

Organised by the
SOUTH AFRICAN MATHEMATICS FOUNDATION

**2011 FIRST ROUND
JUNIOR SECTION: GRADE 9**

16 March 2011

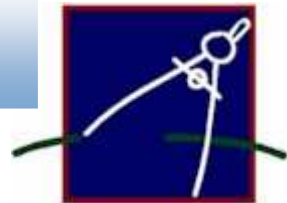
Time: 60 minutes

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

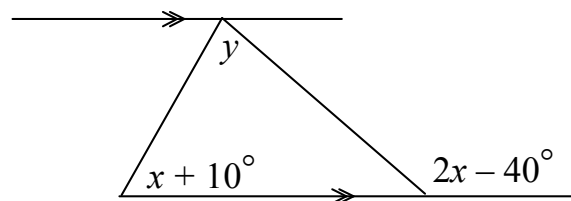
***Do not turn the page until you are told to do so.
Draai die boekie om vir die Afrikaanse vraestel.***



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

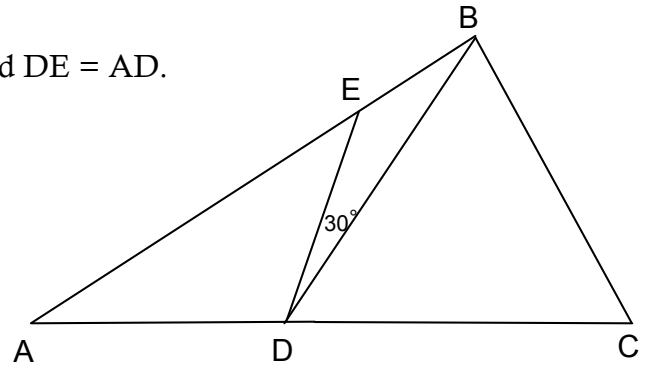
1. $2 + 3 \times 10 =$
 (A) 15 (B) 32 (C) 42 (D) 45 (E) 50
2. The value of 0.014×0.4 is
 (A) 5.6 (B) 0.56 (C) 0.056 (D) 0.0056 (E) 0.00056
3. Which one of the following fractions is nearest to 1 ?
 (A) $\frac{9}{10}$ (B) $\frac{14}{13}$ (C) $\frac{19}{20}$ (D) $\frac{121}{120}$ (E) $\frac{211}{212}$
4. Which one of the following numbers is a multiple of 7?
 (A) 2010 (B) 2020 (C) 2030 (D) 2040 (E) 2050
5. 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
6. A cricket ball and a soccer ball roll in a straight line along the ground and cover the same distance. The cricket ball rotates 27 times while the soccer ball rotates only 9 times. If the radius of the cricket ball is 4 cm, the radius of the soccer ball (in cm) is
 (A) 12 (B) 13 (C) 14 (D) 15 (E) 16
7. 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
8. The angle marked y is equal to



- (A) $3x - 40^\circ$ (B) $2x - 30^\circ$ (C) $x - 20^\circ$ (D) $x - 50^\circ$ (E) $x + 20^\circ$

9. The Olympics are held every four years, and the Holympics every six years. They were held in the same year in 1968. How many times will they be held in the same year between the years 2000 and 2200?
- (A) 11 (B) 13 (C) 14 (D) 15 (E) 17
10. The longer side of a rectangle has a length of 63 cm and the diagonals both have a length of 65 cm. The width of the rectangle (in cm) is
- (A) 4 (B) 8 (C) 12 (D) 16 (E) 20
11. The sum of the numbers in the series $1 - 2 + 3 - 4 + 5 - \dots + 2011$ is
- (A) 1002 (B) 1004 (C) 1006 (D) 1008 (E) 1010
12. 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) $213^2 + 212^2$
13. 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
14. If the number x is increased by 50% and the number $2x$ is decreased by 30%, then the difference between the first new number and the second new number is
- (A) 0 (B) $0.05x$ (C) $0.1x$ (D) $0.15x$ (E) $0.2x$
15. A number from 1 to 99 (including 1 and 99) is chosen at random. The probability that exactly one of its digits is 3 is
- (A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{1}{11}$ (D) $\frac{2}{11}$ (E) $\frac{3}{11}$

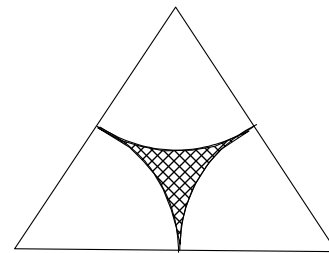
16. In the diagram, $AB = AC$, $BC = BD$ and $DE = AD$.
If $\hat{EDB} = 30^\circ$, then \hat{BAC} is equal to



- (A) 24° (B) 32° (C) 40° (D) 48° (E) 60°
17. A man is now twice as old as his son. Fifteen years ago he was three times as old as his son was then. How old is the son now?
- (A) 12 (B) 15 (C) 18 (D) 24 (E) 30
18. A 45-litre tank is filled with wine. Nine litres are removed and replaced with water. Then ten litres of the mixture are removed and replaced by water. What is the ratio of wine to water in the final mixture?

- (A) 28 : 17 (B) 29 : 16 (C) 30 : 15 (D) 31 : 14 (E) 32 : 13

19. Three equal arcs of circles are drawn centred on the vertices of an equilateral triangle; they touch but do not intersect. The sides of the triangle are of length 2 units. The shaded area is



- (A) $\frac{\sqrt{3}}{2} - \pi$ (B) $\frac{\sqrt{3}}{2} - \frac{\pi}{2}$ (C) $\sqrt{3} - \frac{\pi}{2}$ (D) $2\sqrt{3} - \pi$ (E) $2\sqrt{3} - 2\pi$
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:

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

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

$$a \times a \times a \times a \times \dots \times a = a^n \quad (n \text{ factors of } a)$$

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

3.2 Factorial notation:

$$2! = 2 \times 1 = 2$$

$$3! = 3 \times 2 \times 1 = 6$$

$$4! = 4 \times 3 \times 2 \times 1 = 24$$

$$1 \times 2 \times 3 \times \dots \times n = n!$$

4 Area of a

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

4.2 rectangle is: length \times width = lw

$$\text{length} \times \text{breadth} = lb$$

square is: side \times side = s^2

4.3

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

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: $2lb + 2lh + 2bh$ ($h = \text{height}$)

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 $2l + 2w$ ($w = \text{width}$)

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 \times perpendicular height
or area of base \times perpendicular height

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

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

11. Distance = speed \times time

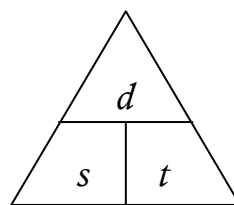
$$(d = s \times t)$$

Speed = distance \div time

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

Time = distance \div speed

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

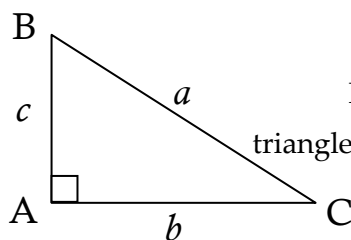


$$d = s \times t$$

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

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

12 Pythagoras:



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

13. Conversions:

$$1 \text{ cm}^3 = 1 \text{ ml} ;$$

$$1000 \text{ cm}^3 = 1 \ell$$

$$1000 \text{ m} = 1 \text{ km}$$

$$; \quad 1000 \text{ g} = 1 \text{ kg} ;$$

$$100 \text{ cm} = 1 \text{ m}$$
