

SYDNEY BOYS HIGH
MOORE PARK, SURRY HILLS

2005
YEAR 9 YEARLY EXAMINATION

Advanced Mathematics

Directions to Candidates:

- Answer all questions in the spaces provided in this question booklet.
- Full marks may not be awarded for careless or badly arranged work.
- Use black or blue pen for written answers, but pencil for diagrams and graphs.

- If additional working space is needed, use the spare pages at the end of the booklet. Show clearly which question you are continuing.
- Board-approved calculators may be used.

Time allowed: 90 minutes

Examiner: E.Choy

Name: _____

Your Mathematics Class (Tick the box)	
9MaA Mr Fuller	<input type="checkbox"/>
9MaB Ms Ward	<input type="checkbox"/>
9MaC Mr Boros	<input type="checkbox"/>
9MaD Ms Nesbitt	<input type="checkbox"/>
9MaE Mr McQuillan	<input type="checkbox"/>
9MaF Mr Kourtesis	<input type="checkbox"/>

Markers' Use Only	
Question 1	/20
Question 2	/20
Question 3	/15
Question 4	/15
Question 5	/15
Question 6	/15
Total	/100

Question 1 (20 marks)

Answers

- (a) Simplify $6\sqrt{3} - \sqrt{3}$. 1
-
- (b) Solve $4x = 6 + 2x$. 1
-
- (c) Use your calculator to evaluate $\cos 53^\circ$ correct to 3 decimal places. 1
-
- (d) Simplify $\frac{h}{3} + \frac{2h}{5}$. 1
-
- (e) Write down the y -intercept of the line $y = \frac{2}{3}x - \frac{3}{7}$. 1
-
- (f) Expand $-3(x - 4)$. 1
-
- (g) Factorise $a^2 - 25$. 1
-
- (h) What is the exterior angle sum of any regular polygon? 1
-
- (i) What is the equation of the vertical line through $(-3, 5)$? 1
-
- (j) A CSIRO scientist doing an experiment took a measurement and wrote down that value as 0.3380 metres. How many significant figures are there in this number? 1
-
- (k) A cash prize of $\$P$ is divided equally among four people. How much does each receive? 1
-

(l) Evaluate $(25)^{\frac{1}{2}}$.

1

(m) Use the index laws to simplify:

(i) $a^8 \div a^4$,

1

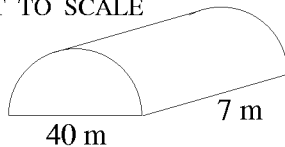
(ii) $(p^3)^5$.

1

(n) Find the surface area of the solid half-cylinder below. (Leave your answer in terms of π .)

1

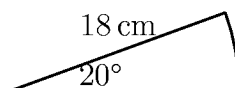
NOT TO SCALE



(o) Solve the inequation $3x + 2 \leq -7$, and graph your solution on a number line.

2

(p)



1

Find, in terms of π , the area of the sector drawn above.

(q) Make p the subject of the formula
 $3p - 7 = x - 5p$.

1

(r) Express $\frac{3}{\sqrt{7} - 2}$ with a rational denominator.

1

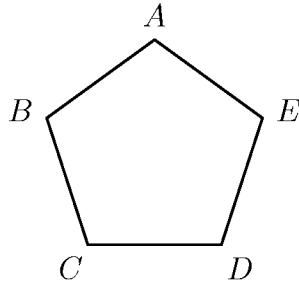
Question 2 (20 marks)

Answers

- (a) Find the coordinates of the midpoint of the interval joining the points $P(2, 4)$ and $Q(6, 8)$.

1

- (b) The following questions concern the regular pentagon, $ABCDE$, pictured below.



- (i) What is the sum of the internal angles of this polygon?

1

- (ii) What is the size of $\angle ABC$?

1

- (c) Consider the line with equation $y = -x + 2$.

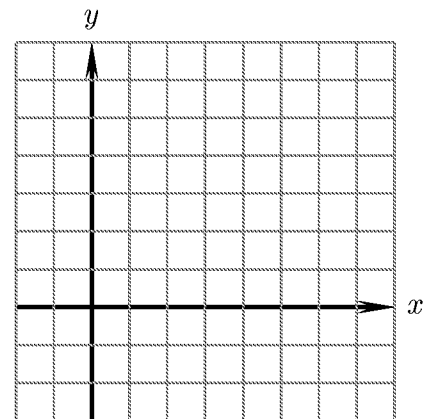
- (i) Write down its gradient.

1

- (ii) Write down its y -intercept.

1

- (iii) Sketch the line.



2

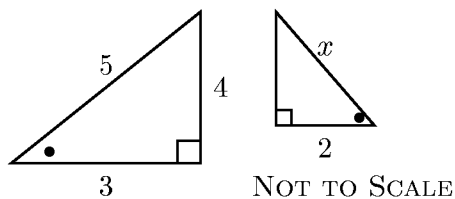
- (iv) Where does the line cut the x -axis?

1

- (d) Does the point $(-2, 1)$ lie on the line $2x - 3y + 7 = 0$? Justify your answer.

1

(e)



The triangles above are similar. Find the value of x .

1

- (f) Without solving them algebraically and without sketching the graph, state how many solutions you would expect to the pair of simultaneous equations

$$y = -3x + 4$$
$$y = -3x + 2$$

Give reasons for your answer

2

- (g) Simplify

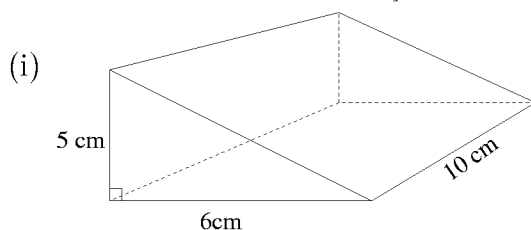
(i) $(4x^8y^2)^{\frac{5}{2}}$

2

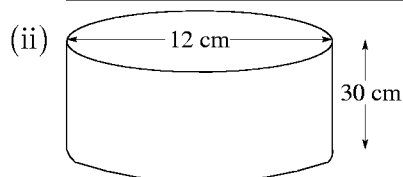
(ii) $\left(\frac{a^2b^{-2}}{a^{-1}b^4}\right)^{-1}$

2

- (h) Find the volume of each of the solids below.
[Take $\pi \approx 3.14$ and give your answer correct to the nearest cubic centimetre.]



2



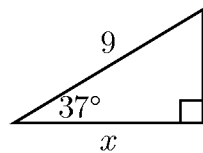
2

Question 3 (15 marks)**Answers**

- (a) What is the equation of the line through (2, 3) with gradient -2 ? Give your answer in general form.

1

- (b)

**1**

Find the unknown length x in the triangle (give your answer correct to two decimal places).

- (c) Solve $\frac{2}{3x} - \frac{3}{x} = 2$.

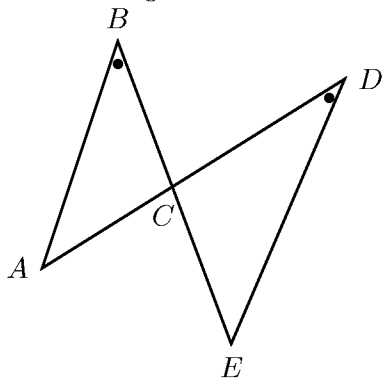
2

- (d) Make a the subject of the formula

$$b = \frac{2 + \sqrt{a}}{2 - \sqrt{a}}$$

2

- (e) Given that $\angle B = \angle D$, prove the two triangles in this diagram are similar.

3

(f) Factorise:

(i) $x^2 - x - 12$

1

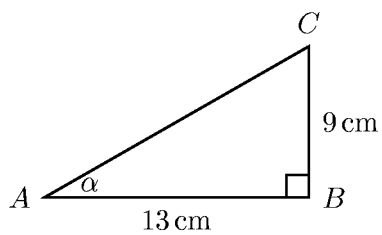
(ii) $2x^2 - 2x - 24$

1

(iii) $a^2 - 64b^2$

1

(g)



(i) What is the value of $\tan \alpha$ in $\triangle ABC$ above?

1

(ii) Find and simplify the exact length of AC .

1

(iii) Hence write down the exact value of $\cos \alpha$.

1

Question 4 (15 marks)

Answers

- (a) Mr Wong managed a Chinese restaurant for a salary of \$68 000. At the end of a successful year in which the business made a profit of \$437 000, he was given a bonus of 1.3% of the profits. What was his bonus and what was his income for the year?

2

-
- (b) In a bag there are 6 green marbles, 4 white marbles, and 2 red marbles. A marble is chosen at random. What is the probability of choosing:

(i) a green marble?

1

(ii) a green or a red marble?

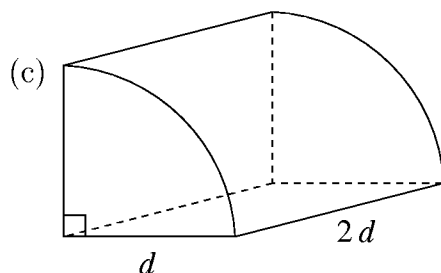
1

(iii) a blue marble?

1

(iv) anything but a red marble?

1



2

The quarter-cylinder drawn above has volume $108\pi \text{ cm}^3$. Find the value of d .

(d) At a grocery store a customer purchased two trays of oranges. In the first tray three quarters were good and in the second tray, which contained four fewer oranges, four fifths were good. In all there were 34 good oranges. Let h represent the number of oranges in the first tray.

(i) What does the expression $h - 4$ represent?

1

(ii) Write down an equation (in terms of h) that could be used to find the number of oranges in each tray.

1

(iii) Solve your equation in (ii) *and* hence find the number of oranges in each tray.

3

(e) You are given that P varies inversely as the square of v , *i.e.*, $P \propto \frac{1}{v^2}$.

2

Now, $P = \frac{4}{250}$ when $v = 10$.

Find P when $v = 15$.

Question 5 (15 marks)

Answers

(a) Simplify $\frac{(x+1)^3y}{(x+1)y^{-1}}$.

1

(b) If $x - y = a$ and $xy = b$:

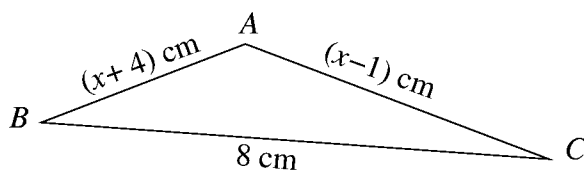
(i) Find an expression for $(x + y)^2$ in terms of a and b ,

2

(ii) If $x = \sqrt{4 - 2\sqrt{3}} - \sqrt{4 + 2\sqrt{3}}$, evaluate x^2 .

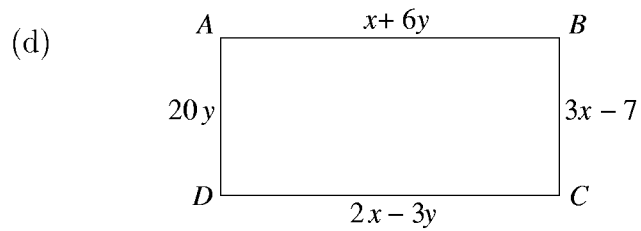
2

(c)



3

It is well known that in any triangle ABC , $AB + AC > BC$. Suppose the perimeter of the triangle shown above is less than or equal to 23 cm. What is the range of possible x ?



In the diagram above $ABCD$ is a rectangle.
(Hint: opposite sides are equal.)

- (i) Find x and y by writing two equations and solving them simultaneously.

4

-
- (ii) Hence find the length and breadth of the rectangle.

2

-
- (iii) What is the area of $ABCD$?

1

Question 6 (15 marks)

Answers

(a) Solve simultaneously: $2x + 3y = 8$
 $x - 7y = 14$

2

(b) For a class of 25 students the following marks were obtained in a trigonometry test:

5 9 6 6 8 6 10 4 7
7 4 4 7 10 5 7 8 7
5 8 3 5 9 9 3

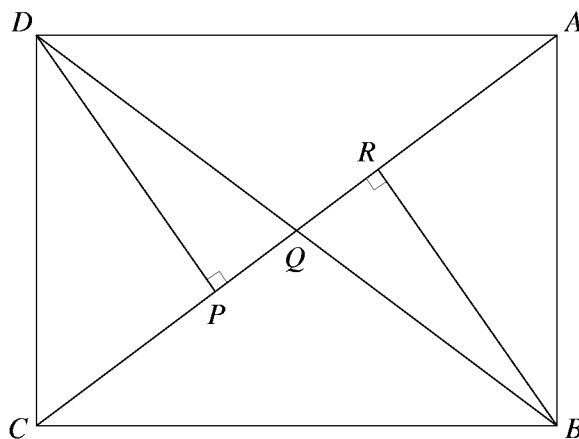
(i) Draw up a frequency table.

1

(ii) Write down the mode and the median.

1

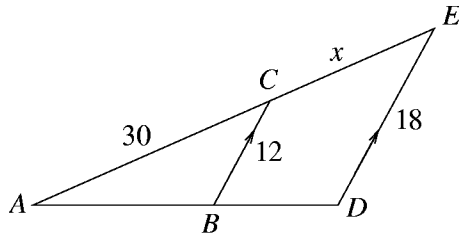
(c)



4

Rectangle $ABCD$ has diagonals AC and BD which meet at Q . If $DP \perp AC$ and $RB \perp AC$, prove $\triangle DPQ \equiv \triangle BRQ$.

(d)



In the diagram above, $BC \parallel DE$, $BC = 12$, $DE = 8$, and $AC = 30$.
Let the length of CE be x .

(i) Prove that $\triangle ABC \sim \triangle ADE$, giving all reasons.

4

(ii) Form an equation and solve it to find the value of x .

3

End of Paper

Extra working page

Extra working page