GRADE 10 EXEMPLAR EXAMINATION
NOVEMBER 2006

MATHEMATICS LITERACY
PAPER 2 MEMORANDUM

LO 3 – SPACE, SHAPE AND MEASUREMENT
LO 4 – DATA HANDLING

QUESTION 1: PARLINGTON ESTATE

(a) (i) 52 plots ✓ (1)

(ii) Plot 13 ✓ (1)

(b) Plot 25 ✓ (1)

(c) (i) 50 mm ✓ (1)

(ii) Distance on the map = 325 mm ✓
50 mm = 1 km

$\Rightarrow$ 1 mm = $\frac{1 \text{ km}}{50}$

= 0,02 km

$\therefore$ Actual distance = 0,02 x 325 ✓
= 6,5 km ✓ (3)

(d) Shortest and quickest route:
- Right into Dong Street
- Left into Circle Drive
- Deliver to Plot 10 ✓
- Left into Straight Street
- Deliver to Plot 31 ✓
- Right into Ding Street
- Right into Circle Drive
- Deliver to Plot 1. ✓

(See the map below for an outline of the shortest and quickest route) (3)

(e) (i) Scale of the plan: 50 mm = 1 km
= 1 000 m

$\Rightarrow$ 1 mm $= \frac{1\,000 \text{ m}}{50}$
= 20 m

Triangular plot (Plot 22):
Height on plan = 25 mm
$\Rightarrow$ Actual height = 20 m x 25
= 500 m

Width on the plan = 22 mm
$\Rightarrow$ Actual width = 20 m x 22
= 440 m

$\therefore$ Area of triangular plot = ½ x 500 m x 440 m (e)

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= 440 m

$\therefore$ Area of triangular plot = ½ × 500 m × 440 m ✓
= 110 000 m^2 ✓

Rectangular plot (Plot 5):
Length on plan = 24 mm
Actual length = 20 m x 24
= 480 m

Width on plan = 11 cm
Actual length = 20 m x 11
= 220 m

$\therefore$ Area of rectangular plot = 480 m x 220 m ✓
= 105 600 m2 ✓ (4)

(ii) Even though Plot 5 is smaller than Plot 22, the shape of Plot 5 is more user-friendly than Plot 22. It will be easier to utilise space better on the rectangular plot (Plot 5) than on the triangular plot (Plot 22).

Two roads border Plot 22 while only one road borders Plot 5. This means that Plot 22 could be noisier than Plot 5.

Since Plot 22 is bigger than Plot 5, it will cost more to fence Plot 22.

Mark allocation:
✓✓ for any two well explained reasons

(2)

[16]

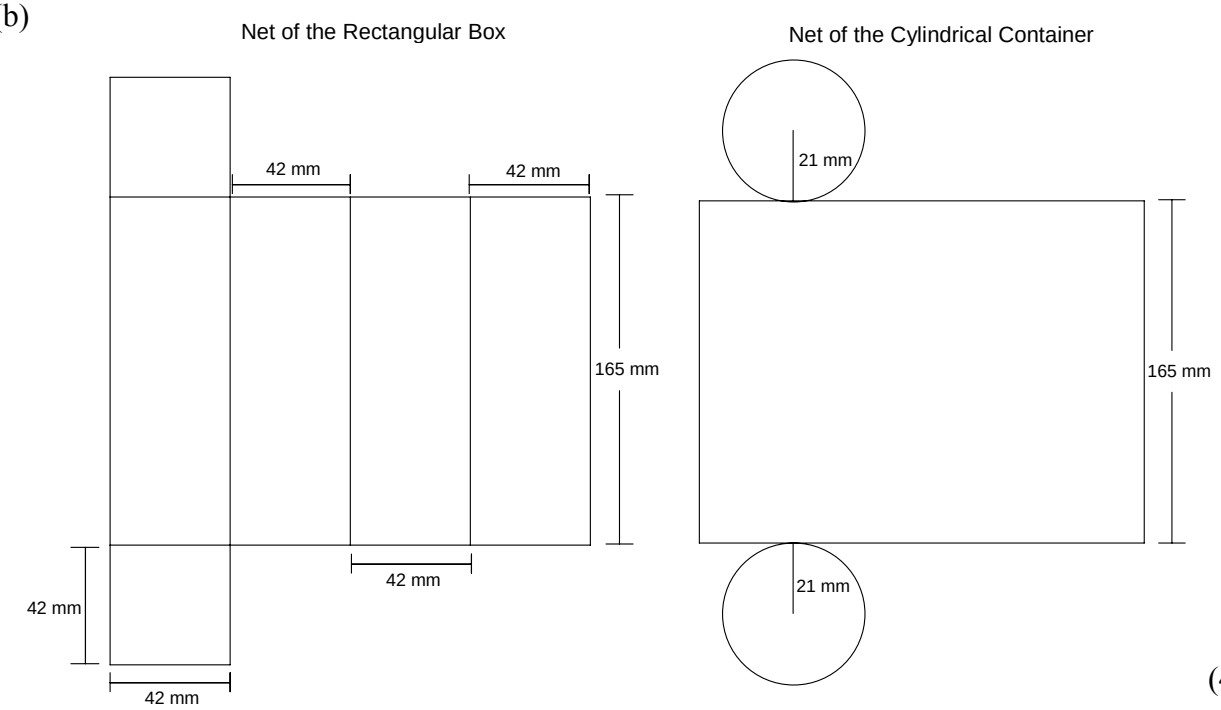
QUESTION 2: BILLY'S BOX BUSINESS

(a) (i) 4 squash balls. ✓

i.e. 165 mm ÷ 40 mm = 4,125 = 4 squash balls (1)

(ii) The box needs to be slightly bigger than the length of 4 balls and the height of one ball so that it is easy to get the balls in and out of the box. ✓ (1)

(b)



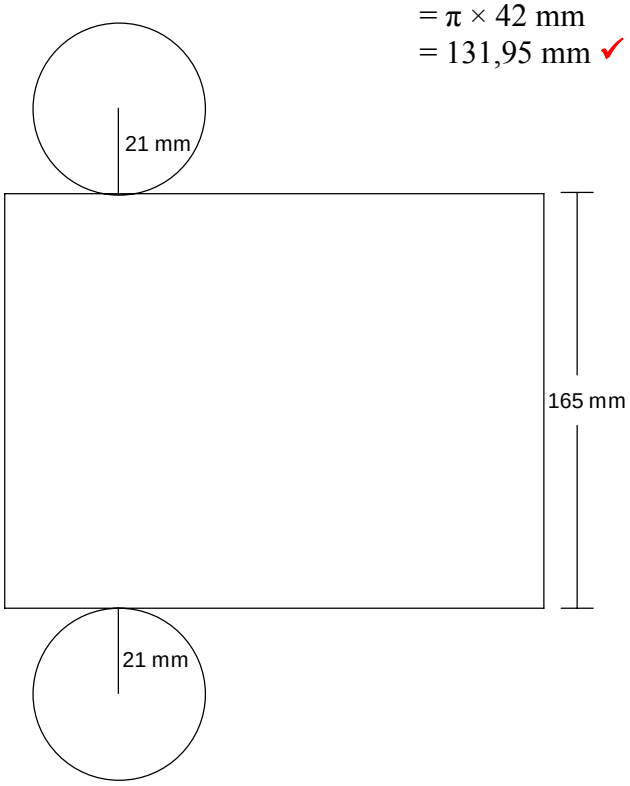
(4)

Mark allocation:
✓✓ for net of the rectangular box
✓✓ for the net of the cylindrical container
A total of one mark must be subtracted if the measurements are not filled in on the nets.

Note:
- Students are not expected to fill in the glue flaps on the nets.
- Students are not expected to fill in the width of the rectangular portion of the cylindrical container because they have not been asked to calculate this width yet.

(c) (i) Surface area of the rectangular box = (4 × area of top) + (2 × area of lid) ✓
= (4 × [42 mm × 165 mm]) + (2 × [42 mm × 42 mm]) ✓
= (4 × 6 930 mm2) + (2 × 1 764 mm2)
= 27 720 mm2 + 3528 mm2
= 31 248 mm2 ✓ (3)

(ii) Width of the rectangular portion = circumference of the lid
= π × diameter
= π × 42 mm
= 131,95 mm ✓



Surface area of the cylinder = 2 × area of lid + area of the rectangle (body) ✓
= (2 × π × [21 mm]2) + (165 mm × 131,95 mm) ✓
= (2 × π × 441 mm2) + (21 771,75 mm2)
= 2 770,88 mm2 + 21 771,75 mm2
= 24 542,63 mm2 ✓ (4)

(iii) The cylindrical box will be the cheapest container for packaging the squash balls. ✓
As the surface area of the cylindrical container is less than the rectangular box.
This means that it takes less cardboard to build the cylindrical container than the rectangular box. ✓ (2)

(e) Despite the fact that less cardboard is needed to build a cylindrical container than a rectangular container with the same dimensions, it is much more difficult to build a cardboard cylinder than a cardboard rectangular box. This is because it is difficult to build a cardboard cylinder with a lid that connects and closes properly. ✓
This is why when cylinders are used for packaging they are usually manufactured out of tin or plastic and not out of cardboard. (1)

(f) (i) Volume of the rectangular box = length × breadth × height
= 165 mm × 42 mm × 42 mm ✓
= 291 060 mm3 ✓ (2)

(ii) 1 mm3 = 0,001 ml
∴ 291 060 mm3 = 0,001 ml × 291 060
= 291,1 ml ✓ (rounded off to one decimal place) (1)

(iii) volume of the cylinder = π × (radius of the lid)2 × height of the cylinder
= π × (21 mm)2 × 165 mm ✓
= π × 441 mm2 × 165 mm
= 228 597,99 mm3 ✓

1 mm3 = 0,001 ml
∴ 228 597,99 mm3 = 0,001 ml × 228 597,99
= 228,6 ml ✓ (rounded off to one decimal place) (3)

(iv) It would be better to buy the rectangular box of fruit juice. As the rectangular box has a bigger volume than the cylindrical container. This means that the rectangular box will hold more fruit juice than the cylindrical container. ✓ (1)

[23]

QUESTION 3: ZANELE'S UNDERAGE DRINKING STUDY

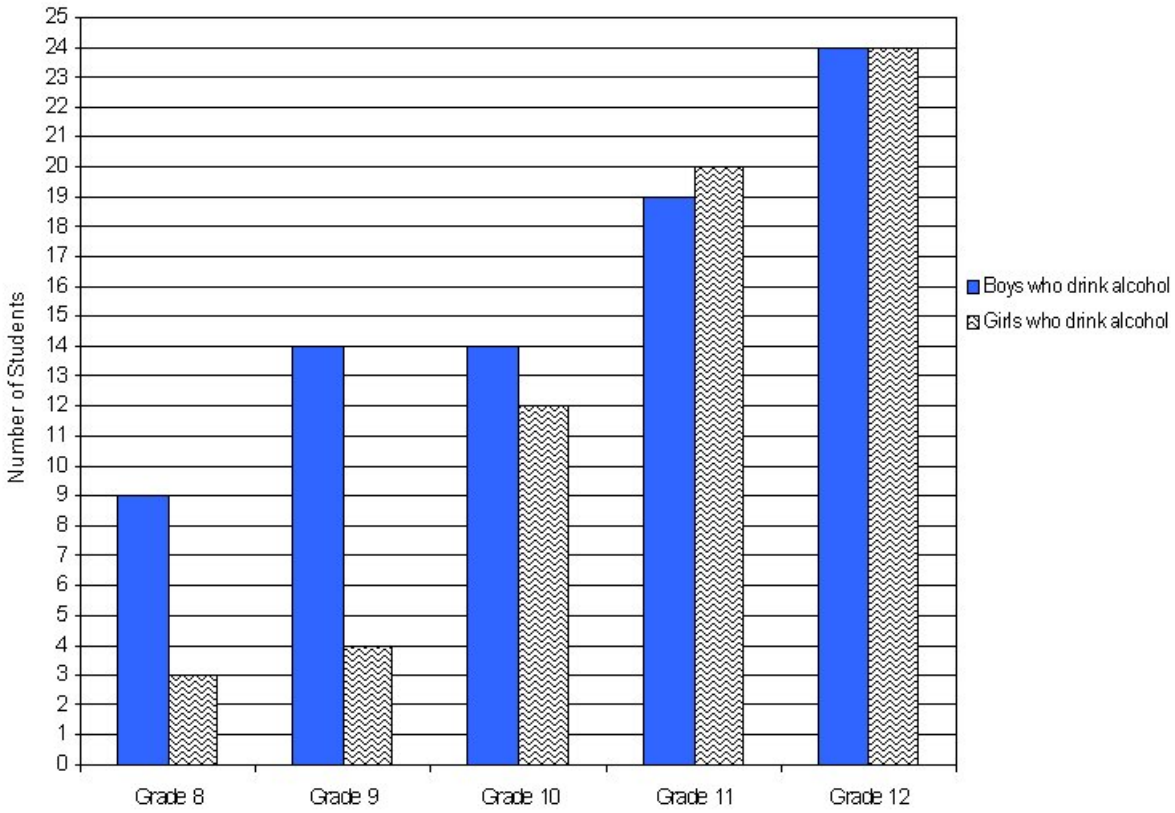
(a) (i) 19 boys ✓ (1)

(ii) Grade 12 ⇒ 48 students drink alcohol ✓ (1)

(iii) Grade 9 students who drink alcohol = 18
Total students surveyed in Grade 9 = 50

∴ Number of Grade 9 students who do not drink alcohol = 50 -18
= 32 ✓ (1)

(b)



Mark allocation:
- ✓ for correctly constructing the bars representing boys
- ✓ for correctly constructing the bars representing girls
- ✓ for correctly constructing and labelling the axes, and using an appropriate scale on the vertical axis
- ✓ for providing a legend or labelling the bars

(4)

(c) Zanele's deduction is correct for students in Grades 8 and 9, but not for students in Grades 10, 11 and 12. ✓
In Grade 8 and Grade 9 there are significantly more boys than girls who drink alcohol. However, from Grade 10 to Grade 12 this changes and the number of boys and girls who drink alcohol in Grades 10 to 12 is fairly equal. In fact, in Grade 11 there are more girls than boys who drink alcohol. ✓ (2)

(d) Total number of students surveyed = 250
Total number of students surveyed who drink alcohol = 143

$\therefore$ % of students surveyed who drink alcohol = $\frac{143}{250} \times 100\%$ ✓

$= 57{,}2\%$ ✓

The percentage of underage drinkers in Zanele's school is 25,4% higher than the national average of 31,8%. This means that the number of underage drinkers in Zanele's school is high and that there is potentially a serious problem with underage drinking in the school. ✓ (3)

(e) % of total students in the school who were surveyed = $\frac{250}{1\,028} \times 100\%$

$= 24{,}3\%$ ✓

Zanele has only surveyed approximately 24% of the school population and so her results do not necessarily reflect the actual reality of underage drinking in the school. ✓ (2)

(f) (i) 1999 ✓ (1)

(ii) % of total deaths attributed to alcohol related causes = $\frac{8\,400}{14\,125} \times 100\%$ ✓

$\approx 59{,}5\%$ ✓ (2)

(iii) From 2003 to 2004 the number of road deaths increased by: 13 195 − 12 333 = 862.
From 2004 to 2005 the number of road deaths increased by: 14 125 − 13 195 = 930.

So, from 2003 to 2004 the number of road deaths increased by an average of approximately 900 deaths per year.
The traffic authorities could use the graph to predict that in 2006 the number of deaths could also increase by approximately 900 deaths. This means that traffic department could expect approximately 14 125 + 900 = 15 025 road deaths in 2006. ✓✓ (2)

Note:
It is to be expected that the answers that your students give will not be exactly the same as the answer given above. What is most important is that your students recognise that the death rate is increasing at a fairly constant rate from 2003 to 2005 and then use the graph and/or calculations to make a sensible prediction about the possible number of road deaths in 2006.

[20]

QUESTION 4: MANDY'S HEART RATE EXPERIMENT

(a) (i) 118 bpm ✓ (1)

(ii) Susan with a heart rate of 60 bpm ✓ (1)

(iii) Elizabeth and Johannes ⇒ both have heart rates of 71 bpm ✓ (1)

(b) (i) Range for Group 1 = highest heart rate ~ lowest heart rate
= 100 bpm - 60 bpm
= 40 bpm ✓

Range for Group 2 = highest heart rate - lowest heart rate
= 118 bpm - 50 bpm
= 68 bpm ✓ (2)

(ii) The heart rates of the girls in Group 1 are all fairly similar and only vary between 60 bpm and 100 bpm. In comparison the heart rates of the boys in Group 2 are much more widely spread, varying from as low as 50 bpm to as high as 118 bpm. ✓ (1)

(c) (i) *Group 1:*

$$\text{Mean heart rate} = \frac{\text{sum of the heart rates of the girls in Group 1}}{\text{no. of girls in Group 1}}$$

$$= \frac{1\,188 \text{ bpm}}{15}$$

= 79,2 bpm ✓

Group 2:

$$\text{Mean heart rate} = \frac{\text{sum of the heart rates of the boys in Group 1}}{\text{no. of boys in Group 1}}$$

$$= \frac{1\,092 \text{ bpm}}{14}$$

= 78 bpm ✓

plus ✓ for using the correct method for calculating the mean for each group. (3)

(ii) *Group 1:*
Heart rate value for Group 1 in ascending order:

60 65 67 69 70 70 71 **72** 78 83 91 96 97 99 100

∴ Median heart rate = middle most heart rate = 72 bpm ✓

Group 2:
Heart rate value for Group 2 in ascending order:

50 51 52 55 60 71 **78 84** 84 90 93 101 105 118

∴ Median heart rate = middle most heart rate
= middle value between 78 bpm and 84 bpm
= 81 bpm ✓

plus ✓ for using the correct method for calculating the median for both groups. (3)

(iii) The mean average is an unrealistic average because there are outliers or extreme values in the Group 2 data set. ✓
The fact that there is a very low heart rate (50 bpm) and a very high heart rate (118 bpm) in Group 2 distorts the mean average.

The median average is the most realistic average of the fitness levels of the two groups because the median average is not affected by the extreme heart rate values in Group 2. ✓

(iv) Based on the median average, the group of girls (Group 1) has a lower average heart rate than the group of boys (Group 2). ✓ This means that the group of girls has an overall higher fitness level than the group of boys. This is in contrast to the boys' boast that boys are naturally fitter than girls. ✓ (2)

[16]