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| Name: | Class: Sec 4 | Class Register No: _____ |
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中正中学

**CHUNG CHENG HIGH SCHOOL
(MAIN)**

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Parent's
Signature

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**2009 PRELIMINARY EXAMINATION 1
SECONDARY 4**

**MATHEMATICS
Paper 1**

Monday, 4th May 2009

1 hour

Instructions to Candidates:

Write your name, class and register number in the spaces at the top of this page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use 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.

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 π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

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 40.

This paper consists of 10 printed pages.

Mathematical Formulae

Compound interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4 \pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} a b \sin C$$

$$\text{Arc length} = r \theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2 b c \cos A$$

Statistics

$$\text{Mean} = \frac{\sum f x}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum f x^2}{\sum f} - \left(\frac{\sum f x}{\sum f} \right)^2}$$

1. (a) Evaluate $\frac{6.44 \times 10^6}{2.7 \times 10^4}$.
Give your answer in standard form.
- (b) Find the decimal number exactly halfway between 2.02 and 2.03.

Ans (a) _____ [1]

(b) _____ [1]

2. Express
- (a) 3.2 hours in minutes,
- (b) $\frac{43}{80}$ as a percentage.

Ans (a) _____ minutes [1]

(b) _____ % [1]

3. Given that p and q are integers where $-10 \leq p \leq 1$ and $1 \leq q \leq 7$, find
- (a) the least possible value of pq ,
 - (b) the greatest possible value of $(p+q)^2$.

Ans (a) _____ [1]

(b) _____ [1]

4. A bag contains 10 balls labelled with different numbers 1, 2, 3, ..., 9, 10 on them. A ball is drawn from the bag. Find the probability that the number on the ball drawn is
- (a) a prime number,
 - (b) a multiple of 4.

Ans (a) _____ [1]

(b) _____ [1]

5. Ali and Bala took a series of online quizzes throughout the year. Their results are shown in the tables below.

Ali

| | | | | | |
|-----------|---|---|---|---|---|
| Marks | 1 | 2 | 3 | 4 | 5 |
| Frequency | 2 | 3 | 1 | 1 | 3 |

Bala

| |
|--------------------------|
| Mean = 3.7 |
| Standard Deviation = 0.6 |

- (a) Calculate the mean and standard deviation of Ali's set of marks.
(b) Compare briefly the results between Ali and Bala.

Ans (a) Mean: _____ [1] Standard Deviation: _____ [1]

(b) _____
_____ [1]

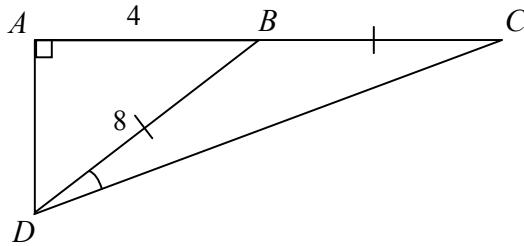
6. Solve the simultaneous equations

$$\begin{aligned}x - 4y &= 11 \\ 2y &= 3x + 2\end{aligned}$$

Ans $x =$ _____

$y =$ _____ [3]

7. In the diagram, ABC is a straight line.
 $AB = 4\text{cm}$, $BD = 8\text{cm}$, $BD = BC$ and $\angle BAD = 90^\circ$.
 (a) Find $\cos\angle CBD$.
 (b) Hence or otherwise, find $\angle BDC$.



Ans (a) _____ [1]

(b) _____ $^\circ$ [2]

8. It is given that y is inversely proportional to x^2 and that $y = 5$ when $x = 2$.
 (a) Express y in terms of x .
 (b) If x is decreased by 50%, find the percentage increase in y .

Ans (a) $y =$ _____ [1]

(b) _____ % [2]

9. It is given that $\mathbf{P} = \begin{pmatrix} -1 \\ 5 \\ 3 \end{pmatrix}$, $\mathbf{Q} = \begin{pmatrix} 2 \\ 0 \\ -4 \end{pmatrix}$, $\mathbf{R} = \begin{pmatrix} 3 & -2 & 2 \\ 0 & 1 & -4 \end{pmatrix}$ and $\mathbf{S} = \begin{pmatrix} 2 & -3 \\ 1 & -4 \end{pmatrix}$.

Find

(a) $\mathbf{P} - 2\mathbf{Q}$,

(b) \mathbf{RQ} ,

(c) \mathbf{S}^2 .

Ans (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

10. A straight line with equation $5x + 2y = 1$ passes through the points A and B .
 A lies on the x -axis and B lies on the y -axis.

Find

(a) the coordinates of A and B ,

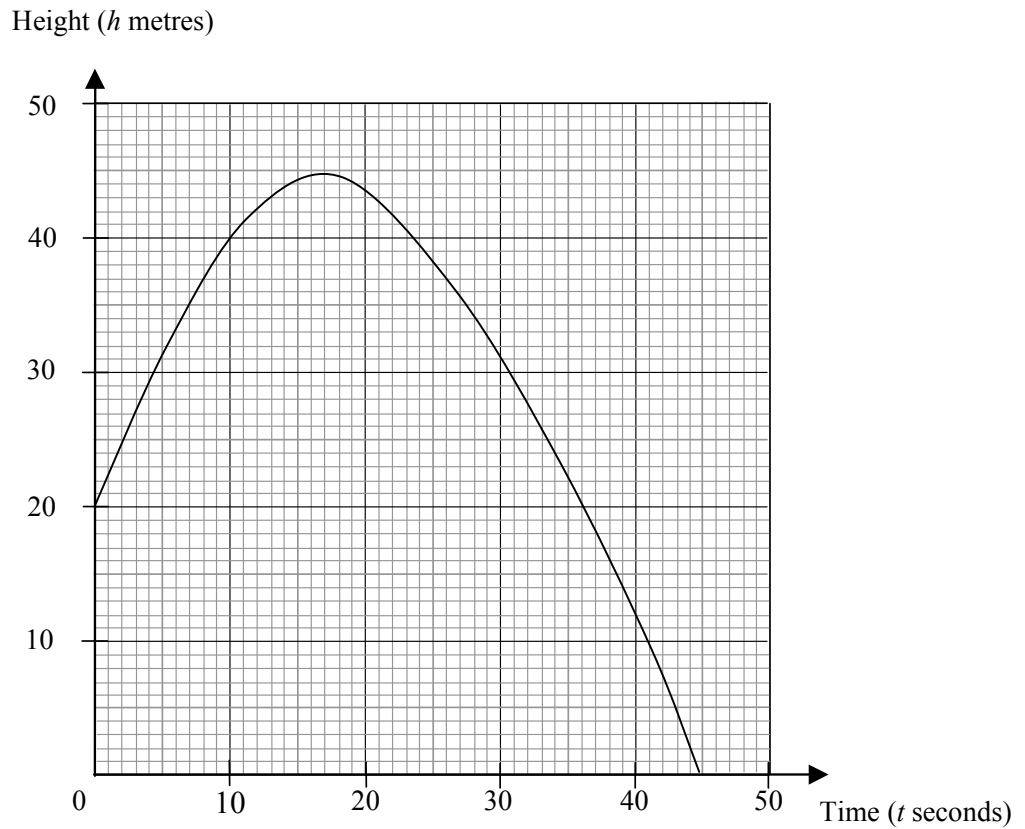
(b) the length of AC , given that C is $(1, 2)$.

Ans (a) A (_____, _____) [1]

B (_____, _____) [1]

(b) _____ units [1]

11. A stone was thrown upwards from the top of a vertical tower. The height, h metres, of the stone above the ground at a time t seconds after it was thrown is shown by the diagram below.



- (a) By drawing a suitable tangent in the above diagram, find the gradient of the graph at the point where $t = 20$.
- (b) Use your answer to (a) to explain what was happening to the stone at $t = 20$.

Ans (a) _____ [2]

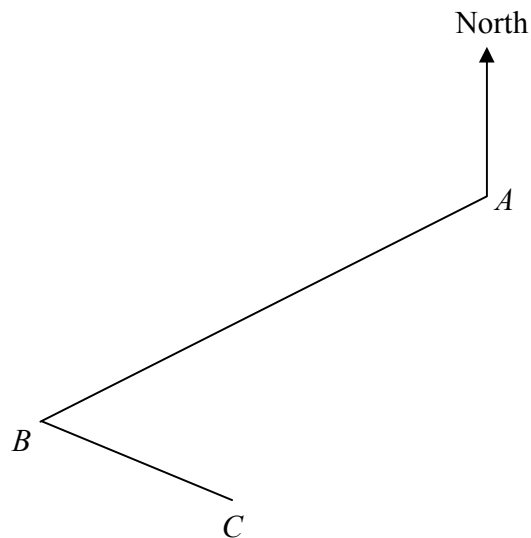
(b) _____
 _____ [1]

12. A map is drawn to a scale of 1 cm : 2km.
 The diagram below shows the positions of three villages A , B and C on the map.
- Find the actual distance, in kilometres, between the villages A and B .
 - Find the bearing of B from A .

Ans (a) _____ km [1]

(b) _____ ° [1]

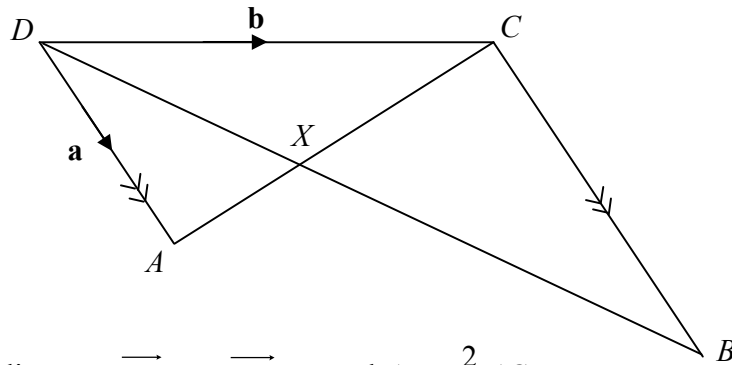
Answer (c), (d)



- Construct the perpendicular bisector of AB . [1]
- A fire-station is to be built so that it is *equidistant from A and B and 10km from C .
 Mark with letters E and F the two possible positions of the fire-station. [2]

**Equidistant means equal distance.*

13.



In the diagram, $\overrightarrow{DA} = \mathbf{a}$, $\overrightarrow{DC} = \mathbf{b}$ and $AX = \frac{2}{5}AC$.

- (a) Find, in the form $p\mathbf{a} + q\mathbf{b}$, where p and q are constants,
- \overrightarrow{AC} ,
 - \overrightarrow{AX} ,
 - \overrightarrow{DX} .
- (b) It is given that AD is parallel to BC .
- Show that triangle ADX is similar to triangle CBX .
 - Find $\frac{\text{area of } \triangle ADX}{\text{area of } \triangle CBX}$.

Ans (ai) _____ [1]

(aii) _____ [1]

(aiii) _____ [1]

(bi) _____

_____ [1]

(bii) _____ [2]

-END OF PAPER-