranged into 5 groups of 3.

To balance, each group of 3 balls needs 2 cubes on the right. That is, 10 cubes are needed on the right. There are already 2 there, so 8 more need to be added,

hence (C).

21. (Also UP19)

In the net we can find the opposite faces.

- ⬛ is opposite ✥ which rules out (D).
- 🟠 is opposite ✱ which rules out (A).
- ✚ is opposite 🍀 which rules out (B).

We can also rule out (C) by looking at what happens if ✚ is the top face of the cube and 🟠 and ✥ are visible. This puts 🟠 on the left and ✥ on the right.

The cube in (E) is possible, since with 🟠 on top, and with ⬛ on the left, 🍀 is on the right,

hence (E).

22. The possibilities are $223, 232, 233, 322, 323$ and 332,

hence (C).

23. (Also UP21)

The folded paper has 8 layers when it is cut. One of these cut layers is shown on the original square on the left, and all 8 are shown on the right,
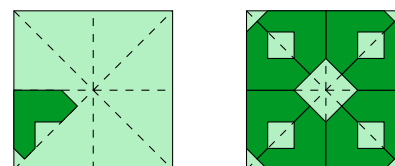
hence (D).

24. $12 = 1 \times 2 \times 2 \times 3$, so the possible dimensions of the rectangular block are:

$$
\begin{array}{ccccc}
1 & \times & 1 & \times & 12 \\
1 & \times & 2 & \times & 6 \\
1 & \times & 3 & \times & 4 \\
2 & \times & 2 & \times & 3
\end{array}
$$

So there are 4 possible rectangular blocks,

hence (C).

25. All the numbers on the clockface add to 78, and $78 \div 3 = 26$.
Checking, this can be done by including 2 pairs of 13 in each region:
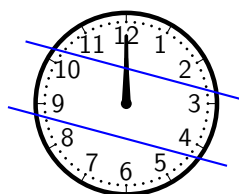
hence (D).

Note: This solution doesn't investigate the possibility that one or both lines split a two-digit number into two one-digit numbers. In these cases the total would be 23

or 20, depending on whether one or two numbers are split. However, in each case it is not possible to find lines that give these totals in all three regions.

26. The smallest any digit could be is 3. So the hundreds and tens digits are both 3 or more. If both hundreds and tens digits were equal to 3, then the ones digit must be 7, and the number is 337,

hence (337).

27. Here are the 13 different ways of climbing the steps, organised by what the first and second steps are.
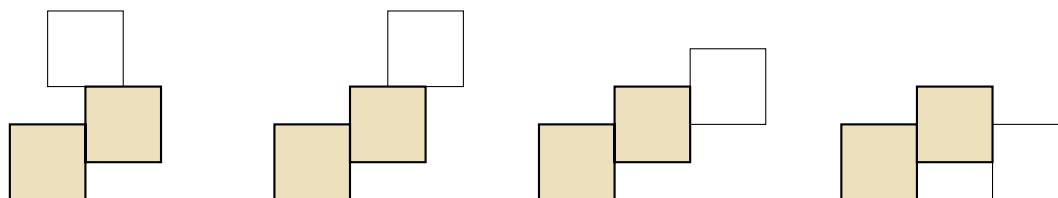
	2nd = 2				2nd = 3		2nd = 4	2nd = 5
1st = 1	1,2,3,4,5	1,2,4,5	1,2,3,5	1,2,5	1,3,4,5	1,3,5	1,4,5	
1st = 2					2,3,4,5	2,3,5	2,4,5	2,5
1st = 3							3,4,5	3,5

hence (13).

28. With two squares, there is only one configuration. The third square must join onto only one of the other squares, which it can do in exactly four distinct ways:

hence (4).

29. The only combinations of ages that add to 28 with the difference between the largest and smallest being 10 are $13 + 12 + 3 = 28$, $14 + 10 + 4 = 28$, and $15 + 8 + 5 = 28$. The products of these are $3 \times 12 \times 13 = 468$, $14 \times 10 \times 4 = 560$, and $15 \times 8 \times 5 = 600$. Of these, 468 is the smallest,

hence (468).

30. (Also UP28, J26, I19, S18)
The numbers must have different first digits, and so the smallest possible difference will be when the first digits differ by 1. Furthermore, the number formed by the remaining digits of the smaller number will be as large as possible and the number formed by the remaining digits of the larger number will be as small as possible.

The largest and smallest possible numbers formed from 4 digits are 9876 and 0123, so the two 5-digit numbers are 50123 and 49876 and their difference is $50123 - 49876 = 247$,

hence (247).

Answers

Question	Middle Primary	Upper Primary	Junior	Intermediate	Senior
1	A	C	A	C	A
2	C	B	B	A	A
3	E	E	A	C	C
4	A	A	B	C	D
5	D	D	D	C	D
6	E	A	A	E	B
7	A	B	D	B	C
8	C	B	D	A	E
9	D	D	C	A	C
10	D	A	E	D	D
11	A	E	B	E	C
12	B	B	D	C	E
13	B	E	E	E	E
14	C	D	A	D	B
15	E	B	C	D	C
16	C	A	A	B	B
17	B	D	D	B	D
18	A	D	E	E	D
19	E	E	E	D	A
20	C	B	D	E	B
21	E	D	B	C	E
22	C	E	B	A	B
23	D	B	C	D	C
24	C	C	B	E	D
25	D	C	D	E	E
26	337	28	247	807	13
27	13	60	18	648	234
28	4	247	27	56	56
29	468	18	286	286	360
30	247	14	234	99	510