| Marks |
| --- |
| /50 |

# END-OF-YEAR EXAMINATION 2012

| | | |
| --- | --- | --- |
| Name of Pupil | : | _____ (  ) |
| Class | : | _____ |
| Subject / Code | : | Mathematics |
| Paper | : | 1 |
| Level | : | Sec 1 Express |
| Date | : | 5 Oct 2012 |
| Duration | : | 1 hour |
| Setter | : | Ms Ng He Li |

## READ THESE INSTRUCTIONS FIRST

Write your name, class and class register number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For $\pi$, use either your calculator value or 3.142, unless the question requires the answer in terms of $\pi$.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This question paper consists of 10 printed pages, including this Cover Page.

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**Answer all the questions.**

**1.** **(i)** Express 2016 as a product of its prime factors.

**Ans:** (i) _____ [1]

**(ii)** Given that $5488 = 2^4 \times 7^3$, find the lowest common multiple of 5488 and 2016.

**Ans:** (ii) _____ [2]

**(iii)** Given that $2016k$ is a perfect square, write down the smallest possible integer value of $k$.

**Ans:** (iii) _____ [1]



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2. Consider the numbers below.

$-\sqrt{10}$, 0.2, $\sqrt{81}$, $\sqrt{25}$, $\frac{2}{81}$

From the list, write down

(i) one irrational number,

**Ans:** (i) _____ [1]

(ii) one positive integer,

**Ans:** (ii) _____ [1]

(iii) one prime number.

**Ans:** (iii) _____ [1]

3. Estimate, without the use of calculators, the value of $\frac{(2.01)^2 \times \sqrt{63.22}}{\sqrt{24.85} \div 4.89}$, giving your answer to 1 significant figure.

**Ans:** _____ [3]



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4. (i) Subtract $3x-5y$ from the sum of $5x-7y+4z$ and $3y+4z-3x$.

**Ans:** (i) _____ [2]

(ii) Simplify $\frac{2}{3x+5}-\frac{3x}{5}$.

**Ans:** (ii) _____ [2]

5. If $x=3$, $y=-1$, $z=-4$, find the value of $x(y-1)+z^2x$.

**Ans:** _____ [2]



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6. (i) Solve the inequality $3x-4 \leq 16$.

**Ans:** (i) _____ [2]

(ii) State the greatest value of $x$ if $x$ is a prime number.

**Ans:** (ii) _____ [1]

(iii) State the greatest value of $x$ if $x$ is a rational number.

**Ans:** (iii) _____ [1]



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7. The table below shows the temperatures in a number of cities at noon on a particular day.

| Beijing | Kuala Lumpur | Singapore | Moscow |
|---|---|---|---|
| $-3°C$ | $28°C$ | $32°C$ | $-10°C$ |

(i) What is the coldest city?

**Ans:** (i) _____ [1]

(ii) Find the difference in temperature between Kuala Lumpur and Moscow.

**Ans:** (ii) _____ $°C$ [1]

(iii) The temperature in Hong Kong is exactly midway between the temperatures in Singapore and Beijing. Find the temperature in Hong Kong?

**Ans:** (iii) _____ $°C$ [1]

8. A sum of money is divided among Gwen, Clara and Devina. The ratio of the amount of money received by Gwen to the amount received by Clara is 2 : 3 and the ratio of the amount of money received by Clara to the amount received by Devina is 5 : 4.

(i) Find the ratio of the amount of money received by Gwen to the amount received by Devina?

**Ans:** (i) _____ [2]

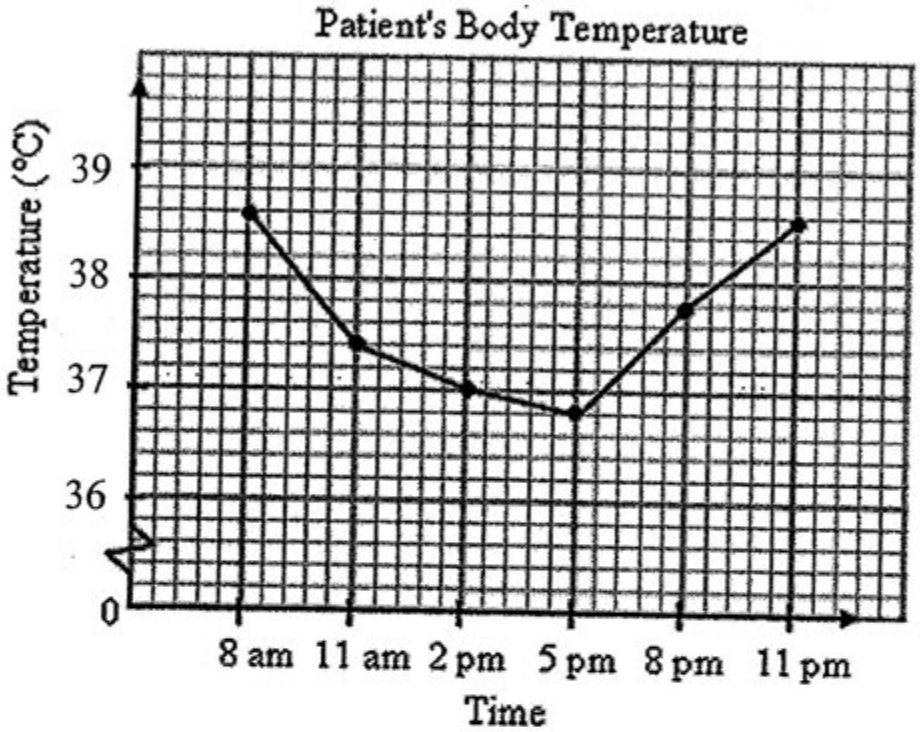
(ii) If Clara receives $225, calculate the total amount of money shared among the three girls.

**Ans:** (ii) $ _____ [2]



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9. The line graph below shows the change in body temperature of a male patient from 8.00 a.m. to 11.00 p.m. The temperatures are taken every 3 hours. The normal temperature of a person is approximately $37°C$.




**(i)** State the period of decline of his temperature till it reaches normal.

**Ans:** (i) _____ [1]

**(ii)** State which is the 3 hours period of highest increase in the temperature and state the percentage increase.

**Ans:** (ii) _____ $°C$ [2]

**(iii)** Calculate the average temperature from 8a.m. to 11p.m.

**Ans:** (iii) _____ [2]



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**10.** The length of a rectangle is two times more than its breadth. The breadth of the rectangle is $x$ centimetres.

**(i)** Express the perimeter of the rectangle in terms of $x$.

**Ans:** (i) _____ [2]

**(ii)** If the perimeter of the rectangle is less than 201 cm, find the largest possible length of the breadth. *cm*

**Ans:** (ii) _____ *cm* [2]

**11.** The diagram below shows a sequence formed by using layers of marbles.

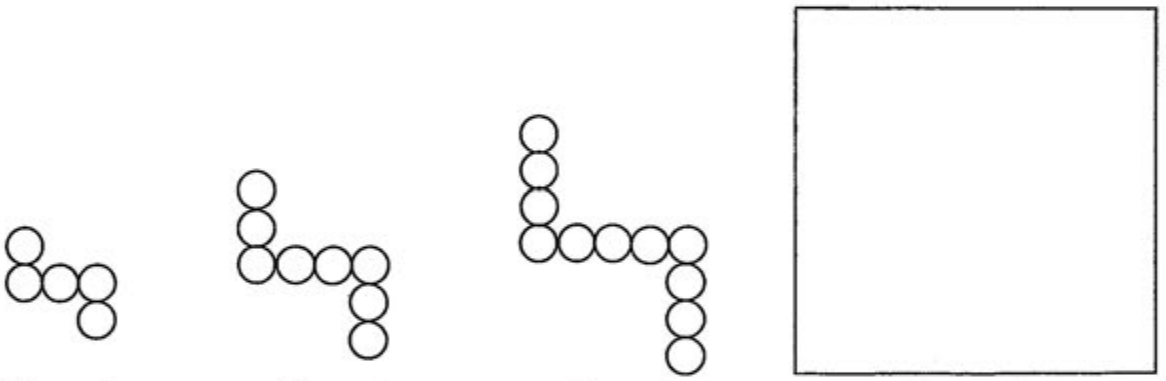


**Figure 1** **Figure 2** **Figure 3** **Figure 4** [1]

**(i)** Draw Figure 4 in the answer space above.

**(ii)** Write down an expression, in terms of $n$, to represent the number of marbles in the $n$th diagram.

**Ans:** (ii) _____ [2]

**(iii)** Find the number of marbles in Figure 28.

**Ans:** (iii) _____ [1]



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**12.** A tap takes 80 seconds to fill 18 litres of water in a tank.

**(i)** Calculate the rate of water flowing into the tank per minute.

**Ans:** (i) _____ *l/min* [2]

**(ii)** If the tank is 90cm long, 50cm wide, 1.5m high, how long would it take to fill the tank completely with water? Give your answer in minutes. ($1000cm^3 = 1$ litre)

**Ans:** (ii) _____ *mins* [2]



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13. (i) Draw the triangle $ABC$ given that the base $AB = 8$ cm, $BC = 9.5$ cm and $\angle BAC = 80°$. Point $A$ is given in the answer space below. [2]

(ii) Write down the angle of $\angle BCA$.

(iii) Construct the perpendicular bisector of line $AB$. [1]

(iv) Construct the angle bisector of $\angle ABC$ and produce it to cut $AC$. Label the intersection $P$. [1]

(v) Write down the length of $BP$.




**Ans:** (ii) _____ ° [1]

**Ans:** (v) _____ *cm* [1]

**END OF PAPER**



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# END-OF-YEAR EXAMINATION 2012 [ANSWERS]

| | | |
| --- | --- | --- |
| Name of Pupil | : | _____ (  ) |
| Class | : | _____ |
| Subject / Code | : | Mathematics |
| Paper | : | 1 |
| Level | : | Sec 1 Express |
| Date | : | 5 Oct 2012 |
| Duration | : | 1 hour |
| Setter | : | Ms Ng He Li |

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The total number of marks for this paper is 50.

This question paper consists of 10 printed pages, including this Cover Page.

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**Answer all the questions.**

**1.** **(i)** Express 2016 as a product of its prime factors.

**(ii)** Given that $5488 = 2^4 \times 7^3$, find the lowest common multiple of 5488 and 2016.

**(iii)** Given that $2016k$ is a perfect square, write down the smallest possible integer value of $k$.

**Answers**

(i)

| | |
|---|---|
| 2 | 2016 |
| 2 | 1008 |
| 2 | 504 |
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

$2016 = 2^5 \times 3^2 \times 7$ [A1]

(ii) $5488 = 2^4 \times 7^3$

$\text{LCM} = 2^5 \times 3^2 \times 7^3$ [M1]

$= 98784$ [A1]

(iii) $k = 2 \times 7 = 14$ [A1]

**2.** Consider the numbers below.

$$-\sqrt{10},\ 0.2,\ \sqrt{81},\ \sqrt{25},\ \frac{2}{81}$$

From the list, write down

**(i)** one irrational number,

**(ii)** one positive integer,

**(iii)** one prime number.

**Answers**

(i) $-\sqrt{10}$ [A1]

(ii) $\sqrt{81}$ or $\sqrt{25}$ [A1]

(iii) $\sqrt{25}$ [A1]



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3. Estimate, without the use of calculators, the value of $\frac{(2.01)^2 \times \sqrt{63.22}}{\sqrt{24.85} \div 4.89}$, giving your answer to 1 significant figure.

**Answers**

$$\frac{(2.01)^2 \times \sqrt{63.22}}{\sqrt{24.85} \div 4.89} \approx \frac{(2)^2 \times \sqrt{64}}{\sqrt{25} \div 5} \quad \text{[M1]}$$

$$= \frac{4 \times 8}{5 \div 5}$$

$$= 32 \quad \text{[M1]}$$

$$\approx 30 \quad \text{[A1]}$$

4. **(i)** Subtract $3x - 5y$ from the sum of $5x - 7y + 4z$ and $3y + 4z - 3x$.

**(ii)** Simplify $\frac{2}{3x+5} - \frac{3x}{5}$.

**Answers**

(i) $(5x - 7y + 4z) + (3y + 4z - 3x) - (3x - 5y)$ [M1]

$= -x + y + 8z$ [A1]

(ii) $\frac{2}{3x+5} - \frac{3x}{5} = \frac{2(5) - 3x(3x+5)}{5(3x+5)}$ [M1]

$= \frac{10 - 9x^2 - 15x}{5(3x+5)}$ [A1]

5. If $x = 3$, $y = -1$, $z = -4$, find the value of $x(y-1) + z^2 x$.

**Answers**

$x(y-1) + z^2 x = (3)[(-1) - 1] + (-4)^2(3)$ [M1]

$= -6 + 48$

$= 42$ [A1]



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6. (i) Solve the inequality $3x-4\le 16$.

(ii) State the greatest value of $x$ if $x$ is a prime number.

(iii) State the greatest value of $x$ if $x$ is a rational number.

**Answers**

(i) $3x-4\le 16$

$3x\le 16+4$

$3x\le 20$ [M1]

$x\le \frac{20}{3}$

$x\le 6\frac{2}{3}$ [A1]

(ii) Greatest value of $x$ if $x$ is a prime number $= 5$ [A1]

(iii) Greatest value of $x$ if $x$ is a rational number $= 6\frac{2}{3}$ [A1]

7. The table below shows the temperatures in a number of cities at noon on a particular day.

| Beijing | Kuala Lumpur | Singapore | Moscow |
|---|---|---|---|
| $-3°C$ | $28°C$ | $32°C$ | $-10°C$ |

(i) What is the coldest city?

(ii) Find the difference in temperature between Kuala Lumpur and Moscow.

(iii) The temperature in Hong Kong is exactly midway between the temperatures in Singapore and Beijing. Find the temperature in Hong Kong.

**Answers:**

(i) Moscow [A1]

(ii) $28-(-10)=38°C$ [A1]

(iii) $\frac{32-(-3)}{2}=17.5°C$ [A1]



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8. A sum of money is divided among Gwen, Clara and Devina. The ratio of the amount of money received by Gwen to the amount received by Clara is 2 : 3 and the ratio of the amount of money received by Clara to the amount received by Devina is 5 : 4.

**(i)** Find the ratio of the amount of money received by Gwen to the amount received by Devina.

**(ii)** If Clara receives $225, calculate the total amount of money shared among the three girls.

**Answers:**

(i) Gwen : Clara  Clara : Devina

2 : 3  5 : 4

10 : 15  15 : 12  [M1]

Gwen : Devina

5 : 6  [A1]

(ii) 15 units → $225

1 unit → $\frac{225}{15} = \$15$  [M1]

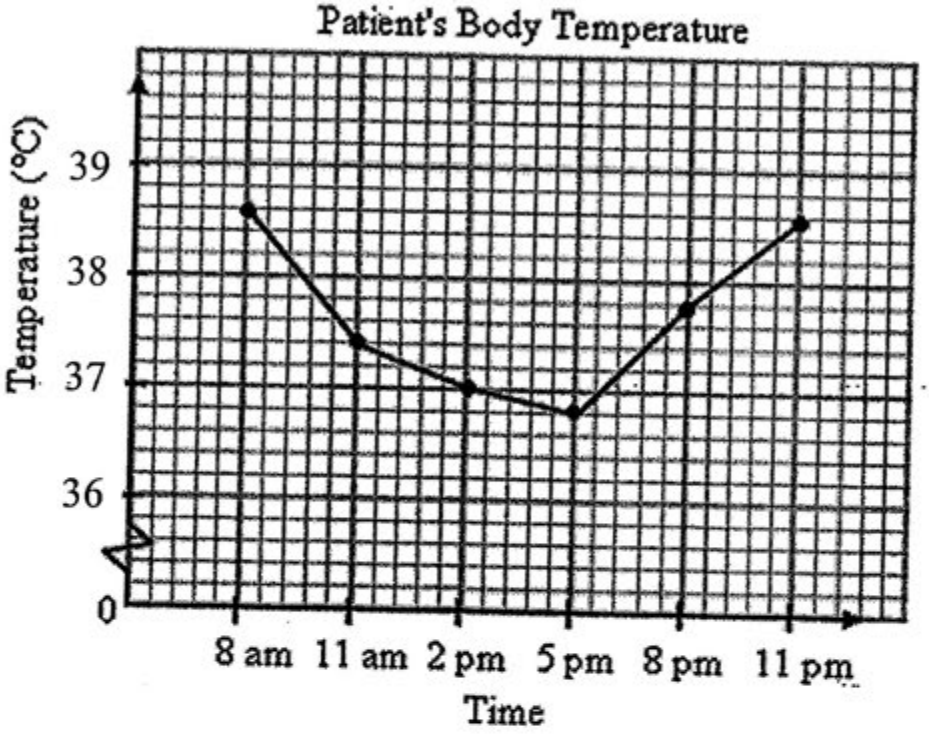
$(10+15+12)\times 15$

$= \$555$  [A1]



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9. The line graph below shows the change in body temperature of a male patient from 8.00 a.m. to 11.00 p.m. The temperatures are taken every 3 hours. The normal temperature of a person is approximately $37°C$.




(i) State the period of decline of his temperature till it reaches normal.

(ii) State which is the 3 hours period of highest increase in the temperature and state the percentage increase.

(iii) Calculate the average temperature from 8a.m. to 11p.m.

**Answers:**

(i) 8 a.m. to 2 p.m. [A1]

(ii) Period of highest increase – 5 p.m. to 8 p.m. [M1]

$$\frac{37.8-36.8}{36.8}\times 100 = 2.717\% \approx 2.72\%$$ [A1]

(iii) $$\frac{38.6+37.4+37+36.8+37.8+38.6}{6}$$ [M1]

$$= 37.7°C$$ [A1]



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**10.** The length of a rectangle is two times more than its breadth. The breadth of the rectangle is $x$ centimetres.

**(i)** Express the perimeter of the rectangle in terms of $x$.

**(ii)** If the perimeter of the rectangle is less than 201 cm, find the largest possible length of the breadth.

Answers:

(i) Length → $3x$ cm

Perimeter → $(2\times 3x)+(2\times x)$ [M1]

$= 8x$ cm [A1]

(ii) $8x < 201$ [M1]

$x < \frac{201}{8}$

$x < 25.125$

The largest possible breadth is 25 cm. [A1]

**11.** The diagram below shows a sequence formed by using layers of marbles.

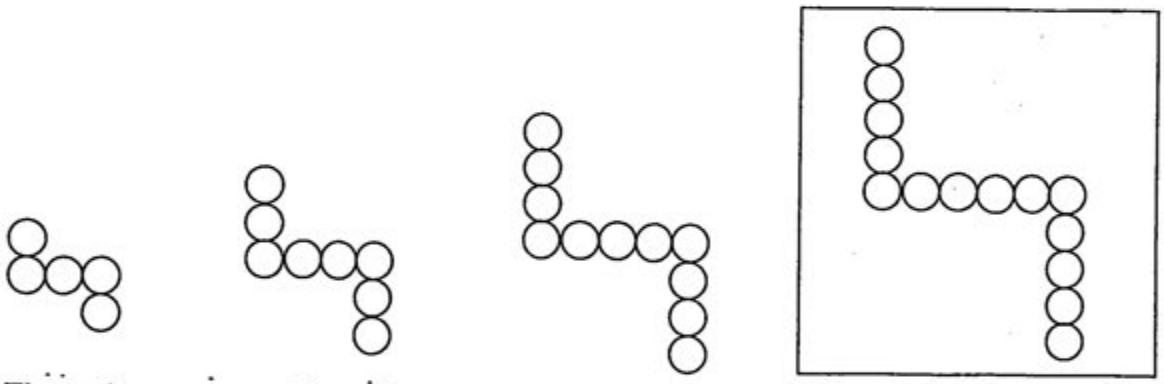


**Figure 1** **Figure 2** **Figure 3** **Figure 4** [1]

**(i)** Draw Figure 4 in the answer space above.

**(ii)** Write down an expression, in terms of $n$, to represent the number of marbles in the $n$th diagram.

**(iii)** Find the number of marbles in Figure 28.

**Answers:**

(ii) $T_1 = 5 \quad = 5 \qquad\qquad = 5+2(1-1)$

$T_1 = 7 \quad = 5+2 \qquad\qquad = 5+2(2-1)$

$T_1 = 9 \quad = 5+2+2 \qquad = 5+2(3-1)$

$T_1 = 11 = 5+2+2+2 = 5+2(4-1)$ [M1]



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$T_n = 5 + 2(n-1)$

$= 3n + 2$ [A1]

(iii) $T_{28} = 3(28) + 2 = 86$ [A1]

**12.** A tap takes 80 seconds to fill 18 litres of water in a tank.

**(i)** Calculate the rate of water flowing into the tank per minute.

**(ii)** If the tank is 90cm long, 50cm wide, 1.5m high, how long would it take to fill the tank completely with water? Give your answer in minutes. ($1000\text{cm}^3 = 1$ litre)

**Answers:**

(i) 80 sec → 18 litres

1 sec → $\frac{18}{80}$

60 sec → $\frac{18}{80} \times 60$ [M1]

= 13.5 litres / minute [A1]

(ii) $90 \times 50 \times 150 = 675000\,\text{cm}^3$ [M1]

$675000\ \text{cm}^3 = 675$ litres

$\frac{675}{13.5} = 50$ minutes [A1]



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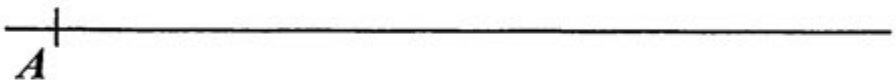
13. (i) Draw the triangle $ABC$ given that the base $AB = 8$ cm, $BC = 9.5$ cm and $\angle BAC = 80^\circ$. Point $A$ is given in the answer space below. [2]

(ii) Write down the angle of $\angle BCA$. [1]

(iii) Construct the perpendicular bisector of line $AB$. [1]

(iv) Construct the angle bisector of $\angle ABC$ and produce it to cut $AC$. Label the intersection $P$. [1]

(v) Write down the length of $BP$. [1]






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| Marks |
| --- |
| /50 |

# END-OF-YEAR EXAMINATION 2012

| | | |
| --- | --- | --- |
| Name of Pupil | : | _____ (  ) |
| Class | : | _____ |
| Subject / Code | : | Mathematics |
| Paper | : | 2 |
| Level | : | Sec 1 Express |
| Date | : | 12 Oct 2012 |
| Duration | : | 1 hour 15 min |
| Setter | : | Mr Tan Y L |

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At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This question paper consists of 4 printed pages, including this Cover Page.

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**Answer all the questions.**

1. **(a)** Tim travels from Town $A$ to Town $B$ by bus to meet his friend Sam. The bus drove at a speed of 50 km/h for 75 km. It was 11.20 am when Tim reached Town $B$.

   **(i)** Convert 50 km/h to m/s. [1]

   **(ii)** Find the time Tim started his journey. [2]

   **(b)** After waiting 15 minutes for Sam, they took Sam's car to Town $C$. It was 1.55 pm when they reached Town $C$. If the distance between Town $B$ and Town $C$ is 154 km, find

   **(i)** the speed of the car, [3]

   **(ii)** the average speed from Town $A$ to Town $C$ for Tim. [2]

2. **(a)** Factorise $4ab - 10c + 6a^2b - 15ac$ completely. [2]

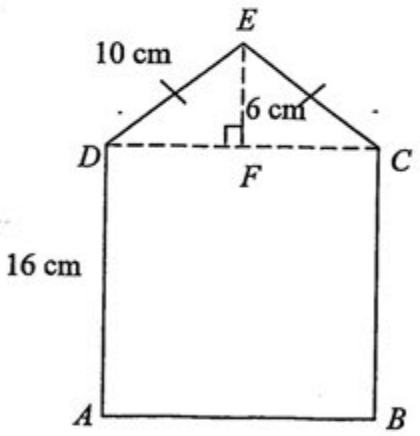
   **(b)** 3 security guards leave their guard room for patrolling at the same time. Guard $A$ takes 8 minutes to finish his route, Guard $B$ takes 22 minutes and Guard $C$ takes 20 minutes. If they leave their room at 3.50 pm, what time would they leave the room together again? [3]

3. During Art lesson, Joe drew a hut consisting of a square $ABCD$ and an isosceles triangle $CED$. $EF = 6$ cm, $ED = 10$ cm, $AD = 16$ cm and $F$ is the midpoint of $CD$.

   Find

   **(a)** the perimeter of the hut, [2]

   **(b)** the area of the hut. [3]






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4. Adam is $a$ years old this year. His sister, Betty, is 4 years older than him.

(a) Express Betty's age this year in terms of $a$. [1]

Five years ago, Adam was two-third as old as Betty.

(b) Form an algebraic equation in terms of $a$. [1]

(c) Solve for $a$ and hence find Betty's age this year. [3]

5. (a) Find the number of sides of a regular polygon whose exterior angle is 72°. [2]

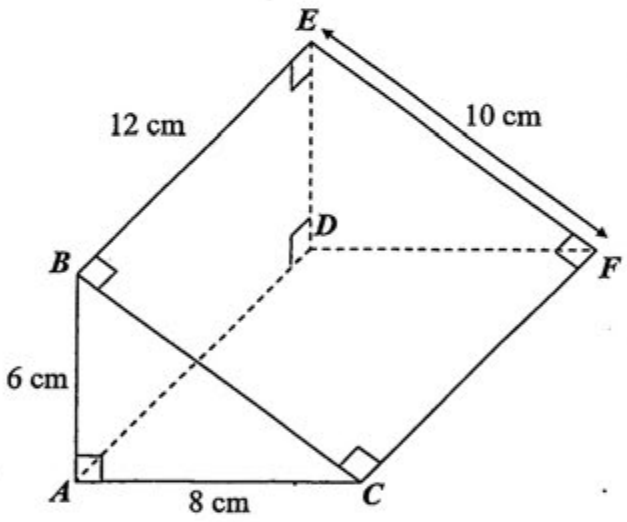
(b) In a 6-sided polygon, 3 of the interior angles are 105°, 99° and 120°. If the size of each remaining interior angle of the polygon is $x°$, calculate

(i) the sum of interior angles of the 6-sided polygon, [2]

(ii) the value of $x$. [2]

6. The prism below has a cross-section which is a right-angled triangle.

$AB = 6$ cm, $AC = 8$ cm, $EF = 10$ cm and $BE = 12$ cm.




Find the

(a) area of the cross-section $ABC$, [2]

(b) volume of the prism, [1]

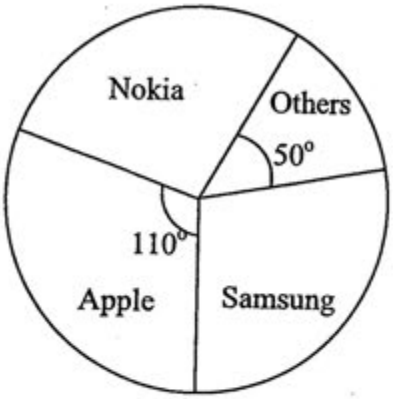
(c) total surface area of the prism, [2]

(d) minimum number of paint bottles needed to paint the prism if each bottle can paint 100 $cm^2$. [2]



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7. The pie chart below shows the survey data of favourite cell phone brands by some Yuying students last year.




(a) If 90 students liked Apple more than Others, find

(i) the number of Yuying students who liked Apple, [2]

(ii) the number of students who liked Nokia, if there were twice as many students who liked Nokia as compared to Others. [2]

(b) 20 % of the Yuying students who liked Apple were females.
How many male students like Apple? [2]

**Answer the whole of this question on a piece of graph paper.**

8. The table below shows some values for the equation $y = 3 - 2x$.

| $x$ | $-1$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| $y$ | 5 | $p$ | 1 | $-1$ | $q$ | $-5$ |

(a) Calculate the values of $p$ and $q$. [2]

(b) Using a scale of 2 cm to 1 unit for both axes, draw the graph of $y = 3 - 2x$ for $-1 \leq x \leq 4$. [3]

(c) Using your graph, find the value of $x$ when $y = -2$. [1]

(d) Draw the line of $x = 1.4$. Find the coordinates of the point of intersection of the two lines. [2]

**- End of Paper -**



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## Marking Scheme

| | | |
|---|---|---|
| **1ai)** | 50 km/h = 13.9 m/s (3 s.f.) | B1 |
| **aii)** | Time taken = 1.5 h<br>Time that journey started: 9.50 am | M1<br>A1 |
| **bi)** | Time taken = $2\frac{1}{3}$ h | M1 |
| | Speed of car = $\frac{154}{2\frac{1}{3}}$ | M1 |
| | = 66 km/h | A1 |
| **bii)** | Average speed = $\frac{75+154}{1\frac{1}{2}+\frac{1}{4}+2\frac{1}{3}}$ | M1 |
| | = 56.1 km/h (3 s.f.) | A1 |
| **2a)** | $4ab - 10c + 6a^2b - 15ac = 2(2ab - 5c) + 3a(2ab - 5c)$<br>$= (2ab - 5c)(2 + 3a)$ | M1<br>A1 |
| **b)** | Prime factorisation = $2^3 \times 5 \times 11$<br>= 440 minutes | M1<br>M1 |
| | Time met = 11.10 pm | A1 |
| **3a)** | Perimeter of hut = 3(16) + 2(10)<br>= 68 cm | M1<br>A1 |
| **b)** | Area of $\Delta EDC = 48$ cm$^2$<br>Area of $ABCD = 256$ cm$^2$<br>Area of Hut = 48 + 256<br>= 304 cm$^2$ | M1<br>M1<br>A1 |

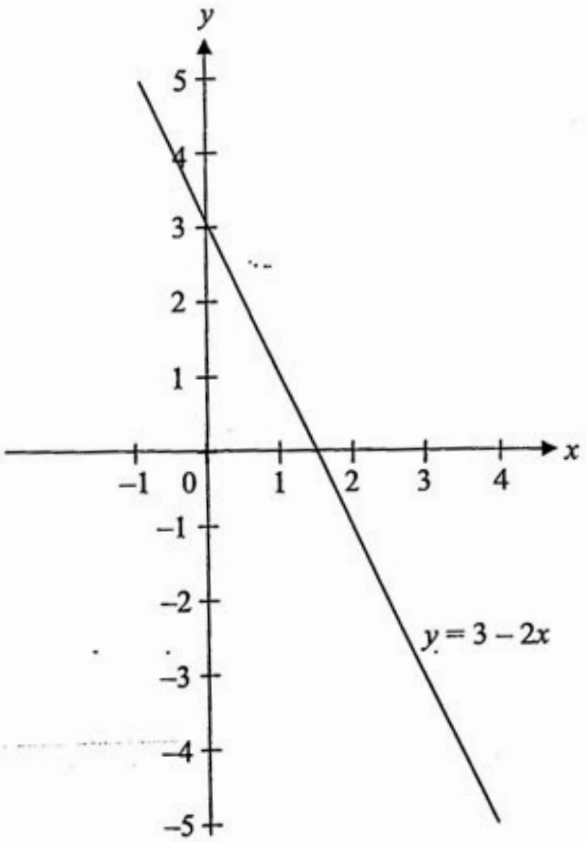


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| | | |
|---|---|---|
| **4a)** | Betty's age: (a + 4) years old | B1 |
| **b)** | $a-5=\frac{2}{3}(a+4-5)$ | B1 |
| **c)** | $a-5=\frac{2}{3}(a-1)$ | |
| | $a-5=\frac{2}{3}a-\frac{2}{3}$ | M1 |
| | $a=13$ | M1 |
| | Betty's age = 17 years old | A1 |
| **5a)** | No. of sides $=\frac{360}{72}$ | M1 |
| | $=5$ | A1 |
| **bi)** | Sum of interior angles $=(6-2)\times 180$ | M1 |
| | $=720^\circ$ | A1 |
| **bii)** | $720^\circ = 105^\circ + 99^\circ + 120^\circ + 3x$ | M1 |
| | $x=132^\circ$ | A1 |
| **6a)** | Area of $\Delta ABC = 0.5\times 8\times 6$ | M1 |
| | $=24\ \text{cm}^2$ | A1 |
| **b)** | Volume $=24\times 12$ | |
| | $=288\ \text{cm}^3$ | B1 |
| **c)** | Total surface area $=(24\times 2)+(12\times 6)+(8\times 12)+(10\times 12)$ | M1 |
| | $=336\ \text{cm}^2$ | A1 |
| **d)** | No. of paint bottles needed $=\frac{336}{100}$ | M1 |
| | $\approx$ 4 bottles (rounded up to nearest whole no.) | A1 |



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| | | |
|---|---|---|
| **7ai)** | No. of students who liked Apple $= \frac{110}{110-50} \times 60$<br>$= 165$ | M1<br>A1 |
| **aii)** | No. of students who liked Nokia $= \frac{2(50)}{60} \times 90$<br>$= 150$ | M1<br>A1 |
| **b)** | No. of male students who liked Apple $= \frac{80}{100} \times 165$<br>$= 132$ | M1<br>A1 |
| **8a)** | $p = 3$,<br>$q = -3$ | B1<br>B1 |
| **b)** |  | B1: correct scale<br>B1: equation labelled<br>B1: axis labelled |
| **c)** | $x = 2.5$ | B1 |
| **d)** | $x = 1.4$ line drawn<br>$(1.4, 0.2 \pm 0.1)$ | B1<br>B1 |



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