No P1.

# YISHUN SECONDARY SCHOOL

*We Seek, We Strive, We Soar*

# MID-YEAR EXAMINATION

**Name:** _____ **Reg. No:** _____ **Class:** _____

**Calculator Model:** _____

**Sec 2 Express** **Date: 14 May 2014**

**MATHEMATICS**

**Part2** **Duration: 1hr 30min**

**MAX MARKS: 60**

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and index 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 with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, 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 of the marks for this paper is 60.



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Answer **all** questions.

**1** Consider the first 3 lines of the following number pattern.

$$2^3-2=6 \quad =1\times2\times3$$
$$3^3-3=24=2\times3\times4$$
$$4^3-4=60=3\times4\times5$$
$$\vdots$$

(i) Write down the $6^{th}$ line of this sequence. [1]

(ii) Express $n^3-n$ as a product of 3 consecutive algebraic expressions. [1]

(iii) Ronald believes that the number 70 359 will not be part of the number pattern. State whether you agree with Ronald or not, and explain why. [1]

**2** (a) Express $1-\dfrac{v-3}{5v}$ as a single fraction. [2]

(b) Simplify $\dfrac{r+4}{p-3r}\div\dfrac{2r^2+r-28}{3r^2-pr}$. [3]

**3** (a) (i) Make $m$ the subject of the formula $x=\sqrt[3]{\dfrac{5K}{4m-3}}$. [3]

(ii) Hence, find the value of $m$ when $x=2$ and $K=40$. [2]

(b) Factorise $4ab-10c+2a^2b-5ac$ completely. [2]

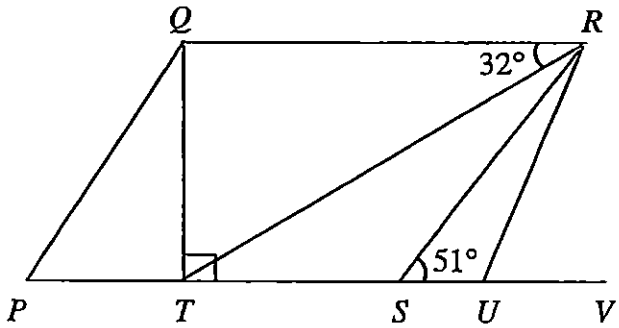
**4** (a) Consider a regular $n$-sided polygon.
The size of each interior angle is three times the size of each exterior angle.
Find the value of $n$. [2]

(b) In a class test, Beniah drew a rhombus$ABCD$.
Using a protractor, he found that $\angle ABC=82°$, while $\angle BCD=98°$.
He got worried and decided to redraw his rhombus.
ShouldBeniah have gotten worried? State your reason(s) clearly. [2]



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5




In the diagram, $PQRS$ is a parallelogram.
It is known that $\angle QTS = 90°$, $\angle QRT = 32°$, $\angle RSU = 51°$, and $TU = UR$.

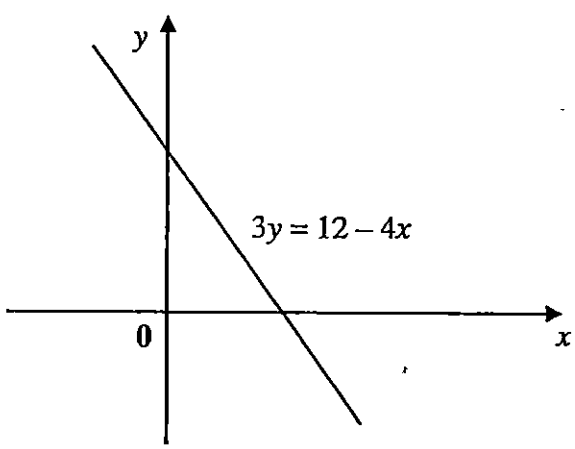
Clearly stating your reasons, find

(i) $\angle TRS$, [1]

(ii) $\angle PQR$, [1]

(iii) $\angle RUV$. [2]

6 A line has an equation given by $3y = 12 - 4x$.




(a) Explain clearly whether the point ( 6 , –10 ) lies on the line. [1]

(b) (i) State the coordinates of the point where the line intersects the $x$-axis. [1]

(ii) State the coordinates of the point where the line intersects the $y$-axis. [1]

(iii) Hence or otherwise, find the gradient of the line. [2]



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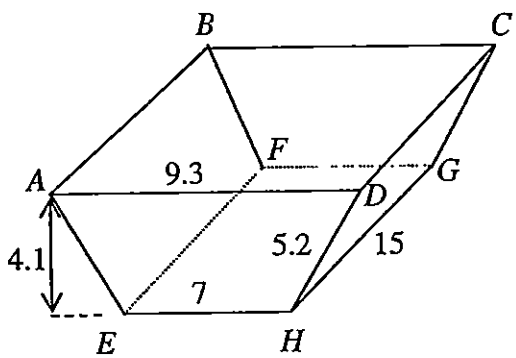
7 A farmer rears $x$ horses and $y$ chickens on his farm.
The animals have 448 legs in total, and there are 5 times as many chickens as horses.

(i) Formulate a pair of simultaneous equations in $x$ and $y$. [2]

(ii) Solve the 2 simultaneous equations in (i),and hence find the number of horses on the farm. [2]

(iii) After a disease struck the farm, 95 chickens died.
Express the remaining number of chickens as a percentage of the original number of chickens. [2]

8




The figure above shows a gold bar.
The gold bar is a prism whose cross-section is a trapezium where $AD = 9.3$ cm, $AE = DH = 5.2$ cm and $EH = 7$ cm.
The vertical height and length of the gold bar are 4.1 cm and 15 cm respectively.

(a) Find the total surface area of the gold bar. [3]

(b) (i) Find the volume of the gold bar. [2]

(ii) The gold bar is then melted down.
The liquid gold is placed into a cylindrical mould of radius 8 cm.
Calculate the height of the liquid gold in the mould. [2]

(iii) State one assumption made in (b)(ii). [1]


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9 Mira and Alan participated in a cross country hike.
They each hiked a distance of 80 km.

(i) Mira hiked at a constant speed of $x$ km/h.
Write down an expression, in terms of $x$, for the time she took to complete the hike. [1]

(ii) Alan hiked at a constant speed which was 4 km/h less than Mira's speed.
Write down an expression, in terms of $x$, for the time he took to complete the hike. [1]

(iii) Given that Mira and Alan finished their respective hikes10 hours apart, form an equation in $x$, and show that it reduces to $x^2 - 4x - 32 = 0$. [3]

(iv) Solve the equation $x^2 - 4x - 32 = 0$. [2]

(v) Hence, calculate how long Alan took to complete the hike. [2]

**Note: Q10 is on page 6**



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

The variables $x$ and $y$ are connected by the equation $y = 15 - 3x - x^2$.
The table below shows some values of $x$ and the corresponding values of $y$.

| $x$ | –3 | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | $a$ | 17 | 17 | 15 | 11 | 5 | –3 |

(i) Find the value of $a$. [1]

(ii) Using a scale of 2 cm to 1 unit, draw a horizontal $x$-axis for $-3 \le x \le 3$.
Using a scale of 1 cm to 1 unit, draw a vertical $y$-axis for $-4 \le y \le 18$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]

(iii) Use your graph to

(a) estimate the maximum value of the graph $y = 15 - 3x - x^2$, [1]

(b) write down the coordinates of the point where the graph cuts the positive $x$-axis, [1]

(c) find the values of $x$ when $y = 16$, [2]

(d) find the equation of the line of symmetry of the graph. [1]

**End of Paper**
**Please check your work thoroughly! ☺**



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Answers to P2

| | | | |
|---|---|---|---|
| 1(i) | $7^3-7=336 \ =6\times7\times8$ | 6(a) | Does not lie on the line. |
| 1(ii) | $(n-1)(n)(n+1)$ | 6(b)(i) | (3,0) |
| 1(iii) | Agree. The sequence always yields an even number, but 70 359 is odd. | 6(b)(ii) | (0,4) |
| 2(a) | $\frac{4v+3}{5v}$ | 6(b)(iii) | $-\frac{4}{3}$ |
| 2(b) | $\frac{r}{7-2r}$ or $-\frac{r}{2r-7}$ | 7(i) | $4x+2y=448$<br>$y=5x$ |
| 3(a)(i) | $\frac{5K}{4x^3}+\frac{3}{4}$ | 7(ii) | $x=32$ |
| 3(a)(ii) | 7 | 7(iii) | 40.625% or $40\frac{5}{8}\%$ |
| 3(b) | $(2+a)(2ab-5c)$ | 8(a) | 467.33 $cm^2$ |
| 4(a) | $n=8$ | 8(b)(i) | 501.225 $cm^3$ or $501\frac{9}{40}$ $cm^3$ |
| 4(b) | No. The angles should add up to 180°. | 8(b)(ii) | 2.49 cm |
| 5(i) | 19° | 8(b)(iii) | Volume remains constant / No air bubbles formed when gold is poured into mould / any other reasonable answer |
| 5(ii) | 129° | 9(i) | $\frac{80}{x}$ |
| 5(iii) | 64° | 9(ii) | $\frac{80}{x-4}$ |
| | | 9(iv) | $x=-4, \ or \ x=8$ |
| | | 9(v) | 20 h |
| | | 10(i) | 15 |

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