



**EPPING BOYS' HIGH SCHOOL**  
**YEAR 10 STAGE 3 MATHEMATICS**  
**2006 Yearly Examination**

Date: 200610275

Time allowed: 70 minutes

Name: \_\_\_\_\_

Class 10M \_\_\_\_\_

*All questions may be attempted.*

*Figures are not necessarily drawn to scale.*

*Except for multiple choice questions, working must be shown.*

*1 mark is awarded for each correct answer to multiple choice questions.*

Section	I	II	III	IV	Total	%
Topic	Algebra	Trig	Vol & SA	Stats		
Full marks	20	20	15	15	70	100
Score						

**SECTION I Algebra**

**Questions**

**Answers**

01. If $4x + 3 = 0$ , then $x =$ A. $\frac{3}{4}$ B. $-\frac{3}{4}$ C. $\frac{4}{3}$ D. $-\frac{4}{3}$	
02. If $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ , then $v =$ A. $\frac{uf}{u-f}$ B. $\frac{uf}{f-u}$ C. $f-u$ D. $u-f$	
03. If $n$ is a non-zero integer, which statement below is always true? A. $2n \geq n-7$ B. $\frac{n}{100} < n$ C. $n^2 \geq n$ D. $2^n$ is an integer.	
04. $a^2 - b^2 =$ A. $(a-b)^2$ B. $(b-a)^2$ C. $(b-a)(b+a)$ D. $(a-b)(a+b)$	

**Questions****Answers**

05. If  $\sqrt{x^2 - 25}$  is a real number, then  $x$  **cannot** be  
A. 36            B. -7            C. 4            D. -5

06. Solve for  $x$ : [10]

(a)  $(x - 7)^2 = 8$  (Leave your answers in surd form.)

(b)  $(x - 5)(x + 2) = 0$

(c)  $x^2 - 7x + 12 = 0$

(d)  $3x^2 - 7x - 8 = 0$  (Leave your answer in surd form.)

(e)  $x + 1 = \frac{6}{x}$

07. Solve the following pair of simultaneous equations: [2]

$$2x - 5y = 30$$

$$14x + 15y = -20$$

08. John is six times as old as his son. In 24 years time, John will be double his son's age. How old is John now? [3]

**SECTION II Trigonometry**

<b>Questions</b>	<b>Answers</b>
<p>09. In <math>\triangle ABC</math>, <math>\angle A = 59^\circ</math>, <math>\angle B = 30^\circ</math>, and <math>BC = 12</math> cm. The length of <math>AC</math> in cm, correct to 3 decimal places is A. 3.051    B. 7.000    C. 10.286    D. 11.800</p>	
<p>10. <math>\sin 78^\circ \neq</math> A. <math>\sin 102^\circ</math>    B. <math>\sin 258^\circ</math>    C. <math>\cos 12^\circ</math>    D. <math>-\cos 168^\circ</math></p>	
<p>11. Which of the following is the correct cosine rule? A. <math>a^2 = b^2 + c^2 + 2bc \cos A</math>    B. <math>a^2 = b^2 + c^2 - 2bc \cos A</math> C. <math>\cos B = \frac{b^2 + c^2 - a^2}{2bc}</math>    D. <math>\cos C = \frac{a^2 + b^2 - c^2}{2bc}</math></p>	
<p>12. <math>\tan \theta =</math> A. <math>\frac{adj}{opp}</math>    B. <math>\frac{adj}{hyp}</math>    C. <math>\frac{opp}{hyp}</math>    D. <math>\frac{opp}{adj}</math></p>	
<p>13. Which of the following set of data gives rise to an ambiguous case in <math>\triangle ABC</math>? A. <math>c = 4</math> cm, <math>b = 3</math> cm, and <math>a = 6</math> cm. B. <math>a = 20</math> cm, <math>b = 13</math> cm, and <math>\angle B = 29^\circ</math>. C. <math>a = 12</math> cm, <math>\angle A = 40^\circ</math>, and <math>\angle B = 60^\circ</math>. D. <math>b = 7</math> cm, <math>c = 5</math> cm, and <math>\angle A = 45^\circ</math>.</p>	

14. In  $\triangle ABC$ ,  $\angle C = 18^\circ$ ,  $a = 4$  cm, and  $c = (\sqrt{5} - 1)$ cm. [5]  
Find the magnitude of  $\angle A$  and the area of  $\triangle ABC$  to 3 decimal places.

- 
15. In  $\triangle ABC$ ,  $a = 23$  cm,  $b = 11$  cm, and  $c = \sqrt{903}$  cm. [4]  
Find the magnitude of  $\angle C$ , and the area of  $\triangle ABC$  to 3 decimal places.

- 
16. Town  $A$  is 12 km north-east of Town  $B$ ; Town  $B$  is 15 km from Town  $C$ .  
The bearing of Town  $C$  from Town  $B$  is  $120^\circ$ . Find the distance between  
Towns  $A$  and  $C$  to 3 decimal places. Find also the bearing of Town  $C$  from Town  $A$   
to the nearest degree. [6]

### SECTION III Volume and Surface area

#### Questions

#### Answers

17. The formula for the volume of a sphere is

- A.  $4\pi r^2$     B.  $\frac{4}{3}\pi r^2$     C.  $\frac{4}{3}\pi r^3$     D.  $2\pi r^3$

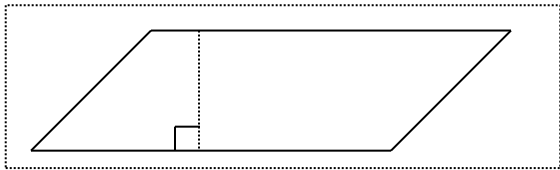
18. The formula for the volume of a cone is

- A.  $2\pi r$     B.  $\frac{1}{3}\pi rh$     C.  $\frac{1}{3}\pi r^2 h$     D.  $\pi r^2 h$

19. The formula for the curved surface area of a cone is

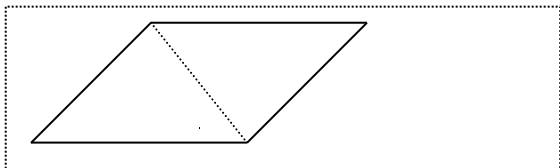
- A.  $3\pi r^2$     B.  $\frac{1}{3}\pi rh$     C.  $\pi rh$     D.  $\pi rs$

20. Given that  $AB = 11$  cm,  $BC = 28$  cm, and the perpendicular distance between  $AD$  and  $BC$  is 9 cm, the area of parallelogram  $ABCD$  in  $\text{cm}^2$  is



- A. 308    B. 252    C. 154    D. 126

21. Given that  $AB = 17$  cm,  $AC = 16$  cm, the area of rhombus  $ABCD$  in  $\text{cm}^2$  is



- A. 136    B. 240    C. 272    D. 480

22. Find the volume of the solid below which consists of a hemisphere surmounted by a cone of equal radii of 3 cm. The height of the cone is 9 cm. Give your answer in terms of  $\pi$ . [4]

23. Find the volume and total surface area of a rectangular pyramid with height 60 cm, and the dimensions of its base is  $50 \text{ cm} \times 22 \text{ cm}$ . **[6]**

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**SECTION IV Statistics**

24. John was awarded 76 marks for both his English and History tests. The mean and standard deviation of the English marks were 52 and 12 respectively; and those of the History marks were 65 and 4 respectively. In which of the two subjects did John do better? Justify your answer with  $z$ -scores. **[4]**

25. Complete the following frequency distribution table:

[1]

<i>Score</i>	<i>frequency</i>	<i>Cumulative frequency</i>
1	13	
2	26	
3	37	
4	33	
5	29	
6	12	

Find the range, mean, mode and median of the above set of scores.

Range =

Mode =

Mean =

Median =

[4]

26.

Class 10MA		Class 10MB	
Leaf	Stem	Leaf	
	1	8	
2	2	345	
	3	0226	
9887	4	1222578	
9986	5	457899	
99988766	6	233	
8876543	7	0027	
766	8		
985	9	13	

The above stem-and-leaf plot shows the marks of a mathematics test of classes 10MA and 10MB. Find the range, median and mode for each of the two classes.

[6]

	Class 10MA	Class 10MB
Range		
Median		
Mode		

**End of the Paper**



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Class 10M

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**SECTION I Algebra**

**Questions**

**Answers**

01. If $4x + 3 = 0$ , then $x =$ A. $\frac{3}{4}$ B. $-\frac{3}{4}$ C. $\frac{4}{3}$ D. $-\frac{4}{3}$	<b>B</b>
02. If $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ , then $v =$ A. $\frac{uf}{u-f}$ B. $\frac{uf}{f-u}$ C. $f-u$ D. $u-f$	<b>A</b>
03. If $n$ is a non-zero integer, which statement below is always true? A. $2n \geq n-7$ B. $\frac{n}{100} < n$ C. $n^2 \geq n$ D. $2^n$ is an integer.	<b>C</b>
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**Questions****Answers**

05. If  $\sqrt{x^2 - 25}$  is a real number, then  $x$  **cannot** be

A. 36

B. -7

C. 4

D. -5

C

06. Solve for  $x$ :

[10]

(a)  $(x-7)^2 = 8$  (Leave your answers in surd form.)

$$x-7 = \pm 2\sqrt{2}$$

$$x = 7 \pm 2\sqrt{2}$$

(b)  $(x-5)(x+2) = 0$

$$x = 5 \text{ or } -2$$

(c)  $x^2 - 7x + 12 = 0$

$$(x-3)(x-4) = 0$$

$$x = 3 \text{ or } 4$$

(d)  $3x^2 - 7x - 8 = 0$  (Leave your answer in surd form.)

$$x = \frac{7 \pm \sqrt{49 + 96}}{6}$$

$$= \frac{7 \pm \sqrt{145}}{6}$$

(e)  $x+1 = \frac{6}{x}$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = 2 \text{ or } -3$$

07. Solve the following pair of simultaneous equations:

[2]

$$2x - 5y = 30$$

$$14x + 15y = -20$$

$$x = 3\frac{1}{2} \text{ and } y = -4\frac{3}{5}$$

08. John is six times as old as his son. In 24 years time, John will be double his son's age. How old is John now? [3]

Let  $x$  be the present age of John.

$$x + 24 = 2\left(\frac{x}{6} + 24\right)$$

$$3x + 72 = x + 144$$

$$x = 36$$

John is 36 years old now.

## SECTION II Trigonometry

Questions	Answers
09. In $\triangle ABC$ , $\angle A = 59^\circ$ , $\angle B = 30^\circ$ , and $BC = 12$ cm. The length of $AC$ in cm, correct to 3 decimal places is A. 3.051    B. 7.000    C. 10.286    D. 11.800	<b>B</b>
10. $\sin 78^\circ \neq$ A. $\sin 102^\circ$ B. $\sin 258^\circ$ C. $\cos 12^\circ$ D. $-\cos 168^\circ$	<b>B</b>
11. Which of the following is the correct cosine rule? A. $a^2 = b^2 + c^2 + 2bc \cos A$ B. $a^2 = b^2 + c^2 - 2bc \cos A$ C. $\cos B = \frac{b^2 + c^2 - a^2}{2bc}$ D. $\cos C = \frac{a^2 + b^2 - c^2}{2bc}$	<b>B</b>
12. $\tan \theta =$ A. $\frac{adj}{opp}$ B. $\frac{adj}{hyp}$ C. $\frac{opp}{hyp}$ D. $\frac{opp}{adj}$	<b>D</b>
13. Which of the following set of data gives rise to an ambiguous case in $\triangle ABC$ ? E. $c = 4$ cm, $b = 3$ cm, and $a = 6$ cm. F. $a = 20$ cm, $b = 13$ cm, and $\angle B = 29^\circ$ . G. $a = 12$ cm, $\angle A = 40^\circ$ , and $\angle B = 60^\circ$ . H. $b = 7$ cm, $c = 5$ cm, and $\angle A = 45^\circ$ .	<b>B</b>

14. In  $\triangle ABC$ ,  $\angle C = 18^\circ$ ,  $a = 4$  cm, and  $c = (\sqrt{5} - 1)$ cm. [5]  
Find the magnitude of  $\angle A$  and the area of  $\triangle ABC$  to 3 decimal places.

$$\frac{\sin A}{4} = \frac{\sin 18^\circ}{\sqrt{5} - 1}$$

$$A = 90^\circ$$

$$CA = \sqrt{16 - (\sqrt{5} - 1)^2}$$

$$= \sqrt{10 + 2\sqrt{5}}$$

$$\text{area of } \triangle ABC = \frac{1}{2}(\sqrt{5} - 1)(\sqrt{10 + 2\sqrt{5}})$$

$$= 2.351 \text{ cm}^2 \text{ (correct to 3 dec. pl.)}$$

15. In  $\triangle ABC$ ,  $a = 23$  cm,  $b = 11$  cm, and  $c = \sqrt{903}$  cm. [4]  
Find the magnitude of  $\angle C$ , and the area of  $\triangle ABC$  to 3 decimal places.

$$\cos C = \frac{23^2 + 11^2 - 903}{2 \times 23 \times 11}$$

$$\angle C = 120^\circ$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times 23 \times 11 \times \sin 120^\circ$$

$$= \frac{253\sqrt{3}}{4} \text{ cm}^2$$

$$= 109.552 \text{ cm}^2$$

16. Town  $A$  is 12 km north-east of Town  $B$ ; Town  $B$  is 15 km from Town  $C$ .  
The bearing of Town  $C$  from Town  $B$  is  $120^\circ$ . Find the distance between Towns  $A$  and  $C$  to 3 decimal places. Find also the bearing of Town  $C$  from Town  $A$  to the nearest degree. [6]

$$AC^2 = 12^2 + 15^2 - 2 \times 12 \times 15 \times \cos 75^\circ$$

$$= 369 - 90(\sqrt{6} - \sqrt{2})$$

$$AC = 3\sqrt{41 - 10\sqrt{6} + 10\sqrt{2}}$$

$$= 16.608 \text{ (correct to 3 dec. pl.)}$$

$$\frac{\sin \angle BAC}{15} = \frac{\sin 75^\circ}{AC}$$

$$\angle BAC = 60^\circ 44' 21.56''$$

The bearing of  $C$  from  $A$  is  $S16^\circ E$  or  $164^\circ$

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**SECTION III Volume and Surface area**

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**Questions****Answers**

17. The formula for the volume of a sphere is

- A.  $4\pi r^2$     B.  $\frac{4}{3}\pi r^2$     C.  $\frac{4}{3}\pi r^3$     D.  $2\pi r^3$     **C**
- 

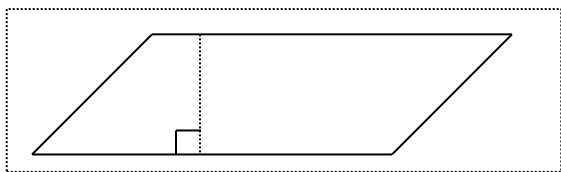
18. The formula for the volume of a cone is

- A.  $2\pi r$     B.  $\frac{1}{3}\pi r h$     C.  $\frac{1}{3}\pi r^2 h$     D.  $\pi r^2 h$     **C**
- 

19. The formula for the curved surface area of a cone is

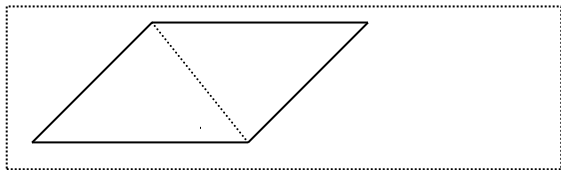
- A.  $3\pi r^2$     B.  $\frac{1}{3}\pi r h$     C.  $\pi r h$     D.  $\pi r s$     **D**
- 

20. Given that  $AB = 11$  cm,  $BC = 28$  cm, and the perpendicular distance between  $AD$  and  $BC$  is 9 cm, the area of parallelogram  $ABCD$  in  $\text{cm}^2$  is

**B**

- A. 308    B. 252    C. 154    D. 126
- 

21. Given that  $AB = 17$  cm,  $AC = 16$  cm, the area of rhombus  $ABCD$  in  $\text{cm}^2$  is

**B**

- A. 136    B. 240    C. 272    D. 480
- 

22. Find the volume of the solid below which consists of a hemisphere surmounted by a cone of equal radii of 3 cm. The height of the cone is 9 cm.

Give your answer in terms of  $\pi$ .

**[4]**

$$\begin{aligned} V &= \frac{1}{3}\pi \times 3^2 \times 9 + \frac{2}{3}\pi \times 3^3 \\ &= 45\pi \text{ cm}^3 \end{aligned}$$

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23. Find the volume and total surface area of a rectangular pyramid with height 60 cm, and the dimensions of its base is 50 cm  $\times$  22 cm. [6]

$$\begin{aligned}V &= \frac{1}{3} \times 60 \times 50 \times 22 \\ &= 22,000 \text{cm}^3\end{aligned}$$

$$\begin{aligned}\text{S.A.} &= 50 \times 22 + 61 \times 50 + 65 \times 22 \\ &= 5580 \text{cm}^2\end{aligned}$$

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#### SECTION IV Statistics

24. John was awarded 76 marks for both his English and History tests. The mean and standard deviation of the English marks were 52 and 12 respectively; and those of the History marks were 65 and 4 respectively. In which of the two subjects did John do better? Justify your answer with  $z$ -scores. [4]

$$\begin{aligned}z_E &= \frac{76-52}{12} \\ &= 2\end{aligned}$$

$$\begin{aligned}z_H &= \frac{76-65}{4} \\ &= 2.75\end{aligned}$$

$$z_H > z_E$$

Therefore, John did better in History.

25. Complete the following frequency distribution table:

[1]

<i>Score</i>	<i>frequency</i>	<i>Cumulative frequency</i>
1	13	<b>13</b>
2	26	<b>39</b>
3	37	<b>76</b>
4	33	<b>109</b>
5	29	<b>138</b>
6	12	<b>150</b>

Find the range, mean, mode and median of the above set of scores.

Range = 5

Mode = 3

Mean = 3.5

Median = 3

[4]

26.

Class 10MA		Class 10MB	
Leaf	Stem	Leaf	
	1	8	
2	2	345	
	3	0226	
9887	4	1222578	
9986	5	457899	
99988766	6	233	
8876543	7	0027	
766	8		
985	9	13	

The above stem-and-leaf plot shows the marks of a mathematics test of classes 10MA and 10MB. Find the range, median and mode for each of the two classes.

[6]

	Class 10MA	Class 10MB
Range	<b>77</b>	<b>75</b>
Median	<b>69</b>	<b>51</b>
Mode	<b>69</b>	<b>42</b>

**End of the Paper**