SOUTH AFRICAN MATHEMATICS OLYMPIAD

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

2011 FIRST ROUND
JUNIOR SECTION: GRADE 8

16 March 2011 **Time: 60 minutes** **Number of questions: 20**

Instructions

1. *This is a multiple choice question paper. Each question is followed by answers marked A, B, C, D and E. Only one of these is correct.*
2. *Scoring rules:*
   2.1. *Each correct answer is worth 5 marks.*
   2.2. *There is no penalty for an incorrect answer or any unanswered question.*
3. *You must use an HB pencil. Rough work paper, a ruler and an eraser are permitted.* ***Calculators and geometry instruments are not permitted.***
4. *Figures are not necessarily drawn to scale.*
5. *Indicate your answers on the sheet provided.*
6. *The centre page is an information and formula sheet. Please tear out the page for your own use.*
7. *Start when the invigilator tells you to do so.*
8. *Answers and solutions will be available at* `www.samf.ac.za`

Do not turn the page until you are told to do so.
Draai die boekie om vir die Afrikaanse vraestel.

PRIVATE BAG X173, PRETORIA, 0001
TEL: (012) 392-9323 Email: ellie@samf.ac.za

Organisations involved: AMESA, SA Mathematical Society,
SA Akademie vir Wetenskap en Kuns

1. $2 + 3 \times 10 =$

(A) 15 (B) 32 (C) 42 (D) 45 (E) 50

2. The value of 0.014×0.4 is

(A) 5.6 (B) 0.56 (C) 0.056 (D) 0.0056 (E) 0.00056

3. A child is 1 500 days old. How old will he become on his next birthday?

(A) 3 years (B) 4 years (C) 5 years (D) 6 years (E) 7 years

4. The value of $4\frac{1}{4} - 3.25$ is

(A) 1.00 (B) 1.15 (C) 1.25 (D) 1.50 (E) 1.75

5. The square of an integer never has a last digit equal to

(A) 1 (B) 4 (C) 5 (D) 8 (E) 9

6. Which one of the following numbers is a multiple of 7?

(A) 2010 (B) 2020 (C) 2030 (D) 2040 (E) 2050

7. If $\underline{\boxed{a}\ \boxed{b}\ \boxed{c}}$ means $a + b \div c$, then the value of $\underline{\boxed{7}\ \boxed{4}\ \boxed{2}}$ is

(A) 9 (B) 13 (C) 15 (D) 18 (E) 22

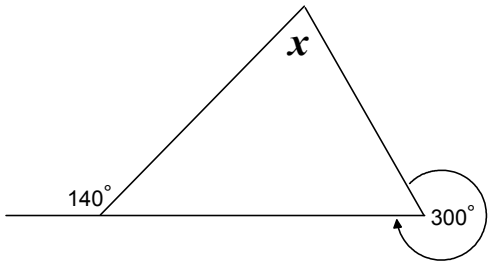
8. Which one of the following fractions is nearest to 1?

(A) $\frac{9}{10}$ (B) $\frac{14}{13}$ (C) $\frac{19}{20}$ (D) $\frac{121}{120}$ (E) $\frac{211}{212}$

9. $2011 - 201.1$ is

(A) 180.99 (B) 1809.9 (C) 1908.9 (D) 180 (E) 190.9

10. The size of the angle marked x is

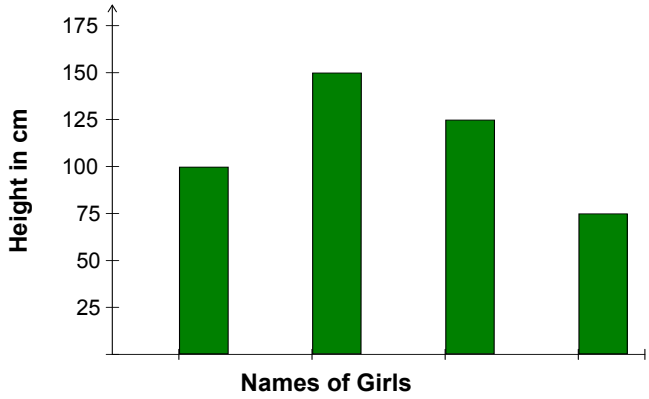


(A) 50° (B) 60° (C) 70° (D) 80° (E) 90°

11. A nurse gives 3 patients their medicines at different intervals. Cherry has to take her medication every 3 hours. Sandy has to take his medication every 4 hours. Nishi has to take her medication every 6 hours. All three were given their medication at 06:00. When will all three next take their medication at the same time?

(A) 09:00 (B) 12:00 (C) 15:00 (D) 18:00 (E) 21:00

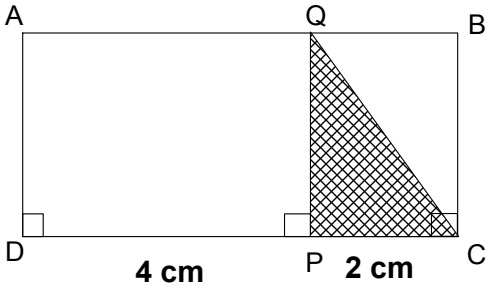
12. The graph shows the heights of four girls.



The names are missing from the graph. Debbie is the tallest. Amy is the shortest. Dawn is taller than Sarah. How tall is Sarah?

(A) 50 cm (B) 75 cm (C) 100 cm (D) 125 cm (E) 150 cm

13. The fraction of rectangle ABCD that is shaded is



(A) $\frac{1}{8}$ (B) $\frac{1}{6}$ (C) $\frac{1}{5}$ (D) $\frac{1}{4}$ (E) $\frac{1}{3}$

14. Assume that 5 miles is 8 kilometres. Then a speed of 120 km per hour expressed in miles per hour is

(A) 60 (B) 75 (C) 90 (D) 105 (E) 192

15. A pattern of numbers is arranged in columns as shown. In which column does the number 163 lie?

A	**B**	**C**	**D**	**E**
1	4	7	10	13
28	25	22	19	16
31	34	etc		

(A) A (B) B (C) C (D) D (E) E

16. The 11 numbers in a list have an average of 18. When the number 42 is added to the list, the new average of all twelve numbers is

(A) 18 (B) 20 (C) 22 (D) 24 (E) 26

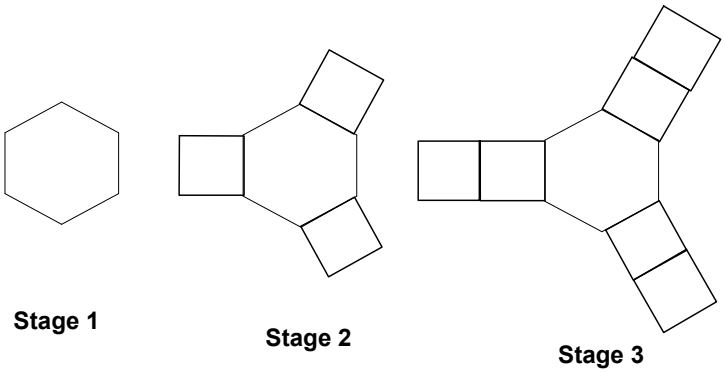
17. The sum of the numbers in the series $1 - 2 + 3 - 4 + 5 - \ldots + 2011$ is

(A) 1002 (B) 1004 (C) 1006 (D) 1008 (E) 1010

18. Which one of the following is not divisible by 5?

(A) $231^2 - 211^2$ (B) $213^2 - 212^2$ (C) $213^2 + 231^2$ (D) $213^2 + 211^2$ (E) $213^2 + 212^2$

19.



A crystal grows as illustrated. How many polygons are there in Stage 100?

(A) 290 (B) 298 (C) 299 (D) 301 (E) 305

20. A soccer ball is made up of 12 pentagons (5-sided figures) and 20 hexagons (6-sided figures) which are stitched together along their edges to form seams. How many seams does the soccer ball have?

(A) 30 (B) 60 (C) 90 (D) 120 (E) 150

Formula and Information Sheet

1.1 The natural numbers are 1; 2; 3; 4; 5; …

1.2 The whole numbers are 0; 1; 2; 3; 4; 5; …

1.3 The integers are …; –4; –3; –2; –1; 0; 1; 2; 3; 4; 5; …

2. In the fraction $\frac{a}{b}$, a is called the numerator and b the denominator.

3.1 Exponential notation:

$2 \times 2 \times 2 \times 2 \times 2 = 2^5$

$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$

$a \times a \times a \times a \times \ldots \times a = a^n$ (n factors of a)

(a is the base and n is the index (exponent))

3.2 Factorial notation:

2!= 2 x 1 = 2

3! = 3 x 2 x 1 = 6

4! = 4 x 3 x 2 x 1 = 24

1 x 2 x 3 x …. x n = n!

4 Area of a

4.1 triangle is: $\frac{1}{2} \times$ (base $\times$ height) = $\frac{1}{2}(b.h)$

4.2 rectangle is: length $\times$ width = lw

length $\times$ breadth = lb

square is: side $\times$ side = s^2

4.3

4.4 rhombus is: $\frac{1}{2} \times$ (product of diagonals)

4.5 trapezium is: $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$

4.6 circle is: πr^2 (r = radius)

5 Surface area of a:

5.1 rectangular prism is: $2lb + 2lh + 2bh$ (h = height)

5.2 sphere is: $4\pi r^2$

6 Perimeter of a:

6.1 rectangle is: $2 \times \text{length} + 2 \times \text{breadth}$

$2l + 2b$

or $2l + 2w$ (w = width)

6.2 square is: $4s$

7. Circumference of a circle is: $2\pi r$

8. Volume of a:

8.1 cube is: $s \times s \times s = s^3$

8.2 rectangular prism is: $l \times b \times h$

8.3 cylinder is: $\pi r^2 h$

9.1 Volume of a right prism is: area of cross-section × perpendicular height

or area of base × perpendicular height

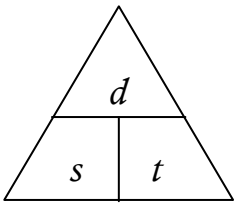
9.2 Surface area of a right prism is: (perimeter of base × h) + (2 × area of base)

10. Sum of the interior angles of a polygon is: $180^\circ(n-2)$ [n = number of sides]

11. Distance = speed × time ($d = s \times t$)

Speed = distance ÷ time ($s = \frac{d}{t}$)

Time = distance ÷ speed ($t = \frac{d}{s}$)

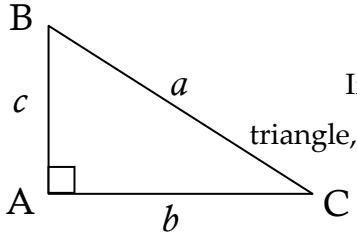


$d = s \times t$

$s = \frac{d}{t}$

$t = \frac{d}{s}$

12 Pythagoras:



If ΔABC is a right-angled triangle, then $a^2 = b^2 + c^2$

13. Conversions:

1 cm³ = 1 mℓ ; 1000 cm³ = 1 ℓ

1000 m = 1 km ; 1000 g = 1 kg ; 100 cm = 1 m