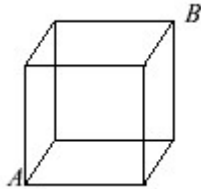1. Each edge of a cubic water container is $2\,m$ long.
    What is the volume of the cube (in m^3)?   _____(m^3) 1

2. A jar contains 7 marbles: 2 white, 2 yellow, and 3 black. You removed
    one marble at random. What is the probability that you removed
    a black marble? Express your answer as a fraction in lowest terms.   _____ 2

3. Simplify to a fraction in lowest terms: $\dfrac{4/30}{2/10}$ _____ 3

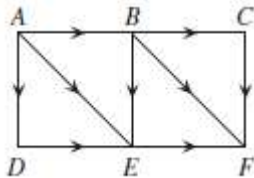4. How many seconds are there in 30 minutes?   _____(sec) 4

5. The edges of the wooden cube (below) are 15 cm each. An ant walks the
    shortest possible distance along the edges of the cube starting at corner A
    and ending at corner B. What distance does the ant have to travel (in cm)?
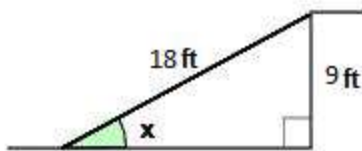

    _____(cm) 5

6. The average of 3 numbers is 2013. What is their sum?   _____ 6

7. Valid paths are along the lines in directions specified by arrows.
    How many paths are there from A to F?

    _____ 7

8. What is the value (in degrees) of the angle marked by the letter x?

    _____(°) 8
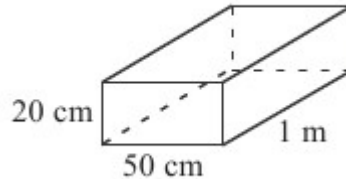
9. Round $\sqrt{255}$ to the nearest odd number.   _____ 9

Grade Six (6) Division

10. You bought one pencil for $0.49, one eraser for $0.59, and 2 pens for $0.75 each. How much money did you spend in total (in dollars correct to 2 decimal places?) _____($) 10

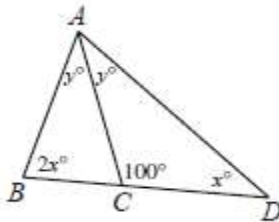11. What is the surface area of the box below (in m^2)? Express your answer as a

20 cm   1 m   50 cm

decimal correct to 1 decimal place. _____(m^2) 11

12. 75% of the 36 boys in the hiking club and 87.5% of the 64 girls in the hiking club participated in the yearly field trip. What percentage of the school hiking club participated in the field trip? _____(%) 12

13. Andrew, Betty, and Carla together spent N dollars, of which one third was spent by Andrew, one fourth was spent by Betty, and 10 dollars were spent by Carla. How many dollars did Betty spend? _____($) 13

14. A survey of 100 households showed that the average number of cars per household was 1.5. If 40 of the households did not have any car, what was the average number of cars among the households that had at least one car? Give the answer as a decimal, to the nearest tenth. _____ 14

15. x and y are measures of angles in $\triangle ABC$ and $\triangle ACD$ as shown below (the figure is not drawn to scale). What is the value of y (in degrees)?

A $y°$ $y°$ $2x°$ $100°$ $x°$ B   C   D

_____(°) 15

16. The binary representation of any non-negative integer is as follows: 0 (for the number 0), 1 (for 1), 10 (for 2), 11 (for 3), 100 (for 4), and so on. What number has the binary representation 100111? _____ 16

17. In the 4×4 grid below, every grid point is 1 unit from its nearest horizontal or vertical neighbours. How many lines pass through exactly 2 grid points?

• • • •

• • • •

• • • •

• • • •

_____ 17

18. Note that $2+4+6+\ldots+196+198+200=10100$. What is the value of $1+2+3+\ldots+98+99+100$? _____ 18

Grade Six (6) Division

19. How many positive integers smaller than 2013 are divisible both by 3 and 37?
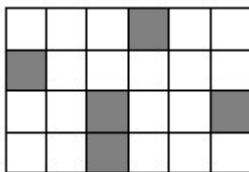
_____ 19

20. Alice made a list of all the positive even numbers smaller than 100. How many times did she write the digit 5?

_____ 20

21. a, b, c, d, e, and f are all different digits and none is 1 or 0. What is the minimum possible value of $a + b$?

$$\begin{array}{r} a\ b\ c \\ +\ \ d\ e\ f \\ \hline 1\ 0\ 0\ 0 \end{array}$$

_____ 21

22. The entry fee per student to the Elmacon competition is $20. The competition costs to PIMS are as follows: (a) $11 per student for the competition material, food, and pencils; (b) $2300 for prizes, mail, meetings, and operations; and (c) $355 extra cost for the site if the number of students exceeds 250. How many students need to participate so that PIMS does not lose money?
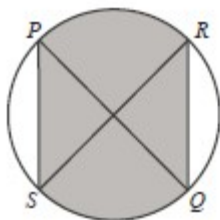
_____ 22

23. The figure below consists of a collection of black and white squares with area 1 each. How many rectangles with area 3 consist of exactly two white squares and one black square?

_____ 23

24. Let $\Phi(a, b)$ be the mean of the numbers a and b. What is the value of $\Phi(\Phi(\Phi(128,64),32),16)$?

_____ 24

25. Together, taps A and B will fill the swimming pool in 6 hours. Tap C will fill the swimming pool alone in 15 hours and together with tap B in 5 hours. Alone, in how many hours will tap A fill the swimming pool?

_____(hrs) 25

26. $PQ \perp RS$ are both diameters of length 10 cm. What is the area of the shaded region rounded to the nearest whole number of cm^2?

_____(cm^2) 26