

THIRD FORM MATHEMATICS
Promotion Examination 2007

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Time $1\frac{3}{4}$ hours

140 Copies

INSTRUCTIONS

Write your name clearly on each sheet of paper used.

All of the questions are to be attempted.

Calculators are allowed.

Number your answers carefully and do **NOT** do questions beside one another.

Write on your foolscap the letter that matches your response for Questions 1 – 5.

All working **MUST** be shown for questions 6 – 18.

If a numerical answer cannot be given exactly, and the accuracy required is not specified in the question, then in the case of an angle it should be given to the nearest degree, and in other cases it should be given correct to three (3) significant figures.

1. The integer closest to $\sqrt{\frac{60.1}{0.99} + 3.95}$ is

- (A) 3 (B) 8 (C) 9 (D) 8.04

2. If m pens are bought for n dollars each, and n pens for m dollars each, then the average cost per pen, in dollars, is

- (A) mn (B) 1 (C) $\frac{m+n}{2}$ (D) $\frac{2mn}{m+n}$

3. Given that $n \in N$, the smallest value of n which will make $12n$ divisible by 15 is

- (A) 56 (B) 6 (C) 5 (D) 7

4. The point $(4, -3)$ is reflected in the x -axis. The image is then reflected in the y -axis. The coordinates of the point in its final position are

- (A) $(3, -4)$ (B) $(-3, 4)$ (C) $(-4, 3)$ (D) $(-4, -3)$

5. The volume of a cone whose radius is $\frac{1}{\pi}$ and altitude 3 is

- (A) $\frac{1}{\pi}$ (B) 1 (C) π (D) 3

[Total: 5 marks]

6. Of the 350 candidates, x candidates passed in both Mathematics and Chemistry. 149 passed in Mathematics, 160 passed in Chemistry and $(2x + 3)$ did not pass neither Mathematics nor Chemistry.

- i) Draw a Venn Diagram to illustrate this information.
- ii) Form an equation in x and solve your equation to find x .
- iii) If a candidate is selected at random from this group, find the probability that the candidate did not pass neither Mathematics nor Chemistry. (Leave your answer as a fraction).

[11 marks]

7. A computer cost \$ 6000. It depreciates in value at the rate of 5 % per annum.

- i) Calculate the amount of depreciation after one year
- ii) Calculate the cost of the computer after three years.

[5 marks]

8. Given that $a = 4$, $b = -2$, and $c = 3$, calculate the value of $\frac{a^2 - bc}{b + c}$.

[5 marks]

9. Given that $x \in \mathbb{R}$, solve for x , and represent the solution on a number line

$$4(2 - x) \geq 3(x + 1) + 12$$

[6 marks]

10. The width of a rectangular field is w metres. The length is 5 metres more than twice the width. Write, in terms of w , algebraic expressions for

- i) the length of the field.
- ii) the area of the field.

[2 marks]

11. Solve the simultaneous equations $x - y = -5$
 $3x + 2y = -5$

[5 marks]

12. No calculators are to be used in this question. All working MUST be shown.

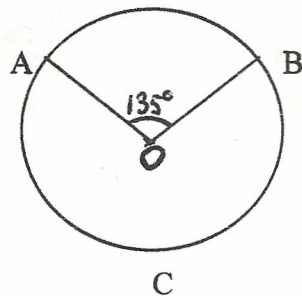
y is inversely proportional to $(x^2 + x)$ and $y = \frac{1}{9}$ when $x = 9$.

Calculate

- i) the value of the constant of proportionality
- ii) the value of y when $x = 4$.

[5 marks]

13.



The diagram above, not drawn to scale, shows a circle, centre O , and radius 6 cm.
 $\angle AOB = 135^\circ$.

Taking $\pi = 3.14$, calculate

- a) i) the area of the minor sector AOB
 ii) the perimeter of the region bounded by the lines AO and OB , and the arc BCA .
- b) The above circle represents the base of a container 15 cm high, calculate the volume of this container. [7 marks]

14. This question is to be done on the graph paper provided

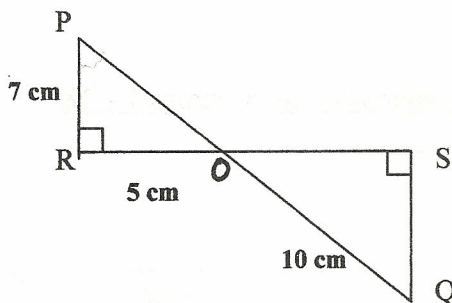
The point $A(0, 9)$ and $B(0, 4)$ are mapped by a rotation with centre C onto the points $A'(8, 7)$ and $B'(4, 4)$.

- i) Using a scale of 2cm to 1 unit on both axes, plot the points A, B, A' and B' .
- ii) Given that C is the point $(2, 0)$, measure and state the size of the angle of rotation to the nearest degree.
- iii) By calculation, find the gradient of the line $A'B'$. [8 marks]

15. The angle of elevation from a point P on the ground to the top of a vertical tower 20 metres tall, is 65° .

- i) Draw a diagram to show the above information.
- ii) Calculate the distance of P from the foot R , of the tower. [7 marks]

16.



In the diagram above, not drawn to scale, $PR = 7$ cm, $RO = 5$ cm, $OQ = 10$ cm. Angles at R and S are right angles. Calculate

- i) the angle of depression of the point O from the point P .
- ii) the length of RS . [7 marks]

17. A ship leaves a harbour at point A and travels for a distance of 15 km to point B on a bearing of 135° . The ship then changes course and travels to point C which is due west

of B and due south of A .

a) Illustrate the above information in a clearly labelled diagram. The diagram should show the

- i) north direction
- ii) bearing 135°
- iii) distance 15 km.

b) Calculate

- i) the distance BC
- ii) the bearing of A from B .

[8 marks]

18. A survey was taken among 25 students to find out the time spent waiting in line for service at a cafeteria. The following table shows the results of the survey.

Waiting time (in minutes)	No. of students
1 – 5	5
6 – 10	8
11 – 15	3
16 – 20	7
21 – 25	2

i) By finding the midpoint of each class interval, calculate the mean waiting time of the students.

ii) Calculate the probability that a student chosen at random would have waited for less than $\textcircled{15.5}$ minutes.

[9 marks]

Only attempt question 19 after you have checked over your work in questions 1 – 18.

No calculators are to be used in this question.
All working MUST be shown.

19. The roots of the equation $ax^2 + bx + c = 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Find the roots of the equation $9x^2 + 6x = 11$, giving your answer in the form

$\frac{p \pm q\sqrt{r}}{t}$ where p , q , r and t are constants.