General Mathematics Paper 2,Nov/Dec. 2007

Question 1

(a) Without using four-figure tables or calculators, evaluate

$$\frac{0.0024 \times 0.064}{0.048}$$

leaving your answer in standard form.

(b) (i). What range of values of x satisfies the inequalities

$3x - 2 > 4$ and $2x - 1 \leq 9$?

(ii). Illustrate your answer on the number line.

Observation

(a) This question required candidates to evaluate decimal expressions in standard form without using calculators or four-figure tables. It was designed to test the candidates manipulative skills but some candidates resorted to the use of calculators. They were expected to multiply the numerators and denominator by the appropriate powers of 10 so as to convert the numbers into whole numbers, cancel out the common factors and write the final answer in standard form. Those who followed the instruction found the question quite cheap.

(b) This part of the question was satisfactorily done by most candidates, however there were some cases where candidates did not draw the graph. Some of them were not able to combine the inequalities to have

$$2 < x \leq 5$$

QUESTION 2

(a) In a class of 90 students, 45 take Physics and 58 Economics. If each student takes at least one of the subjects, how many take both?

(b). Simplify $(2\sqrt{12} - 3)(2\sqrt{3} + 1)$.

OBSERVATION

This question was properly handled by many candidates. The candidates displayed good knowledge of the venn diagram approach as well as formula method for two sets.

The question in multiplication of surds was also well attempted by most candidates and they also performed well.

QUESTION 3

In the diagram, <PRA = 50˚, |AB| = 67*m*, |BQ| = 28 *m* and |AP| = 48 *m*. Find, correct to the nearest whole number:

(a) |RB|;

(b) < QPA.

OBSERVATION

Many candidates found this question very challenging. Some of the candidates who attempted it did not correct their answers to the nearest whole number while others could not determine the angle QPA. A good number of them assumed that <PRQ is 90˚. To get |RBZ, they were to find |AR| which is $\frac{48}{\tan 50}$ m then subtract it from 67 m to get 27 m to the nearest whole number.

To get <QPA, draw a line from Q, parallel to AB to meet line |PA|at S. PS will then be 20. Hence,

$$<QPA = \tan^{-1} \frac{67}{20} = 73^\circ \text{ to the nearest degree.}$$

QUESTION 4

(a) An article valued at NP when new depreciates by 10% of its value at the end of every year. If at the end of the third year, the article is valued at
N7,290, find the value of P.

(b)In the diagram, ABCD is a cyclic quadrilateral. If DÂX = 40˚ and
AXD = 60˚, calculate ABC.

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OBSERVATION

Most candidates attempted this question and they performed very well. In the (a) part, while some used the method of first principle as it was in the marking scheme, others used the compound interest formular A = P 1+ (-R) n .
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The (b) part on geometry was also well done by the candidates <ADX = 180 - (60 + 40) = 80˚ (sum of <s of a<). <ABC = 180 - 80 = 100˚ (opp. <s of a cyclic quad).

QUESTION 5

Let U = {*x* : *x* is an integer from 1 to 20},
A = {multiples of 5 },
B = {multiple of 3 } and
C = { factors of 20 }

If *x* is chosen at random from U , find the probability that :

- *x* € A n B;
- *x* € A u B;
- *x* € A n B n C

OBSERVATION

This question was very popular among the candidates and many gave a good account of themselves. However, many candidates failed to enclose the elements in the curly brackets. Some did not separate the elements with commas while others omitted 1 and 20 in set C as factors of 20.

QUESTION 6

(a) A contractor employs 12 men for $44\frac{1}{2}$ days and pays each man $6.50 per day. He employs some other 4 women for 36 days and pays each of them $3.00 per day. Find:

(i) his total wage bill;
(ii) the percentage of the total wage bill paid to the women.

(b) Simplify: $\dfrac{2 \log 8 + \log 4 - \log 16}{\log 32}$

OBSERVATION

(a). This question was attractive to most candidates and they did very well.

(b). The case here was different as many candidates exhibited lack of the knowledge of laws of logarithms.

The numerator $= \log \dfrac{64 \times 4}{16} = \log 16$ or $4\log 2$

The denominator $= \log 32$ or $5 \log 2$

Thus, the expression simplifies to $\dfrac{4\log 2}{5\log 2} = 4/5$

Some candidates applied Laws of logarithm here to get 4log2 - 5log2 which is wrong.

QUESTION 7

(a) If 126n = 86, find n.

(b) Solve the equations

$$3x + \frac{1}{2}y = 8$$

$$\frac{1}{2}x + 2y = 9$$

(c) Solve for x in the inequality $\frac{2(x - 1)}{3} - \frac{3(2x - 1)}{4} \leq \frac{2}{3}$

OBSERVATION

This question was also very popular among the candidates. However, there was a need to emphasize that number bases are non-negative. Some candidates did not state so. Also, some candidates had problems with the (b) part as they did not realize that they had to clear the fraction first.

Generally, the performance was satisfactory.

QUESTION 8

(a) Copy and complete the following table of values for $y = 6 + x - 2x^2$

x	-3	-2	-1	0	1	2	3
y	-15			6		0	

(b) Using a scale of 2 cm to 1 unit on the x-axis and a scale of 2 cm to 5 units on the y-axis, draw the graph of the relation
$y - 6 + x - 2x^2$ for $-3 \leq x \leq 3$.

(c) Use your graph to:

(i) find the greatest value of y;
(ii) solve the equation $2x^2 - x - 11 = 0$;
(iii) find the range of values of x for which $6 + x - 2x^2 \geq 4$.

OBSERVATION

This question on graph was very popular and well attempted by most candidates. They were able to complete the table of values and plot the points. However, the inability of the candidates to read from their graphs was very evident. They were unable to draw the suitable straight line to solve the equation
$2x^2 - x - 11 = 0$ >> $0 = 11 + x - 2x2$ >> $-5 = 6 + x - 2x^2$. Thus, the straight line that was required was $y = -5$ and the points of intersection of this line with the graph gives the solution of the equation $2x^2 - x - 11 = 0$.

Candidates were also not able to define the range of values of x for which $6 + x - 2x^2 \geq 4$. They were expected to draw the line $y = 4$ and the solution is those value of x whose corresponding values of y on the graph lie above the line $y = 4$.

Question 9

In the diagram, O is the centre of the circle,   PT is a tangent to the circle at A. AÔB = 126° and ABC = 27° .

1. Calculate PÂB.
2. Show that OA is parallel to BC.

(b) Each interior angle of a regular polygon is 20n° , where n is the number of sides. Find the least value of n.

OBSERVATION

The (a) part of the question which is based on circle and tangency principles was not attractive to candidates as few of them attempted it. Many candidates did not
see <OAB = <OBA = 27° . Furthermore, since OA is a radius and PAC is a tangent, <PAO = 90°.   Hence<PAB = 117° and ABC = 27° >> OA//BC. Since <AOB +<OBC = 180° and <OAB = <ABC = 27°.

The case was the opposite in the (b) part. It was well attempted. Most of them did well, scoring high marks. Many were able to get the equation
$20n^2 - 180n + 360 = 0$ thus obtaining n = 3.

QUESTION 10

The table shows the height, in cm, of 80 plants in a garden.

Height (*cm*)	60-64	65-69	70-74	75-79	80-84	85-89
Frequency	8	13	17	24	11	7

(a) Calculate the mean height, correct to 1 decimal place.
(b) Construct a cumulative frequency table.
(c) Draw a cumulative frequency curve. Use your curve to estimate the median height, correct to 1 decimal place.

OBSERVATION

The question was also very popular among the candidates and a majority did well and scored high marks. However, it was also observed that some candidates used the class mid point instead of the class-boundaries to draw the Ogive which is wrong. Some others were unable to read the median from the graph and hence, they lost some marks.

QUESTION 11

(a) A father gives a sum of \$5500 to his three daughters to share in the ratio 2:4:5. How much does each receive?

(b) (i) Using a ruler and a pair of compasses only, construct a quadrilateral PQRS in which |PQ|= 7 cm, |QR|= 11 cm, |SP|= 6 cm, <PQR = 60° and PS//QR.

(ii) Measure |SR|.

OBSERVATION

Quite a few candidates attempted this questions and fewer still, attempted the (b) part of the question which was on geometrical construction, an area which is traditionally dodged by majority of the candidates.

While the (a) part was very well done, the (b) part proved to be difficult for many. Majority of them had problems in drawing line PS parallel to QR. They could only draw the line /PQ/ = 7 cm or /QR/ = 11 cm and probably angle 60°.

QUESTION 12

A pyramid has a square base ABCD of side 40 cm. The vertex V is 35 cm above the centre, O. of the base. Calculate:

(a) the angle VCO correct to the nearest degree;
(b) |VC|;

- the area of a triangular face of the pyramid, correct to one decimal place.

OBSERVATION

This question was not popular. Only a few candidates attempted it. Candidates found it pretty difficult. Many of them could not draw the correct diagram and hence could not solve the problem.

From the diagram, $|AC| = \sqrt{40^2 + 40^2} = 40\sqrt{2}$ Or 56.56 cm
Therefore, $OC = \frac{1}{2}AC = 20\sqrt{2}$ or 28.28 cm. $<VCO = \tan^{-1}\frac{35}{20\sqrt{2}} =$ 51°
to the nearest degree. $|VC| = \sqrt{35^2 + (20\sqrt{2})^2} = 45$ cm

Taking Δ VBC, height $= \sqrt{VO^2 + (\frac{1}{2} DC)^2} = \sqrt{35^2 + 20^2} = 40.31$ cm

Area of Δ VBC $= 20$ cm x 40.31 cm $= 806.2$ cm^2

QUESTION 13

(a) A (60°N, 30°E) and B (60°N, 42°W) are two towns on the surface of the earth. Calculate, correct to three significant figures, the:

1. radius of the circle of latitude on which A and B lie;
2. distance on the Earth's surface between A and B along the circle of latitude.

[Take the radius of the Earth to be 6400 km and π = 3.142]

(b). In the diagram, O is the centre of the circle with radius 3.5 cm.
If <BAC = 42°, calculate, correct to two decimal places, the area of the shaded segment. [Take p = $\frac{22}{7}$].

OBSERVATION

(a). This question on longitude and latitude was very popular among the candidates. Many candidates exhibited a good understanding of longitude and latitude, latitudinal radius and using same to find the distance between the points on the earth's surface, along the same latitude. However, some candidates failed to correct their answer to three significant figures as required while others wrongly regarded the longitudinal difference as the degree of the latitude.

(b). The question on a composite body was a good test on mensuration. Many students, however, did not attempt the question even though it is not difficult. Those who attempted it did not get far before abandoning it or getting confused. Others used 42° instead of 84° to calculate the area of the sector which should not be so. They were expected to get <BOC = 84° (< at the centre is twice angle at the circumference of a circle).

Area of the sector will then be $84/360 \times 22/7 \times 3.5^2$ =

Area of Δ BOC = $\frac{1}{2} \times 3.5 \times 3.5 \times \sin 84 = 6.09\ cm^2$

Hence, Area of segment = $8.98\ cm^2 - 6.09\ cm^2 = 2.89\ cm^2$