S4021 WASSCE
May/June 2013
MATHEMATICS (CORE) 1
Objective Test
1½ hours

1

Name..

Index Number..

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination

May/June 2013   MATHEMATICS (CORE) 1   1½ hours
OBJECTIVE TEST
[50 marks]

Do **not** *open this booklet until you are told to do so. While you are waiting, read and observe the following instructions carefully. Write your* **name** *and* **index number** *in the spaces provided above.*

Answer **all** *the questions on your Objective Test answer sheet.*

1. Use 2B pencil throughout.
2. On the pre-printed answer sheet, check that the following details are **correctly** printed:
   - (*a*) In the space marked *Name*, check your **surname** followed by your **other names**.
   - (*b*) In the spaces marked *Examination, Year, Subject* and *Paper*, check 'WASSCE May/June', '2013', 'MATHEMATICS (CORE)', and '1' in that order.
   - (*c*) In the box marked *Index Number,* your **index number** has been printed vertically in the spaces on the left-hand side, and each numbered space has been shaded in line with each digit. **Reshade** each of the shaded spaces.
   - (*d*) In the box marked *Subject Code*, the digits 402112 are printed vertically in the spaces on the left-hand side. **Reshade** the corresponding numbered spaces as you did for your index number.
3. An example is given below. This is for a female candidate whose *name* is Nasadi Maku BOADI. Her *index number* is 7102143958 and she is offering *Mathematics (Core)* 1.

THE WEST AFRICAN EXAMINATIONS COUNCIL
ANSWER SHEET

PRINTED IN BLOCK LETTERS.

Name: **BOADI NASADI MAKU**   **GHA**

Examination: **WASSCE May/June**   Year: **2013**

Subject: **MATHEMATICS (CORE)**   Paper: **1**

INSTRUCTIONS TO CANDIDATES
1. Use grade 2B pencil throughout.
2. Answer each question by choosing one letter and shading it like this: ⊂A⊃ ⬛ ⊂C⊃ ⊂D⊃ ⊂E⊃
3. Erase completely any answer you wish to change.
4. Leave extra spaces blank if the answer spaces provided are more than you need.
5. Do not make any markings across the heavy black marks at the right hand edge of your answer sheet.

INDEX NUMBER	SUBJECT CODE
7	4
1	0
0	2
2	1
1	1
4	2
3	For Supervisors only
9	If candidate is absent
5	shade this space.
8	

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Answer **all** *the questions.*

Mathematical tables may be used in any question. The use of non-programmable, silent and cordless calculator is allowed.

Each question is followed by four options lettered A *to* D. *Find the* **correct** *option for* **each** *question and shade in* **pencil** *on your answer sheet, the answer space which bears the same letter as the option you have chosen.*

Give only **one** *answer to* **each** *question. An example is given below.*

The ages, in years, of four boys are 10, 12, 14 and 18. What is the average age of the boys?

A.   12 years

B.   12½ years

C.   13 years

D.   13½ years

The correct answer is 13½ years, which is lettered D, *and therefore answer space* D *would be shaded.*

⊂A⊃   ⊂B⊃   ⊂C⊃   ▬D▬   ⊂E⊃

Think carefully before you shade the answer spaces; erase completely any answers you wish to change.

Do all rough work on this question paper.

Now answer the following questions:

1.   Solve the equation: $2^{(9x-3)} = 8^{(3-x)}$.
   A. $x = 3$
   B. $x = 2$
   C. $x = 1$
   D. $x = 0$

2.   Multiply 6.4×10^8 by 3.1×10^{-5} and leave the answer in standard form.
   A. 1.984×10^5
   B. 1.984×10^4
   C. 1.984×10^3
   D. 1.984×10^2

3.   Simplify: $6\frac{3}{4} \div (21\frac{1}{3} \times 2\frac{1}{4} - 21)$.

   A. $6\frac{3}{4}$
   B. 4
   C. $\frac{1}{4}$
   D. $\frac{4}{27}$

4.   Express as a ratio: the speed of 1 km/min to the speed of 10 m/s.
   A. $5 : 3$
   B. $5 : 4$
   C. $3 : 4$
   D. $3 : 5$

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5. If y varies directly as $(2x + 3)$ and $x = 5$ when $y = 52$, what is the value of x when $y = 36$?
   - A. 4
   - B. 3
   - C. 2
   - D. 1

6. If $4m4_{\text{five}} = 119_{\text{ten}}$, what is the value of m?
   - A. 4
   - B. 3
   - C. 2
   - D. 1

7. Simplify: $\frac{3}{4}\sqrt{128} - \sqrt{32} - \frac{1}{5}\sqrt{50}$
   - A. $2\sqrt{2}$
   - B. $\sqrt{2}$
   - C. $-\sqrt{2}$
   - D. $-2\sqrt{2}$

8. An agent receives x % commission on every sale on product **P** and y % commission on every sale on product **Q**. If his total sales for a particular day were \$2000 and \$7000 for products **P** and **Q** respectively, what was the total commission of the agent?
   - A. $ (70x + 40y)$
   - B. $ (20x + 5y)$
   - C. $ (20x + 70y)$
   - D. $ (70x + 20y)$

9. Solve the simultaneous equations: $\frac{u}{2} - v = 1, \quad \frac{2u}{3} - v = 2.$
   - A. $u = 6, v = 2$
   - B. $u = 2, v = 6$
   - C. $u = -2, v = 6$
   - D. $u = -6, v = 2$

10. If $\frac{x+1}{2} - \frac{2x-1}{3} < 2$, solve for x.
    - A. $x < -7$
    - B. $x < -17$
    - C. $x > -17$
    - D. $x > -7$

11. Find the smaller value of x which satisfies the equation: $x \left(x + \frac{6}{x} - 1\right) = 12.$
    - A. 3
    - B. 2
    - C. -2
    - D. -3

Turn over

12. If $R = \frac{h}{2} + \frac{d^2}{8h}$, express d in terms of R and h.

    A. $\sqrt{4h(2R - h)}$

    B. $\sqrt{4h(R - h)}$

    C. $\sqrt{4h(h - R)}$

    D. $\sqrt{4h(h - 2R)}$

13. The sum of two numbers is 15. One of the numbers is $1\frac{1}{2}$ times the other. Find the bigger number.
    A.   6
    B.   9
    C.   10
    D.   12

14. If $x^2 + 1 - (x - 2)(x + 1) = 0$, find the value of x.
    A.   3
    B.   1
    C.   −1
    D.   −3

15. The radius, r, of a cone is twice its height, h (in metres). Express the volume of the cone in terms of h.

    A. $\frac{4}{3} \pi h^3 \text{ m}^3$

    B. $\frac{5}{3} \pi h^2 \text{ m}^3$

    C. $\frac{1}{12} \pi h^3 \text{ m}^3$

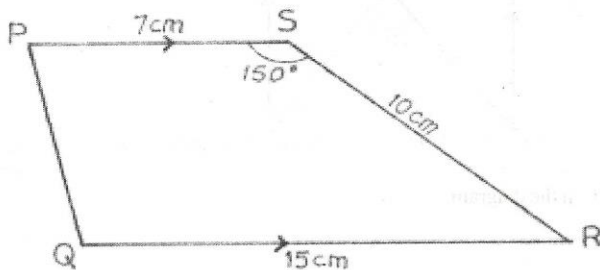   D. $\frac{2}{3} \pi h^2 \text{ m}^3$

16.
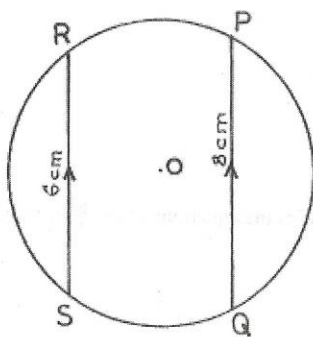
In the diagram, PQ and RS are parallel chords of a circle of radius 5 cm. If $/PQ/ = 8$ cm and $/RS/ = 6$ cm, how far apart are the chords?
    A.   3 cm
    B.   4 cm
    C.   7 cm
    D.   9 cm

17. A pyramid has a square base and its vertical height is 8 cm. If the diagonal of its base is $12\sqrt{2}$ cm, calculate its volume.
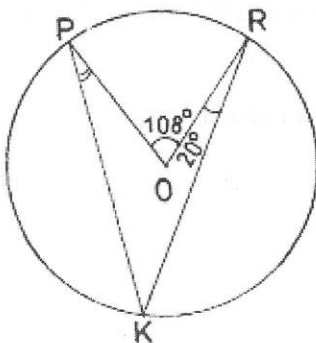   A. 364 cm³
    B. 374 cm³
    C. 384 cm³
    D. 398 cm³

18.

In the diagram, $PQRS$ is a trapezium with $/PS/ = 7$ cm, $/QR/ = 15$ cm and $/SR/ = 10$ cm. If $P\hat{S}R = 150^0$ and $PS //QR$, calculate the area of the trapezium.
    A. 35 cm²
    B. 55 cm²
    C. 56 cm²
    D. 70 cm²

19. The interior angles of a hexagon are 2r, 3r, 2r, 5r, r and 2r. Find the value of r.
    A. 96°
    B. 80°
    C. 48°
    D. 36°
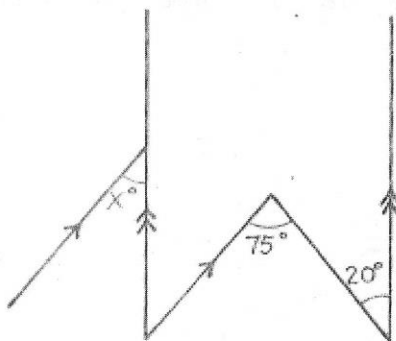
20.

In the diagram, O is the centre of the circle, $P\hat{O}R = 108°$ and $\angle ORK = 20°$.
Calculate $\angle OPK$.
    A. 27°
    B. 34°
    C. 36°
    D. 42°

Turn over

21.

Find the value of x in the diagram.

A. 95°
B. 75°
C. 55°
D. 20°

22. Edem drew a straight line XY on a plain sheet of paper. Using a pair of compasses with centre X and a convenient radius, he drew an arc intersecting XY at P. Using the same radius and P as the centre, he drew another arc to intersect the first arc at T. He joined T to X and read off $\angle TXP$ with a protractor. What value did he read?

A. 90°
B. 75°
C. 60°
D. 45°

23. A bird on top of a tree 15 m high was observed at an angle of elevation of 75° from the same horizontal ground as the foot of the tree. Calculate, correct to the nearest whole number, the distance of the observer from the foot of the tree.

A. 4 m
B. 6 m
C. 7 m
D. 56 m

24. If $\tan x = \frac{1}{\sqrt{3}}$, where $0° \le x \le 90°$, find $(\sin x - \cos x)$

A. $\frac{(1-\sqrt{3})}{2}$

B. $\frac{2}{(1-\sqrt{3})}$

C. $\frac{(\sqrt{3}-1)}{2}$

D. $\frac{2}{(\sqrt{3}-1)}$

25. If the bearing of R from Q is 135°, find the bearing of Q from R.

A. 045°
B. 225°
C. 270°
D. 315°

Mark	2	3	4	5	6
Frequency	2	4	5	3	1

The table shows the distribution of marks scored by some students in a test. Use it to answer Questions 26 and 27.

26. What is the median mark?
    A. 3.0
    B. 3.5
    C. 4.0
    D. 4.5

27. If two students are selected at random without replacement, what is the probability that they scored above the mode?

    A. $\frac{2}{225}$

    B. $\frac{1}{35}$

    C. $\frac{2}{35}$

    D. $\frac{16}{225}$

28. A box contains 20 identical balls. 8 of them are red, 7 white and the rest black. If two balls are chosen at random from the box without replacement, find the probability that they are both red or both white or both black.

    A. $\frac{59}{200}$

    B. $\frac{77}{200}$

    C. $\frac{59}{190}$

    D. $\frac{77}{190}$

29. Express $2 - 3\log_{10} 2$ as the logarithm of a single number.

    A. $\log_{10}\left(\frac{25}{12}\right)$

    B. $\log_{10}\left(\frac{25}{8}\right)$

    C. $\log_{10}\left(\frac{25}{4}\right)$

    D. $\log_{10}\left(\frac{25}{2}\right)$

Turn over

The pie chart shows the distribution of 600 mathematics textbooks for Science, Arts, Business and Technical classes. Use it to answer Questions 30 and 31.
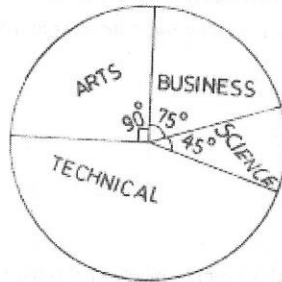
30. How many text books are for the technical class?
    A. 100
    B. 150
    C. 200
    D. 250

31. What percentage of the total number of textbooks belong to science class?
    A. $12\frac{1}{2}\%$
    B. $20\frac{5}{6}\%$
    C. 25%
    D. $41\frac{2}{3}\%$

32. A trader took a loan of GH¢ 5,500.00 from a bank and paid back GH¢ 6,000.00 after 10 months. At what rate, correct to the nearest percentage, was the simple interest charged?
    A. 11%
    B. 10%
    C. 8%
    D. 7%
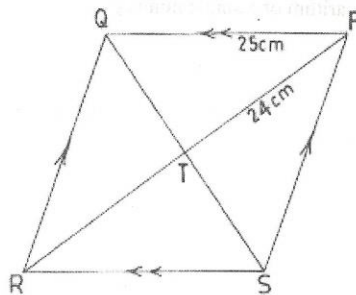
The diagram shows a rhombus PQRS with diagonals PR and SQ, / PT/ =24 cm and /PQ/ = 25 cm. Use this information to answer Questions 33 and 34.
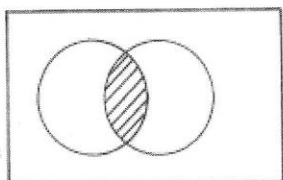
33. What is the value of ∠PTQ?
    A. 45°
    B. 60°
    C. 75°
    D. 90°

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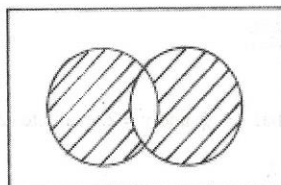34. Calculate /ST/.
   A.   35 cm
   B.   28 cm
   C.   22 cm
   D.   7 cm

35. Which of the shaded regions in the Venn diagrams illustrates the set $\mathbf{P'} \cup \mathbf{Q'}$?
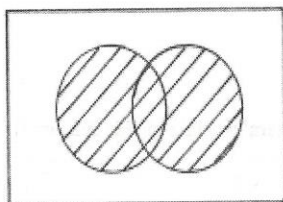
   A.
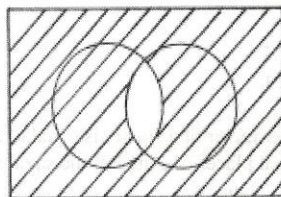
   C.

   B.

   D.

36. Calculate the product of the third and fourth terms of the sequence
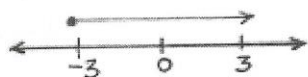 $$T_n = 2(2 + 3^{(n-1)})$$
   A.   1616
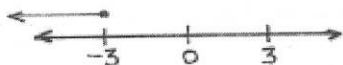   B.   1352
   C.   1276
   D.   1160

37. Which of the following illustrates the solution of the inequality
   $\frac{x}{3} - \frac{(x-3)}{2} \leq 1$ on a number line.

   A.

   B.

   C.

   D.

Turn over

38. Simplify: $\frac{1}{x+1} - \frac{2}{x-1} + \frac{3}{x^2-1}$

   A. $\frac{-x}{x^2-1}$

   B. $\frac{-3x}{x^2-1}$

   C. $\frac{x}{x^2-1}$

   D. $\frac{x+1}{x^2-1}$

39. Given that $x = \frac{1}{5}$ and $y = 2$, evaluate $(2xy)^{-1} + \frac{4}{y^{-1}}$.

   A. $2\frac{5}{7}$

   B. $8\frac{1}{4}$

   C. $9\frac{1}{4}$

   D. 29

40. If the perimeter of a square is equal to the area of an equilateral triangle of side 3.2 cm, find, correct to 2 decimal places, the area of the square.
   A. 1.23 cm²
   B. 1.92 cm²
   C. 7.68 cm²
   D. 15.36 cm²

41. Factorize completely: $m^2n - 2mn^2 + n^3$.
   A. $n(m - n)^2$
   B. $n(m + n)^2$
   C. $n(m-n)(m + n)$
   D. $n(m-n)(n - m)$

42. Simplify: $\frac{3}{x+3} - \frac{2(x-3)}{x^2-9}$.

   A. $\frac{2}{x+3}$

   B. $\frac{2}{x-3}$

   C. $\frac{1}{x+3}$

   D. $\frac{1}{x-3}$
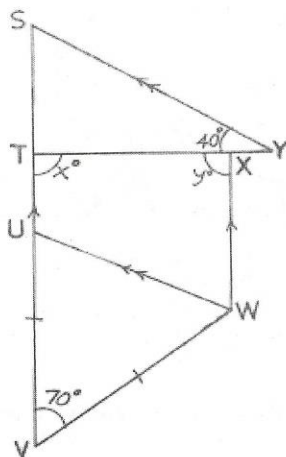
In the diagram, $\overline{SY}//\overline{UW}$, $\overline{SV}//\overline{XW}$, $\angle SYT = 40°$ and $\angle UVW = 70°$. *Use the diagram to answer Questions* **43** *and* **44**.

43. Find the value of *x*.
    A. 110°
    B. 95°
    C. 90°
    D. 85°

44. Find the value of *y*.
    A. 70°
    B. 85°
    C. 90°
    D. 95°

45. If (–2, 4) is a point on the graph of $y = px^2 - 2x + 4$, where *p* is a constant, find the value of *p*.
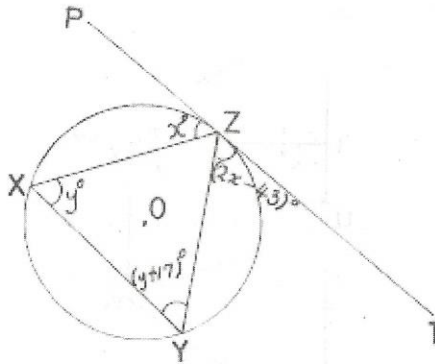   A. 2
    B. 1
    C. –1
    D. –2

46.
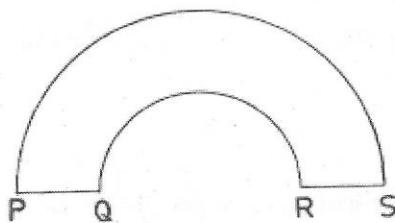
The figure is made up of two semi-circles whose diameters are 14 cm and 7 cm.
If $/PQ/ = /RS/ = 3\frac{1}{2}$ cm, find the perimeter of the figure.
    [Take $\pi = \frac{22}{7}$]
    A. 73 cm
    B. 66 cm
    C. 44 cm
    D. 40 cm

Turn over

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47.
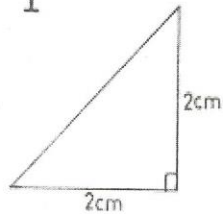

In the diagram, $\angle ZXY = y°$, $\angle ZYX = (y + 17)°$, $\angle PZX = x°$ and $\angle YZT = (2x - 43)°$.
Find the value of y.
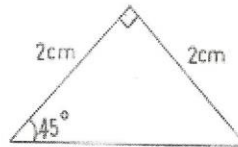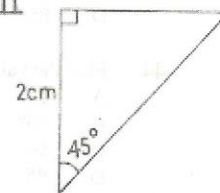
A.   40°
B.   36°
C.   20°
D.   9°

48.

Which of these triangles are congruent to each other?

A.   I, II and III
B.   I and II only
C.   II and III only
D.   I and III only

49.   Two adjacent angles on a straight line are $(x - 60)°$ and $(y + 30)°$. Find the value of $(x + y)$.

A.   210°
B.   150°
C.   90°
D.   30°

50.   Given that $\{x : 4.5 < x \leq 12\}$, where x is an even integer. List the values of x.

A.   {6, 8, 10, 12}
B.   {4, 6, 8, 10}
C.   {6, 8, 12}
D.   {4, 10, 12}

END OF PAPER