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**CHUNG CHENG HIGH SCHOOL (MAIN)**

<b>40</b>
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Parent's  
Signature

Chung Cheng High School Chung Cheng High School

**END OF YEAR EXAMINATION 2007  
SECONDARY 3**

**Mathematics  
Paper 1**

**2 OCTOBER 2007  
1 hour**

*Instructions to Candidates:*

Write your name, class and register number on this cover page.  
 Write in dark blue or black pen for your workings.  
 You may use a pencil for any diagrams or graphs.  
 Do not use staples, paperclips, highlighters, glue or correction fluid.  
 Answer **ALL** questions  
 If working is needed for any question it must be shown with the answer.  
 Omission of essential workings will result in loss of marks.  
 You are expected to use an electronic calculator to evaluate explicit numerical expressions.  
 If the degree of accuracy is not specified in the question, and the answer is not exact, give the answer to 3 significant figures or 1 decimal place in the case of angles in degrees.  
 For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .  
 You are reminded of the need for clear presentation in your answers.  
 At the end of the examination, fasten all your work securely together.

The marks are given in brackets [ ] at the end of each question or part question.  
 The total marks for this paper is 40.

This paper comprises 7 printed pages (including this cover page)

**DO NOT TURN OVER THE PAGE UNTIL YOU ARE TOLD TO DO SO.**

Answer all questions:

(a) Evaluate the exact value of  $\frac{36.5 + (-1.34)^3}{\sqrt{14.2} - \sqrt[3]{22.9}}$ .

(b) List the integer values of  $x$  for which  $5x - 2 \leq 28 < 15x - 4$ .

Ans: (a) \_\_\_\_\_ [1]

(b) \_\_\_\_\_ [2]

(a) Find  $x$  if  $0.25^x = \frac{1}{8}$ .

(b) If  $10^m = 2$  and  $10^n = 3$ , find the value of  $10^{3m-n}$ .

Ans: (a)  $x =$  \_\_\_\_\_ [2]

(b) \_\_\_\_\_ [2]

3. Given that  $\begin{pmatrix} x & 3 \\ 4 & 0 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 2 & y \end{pmatrix} = \begin{pmatrix} 15 & 21 \\ 12 & 4 \end{pmatrix}$ , find the value of  $x$  and  $y$ .

Ans:  $x = \underline{\hspace{2cm}}$ ,  $y = \underline{\hspace{2cm}}$  [3]

4. Solve the following equations :

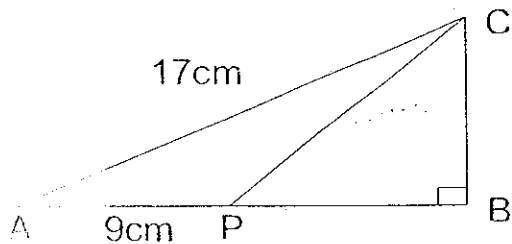
(a)  $\frac{x+1}{9} - \frac{2}{x+4} = 0$

(b)  $(x+2)^2 = 25$

Ans : (a)  $x = \underline{\hspace{2cm}}$  [3]

(b)  $x = \underline{\hspace{2cm}}$  [2]

5. In the diagram, APB is a straight line,  $\angle ABC = 90^\circ$ ,  $AC = 17\text{cm}$ ,  $AP = 9\text{cm}$  and area of  $\triangle APC = 36\text{ cm}^2$ . Calculate
- BC
  - $\tan \angle CPA$



Ans: (a) \_\_\_\_\_ [2]  
 (b) \_\_\_\_\_ [2]

6. The two straight lines  $my - 4x = 5$  and  $9y - mx = 2$  are parallel. Find the values of  $m$ .

Ans: \_\_\_\_\_ [3]

7. (a) Factorise completely :  $2x^2 - 5x - 2xy + 5y$

(b) If  $\frac{x}{2} = \sqrt{\frac{y+7}{3+y}}$ , express  $y$  in terms of  $x$ .

Ans : (a) \_\_\_\_\_ [1]

(b) \_\_\_\_\_ [2]

8. Given that  $2 \leq x \leq 4$  and  $-5 \leq y \leq -2$ . Find

(a) the least possible value of  $y^2 - x$ ,

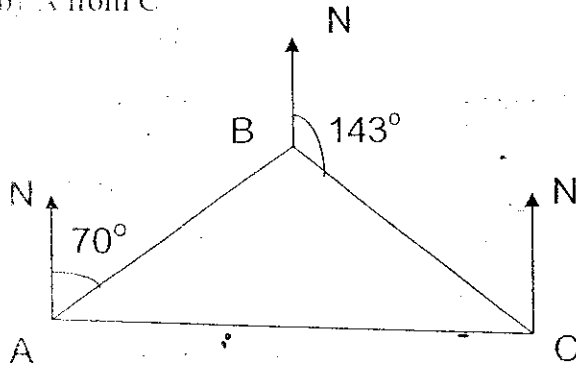
(b) the greatest possible value of  $\frac{x}{y}$ .

Ans: (a) \_\_\_\_\_ [1]

(b) \_\_\_\_\_ [1]

9. In the diagram, the bearing of B from A is  $070^\circ$ , and the bearing of C from B is  $143^\circ$ .  
 If  $AB = BC$ , find the bearing of

- (a) A from B
- (b) A from C



Ans:(a) \_\_\_\_\_ [1]

(b) \_\_\_\_\_ [2]

10. (a) By selling a radio for \$75.60, a shopkeeper makes a profit of  $12\frac{1}{2}\%$  on

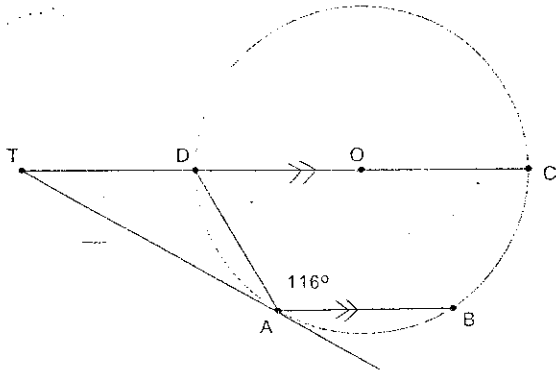
the cost price. Find his profit.

(b) A developer needs 14 workers to complete a project in 9 days. After working for 3 days, 2 workers left, Calculate the number of days the remaining workers will need to complete the project?

Ans: (a) \_\_\_\_\_ [2]

(b) \_\_\_\_\_ [2]

11. In the diagram, TA is a tangent to the circle with centre O, AB is parallel to the diameter DOC and CODT is a straight line. If  $\angle DAB = 116^\circ$ , calculate the value of
- $\angle BCD$ ,
  - $\angle DCA$ ,
  - $\angle CTA$ ,
  - $\angle BOC$ .



Ans: (a) \_\_\_\_\_ [1]  
 (b) \_\_\_\_\_ [2]  
 (c) \_\_\_\_\_ [2]  
 (d) \_\_\_\_\_ [1]



Answer all questions:

1. (a) Evaluate the exact value of  $\frac{36.5 + (-1.34)^3}{\sqrt{14.2} - \sqrt[3]{22.9}}$ .  
(b) List the integer values of  $x$  for which  $5x - 2 \leq 28 < 15x - 4$ .

$$\begin{aligned} 5x - 2 &\leq 28 & \text{and} & & 28 < 15x - 4 \\ 5x &\leq 30 & & & 32 < 15x \\ x &\leq 6 & & & 2.13 < x \\ \therefore & 2.13 < x \leq 6 \end{aligned}$$

Ans: (a) 36.7 [1]

(b)  $x = 3, 4, 5, 6$  [2]

2. (a) Find  $x$  if  $0.25^x = \frac{1}{8}$ .  
(b) If  $10^m = 2$  and  $10^n = 3$ , find the value of  $10^{3m-n}$ .

(a)  $\left(\frac{1}{4}\right)^x = 2^{-3}$

$$\begin{aligned} 2^{-2x} &= 2^{-3} \\ -2x &= -3 \end{aligned}$$

$$x = \frac{3}{2} = 1\frac{1}{2}$$

(b)  $10^{3m-n} = 10^{3m} \div 10^n$   
 $= (10^m)^3 \div 10^n$   
 $= \frac{2^3}{3}$   
 $= \frac{8}{3}$   
 $= 2\frac{2}{3}$

Ans: (a)  $x = 1\frac{1}{2}$  [2]

(b)  $x = 2\frac{2}{3}$  [2]

3. Given that  $\begin{pmatrix} x & 3 \\ 4 & 0 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 2 & y \end{pmatrix} = \begin{pmatrix} 15 & 21 \\ 12 & 4 \end{pmatrix}$ , find the value of  $x$  and  $y$ .

$$\begin{pmatrix} 3x+6 & x+3y \\ 12 & 4 \end{pmatrix} = \begin{pmatrix} 15 & 21 \\ 12 & 4 \end{pmatrix}$$

Therefore  $3x+6 = 15$  and  $x+3y = 21$   
 $3x = 9$   $3+3y = 21$   
 $x = 3$   $3y = 18$   
 $y = 6$

Ans:  $x = 3, y = 6$  [3]

4. Solve the following equations :

(a)  $\frac{x+1}{9} - \frac{2}{x+4} = 0$

(b)  $(x+2)^2 = 25$

(a)  $\frac{x+1}{9} = \frac{2}{x+4}$

$(x+1)(x+4) = 18$

$x^2 + 5x + 4 = 18$

$x^2 + 5x - 14 = 0$

$(x+7)(x-2) = 0$

$x = -7$  or  $x = 2$

(b)  $x+2 = \pm 5$

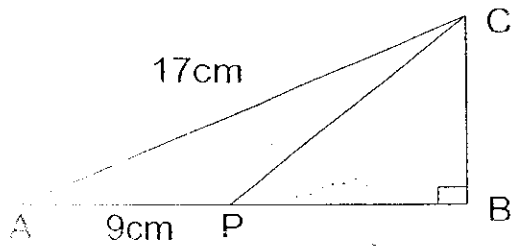
$x+2 = 5$  or  $x+2 = -5$

$x = 3$  or  $x = -7$

Ans : (a)  $x = -7$  or  $2$  [3]

(b)  $x = -7$  or  $3$  [2]

5. In the diagram, APB is a straight line,  $\angle ABC = 90^\circ$ ,  $AC = 17\text{cm}$ ,  $AP = 9\text{cm}$  and area of  $\triangle APC = 36\text{ cm}^2$ . Calculate  
 (a)  $BC$   
 (b)  $\tan \angle CPA$



(a) Area of  $\triangle APC = \frac{1}{2} \times AP \times BC$

$$36 = \frac{1}{2} \times 9 \times BC$$

$$BC = 8$$

(b)

$$AB^2 + BC^2 = AC^2$$

$$AB^2 + 8^2 = 17^2$$

$$AB = 15$$

$$PB = 15 - 9 = 6$$

$$\tan \angle CPA = -\tan \angle CPB$$

$$= \frac{-8}{6} = \frac{-4}{3}$$

Ans: (a) BC = 8 cm [2]

(b)  $-1\frac{1}{3}$  [2]

6. The two straight lines  $my - 4x = 5$  and  $9y - mx = 2$  are parallel. Find the values of

$m$

$$my = 4x + 5$$

$$y = \frac{4}{m}x + \frac{5}{m}$$

$$\text{gradient} = \frac{4}{m}$$

$$9y = mx + 2$$

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

$$\text{gradient} = \frac{m}{9}$$

$$\frac{4}{m} = \frac{m}{9}$$

$$m^2 = 36$$

$$m = \pm 6$$

Ans:  $m = \pm 6$  [3]

7. (a) Factorise completely :  $2x^2 - 5x - 2xy + 5y$

(b) If  $\frac{x}{2} = \sqrt{\frac{y+7}{3+y}}$ , express  $y$  in terms of  $x$ .

(a)  $x(2x-5) - y(2x-5) = (2x-5)(x-y)$

(b)

$$\frac{x^2}{4} = \frac{y+7}{3+y}$$

$$3x^2 + x^2y = 4y + 28$$

$$x^2y - 4y = 28 - 3x^2$$

$$y(x^2 - 4) = 28 - 3x^2$$

$$y = \frac{28 - 3x^2}{x^2 - 4}$$

Ans : (a)  $(2x-5)(x-y)$  [1]

(b)  $y = \frac{28-3x^2}{x^2-4}$  [2]

8. Given that  $2 \leq x \leq 4$  and  $-5 \leq y \leq -2$ . Find

(a) the least possible value of  $y^2 - x$ ,

(b) the greatest possible value of  $\frac{x}{y}$ .

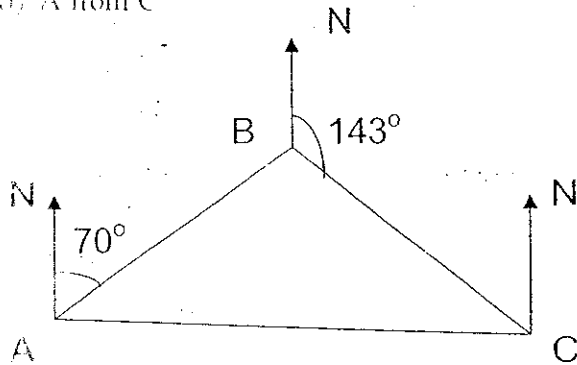
(a)  $(-2)^2 - 4 = 4 - 4 = 0$

(b)  $\frac{2}{-5} = -\frac{2}{5}$

Ans: (a) 0 [1]

(b)  $-\frac{2}{5}$  [1]

9. In the diagram, the bearing of B from A is  $070^\circ$ , and the bearing of C from B is  $143^\circ$ .  
 (a) Find  $\angle ABC$ .  
 (b) Find the bearing of  
 (i) A from B  
 (ii) A from C



- (a)  $\angle ABN = 180^\circ - 70^\circ = 110^\circ$   
 Bearing of A from B is  $360^\circ - 110^\circ = 250^\circ$   
 (b)  $\angle ABC = 360^\circ - 110^\circ - 143^\circ = 107^\circ$   
 $\angle BCA = (180^\circ - 107^\circ) / 2 = 36.5^\circ$   
 $\angle BCN = 180^\circ - 143^\circ = 37^\circ$   
 Bearing of A from C is  $360^\circ - 36.5^\circ - 37^\circ = 286.5^\circ$

Ans:(a) 250° [1]

(b) 286.5° [2]

10. (a) By selling a radio for \$75.60, a shopkeeper makes a profit of  $12\frac{1}{2}\%$  on the cost price. Find his profit.

- (b) A developer needs 14 workers to complete a project in 9 days. After working for 3 days, 2 workers left. Calculate the number of days the remaining workers will need to complete the project?

(a)  $\frac{\$75,60}{112.5} \times 12.5 = \$8.40$

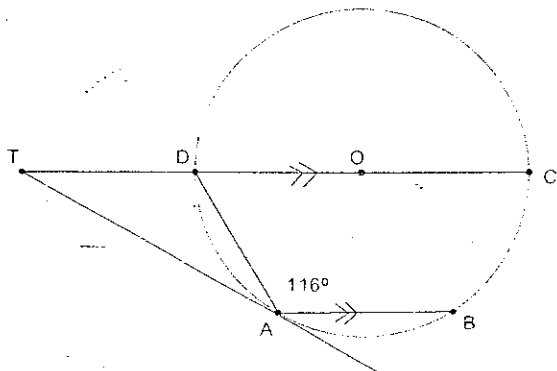
- (b) The project needs.  $14 \times 9 = 126$  man-day  
 3-day work completed  $14 \times 3 = 42$  man-day  
 $126 - 42 = 84$  man-day left

Remaining 12 workers need  $\frac{84}{12} = 7$  days

Ans: (a) \$ 8.40 [2]

(b) 7 days [2]

11. In the diagram, TA is a tangent to the circle with centre O, AB is parallel to the diameter DOC and CODT is a straight line. If  $\angle DAB = 116^\circ$ , calculate the value of
- $\angle BCD$ ,
  - $\angle DCA$ ,
  - $\angle CTA$ ,
  - $\angle BOC$ .



(a)  $\angle BCD = 180^\circ - 116^\circ$  ( $\angle$ s in opp. Segments are supplementary)  
 $= 64^\circ$

(b)  $\angle DAC = 90^\circ$  (rt  $\angle$  in semicircle)  
 $\angle CAB = 116^\circ - 90^\circ$   
 $= 26^\circ$   
 $\angle DCA = 26^\circ$  ( $AB \parallel DC$ , alter.  $\angle$ )

(c)  $\angle OAT = 90^\circ$  (Radius perpendicular to tangent)  
 $\angle TOA = 2 \times 26^\circ$  ( $\angle$  at centre =  $2 \times \angle$  at circumference)  
 $= 52^\circ$   
 $\angle CTA = 180^\circ - 90^\circ - 52^\circ$  ( $\angle$  sum of triangle)  
 $= 38^\circ$

(d)  $\angle CAB = \angle DCA = 26^\circ$  ( $AB \parallel DC$ , alter.  $\angle$ )  
 $\angle BOC = 2 \times 26^\circ$  ( $\angle$  at centre =  $2 \times \angle$  at circumference)  
 $= 52^\circ$

Ans: (a) 64° [1]

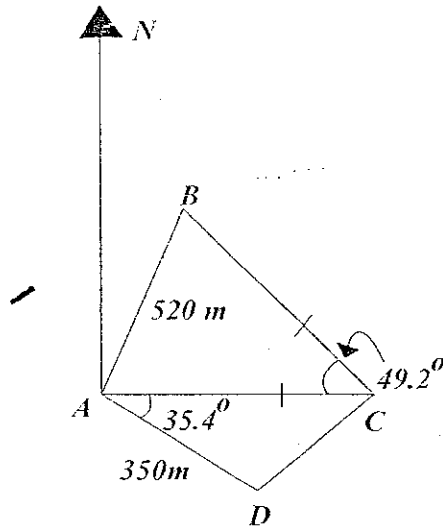
(b) 26° [2]

(c) 38° [2]

(d) 52° [1]

Answer all questions:

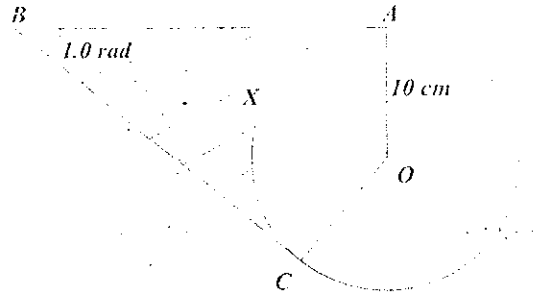
1.



In the diagram,  $A$ ,  $B$ ,  $C$  and  $D$  are markers on a horizontal field where  $A$  is due west of  $C$ . Given  $\angle CAD = 35.4^\circ$ ,  $\angle BCA = 49.2^\circ$ ,  $BA = 520$  m,  $AD = 350$  m and  $B$  and  $A$  are equidistant from  $C$ .

- (a) Calculate  $AC$ . [2]
- (b) Calculate
- (i) the bearing of  $A$  from  $D$ , [2]
  - (ii) distance  $CD$ . [2]
  - (iii) area of triangle  $ADC$ , [2]
  - (iv) the shortest distance from  $D$  to  $AC$ . [2]
- (c) A pole of 50 m high stands vertically at point  $C$ . Find angle of elevation of the top of the pole from  $B$ . [2]

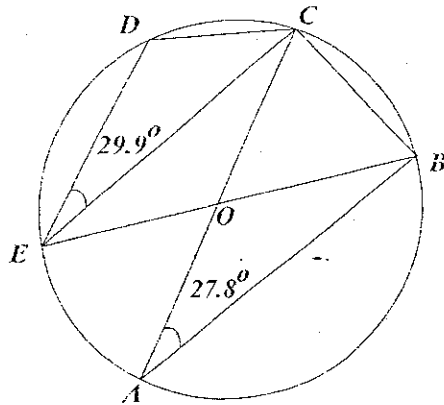
2. (a)



The diagram shows a circle, center  $O$ , of radius 10 cm. The line  $BA$  and  $BC$  are tangents to the circle at  $A$  and  $C$ . Given that  $\angle ABC = 1 \text{ rad}$ , calculate

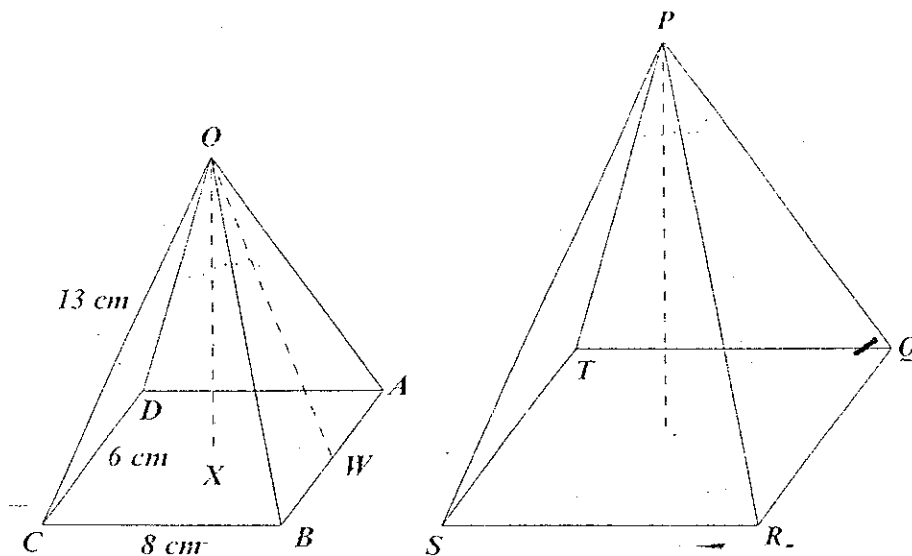
- (i) the length of  $BC$ , [1]
- (ii) perimeter of shaded region  $ABCX$ , [3]
- (iii) area of the shaded region  $ABCX$ . [2]

(b)



$A$ ,  $B$ ,  $C$ ,  $D$  and  $E$  are 5 points on the circumference of a circle, center  $O$  with diameter  $EB$  and  $AC$ . Given  $\angle CAB = 27.8^\circ$  and  $\angle DEC = 29.9^\circ$ , calculate

- (i)  $\angle CEB$ , [1]
- (ii)  $\angle OCB$ , [2]
- (iii)  $\angle EDC$ , [1]
- (iv)  $\angle DCE$ . [1]



The diagram shows a rectangular pyramid,  $OABCD$ .  $ABCD$  is a rectangle.  $X$  is the center of the rectangle  $ABCD$ . Given that  $CD = 6$  cm,  $BC = 8$  cm and  $OC = 13$  cm. Find

- (i) the length of  $AC$ , [1]
- (ii) the length of  $OX$ , [2]
- (iii) the length of  $OW$ , [2]
- (iv) volume of the pyramid. [volume of a pyramid =  $\frac{1}{3} \times \text{base area} \times \text{height}$ ], [2]

Given that another pyramid  $PQRST$  is geometrically similar to  $OABCD$ . Both pyramids are made of the same material. If the ratio of  $BA$  to  $RQ$  is  $2 : 3$  and mass of the pyramid  $OABCD$  is  $50$  kg, find the mass of pyramid  $PQRST$ .

[3]

4 Given

$$\xi = \{\text{integers } x : 1 \leq x \leq 15\}$$

$$A = \{\text{integers divisible by } 2\}$$

$$B = \{\text{integers divisible by } 3\}$$

- (i) Draw a Venn Diagram to illustrate this information. [2]
- (ii) List the elements contained in the set  $(A \cup B)'$ . [3]
- (iii) Write down  $n(B)$ . [1]
- (iv) Describe, as simply as possible, in words, the elements contained in the set  $A \cap B$ . [1]

5. (a) Amy came to Singapore from Australia in December during the Christmas season. Before she came, she changed some money from the local bank. The exchange rate was 1 Australian dollar to Singapore Dollars \$1.274. She was charged 2 % administrative fee for the change. How much money in Singapore dollars did she change with 2000 Australian money? [4]
- (b) Amy decided to stay in Ritz Carlton Hotel. The rate as advertised on internet was Singapore Dollars \$300 per day. This is exclusive of the 10% service charge and 7 % GST.
- (i) Calculate, in Singapore Dollars, the amount she has to pay if she stayed in the hotel for 1 week. [2]
- (ii) Express the amount that she has to pay for service charge and GST as a percentage of the total cost she has to pay. [3]
- (c) At Funan IT Mall, she paid a GST amount of Singapore Dollars \$90.93 for the camera. Find, in Singapore dollars, the cost price of the camera assuming no discount was given for the camera. [2]
6. (a)  $A$  and  $B$  are the points  $(3, 5)$  and  $(4, -2)$  respectively.
- (i) Find the length of  $AB$ . [1]
- (ii) Find the midpoint of  $AB$ . [1]
- (iii) Find the equation of the line  $AB$ . [2]

4. Three Indian stalls serve 2 different types of fish head and 2 different types of rice. The table below shows the number of each type of food served during a busy lunch and the prices of each type of food.

	Curry Fish Head	Thai Style Fish Head	Nasi Bryani	White Rice
Stall 1	10	5	40	20
Stall 2	8	4	30	15
Stall 3	15	2	60	20
Cost of each item	\$15.00	\$10.00	\$1.00	\$0.30

- i) Write down 2 matrices only such that the elements of their product under matrix multiplication gives the total amount of money collected from the each stall. Find this product. [3]

- ii) Using your answer in (i) and multiply by the matrix  $\begin{pmatrix} 1 & 1 & 1 \end{pmatrix}$ , evaluate this product and explain what the elements in the product represent. [2]

**-END OF PAPER-**

Solutions to E'Maths P2

Q1.	<p>a. AC = 625 m (3.s.f)            b. i. Bearing of A from D is <math>305.4^\circ</math>                ii. CD = 395 m (3.s.f)                iii. Area of <math>\triangle ADC = 63300 \text{ m}^2</math> (3.s.f)                iv. Shortest distance is 203 m.            c. Angle of elevation of pole from B is <math>4.6^\circ</math></p>
Q2.	<p>a. i. BC = 18.3 cm (3.s.f)                ii. Perimeter of shaded region ABCX is 58.0 cm (3.s.f).                iii. Shaded area ABCX is <math>76.0 \text{ cm}^2</math> (3.s.f)            b. i. <math>\angle CEB = 27.8^\circ</math>                ii. <math>\angle OCB = 62.2^\circ</math>                iii. <math>\angle EDC = 117.8^\circ</math>                iv. <math>\angle DCE = 32.3^\circ</math></p>
Q3.	<p>i. AC = 10 cm            ii. OX = 12 cm            iii. OW = 12.6 cm (3.s.f) or <math>4\sqrt{10}</math> cm            iv. Vol of pyramid is <math>192 \text{ cm}^3</math> (3.s.f)             Mass of pyramid PQRST is 168.75 kg (exact)</p>
Q4.	<p>i. <math>\xi</math></p> <div style="text-align: center;"> <p style="text-align: center;"><math>A \cup B = \{1, 5, 7, 11, 13\}</math></p> </div> <p>ii. <math>(A \cap B) = \{1, 5, 7, 11, 13\}</math>            iii. <math>n(B) = 5</math>            iv. Elements in <math>A \cap B</math> are integers lying between 1 and 15 inclusive and they are divisible by 2 and 3.</p>
Q5.	<p>a. She changed \$2497.04 of Singapore dollars.            b. i. She has to pay \$2471.70.                ii. She has to pay 15.0 % of total amount for GST or service charge.            c. The cost price of the camera is \$1299.</p>
Q6.	<p>a. i. <math>5\sqrt{2}</math> units or 7.07 units (3.s.f)                ii. (3.5, 1.5)                iii. Equation of line AB is <math>y = -7x + 26</math></p>

*Solutions to E' Maths P2*

$$\begin{pmatrix} 10 & 5 & 40 & 20 \\ 8 & 4 & 30 & 15 \\ 15 & 2 & 60 & 20 \end{pmatrix} \begin{pmatrix} 15 \\ 10 \\ 1 \\ 0.3 \end{pmatrix} = \begin{pmatrix} 246 \\ 194.5 \\ 311 \end{pmatrix}$$

i. (751.5)

The elements in the products represent the total amount of money earned by all 3 stalls.