1. Round off 420.9749 to:
a) 4 significant figures

b) 2 decimal places

Ans: a)_____[1]

b)_____[1]

2. Given that $210 = 2 \times 3 \times 5 \times 7$, $60 = 2^2 \times 3 \times 5$ and $42 = 2 \times 3 \times 7$

a) Find the HCF of 210, 60 and 42.

Ans: a)_____[1]

b) Find the LCM of 210, 60 and 42.

b)_____[1]

3. Fill in the missing terms in the following sequences:
a) 9, 13, ___, 24, 31

b) 13, 13, ___, 78, 312

Ans: a)_____[1]

b)_____[1]

4.   Solve x for the following.

a) $6(2-3x) = 2(3x+1)$

b) $\dfrac{6}{1-x} + \dfrac{4}{2-2x} = 7$

Ans: a)_____[2]

b) _____[3]

5.   Solve the following equation, giving your answers to 2 decimal places.

$$\frac{4x-3}{5} = \frac{3x-5}{7} + x$$

Ans: _____[2]

6. Estimate the following, giving your answers correct to 2 significant figures:

$$\frac{58.02 \times \sqrt{143.94}}{24.04}$$
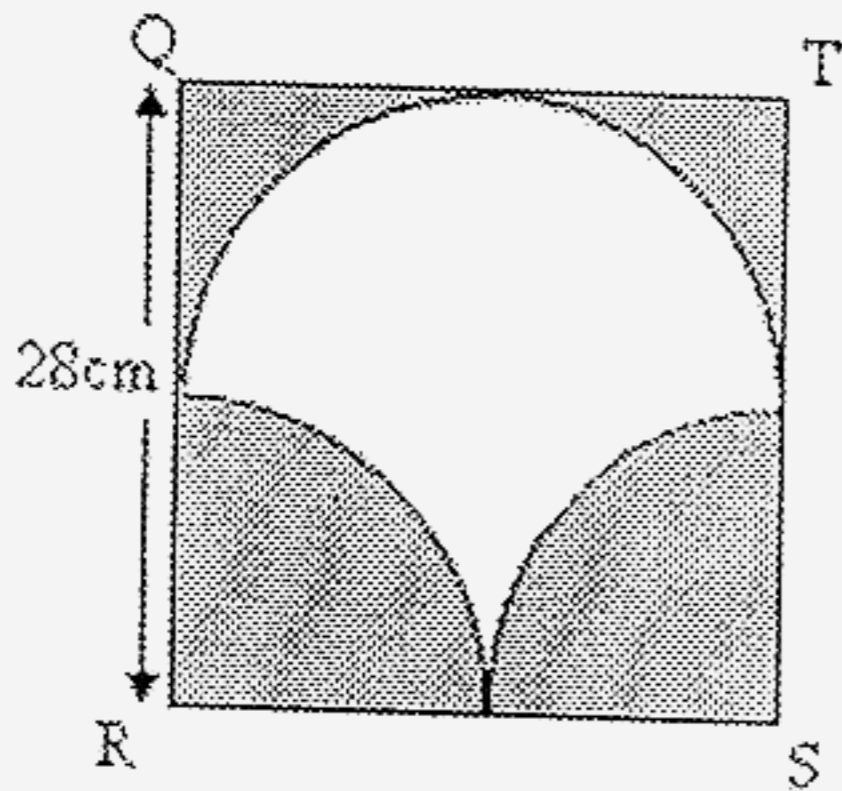
Ans: _____ [2]

7. A father is 9 times older than his son, and the half of the sum of their ages is 20 years. Find the sum of their ages 5 years later.

Ans: _____ [3]

8. Calculate $\left[3 \times 13 + 84 \div 7 - (-47 + 73) \div 13\right] \times 5$.
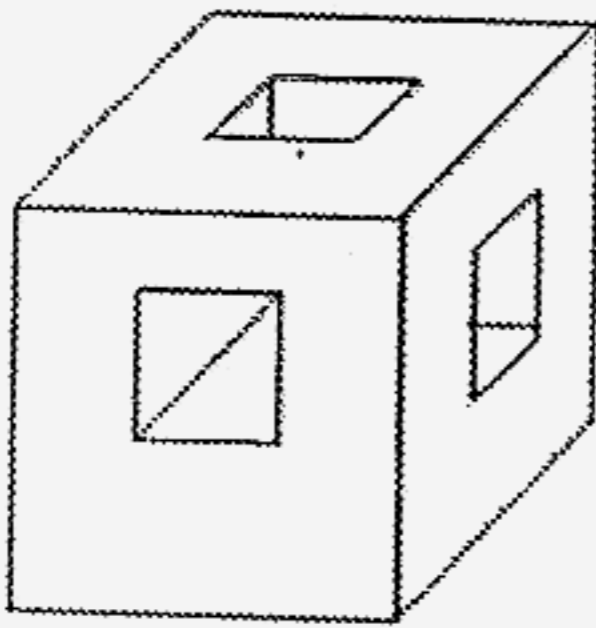
Ans: _____ [3]

4

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9. In the below diagram, QRST is a square of length 28cm. The unshaded figure is made up of 3 arcs. Taking $\pi = \dfrac{22}{7}$, find

a) The area of the shaded figure.

b) The perimeter of the unshaded region.

Ans: a) _____ [2]

b) _____ [2]

10. A solid cube of length 10 cm has "square holes" of length 2 cm in the centre of every face of the cube. Find the volume of the below object.

Ans: _____ [3]

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11. During the Great Singapore Sale, the original price of a pair of shoes was reduced by 20%. After the Sale, the price of the pair of shoes was increased to its original price. By what percentage was the reduced price increased?
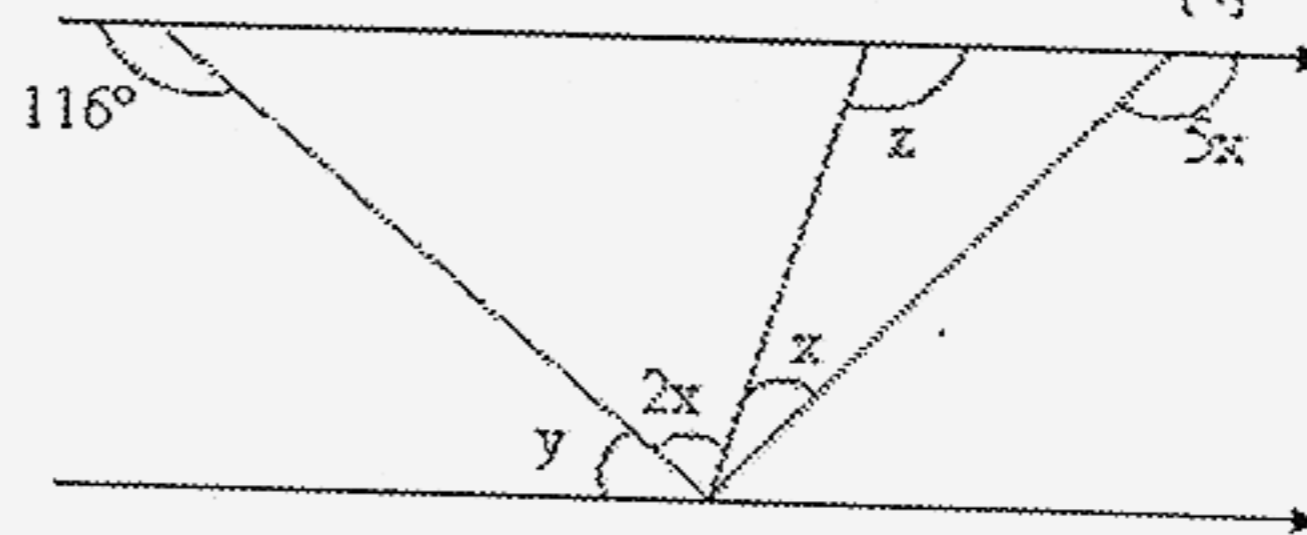
Ans: _____[2]

12. "Creativity" plans to produce 2 million MP3 players for the Christmas season. If Factory A takes a total of 40 days to complete the production, while Factory B takes 30 days, and Factory C takes 24 days. If all 3 Factories operate together, how many days will it take to complete the production?

Ans: _____[4]

13. Find the values of x, y and z in the diagram. State your reasons. [4]

Ans: x = _____

y = _____

z = _____
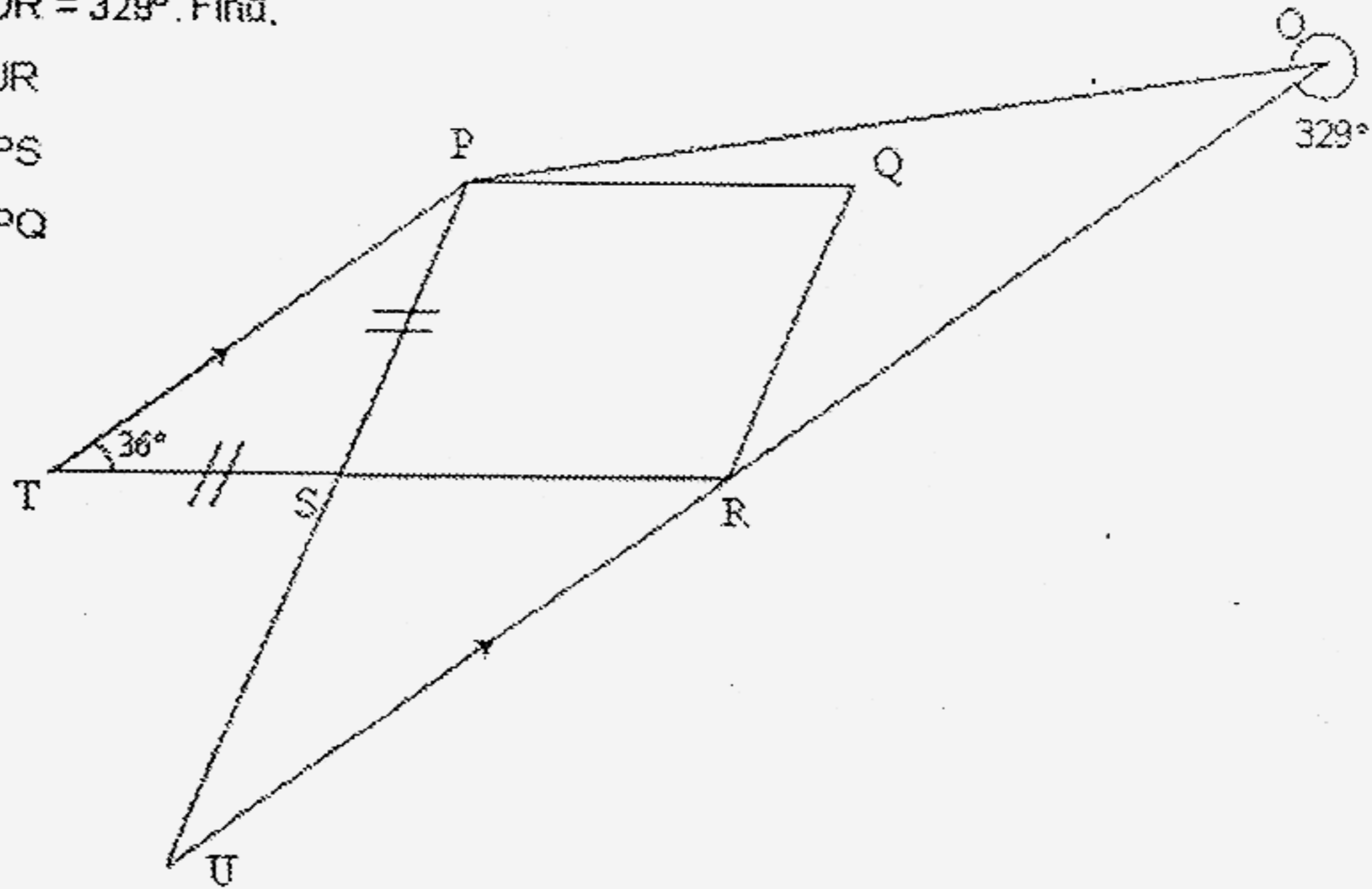
14. Factorise the following:

a) $3x^2y - 6xy^2$

b) $2x + ty + tx + 2y$

c) $6x(3x + 5y) - (3x + 5y)^2$

Ans: a)_____ [2]

b) _____ [2]

c)_____ [2]

15. In the below diagram, PTS is an isosceles triangle with TS = PS, while PQRS is a parallelogram. Given that TSR and PSU are straight lines, $\angle PTS = 36°$ and reflex $\angle POR = 329°$. Find,

a) $\angle SUR$

b) $\angle QPS$

c) $\angle OPQ$

Ans: a) _____ [2]

b) _____ [2]

c) _____ [2]

Name: _____   Register Number: _____   Class: _____

Nan Chiau High School

End-of-Year Examination 2006

Mathematics Paper 2
Secondary 1 Express

1 hour 30 minutes

Maximum Marks: 50

12 October 2006, Thursday

INSTRUCTIONS TO CANDIDATES

Write your name, class and index number in the spaces above.

Answer all questions in this paper.

Write your answers in the spaces provided on the question paper.

If working is needed for any questions it must be shown below that question.   Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATOR MAY BE USED IN THIS PAPER。

FOR MARKER'S USE

/50

This question paper consists of 7 printed pages, including this cover page.

Section A: Answer all questions (42%)

(1) (a)   Using Prime Factorization, evaluate $\sqrt[3]{1728}$

      [3m]

(b)   Royal, Raymond and Zijian runs at a constant speed and completes 400m in 80sec, 75sec and 60sec respectively. If they were to start from the same point, how many minutes would have passes before they are side by side again?

      [4m]

2

(2)　Consider the number pattern below:

$$1 = 1$$
$$1 + 2 + 1 = 4$$
$$1 + 2 + 3 + 2 + 1 = 9$$
$$1 + 2 + 3 + 4 + 3 + 2 + 1 = 16$$
$$......$$
$$......$$

(a)　Write down the 5th line of the sequence. [1m]

(b)　Find the value of $1 + 2 + ... + 9 + 10 + 9 + 8 + ... + 2 + 1$ [1m]

(c)　If $1 + 2 + 3 + ... + (x-1) + x + (x-1) + ... + 3 + 2 + 1 = 225$, Find the value of x. [1m]

(3)　(a)　Simplify

$$\frac{1\frac{5}{6} - 1\frac{1}{2}}{\frac{9}{10} \times (1\frac{1}{2} - 1\frac{5}{6}) + 2\frac{2}{3} \div 3\frac{1}{3}}$$

[3m]

3

(b) Arrange the following in ascending order.
[2m]

$$1.3\ddot{1}\ddot{5}\ , \ 1.31\dot{5}\ , \ 1.\dot{3}1\dot{5}\ , \ 1\frac{31}{99}$$

_____, _____, _____, _____

(4) (a) During a sale, the price of a computer was reduced from $1200 to $1060. If the computer was sold at its original selling price, the sale agent would make a 25% profit. Find the percentage profit when it was sold at the reduced price.

[3m]

(b) The radius of a cylinder is increased by 10% and its height decreased by 20%. Find the percentage change in the volume of the cylinder.
[3m]

(5) A rectangular metal piece of 4m × 5m is being rolled to fit and form the cylindrical surface of a metal container. Assuming thickness and base of the cylinder are accounted for. What is the volume of this container? (Take $\pi = 3.14$)

Express your answer to 3 significant figures.
[4m]

4

(6) Form an equation connecting **a, b, c** and **d**. State clearly the angles properties used.

[4m
]
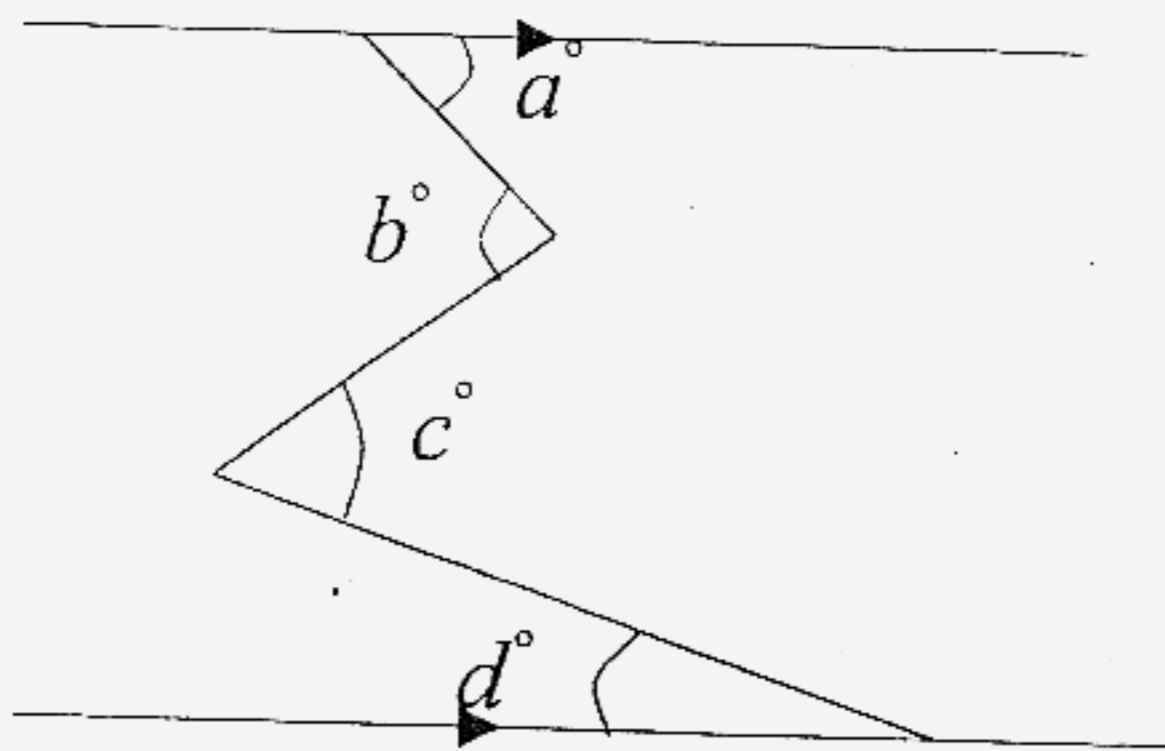
(7) *Cristine* and *Lok Lin* can clean a house in 5 hours. *Lok Lin* and *Winnie* together will do it in 8 hours while *Cristine* and *Winnie* will spend 10 hours to complete the same job. How many hours will it take *Cristine, Winnie* and *Lok Lin* to complete the job together?

[5m]

(8)   Benjamin drives from town A to town B which is 300km apart. He travels part of the journey on a highway at 80km/h and the rest of the journey at 60km/h. The total time he spends traveling at the slower speed is twice that of the time he spends on the highway, How long does he take for the whole journey
      [4m]

(9)   Mandy bought 10kg of fruits on a Sunday. The following distribution shows the proportion of fruits she bought;

Watermelon	:	4kg
Apples	:	5 at 250g each
Oranges	:	20% of total weight
Papaya	:	$\frac{1}{6}$ of the total
Grapes	:	the rest

Using the diagram below, design a **pie-chart** to represent the above information. Find also the weight of grapes Mandy bought.

[4m]
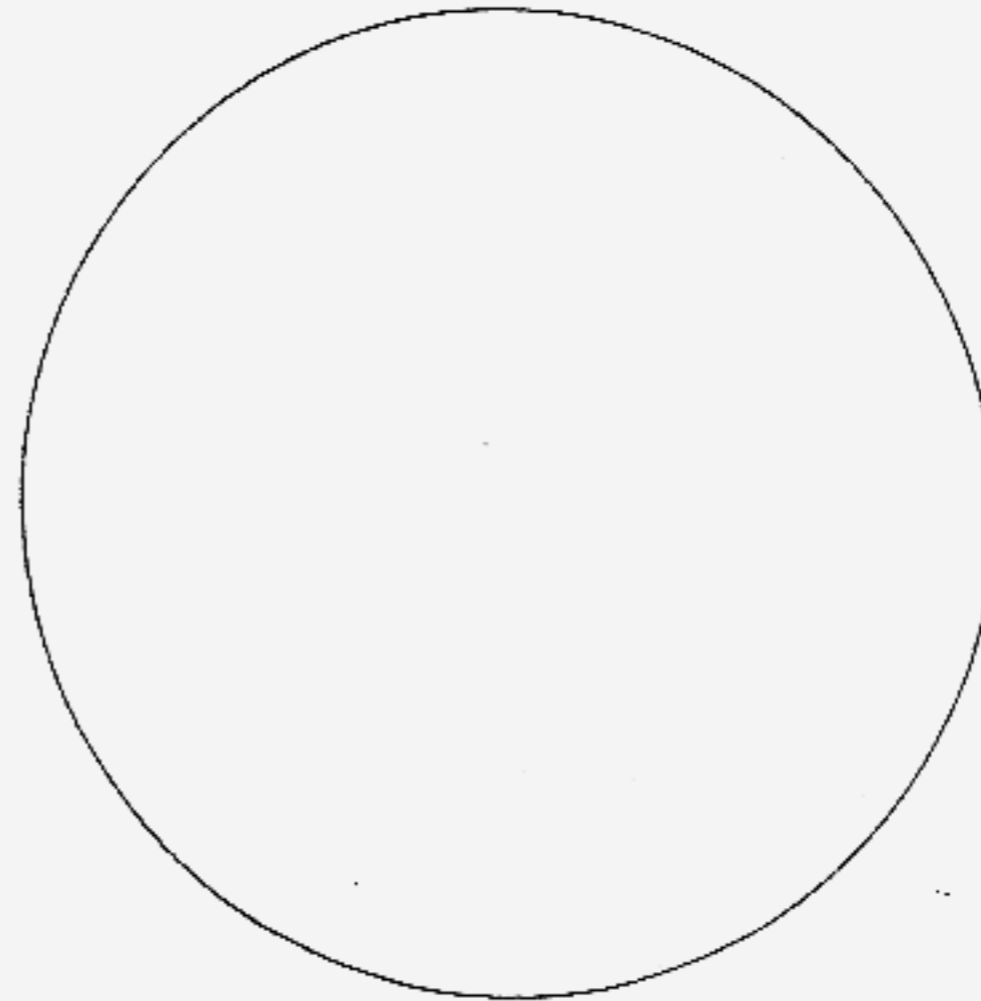
Section B: Answer ONE question only (8%)

(10) Construct a quadrilateral PQRS where $PQ = 6.5cm$, $QR = 4.8cm$, $RS = 8.5cm$, $\angle P\hat{Q}R = 75°$ and $\angle Q\hat{R}S = 98°$

[3m]

(i) Measure PS and $\angle S\hat{P}Q$

[2m]

(ii) The angular bisector of $\angle R\hat{S}P$ meets the perpendicular bisector of PQ at **x**. Measure the perpendicular distance of **x** from QR

[3m]

(11) In a recent test, a class of 30 students were asked to answer 10 questions. The following are the results of the students.

2	6	5	10	5	7	4	6	5	7
8	3	9	5	7	3	7	4	7	4
7	4	8	4	2	8	6	8	6	3

(a) Construct a frequency table for the above data.
[3m]

(b) Draw the corresponding Histogram.
[3m]

(c)   Find the mean(average) score of the class
        [2m]

Nan Chiau High School

1a)   __421.0__ [1]
1b)   __420.97__ [1]

2a) $2 \times 3 = 6$
2b) $2 \times 2 \times 3 \times 5 \times 7 = 420$

3a)   __18__   [1]
3b)   __26__   [1]

4a) $12 - 18x = 6x + 2$ M1
        $x = \frac{5}{12}$ A1

b) $12 + 4 = 7(2 - 2x)$ M1
        $16 = 14 - 14x$ M1
        $x = -\frac{1}{7}$ A1

5. $7(4x - 3) = 5(3x - 5) + 35x$ M1
        $-22x = -4$
        $x = 0.1818 \, or \, 0.18 (2 \, dec. \, pl.)$ A1

    Note: Must be in correct 2 dec. pl. for 1 mark.

6. $= \dfrac{58 \times 12}{24}$ M1
    $= 29$ A1

7.
    Let x be age of son
    Father age = 9x
    Sum of ages = 10x
    ½ x 10x = 20   M1
    x = 4   A1
    Sum of ages 4 years later   = 36 + 5 + 4 + 5
                = 50   A1

8. $[3 \times 13 + 84 \div 7 - (-47 + 73) \div 13] \times 5$ M1

    $= [39 + 12 - (26) \div 13] \times 5$ M1

    $= 245$ A1

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9.
a) Area of shaded figure = 14×28 M1
     $= 392 \text{ cm}^2$ A1

b) Perimeter of unshaded region = $2 \times \dfrac{22}{7} \times 14$ M1

     $= 88 \text{ cm}$ A1

10.

Vol. of whole cube $= 1000 \text{ cm}^3$ M1

Vol. of square holes $= 3(2 \times 2 \times 10) - 2(2 \times 2 \times 2)$

     $= 120 - 16$

     $= 104 \text{ cm}^3$ M1

Vol. of object $= 1000 \text{ cm}^3 - 104 \text{ cm}^3$

     $= 896 \text{ cm}^3$ -A1

Note: Units must be written for marks

11.   Original Price = Reduced price/ 0.8   M1
         = 1.25 Reduced price

     Therefore, reduced price was increased by 25%   B1

12.

Rate of Factory A = $\frac{1}{40}$

Rate of Factory B = $\frac{1}{30}$ M1

Rate of Factory C = $\frac{1}{24}$

Rate of 3 Factories $= \frac{1}{40} + \frac{1}{30} + \frac{1}{24}$ M1

               $= \frac{1}{10}$ M1

10 days will be taken to complete the production.   B1

13.

$180° - 5x + 3x = 116°$ (ext. $\angle$ = sum int $\angle$s)
$\angle x = 32°$ A1

$\angle y = 180° - 116°$ (int. $\angle$)
     $= 64°$ A1

$x + z + 180° - 5x = 180°$ (sum $\angle$s of tri.)
$\angle z = 128°$ A1

Reasons - B1

14.

a) $3x^2y - 6xy^2$

  $3xy(x - 2y)$ A2 for taking x (A1) and y (A1) out correctly

b) $x(2+t) + y(2+t)$ M1

  $= (x+y)(2+t)$ A1

c) $(3x+5y)[6x - (3x+5y)]$ M1

  $= (3x+5y)(3x-5y)$ A1

15.

a) $\angle TPS$ $= 36°$ (base $\angle$s of isos. Tri)   B1

       $\angle SUR$ $= 36°$ (alt. $\angle$s)   B1

b) $\angle USR$ $= 180° - 2 \times 36°$ (base $\angle$s of isos. Tri)

                $= 108°$ B1

       $\angle QPS$ $= 108°$ (corr. $\angle$s)   B1

c) $\angle POR$ $= 360° - 329°$ ($\angle$s at a pt.)   B1

                $= 31°$

     $\angle OPQ + 108° + 36° + 31° = 180°$ ($\angle$s of tri.)   B1

       $\angle OPQ$ $= 5°$

Section A: Answer all questions (42%)

(1) (a)   Using Prime Factorization, evaluate $\sqrt[3]{1728}$
     [3m]

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3

[M2]

$1728 = 2 \times 2 \times 3$
$\times 2 \times 2 \times 3$
$\times 2 \times 2 \times 3$

$\therefore \sqrt[3]{1728} = 2 \times 2 \times 3 = 12$ **[A1]**

(b)   Royal, Raymond and Zijian runs at a constant speed and completes 400m in 80sec, 75sec and 60sec respectively. If they were to start from the same point, how many minutes would have passes before they are side by side again?

     [4m]

$Time = \dfrac{dis\tan ce}{speed}$

5	80, 75, 60
2	16, 15, 12
2	8, 15, 6
3	4, 15, 3
	4, 5, 1

[M2]

$\therefore LCM = 5 \times 2 \times 2 \times 3 \times 4 \times 5$

$= 1200 \text{ sec}$ **[M1]**

They will be side by side again in 20 minutes time.   **[A1]**

(2)   Consider the number pattern below:

$$1 = 1$$
$$1 + 2 + 1 = 4$$
$$1 + 2 + 3 + 2 + 1 = 9$$
$$1 + 2 + 3 + 4 + 3 + 2 + 1 = 16$$
$$......$$
$$......$$

(a)   Write down the 5th line of the sequence.
[1m]

(b)   Find the value of $1 + 2 + ... + 9 + 10 + 9 + 8 + ... + 2 + 1$
[1m]

(c)   If $1 + 2 + 3 + ... + (x - 1) + x + (x - 1) + ... + 3 + 2 + 1 = 225$, Find the value of x. [1m]

(a) $1 + 2 + 3 + 4 + 5 + 4 + 3 + 2 + 1 = 25$ [A1]

(b)   100   [A1]

(c)   15   [A1]

(3)   (a)   Simplify $\dfrac{1\frac{5}{6} - 1\frac{1}{2}}{\frac{9}{10} \times (1\frac{1}{2} - 1\frac{5}{6}) + 2\frac{2}{3} \div 3\frac{1}{3}}$

[3m]

$$= \dfrac{\frac{1}{3}}{\frac{9}{10} \times (-\frac{1}{3}) + \frac{8}{3} \div \frac{10}{3}}$$ [M1]   *NB: for numerator*

$$= \dfrac{\frac{1}{3}}{-\frac{3}{10} + \frac{8}{10}}$$ [M1]   *NB: for denominator*

$$= \dfrac{\frac{1}{3}}{\frac{1}{2}} \qquad = \qquad \frac{2}{3}$$ [A1]

(b)   Arrange the following in ascending order.
[2m]

$$1.31\overset{..}{5}, \quad 1.31\overset{.}{5}, \quad 1.3\overset{.}{1}\overset{.}{5}, \quad 1\frac{31}{99}$$

$$1\frac{31}{99} \qquad 1.3\overset{..}{1}\overset{}{5} \qquad 1.3\overset{.}{1}\overset{.}{5} \qquad 1.31\overset{.}{5} \qquad$$ **[A2]** *NB: -1 for 1 arrangement*

_____, _____, _____, _____   *mistake*

(4)   (a)   During a sale, the price of a computer was reduced from $1200 to $1060. If the computer was sold at its original selling price, the sale agent would make a 25% profit. Find the percentage profit when it was sold at the reduced price.

[3m]

Original Price $= \dfrac{1200}{125} \times 100$ **[M1]**

            $= \$960$

% Profit $= \dfrac{1060 - 960}{960} \times 100$ **[M1]**

            $= 10.42\%$ (or 10.4%)   **[A1]**

(b)   The radius of a cylinder is increased by 10% and its height decreased by 20%. Find the percentage change in the volume of the cylinder.
[3m]

Vol. of Cylinder $= \pi r^2 h$

New Volume $= \pi(\Delta r)^2(\Delta h)$ **[M1]** *NB: for applying formulae*

            $= \pi(1.1)^2 (0.8h)$

            $= 0.968 \, \pi r^2 h$ **[M1]**

$\therefore \%\Delta$ in volume $= 1 - 0.968 = 0.032 = 3.2\%$ **[A1]**

(5)   A rectangular metal piece of 4m x 5m is being rolled to fit and form the cylindrical surface of a metal container. Assuming thickness and base of the cylinder are accounted for. What is the volume of this container? (Take $\pi = 3.14$)

Express your answer to 3 significant figures.
[4m]

Area of metal $= 4 \times 5 = 20 \text{ m}^2$ **[M1]**

Curved Surface Area of Cylinder $= 2\pi r h = 20 \text{ m}^2$ **[M1]**

$$\therefore 10\,\pi r = 20$$

$$\pi r = 2 \qquad\qquad r = \frac{2}{\pi}$$

or $\qquad 8\,\pi r = 20$

$$r = \frac{5}{2\pi}$$

Vol. of Cyl. $= \pi r^2 h = \pi(\frac{2}{\pi})^2 h$ **[M1]** $\qquad$ Vol. $= 7.96$ m³

$$= \frac{4 \times 5}{3.14}$$

$$= 6.37 \text{ m}^3 \qquad \textbf{[A1]}$$

(6) Form an equation connecting **a**, **b**, **c** and **d**. State clearly the angles properties used.

[4m]
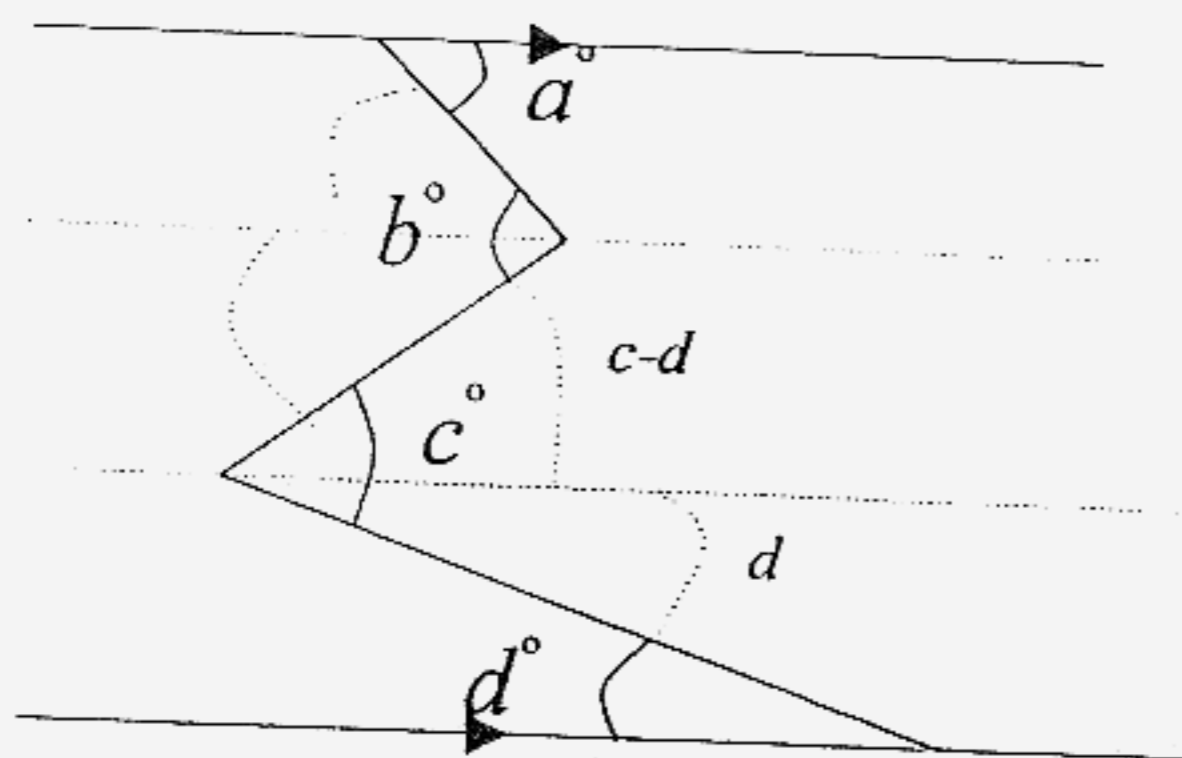
[M1] NB: for clear workings (on drawings)
[M2] NB: -1 for not stating angles properties

$$\angle c = \angle[(c-d)+d] \quad \text{(alt. } \angle s)$$
$$\angle b = \angle(c-d)+a \quad \text{(alt. } \angle s)$$

$$\therefore b - a = c - d \qquad \textbf{[A1]}$$

(7) Cristine and Lok Lin can clean a house in 5 hours. Lok Lin and Winnie together will do it in 8 hours while Cristine and Winnie will spend 10 hours to complete the same job. How many hours will it take Cristine, Winnie and Lok Lin to complete the job together?
[5m]

Let $\quad x \qquad$ be the work needed
$\qquad C \quad =$ Cristine
$\qquad L \quad =$ Lok Lin
$\qquad W \quad =$ Winnie

If number of men $\times$ time = man-hours = amount of job needed

Then $(C+L) \times 5 = x$, $\qquad$ hence $\qquad C+L = \dfrac{x}{5}$

$\quad (L+W) \times 8 = x$, $\qquad\qquad\qquad L+W = \dfrac{x}{8}$

$$(W + C) \times 10 = x \quad , \qquad\qquad W + C = \frac{x}{10} \qquad \text{[M2]}$$

$$\therefore \quad 2(C + L + W) = \frac{x}{5} + \frac{x}{8} + \frac{x}{10} \qquad\qquad\qquad \text{[M1]}$$

$$2(C + L + W) = \frac{8x + 5x + 4x}{40}$$

$$(C + L + W) = \frac{17x}{80} \quad = \frac{x}{\frac{80}{17}} \quad \text{where } \frac{80}{17} \text{ is the time spent} \qquad \text{[M1]}$$

∴ the three girls will complete the job in 4.7 hours. **[A1]**

(8) Benjamin drives from town A to town B which is 300km apart. He travels part of the journey on a highway at 80km/h and the rest of the journey at 60km/h. The total time he spends traveling at the slower speed is twice that of the time he spends on the highway, How long does he take for the whole journey
[4m]

Let time unit be t (highway)

$$\therefore \quad 80t + 60 \times 2t = 300 \qquad \text{[M2] } \textit{NB: for relating speed-time relationship}$$

$$200t = 300$$

$$t = \frac{3}{2} \qquad \text{[A1]}$$

since total time = 3t units

$$\therefore \quad \text{total time taken} = \frac{3}{2} \times 3 = \quad 4.5 \quad \text{hours } \text{[A1]}$$

(9) Mandy bought 10kg of fruits on a Sunday. The following distribution shows the proportion of fruits she bought;

Watermelon	:	4kg
Apples	:	5 at 250g each
Oranges	:	20% of total weight
Papaya	:	$\frac{1}{6}$ of the total
Grapes	:	the rest

Using the diagram below, design a *pie-chart* to represent the above information. Find also the weight of grapes Mandy bought.
[4m]

Watermelon $= \dfrac{4}{10} \times 360°$

$\qquad\qquad = 144°$

apple $\qquad = \dfrac{1.25}{10} \times 360°$

$\qquad\qquad = 45°$

[M1] *NB: for at least 1 workings*

Oranges $\quad = 72°$

Papaya $\qquad = 60°$

Grapes $\qquad = 39°$

Wt. of grapes = 1.08 kg $\quad$ **[A1]**
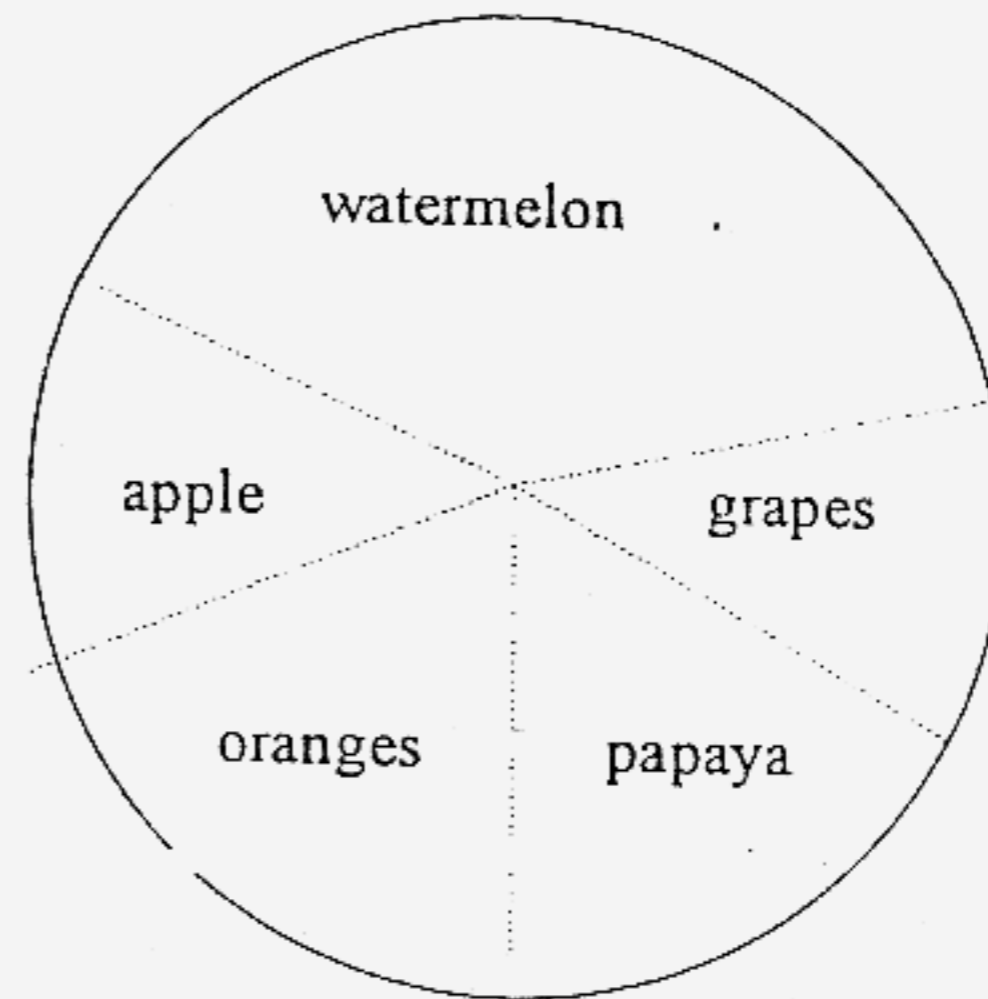
[M2]

Section B: Answer ONE question only (8%)

NB: complete this section on the given graph paper

(10) Construct a quadrilateral *PQRS* where *PQ* = 6.5cm, *QR* = 4.8cm, *RS* =8.5cm,

$\angle P\hat{Q}R = 75°$ and $\angle Q\hat{R}S = 98°$

[3m]

(i) Measure *PS* and $\angle S\hat{P}Q$

[2m]

(ii) The angular bisector of $\angle R\hat{S}P$ meets the perpendicular bisector of *PQ* at *x*.

Measure the perpendicular distance of *x* from *QR*

[3m]

(11) In a recent test, a class of 30 students were asked to answer 10 questions. The following are the results of the students.

2	6	5	10	5	7	4	6	5	7
8	3	9	5	7	3	7	4	7	4
7	4	8	4	2	8	6	8	6	3

(a) Construct a frequency table for the above data.

[3m]

7

(b)   Draw the corresponding Histogram.
       [3m]

(c)   Find the mean(average) score of the class
       [2m]