



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 10

Half Yearly Examination 2004

Advanced

Mathematics

Examiner: P. Parker

General Instructions

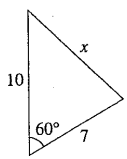
- Working time – 90 minutes
- Write using black or blue pen.
- *Approved* calculators may be used.
- All necessary working should be shown in every question if full marks are to be awarded.
- Marks may not be awarded for messy or badly arranged work.
- If more space is required, clearly write the number of the QUESTION on one of the back pages and answer it there. Indicate that you have done so.
- Clearly indicate your class by placing an **X**, next to your class

YOUR NAME:

Class	Teacher	
10 A	Ms Opferkuch	
10 B	Mr Boros	
10 C	Mr Fuller	
10 D	Ms Ward	
10 E	Mr Hespe	
10 F	Mr Kourtesis	

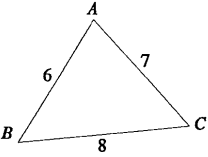
Section	Mark
A	/25
B	/20
C	/15
D	/15
E	/15
F	/10
Total	/100

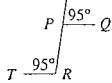
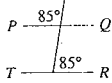
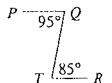
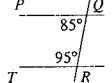
SECTION A (25 MARKS)

QUESTION		ANSWER
(1)	Simplify $(a^2)^3$	1
(2)	Alex works in a shop where the normal weekday rate of pay is \$12 per hour. On Saturdays he is paid time-and-a-half. How much does Alex earn in a week in which he worked for seven hours on Thursday and three hours on Saturday?	1
(3)	Simplify $36y^3 \div 12y^2$	1
(4)	Simplify $0.\dot{3} + 1.4$, leaving your answer as an exact <i>decimal</i> .	1
(5)	Which of the equations should be used to obtain the value of x in this triangle? <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;">NOT TO SCALE</div> </div> (A) $\frac{x}{\sin 60^\circ} = \frac{7}{\sin 10^\circ}$ (B) $\cos 60^\circ = \frac{x^2 + 10^2 - 7^2}{2 \times 10 \times 7}$ (C) $x^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \cos 60^\circ$ (D) $x^2 = 10^2 - 7^2$	1
(6)	Evaluate $6x - 5y$ when $x = 7$ and $y = -2$	1
(7)	Simplify $4a + a^2 - a + 2a^2$	1
(8)	True or False: $(2\sqrt{3})^2 = 18$	1

<p>(9) The Great Pyramid of Egypt has a square base of side 230 m. Its perpendicular height is 135 m.</p> <p>What is the volume of the pyramid?</p>		1												
<p>(10) Expand and simplify</p> <p>(i) $-4(x-2)$</p> <p>(ii) $(3-x)(3+x)$</p>		1 1												
<p>(11) If $\sqrt{54} = a\sqrt{6}$ find a.</p>		1												
<p>(12) The number represented by a 1 followed by a hundred zeros is called a googol.</p> <p>Which of the following is equal to a googol?</p> <p style="text-align: center;">(A) 10^2 (B) 10^{10} (C) 10^{99} (D) 10^{100}</p>		1												
<p>(13) If $d = \sqrt{\frac{h}{5}}$, what is the value of d, correct to one decimal place, when $h = 28$?</p>		1												
<p>(14) The following frequency table shows Ravdeep's scores on a number of quizzes.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Score</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> </tr> <tr> <td>2</td> <td>3</td> </tr> <tr> <td>3</td> <td>5</td> </tr> <tr> <td>4</td> <td>2</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table> <p>What is Ravdeep's mean score?</p>	Score	Frequency	1	2	2	3	3	5	4	2	5	1		1
Score	Frequency													
1	2													
2	3													
3	5													
4	2													
5	1													


SECTION A (CONTINUED)

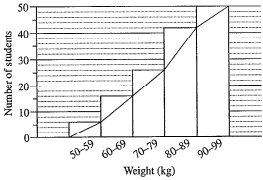
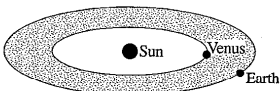
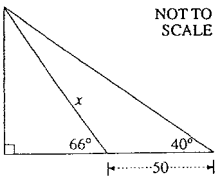
<p>(15) Bing Lee buys a television for \$574.20, including 10% GST.</p> <p>What is the value of the GST component?</p>		1
<p>(16) Simplify $3(x - 2) - 2(x - 1)$</p>		1
<p>(17) If an event has a <i>probability of zero</i>, what does this mean?</p>		1
<p>(18) In any circle, the circumference is approximately</p> <p>(A) twice the diameter. (B) twice the radius. (C) three times the radius. (D) three times the diameter.</p>		1
<p>(19) For the triangle ABC we use the cosine rule to work out the angle A.</p> <div style="text-align: center;">  </div> <p>Which is the correct expression for $\cos A$?</p> <p>(A) $\frac{6^2 + 7^2 - 8^2}{2 \times 6 \times 7}$ (B) $\frac{8^2 + 7^2 - 6^2}{2 \times 8 \times 7}$ (C) $\frac{6^2 + 8^2 - 7^2}{2 \times 6 \times 8}$ (D) $\frac{6^2 + 7^2 - 8^2}{2 \times 6 \times 8}$</p>		1
<p>(20) If $\cos \theta < 0$ and $\sin \theta > 0$ then</p> <p>(A) $0^\circ < \theta < 90^\circ$ (B) $90^\circ < \theta < 180^\circ$ (C) $180^\circ < \theta < 270^\circ$ (D) $270^\circ < \theta < 360^\circ$</p>		1

<p>(21) Which of the following is equivalent to $64a^{2/3}$?</p> <p>(A) $16\sqrt[3]{a^2}$ (B) $16\sqrt{a^3}$ (C) $64\sqrt[3]{a^2}$ (D) $512\sqrt{a^3}$</p>		1
<p>(22) What is the sum of the interior angles of a hexagon?</p>		1
<p>(23) In which diagram is $PQ \parallel TR$?</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>(A)</p>  </div> <div style="text-align: center;"> <p>(B)</p> <p>NOT TO SCALE</p>  </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="text-align: center;"> <p>(C)</p>  </div> <div style="text-align: center;"> <p>(D)</p>  </div> </div>		1
<p>(24) By factorising first, simplify $\frac{3t+12}{9}$</p>		1

END OF SECTION A

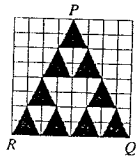
SECTION B (20 Marks)

<p>(25) With $\frac{4}{3\sqrt{2}}$, rationalise the denominator and then simplify.</p>		2
<p>(26) Josephine invested \$1000 for five years. Her investment earned interest at 4.8% pa compounded annually.</p> <p>What was the value of Josephine's investment (to the nearest dollar) at the end of the five years?</p>		1
<p>(27) In his garden, Woo has a birdbath in the shape of a hemisphere.  The internal diameter is 45 cm.</p> <p>What is the internal surface area of this birdbath?</p> <p>Leave your answer to the nearest square centimetre.</p>		1
<p>(28) Find x if $\sqrt{16^8} = 4^x$</p>		2
<p>(29) Arrange the numbers</p> <p style="text-align: center;">$5.6 \times 10^{-2}, 17.2 \times 10^{-3}, 0.48 \times 10^{-1}$</p> <p>in <i>ascending</i> order.</p>		1
<p>(30) Factorise $x^2 - 4x - 12$</p>		1

<p>(31) Solve the equation $5x = 11 - x$</p>	<p>1</p>
<p>(32) Ariya recorded the weights of a random sample of male students in Year 10.</p> <p>The cumulative frequency graph displays the results</p>  <p>How many students surveyed were in the 80-89 kg class?</p>	<p>1</p>
<p>(33) A car is purchased for \$42 000. Calculate the salvage value of the car after 4 years at a depreciation rate of 15% pa.</p>	<p>2</p>
<p>(34) The orbits of Earth and Venus around the Sun are almost circular, and in the same plane.</p>  <p>Earth is 1.496×10^8 km from the Sun. Venus is 1.082×10^8 km from the Sun.</p> <p>Treating the space between the orbits as an <i>annulus</i>, calculate its area. Write your answer in scientific notation correct to two significant figures.</p>	<p>2</p>
<p>(35) Which of the following statements are true for the diagram below.</p>  <p>(A) $\frac{x}{\sin 40^\circ} = \frac{50}{\sin 66^\circ}$ (B) $\frac{x}{\sin 40^\circ} = \frac{50}{\sin 26^\circ}$ (C) $\frac{x}{\sin 66^\circ} = \frac{50}{\sin 40^\circ}$ (D) $\frac{x}{\sin 26^\circ} = \frac{50}{\sin 40^\circ}$</p>	<p>1</p>

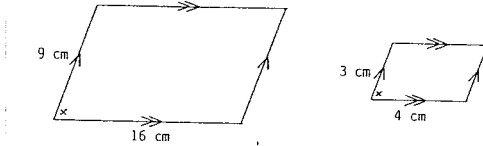
SECTION B CONTINUED

(36) What fraction of the triangle PQR is *unshaded*?



2

(37) Is the following statement TRUE or FALSE?



The two parallelograms above are similar figures.

1

(38) Trieu surveyed ALL the students in Year 10 and summarised the results in the following table.

	Play volleyball	Do not play volleyball	TOTALS
Right-handed	53	81	134
Left-handed	22	29	51
TOTALS	75	110	185

What is the probability that:

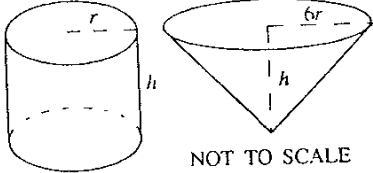
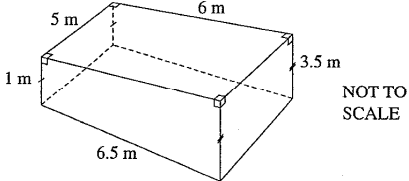
- (i) a student plays volleyball?
- (ii) a left-handed student plays volleyball?

1

1

END OF SECTION B

SECTION C (15 Marks)

<p>(39) A sphere has a volume of 360cm^3.</p> <p>What is its radius (correct to one decimal place)?</p>		2
<p>(40) Factorise $6x^2 - x - 1$</p>		1
<p>(41) What is the ratio of the volume of the cylinder to the volume of the cone? (The radius of the cone is six times the radius of the cylinder.)</p> <div style="text-align: center;">  </div>		3
<p>(42) A swimming pool has a length of 6 m and a width of 5 m. The depth of the pool is 1 m at one end and 3.5 m at the other end, as shown in the diagram.</p> <div style="text-align: center;">  </div> <p>What is the volume of this pool in cubic metres?</p>		2
<p>(43) Evaluate $\frac{-63 + \sqrt{63^2 - 4 \times 6 \times (-294)}}{12}$</p>		1

SECTION C CONTINUED

(44) Use the following back-to-back stem-and leaf plot to answer the following questions.

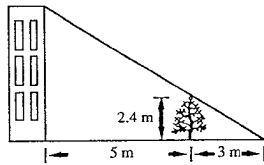
SCORES ON A CLASS TEST		
<i>Boys</i>		<i>Girls</i>
9 8 8	0	6
5 4 4 2 2	1	2 2 5 8
9 3 1 1	2	1 3 3 4 5 5 6
5 4 2	3	2 2 4

- (i) What is the range of scores in this class test?
- (ii) Find the median score for the boys in this class test.

2

1

(45) Calculate the height of the building in metres.



(You do **NOT** need to prove any triangles similar)

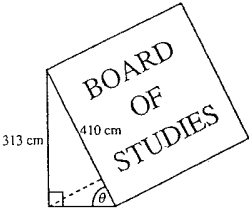
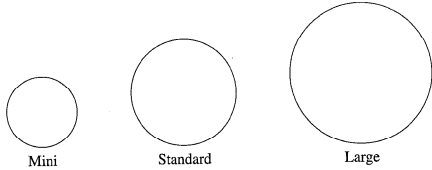
2

(46) Write down the exact value of $\sin 120^\circ$

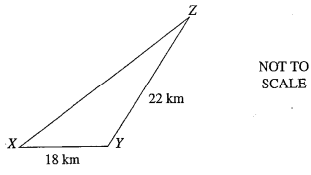
1

END OF SECTION C

SECTION D (15 Marks)

<p>(47) The diagram shows a large sloping advertising board.</p> <p>Find the angle θ, to the nearest degree, between the board and the ground.</p>		2
<p>(48) Joe's pizzas are made in three different sizes.</p> <div style="text-align: center;">  </div> <p>Joe puts olives on all his pizzas. The number of olives depends on the size of the pizza.</p> <p>He worked out that the number of olives varies as the square of the diameter. A <i>Standard</i> pizza with a diameter of 30 cm has 18 olives.</p> <p>(i) Show that $n = 0.02d^2$, where d is the diameter and n is the number of olives.</p> <p>(ii) Joe decides to make a mega-pizza, with diameter 52 cm.</p> <p>How many olives would Joe need for a mega-pizza?</p> <p>(iii) Joe is asked to make a pizza in the shape of a square with side lengths 25 cm. He decides to use the same number of olives as would be needed on a round pizza with the same area.</p> <p>How many olives will be needed?</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">1</p> <p style="text-align: center;">2</p>	

SECTION D CONTINUED

<p>(48) (iv) Joes uses a microwave oven to heat lasagne. The time taken for heating is inversely proportional to the power setting (in watts). It takes ten minutes at a power setting of 240 watts to heat the lasagne.</p> <p>How long would it take at a power setting of 500 watts?</p>		3
<p>(49) In the diagram X, Y and Z represent the locations of three towns. The town Y is due east of X, and the bearing of Z from Y is 046°.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>(i) Show that $\angle XYZ = 136^\circ$.</p> <p>(ii) Find the distance XZ correct to one decimal place.</p> <p>(iii) What is the bearing of Y from Z?</p>		<p>1</p> <p>2</p> <p>2</p>

END OF SECTION D

SECTION E (15 Marks)

(50) Kei and Ilya each own a butcher's shop. The number of accidents each month in their shops are recorded below.

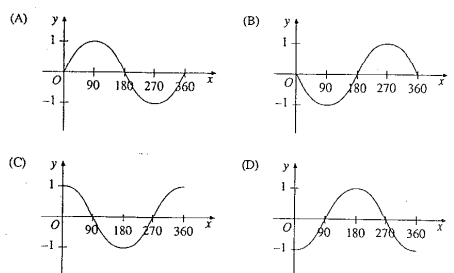
Kei	3	4	8	0	4	3	2	0	1	4	2	1
Ilya	0	6	8	6	4	7	8	6	5	7	4	8

For *each* shop calculate the:

- (i) mean number of accidents per shop;
- (ii) interquartile range;
- (iii) standard deviation.

2
3
2

(51) Which of the following is the graph of $y = -\sin x^\circ$ for $0 \leq x \leq 360$?



1

(52) Make R the subject of the formula $E = 1 - \sqrt{\frac{G}{R}}$.
Leave your answer as a single fraction.

2

(53) Amber Tiles is running a special on terra-cotta tiles:

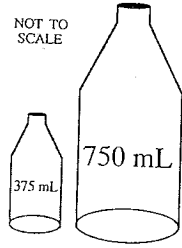
Buy TWO, get an extra ONE FREE!!

Sri planned to spend \$1240 on tiles. Express his saving as a percentage of the cost before the sale.

1

SECTION E CONTINUED

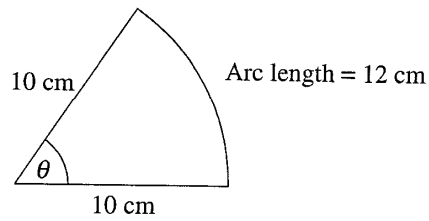
(54) The soft drink bottles below are *similar*.



Calculate the ratio of the *heights* of the bottle, leaving your answer accurate to *two significant figures* places.

2

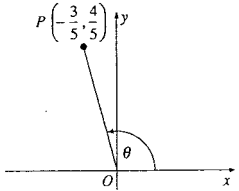
(55) Find the value of θ to the nearest degree.



2

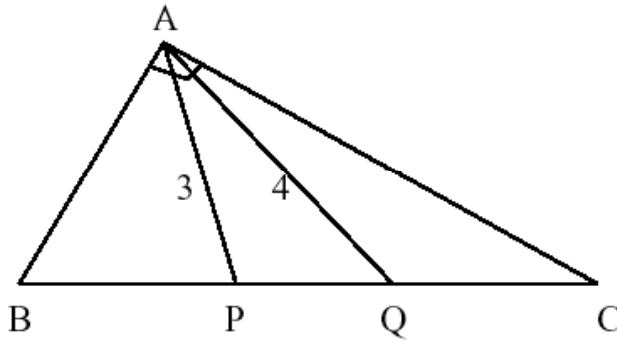
END OF SECTION E

SECTION F (10 Marks)

<p>(56) Find the value of $\sin(180 - \theta)$, if θ is defined according to the diagram below. Justify your answer.</p> <div style="text-align: center;">  </div>		2
<p>(57) Anton has four different letters and four corresponding envelopes. A wind blows and scatters the envelopes and letters. His wife seeing the mess, randomly puts each letter in a different envelope. What is the probability that she gets all the letters in their corresponding envelopes?</p>		2
<p>(58) $P = \frac{x+y}{y}$ and $Q = \frac{4x}{x+y}$, where x and y are positive integers. By considering $P - Q$, show that $P \geq Q$.</p>		2

SECTION F CONTINUED

- (59) Triangle ABC is right angled with its right angle at A .
 The points P and Q are on the hypotenuse BC such that $BP = PQ = QC = m$, $AP = 3$ and $AQ = 4$.



- (i) Show that $AB = 3m \cos \theta^\circ$, where $\angle ABC = \theta^\circ$
- (ii) Hence, or otherwise, find the *numerical* value of the perimeter of triangle ABC .

1

3

Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **SECTION** and the **QUESTION** number.

Section	Question	

Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **SECTION** and the **QUESTION** number.

Section	Question	

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Section	Question	