AUSTRALIAN MATHEMATICS COMPETITION

AN ACTIVITY OF THE AUSTRALIAN MATHEMATICS TRUST

THURSDAY 4 AUGUST 2011

JUNIOR DIVISION COMPETITION PAPER

AUSTRALIAN SCHOOL YEARS 7 AND 8

TIME ALLOWED: 75 MINUTES

INSTRUCTIONS AND INFORMATION

GENERAL

1. Do not open the booklet until told to do so by your teacher.
2. NO calculators, slide rules, log tables, maths stencils, mobile phones or other calculating aids are permitted. Scribbling paper, graph paper, ruler and compasses are permitted, but are not essential.
3. Diagrams are NOT drawn to scale. They are intended only as aids.
4. There are 25 multiple-choice questions, each with 5 possible answers given 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 State or Region 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.

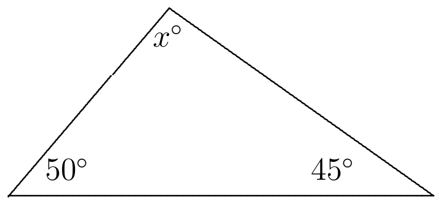
Junior Division

Questions 1 to 10, 3 marks each

1. The value of $2011 - 1102$ is

(A) 1111 (B) 1191 (C) 1001 (D) 989 (E) 909

2. In the diagram, the value of x is

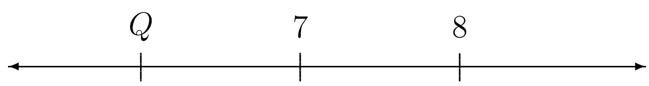


(A) 75 (B) 80 (C) 85 (D) 90 (E) 95

3. I left for a walk at 2:15 pm and returned at 3:20 pm. How long was I out walking?

(A) 50 minutes (B) 55 minutes (C) 60 minutes (D) 65 minutes (E) 70 minutes

4. On this number line,



the point 15 units to the left of Q is

(A) -10 (B) -9 (C) 0 (D) 5 (E) 10

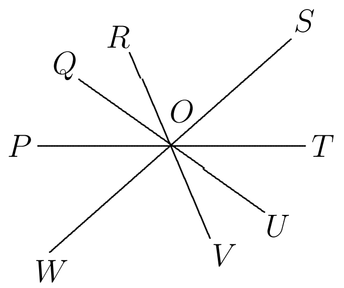
5. The value of $888 - (88 - 8)$ is

(A) 808 (B) 880 (C) 800 (D) 792 (E) 2011

6. We know that $5 \times 7 \times 11 = 385$. What is the value of $0.5 \times 0.7 \times 0.11$?

(A) 38.5 (B) 3.85 (C) 0.385 (D) 0.0385 (E) 0.00385

7. In the diagram, lines PT, QU, RV and SW intersect at O.
$\angle QOR = 20°$, $\angle SOT = 50°$ and $\angle VOW = 70°$. The size of $\angle POQ$ is



(A) 30° (B) 40° (C) 50° (D) 60° (E) 80°

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8. The value of $2^4 + 4^2$ is

(A) 16 (B) 32 (C) 34 (D) 36 (E) 64

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9. Warren reads 20 pages in 30 minutes. At this rate how long will it take him to read 66 pages?

(A) 1 hr 34 min (B) 1 hr 36 min (C) 1 hr 37 min (D) 1 hr 38 min (E) 1 hr 39 min

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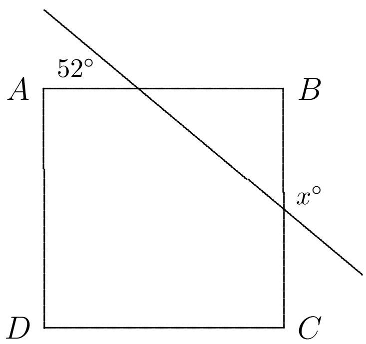
10. Each of the following 2-digit numbers has one digit covered. Which of the five numbers is the only possible multiple of 12?

(A) 3☐ (B) ☐9 (C) ☐5 (D) ☐3 (E) 5☐

Questions 11 to 20, 4 marks each

11. In the diagram, $ABCD$ is a square. What is the value of x?

(A) 142 (B) 128 (C) 48 (D) 104 (E) 52



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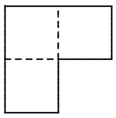
12. Billy counts backwards by 7, starting at 5907. When he reaches a single-digit number, he stops counting. The number he stops at is

(A) 4 (B) 6 (C) 7 (D) 8 (E) 9

13. The following tile is made from three unit squares.



What is the area, in square units, of the smallest square which can be made from tiles of this shape?

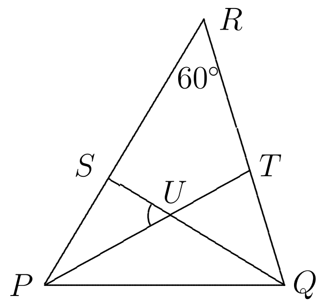
(A) 16 (B) 25 (C) 36 (D) 64 (E) 81

14. Which of the following is closest to $\dfrac{0.333}{0.222 \times 0.111}$?

(A) 0.01 (B) 0.1 (C) 1 (D) 10 (E) 100

15. In the diagram, PT divides $\angle RPQ$ in half and SQ divides $\angle PQR$ in half. $\angle PRQ = 60°$. What is the size of $\angle SUP$?

(A) 75° (B) 60° (C) 45° (D) 40° (E) 30°



16. The numbers on the six faces of this cube are consecutive even numbers.

If the sums of the numbers on each of the three pairs of opposite faces are equal, find the sum of all six numbers on this cube.

(A) 196 (B) 188 (C) 210 (D) 186 (E) 198

17. If m and n are positive whole numbers and $mn = 100$, then $m + n$ cannot be equal to

(A) 25 (B) 29 (C) 50 (D) 52 (E) 101

18. In the following addition, some of the digits are missing.

$$\begin{array}{cccc} & \square & 9 & \square \\ + & \square & 8 & 7 \\ \hline \square & 0 & \square & 2 \\ \hline \end{array}$$

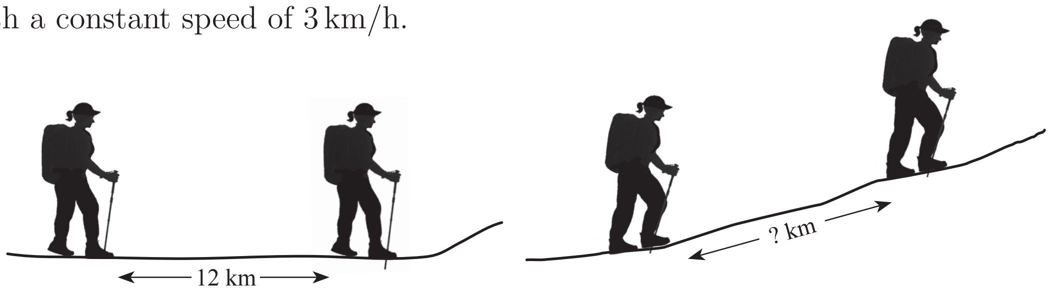
The sum of the missing digits is

(A) 23 (B) 21 (C) 20 (D) 18 (E) 15

19. If Peter lost 20 kg in weight he would then weigh 4 times as much as his pet wombat. Together they weigh 200 kg. How much does the wombat weigh?

(A) 30 kg (B) 36 kg (C) 40 kg (D) 164 kg (E) 170 kg

20. Two tourists are walking 12 km apart along a flat track at a constant speed of 4 km/h. When each tourist reaches the slope of a mountain, she begins to climb with a constant speed of 3 km/h.



What is the distance, in kilometres, between the two tourists during the climb?

(A) 16 (B) 12 (C) 10 (D) 9 (E) 8

Questions 21 to 25, 5 marks each

21. Each of thirty-four students wrote a story. All thirty-four stories were of different lengths ranging from 1 to 34 pages. These were put into a single book where the book starts at page 1, each new story begins on a new page and there are no blank pages. What is the largest possible number of stories that start at an odd page number of such a book?

(A) 8 (B) 9 (C) 17 (D) 26 (E) 33

22. The six faces of a dice are numbered $-3, -2, -1, 0, 1, 2$. If the dice is rolled twice and the two numbers are multiplied together, what is the probability that the result is negative?

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{11}{36}$ (D) $\frac{13}{36}$ (E) $\frac{1}{3}$

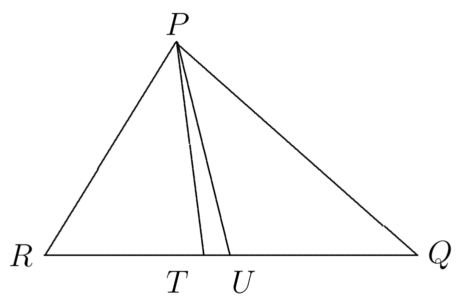
23. A grocer packed 52 boxes of oranges each with the same number of oranges in it and had 8 oranges left over. If he had packed 2 less oranges in each box, he would have filled 60 boxes. How many oranges did he have?

(A) 540 (B) 480 (C) 840 (D) 720 (E) 900

24. A square-based pyramid is built using cubical blocks, 1 on top, 4 on the next layer, 9 on the next, 16 on the next, and so on.
What is the minimum number of blocks needed if the pyramid is to be dismantled and rebuilt into 2 separate cubes with no blocks left over?

(A) 55 (B) 91 (C) 140 (D) 204 (E) 285

25. In $\triangle PQR$, U is the midpoint of RQ, $PU = RU$, PT bisects $\angle RPQ$ and $\angle RTP = 60^\circ$.



What is the size of $\angle RUP$?

(A) 15° (B) 30° (C) 40° (D) 45° (E) 50°

For questions 26 to 30, shade the answer as an integer 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.

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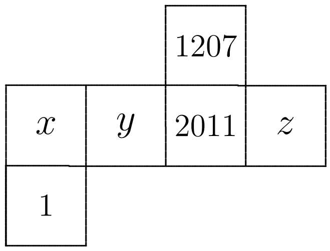
26. The diagram shows the net of a cube. On each face there is an integer: 1, 2011, 1207, x, y and z.



If each of the numbers 1207, x, y and z equals the average of the numbers written on the four faces of the cube adjacent to it, find the value of x.

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27. An arrangement of numbers has *different differences* when the differences between neighbours are all different. For example, the numbers

$$\boxed{1}\,\boxed{4}\,\boxed{2}\,\boxed{3}$$

have differences 3, 2 and 1 – all different.

If the numbers from 1 to 6 are arranged with different differences, and with 3 in the third position,

$$\boxed{}\,\boxed{}\,\boxed{3}\,\boxed{}\,\boxed{}\,\boxed{}$$

what are the last three digits?

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28. Which two-digit number is equal to the sum of its first digit plus the square of its second digit?

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29. The first digit of a six-digit number is 1. This digit 1 is now moved from the first digit position to the end, so it becomes the last digit. The new six-digit number is now 3 times larger than the original number. What are the last three digits of the original number?

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30. Joe the handyman was employed to fix house numbers onto the doors of 80 new houses in a row. He screwed digits on their front doors, numbering them from 1 to 80. Then he noticed that there were houses already numbered 1 to 64 in the street, so he had to replace all the numbers with new ones, 65 to 144. If he re-used as many digits as possible (where he could use an upside down 6 as a 9 and vice versa), how many new digits must he have supplied?

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