EPPING BOYS' HIGH SCHOOL

YEAR 11 GENERAL MATHEMATICS

2005 YEARLY EXAMINATION

NAME: _____

TEACHER: _____

CLASS: _____

Time Allowed: 2 Hours

Directions to students:

Section 1 (25 marks)

1. This section contains 25 multiple choice questions. Allow 30 mins.
2. Attempt all questions.
3. Write answers on answer sheet provided.

Section 2 (60 marks)

4. This section contains 4 questions of equal value..... allow 1 hour 30 mins.
5. Attempt all questions.
6. Writing Booklets are provided.
7. **Start question on a new page.**
8. All necessary working to be shown.
9. Formula Sheet provided.

Question	Section 1	Q26	Q27	Q28	Q29	Total	%
Mark							

Student Name: _____

Teacher: _____

Section I
Total marks (25)
Attempt questions 1-25
Allow about 30 minutes for this part.

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

	A	B	C	D
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Student Name: _____

Teacher: _____

SECTION 1

Total marks (25 - 1 mark each)

Attempt Questions

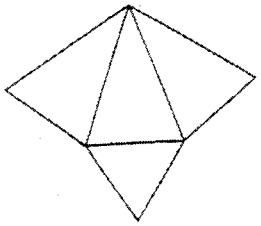
Select the alternative A,B,C or D that best answers the question.

Mark your answer in black or blue pen on the separate answer sheet provided on page 2.

1. Nathan's 215L hot water system is dripping at a rate of 17 drops per minute and each drop contains 0.5mL of water. How long does it take for 1L to drip from the hot water.

   A. 116 mins
   B. 117 mins
   C. 118 mins
   D. 120 mins

2. The solid that would be produced from this net would have:



   A. 3 vertices, 4 faces and 9 edges
   B. 4 vertices, 4 faces and 9 edges
   C. 4 vertices, 4 faces and 6 edges
   D. 3 vertices, 4 faces and 7 edges

3. When the expression $3x^2(2+x)-4(3x-x^2)$ is expanded and simplified, the result is:

   A. $3x^3 + 2x^2 - 12x$
   B. $3x^3 + 2x^2 + 12x$
   C. $3x^3 + 10x^2 + 12x$
   D. $3x^3 + 10x^2 - 12x$

4. A group of teachers were asked how many cups of coffee they drank on a particular day. The results are shown in the table.

Cups of coffee	Number of teachers
5	1
6	4
7	9
8	8
9	5
10	3

   What is the total number of cups of coffee drunk by the teachers on this particular day?

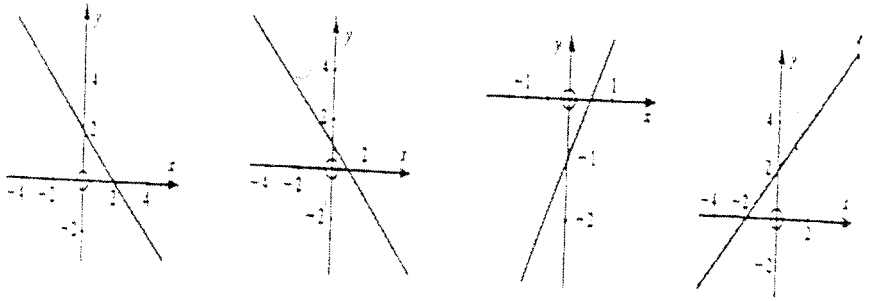
   A. 30
   B. 45
   C. 206
   D. 231

5. After 5 Mathematics tests, Hannah's mean score was 77. She hopes to raise her mean score to 80 after the next test. What mark will Hannah need to achieve on her sixth test if her mean mark is to be 80?

   A. 80
   B. 85
   C. 90
   D. 95

6. The graph of $y = 2x - 1$ is:

A B C D



7. John surveys 15% of the students in his school. He decides to make a stratified sample by surveying a random group from each year. The number of students in each year group is shown below.

Year	7	8	9	10	11	12
Number of Students	175	200	205	180	165	155

How many Year 8 students should John choose?

A. 15
B. 27
C. 30
D. 162

8. The number of 0.0007055 written in scientific notation to 2 significant figures is:

A. 7.05×10^{-4}
B. 7.1×10^{-4}
C. 7.05×10^{-5}
D. 7.1×10^{-5}

9. A new colour of paint is made using a mixture of blue, yellow and white paint in the ration 3:2:5. How much of the blue paint is needed to make 20 litres of the new paint?

A. 6 L
B. 7 L
C. 8 L
D. 9 L

10. John made two errors in his solution to the following equation:

$4(x + 4) - 2(x-1) = 14$
$4x + 16 - 2x - 2 = 14$ ..... Line 1
$2x + 14 = 14$ ..... Line 2
$2x = 28$ ..... Line 3
$x = 14$ ..... Line 4

What lines DO NOT follow correctly from the previous line:

A. Line 1 and Line 4
B. Line 1 and Line 3
C. Line 2 and Line 4
D. Line 2 and Line 3

11. Nicole bought 7000 shares in 'Tissue Australia' at 73 cents per share. At the end of that year the shares were worth 97 cents per share. During the year 'Tissue Australia' paid a dividend of $0.13 per share. Calculate the dividend yield.

A. 0.13%
B. 17.81%
C. 19.59%
D. 24.74%

12. Shaun invested $2,700 at 4.2% p.a. compounded monthly for 3 years. What will be the value of Shaun's investment at the end of 3 years?

A. $ 2,728.45
B. $ 2,737.28
C. $ 3,061.89
D. $11,874.13

13. For the scores 17,19,19,11,16,19,17,18,20,9, consider the following statements.

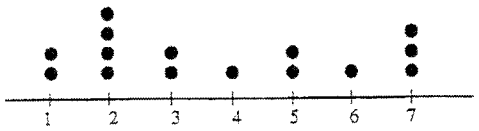
I The median is greater than the mean
II The mode is less than the median

A. Both statement I and II are true
B. Both statement I and II are false
C. Statement I is true and statement II is false
D. Statement I is false and statement II is true

14. Bonnie sells cosmetics for a beauty company and receives wages of $1,250 per month plus 4% commission on all her sales. If she receives a total pay of $1,302 for one month, what were her sales that month?

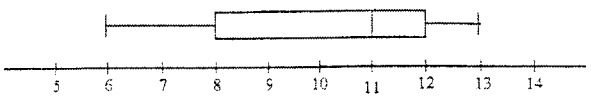
A. $ 52.00
B. $1,297.92
C. $1,300.00
D. $1,406.08

15. Using the dot plot below, the median is:



A. 2
B. 3
C. 4
D. 5

16. The results of a Mathematics Quiz (out of 15 marks) is shown below.



The interquartile range for the results is:

A. 4
B. 7
C. 9
D. 11

17. A tree's height is measured to be 17.3m, correct to 1 decimal place. The maximum percentage error in The measurement of the tree is closest to:

A. 0.3%
B. 1.7%
C. 2.9%
D. 17%

18. Simplify $\frac{5k^3p}{25k^2}$

A. 5kp

B. $5k^2p$

C. $\frac{p}{5}$

D. $\frac{kp}{5}$

19. The scores of students in a Year 11 Maths examination were recorded in a stem and leaf plot, as shown below:

1	2	2	5	6	8			
2	6	7	8	8	9	9		
3	0	0	0	2	5	6	7	8
4	1	1	4	5				
5	0	2						

What percentage of students scored below 30?

A. 11%
B. 22%
C. 44%
D. 56%

20. The table below gives the personal income tax rates.

Taxable Income 2000/2001	Tax Payable
\$0 - \$6,000	Nil
\$6,001 - \$20,000	Nil plus 17 cents for each dollar over \$6,000
\$20,001 - \$50,000	\$2,380 plus 30 cents for each dollar over \$20,000
\$50,001 - \$60,000	\$11,380 plus 42 cents for each dollar over \$50,000
\$60,001 and over	\$15,580 plus 47 cents for each dollar over \$60,000

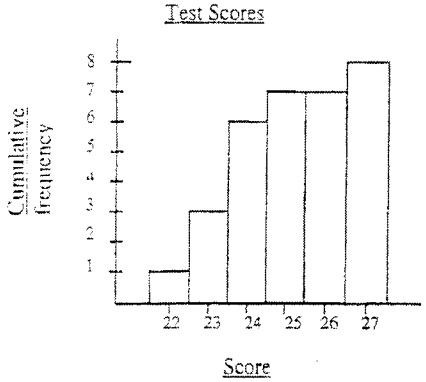
The tax payable on a taxable income of \$70,000 is:

A. \$8,942.00
B. \$9,934.28
C. \$20,280.00
D. \$25,346.00

21. The SRC is trying to determine whether the student body would support a change to sell only "healthy" food at the canteen. They decide to do a stratified random sample. This would best be done by:

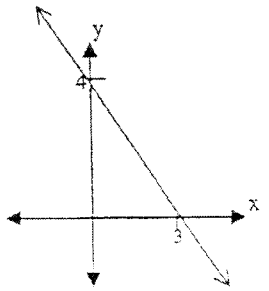
A. surveying students randomly as they enter the canteen
B. surveying an equal number of students from each form
C. selecting 50 students' names from a hat
D. selecting a number of students from each form, in proportions that reflect that form's proportion of the school body.

22. A cumulative frequency histogram for the test results of a small class is shown. The mode of the scores would be:



A. 24
B. 25
C. 26
D. 27

23. The equation of the line sketched on the number plane shown is:



A. $y=\frac{4}{3}x+4$

B. $y=-\frac{4}{3}x+4$

C. $y=\frac{4}{3}x+3$

D. $y=-\frac{4}{3}x+3$

24. Pina's normal hourly rate of pay is $12.40. One particular week, Pina works 36 hours at the normal rate and 5 hours at time-and-a-half. Her PAYE tax for the week is $148.80 and she has union fees of $3.25 deducted from her pay each week.

Her net pay for this particular week would be:

A. $152.05
B. $387.35
C. $390.60
D. $539.40

25. The scale 1cm to 5m is equivalent to:

A. 1:5
B. 1:50
C. 1:500
D. 1:5000

THIS IS THE END OF THE MULTIPLE-CHOICE SECTION.

Go on to Section II.

Student Name: _____

Teacher: _____

SECTION II

Questions 26-30

Total marks (75)

Allow about 90 minutes for this section.

Answer each question on your own paper.

Begin each question on a new page.

Question 26 (15 marks) Begin a new page.

A. Kristy's monthly wage is $ 1,963.87. At the end of one full year of work, she is entitle to 4 weeks annual leave and 17½ % leave on these 4 weeks.

i. What is Kristy's weekly wage? ***(2 marks)***

ii. What does her 17½% leave loading amount to: ***(2 marks)***

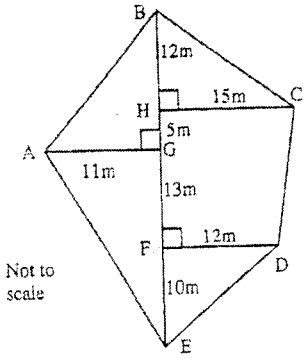
B. The world record for running 200m is 19.32 seconds..

i. Write this as a rate in metres per 10 seconds (m/10 sec) ***(1 mark)***

ii. Given that running times are measured to the nearest hundredth of a second, calculate the percentage error in this time? ***(1 mark)***

C. A colony of bats live near a school. Wildlife officers try to estimate that bat population by catching 60 bats and tagging them. These bats are then released and another 60 are caught, 9 of which have tags. Estimate the size of the bat population living near the school. ***(2 marks)***

D. A traverse survey of a field is shown.



(i) Calculate the length of CD ***(1 mark)***

(ii) Calculate the area of the portion of the field with corners at HCDF. ***(2 marks)***

(iii) If this field was to be drawn using a scale of 1:250, calculate the length of the interval which would represent BE. ***(1 mark)***

E. The sales of different sizes of shoes over a period of one week are shown below.

Shoe size	4	5	6	7	8	9	10	11
Number sold	5	7	10	11	13	7	3	1

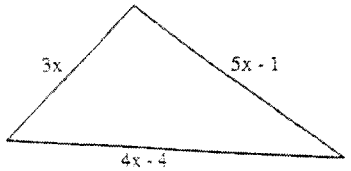
(i) From this data, calculate the mean shoe size and the modal shoe size. ***(2 marks)***

(ii) The manager of the store wishes to know which size is sold most often. Which measure, the mean or the mode, will be of most value to him? Give a reason for your answer. ***(1 mark)***

End of Question 26

Question 27 (15 marks) Begin a new page.

A. The triangle diagram shown below is not drawn to scale.

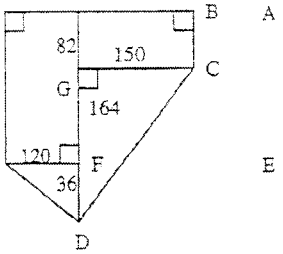


(i) Show that the perimeter P cm of the above triangle is given by $P = 12x - 5$. ***(1 mark)***

(ii) If the perimeter is 91 cm, calculate the value of x. ***(1 mark)***

B. Given $V = \pi r^2 h$, find r when V = 166.3 and h=8. (Answer to 1 decimal place). ***(1 mark)***

C. A block of land is surveyed and the measurements are shown on the figure below. Measurements are in metres.



(i) Using a scale of 1:2000, draw a scale diagram of the field. ***(2 marks)***

(ii) Hence, or otherwise, calculate the cost of fencing the perimeter of the land, if the selected fencing costs \$8.25/m erected. ***(2 marks)***

D. In an experiment, two dice were thrown fifty times and the total score in each case was recorded, as shown in the table below.

Score	Frequency	Cumulative Frequency
2	1	
3	2	
4	4	
5	5	
6	7	
7	9	
8	6	
9	6	
10	7	
11	1	
12	2	

(i) Copy and complete the cumulative frequency column in the table onto your answer sheet. ***(1 mark)***

(ii) Using the graph paper provided, on page 15, draw a cumulative frequency histogram and cumulative frequency polygon on the same diagram. ***(2 marks)***

(iii) From your graph, estimate the median and the interquartile range of the scores. ***(2 marks)***

(iv) Draw a box and whisker plot show all relevant information. ***(2 marks)***

(v) Calculate the standard deviation (σ_n) for this set of scores. ***(1 mark)***

Question 28 (15 marks) Begin a new page.

A. The Carter family converted their electricity to "off peak" so they could receive savings on their electricity bill. The "regular" rate for electricity is 10.7 per kilowatt hour (kWh). The "offpeak" rate is 4.7 cents per kilowatt hour.

On their most recent bill the Carters used 1887 kWh.

(i) If the Carters had to pay the "regular rate" on the full electricity usage, how much would their bill have been? ***(1 mark)***

(ii) Due to their conversion to "off peak" electricity charges, only 380 kWh were charged at the "regular" rate and the remainder were charged at the "off peak" rate. How much did the Carter family save by the conversion? ***(2 marks)***

B. Debbie has a room measuring 5230 mm by 4930 mm that needs carpeting.

(i) If the cost of the carpet is \$32/m^2, and the tradesperson charges \$15/m^2 to lay the carpet, how much will the laid carpet cost? ***(2 marks)***

(ii) The lounge room has a ceiling height of 2700 mm and two possible heaters are shown in the table below.

Series 1	Heats up to $65m^3$	Cost = \$679
Series 2	Heats up to $73m^3$	Cost = \$709

Determine the most suitable heater and efficient heater and give reasons for your answer. ***(2 marks)***

C. Solve the equation: $\frac{2t+3}{5} - \frac{t}{4} = 3$. ***(1 mark)***

D. Steve invests \$12,500 in an account earning 3% p.a. compounding monthly for 5 years.

(i) Calculate the total amount of interest earned. ***(1 mark)***

(ii) Calculate the annual percentage rate of simple interest that would produce the same amount of interest. ***(2 marks)***

E. A small car tyre has a radius of 37.5 cm and a four wheel drive tyre has a radius of 47.5 cm. Over 1 km, determine how many more revolutions the small car tyre would make compared to the four wheel drive tyre. ***(2 marks)***

F. Jane and Cindy divide the profit from their business in the ratio 3:4. The profit in one year of operation was \$21,750. Calculate the amount of money each would receive. ***(2 marks)***

End of Question 28

Question 29 (15 marks) Begin a new page.

A. Veronica bought a shirt signed by the Australian cricket team after it won the 1999 World Cup for $200.

(i) If the value of the shirt increases by 20% per annum for the next 5 years, calculate the value of the shirt (to the nearest $10). ***(2 marks)***

(ii) Complete the class centre column for each of the following distributions and hence use your calculator to find an estimate for the mean and standard deviation (correct to 2 decimal places). In each case use the population standard deviation. ***(2 marks)***

Class	Class Centre	Frequency
10-12		12
13-15		16
16-18		25
19-21		28
22-24		13

B. The formula $C=\frac{5}{9}(F-32)$ is used to convert temperatures in degrees Fahrenheit (^{0}F) to degrees Celsius (^{0}C).

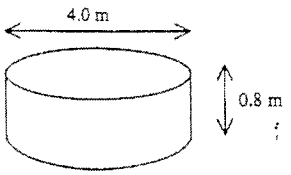
Water boils at 100^{0}C. What is the equivalent temperature in ^{0}F? ***(2 marks)***

C. The type of vehicles passing through a motorway toll booth 7:00am and 9:00am Monday morning are counted and the results shown in the table below.

Type of vehicle	No. of vehicles
Cars	5336
Utes/Vans	1660
Small tracks	374
Large trucks	589
Buses	142
Total vehicles	

Find the relative frequency of cars using the motorway, to 2 decimal places. ***(1 mark)***

D. A circular above ground swimming pool has a diameter of 4.0 metres and contains water to a uniform depth of 0.8 metres.



(i) What is the volume of water in the pool, in cubic metres? ***(1 mark)***
(Write your answer correct to 2 decimal places.)

(ii) How many litres of water are in the pool? ($1m^3$ = 1000L).
Write your answer correct to the nearest metre). ***(1 mark)***

(iii) Chlorine is to be added to the water at a rate of two tablets per 1500L. How many whole tablets are needed for this pool? ***(1 mark)***

Question 29 continued next page

E. Lance is paid $14.86 per hour and works 38 hours at normal time and 3 hours overtime for which he is paid time and a half.

(i) Calculate Lance's gross weekly pay. ***(1 mark)***

(ii) Lance has his private health cover deducted from his gross pay. The annual contribution is $689.40. Calculate the amount deducted weekly from Lance's pay. ***(1 mark)***

(iii) Lance pays 3.5% of his gross pay in superannuation. Calculate the amount of Lance's superannuation contribution. ***(1 mark)***

(iv) If Lance also pays $140.30 in tax, calculate Lance's net wage. ***(1 mark)***

F. The table below shows the rate per kilometre allowed as a tax deduction for travel in a private vehicle (for cars using up to 5000 km/year on work-related travel).

Engine capacity	**Allowable deduction**
Up to 1.6 L	45.7 c/km
More than 1.6 L and up to 2.6 L	51.9 c/km
More than 2.6 L	53.8 c/km

(i) Calculate the total tax deduction allowed for a person who claims:
2000 km in a Mazda 323 with a 1.3 L engine. ***(1 mark)***

FORMULA SHEET

Area of an annulus

$A = \pi(R^2 - r^2)$

R = radius of outer circle
r = radius of inner circle

Area of an ellipse

$A = \pi ab$

a = length of semi-major axis
b = length of semi-minor axis

Area of a sector

$$A = \frac{\theta}{360}\pi r^2$$

θ = number of degrees in central angle

Arc Length of a Circle

$$l = \frac{\theta}{360}2\pi r$$

θ = number of degrees in central angle

Surface Area of a Sphere

$A = 4\pi r^2$

Simpson's rule for area approximation

$$A = \frac{h}{3}(d_f + 4d_m + d_l)$$

h = distance between successive measurements
d_f = first measurement
d_m = middle measurement
d_l = last measurement

Volume

Cone $V = \frac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

Pyramid $V = \frac{1}{3}Ah$

Sphere $V = \frac{4}{3}\pi r^3$

A = area of base
h = perpendicular height

Mean of a distribution

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

x = individual score

$\bar{x}$ = mean

Formula for z-scores

$$z = \frac{x - \bar{x}}{s}$$

s = standard deviation

Probability of an event

The probability of an event where outcomes are equally likely is given by:

$$P(event) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Simple interest

$I = Prn$

$P =$ initial quantity
$r =$ percentage interest rate per period expressed as a decimal
$n =$ number of periods

Compound interest

$A = P(1+r)^n$

$A =$ final balance
$P =$ initial quantity
$n =$ number of compounding periods
$r =$ percentage interest rate per compounding period expressed as a decimal

Future value (A) of an annuity

$$A = M\left\{\frac{(1+r)^n - 1}{r}\right\}$$

M = contribution per period, paid at the end of the period

Present value (N) of annuity

$$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$S = V_0 - Dn$

$S =$ salvage value of asset after n periods
$V_0 =$ purchase price of the asset
$D =$ amount of depreciation appointed per period
$n =$ number of periods

Declining balance formula for depreciation

$S = V_0(1-r)^n$

$S =$ salvage value of asset after n periods
$r =$ percentage interest rate per period, expressed as a decimal

Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

$$A = \frac{1}{2}ab\sin C$$

Cosine rule

$C^2 = a^2 + b^2 - 2ab\cos C$

or

$$\cos C = \frac{a^2 + b^2 + c^2}{2ab}$$

Gradient of a straight line

$m =$ *vertical change in position* / *horizontal change in position*

Gradient-intercept form of straight line

$y = mx + b$

$m =$ gradient
$b =$ y - intercept