

**SENIOR  
CATEGORY**



**COWBELL**  
PEDIA  
SECONDARY SCHOOL MATHEMATICS TV QUIZ SHOW

March 11, 2017

10:00am

1 HOUR 15 MINUTES

## **INSTRUCTIONS**

1. THIS PAPER IS IN TWO PARTS ( I & II ).
2. ANSWER ALL QUESTIONS IN BOTH PARTS.
3. USE HB PENCIL THROUGHOUT FOR THE MULTIPLE CHOICE QUESTION.
4. THE USE OF CALCULATOR IS NOT ALLOWED.
5. SHADE THE CORRECT OPTION IN THE SPACE PROVIDED IN THE ANSWER BOOKLET.
6. PLEASE WRITE YOUR NAMES IN CAPITAL LETTERS.
7. CANDIDATES WHO DO NOT SHADE THEIR CORRECT CATEGORIES WILL BE DISQUALIFIED.
8. YOU ARE ADVISED NOT TO SPEND MORE THAN 1 HOUR IN PART I AND 15 MINUTES IN PART II.
9. EACH MULTIPLE CHOICE QUESTION ATTRACTS 2 MARKS.
10. PART II ATTRACTS 20 MARKS.



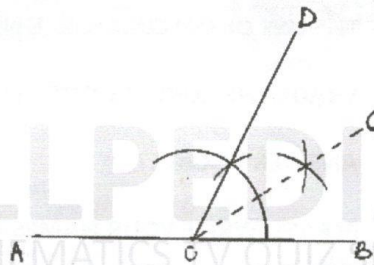
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- Simplify  $\left(2\frac{1}{4}\right)^{\frac{1}{2}}$ .  
A. 4    B. 2    C.  $\frac{3}{2}$     D.  $\frac{2}{3}$
- Find the product of 0.0019 and 0.015. Leave your answer in standard form.  
A.  $2.65 \times 10^{-5}$     B.  $2.65 \times 10^{-1}$     C.  $2.85 \times 10^{-7}$     D.  $2.85 \times 10^{-5}$
- Evaluate  $\log_3 9 + \log_3 2 - \log_3 6$   
A. 1    B.  $\frac{1}{3}$     C. 0    D. 3
- By how much is  $246_{\text{seven}}$  less than  $573_{\text{eight}}$ , leaving your answer in base 10?  
A. 132    B. 247    C. 379    D. 511
- Find the value of  $52 \oplus 5 \pmod{7}$   
A.  $3 \pmod{7}$     B.  $2 \pmod{7}$     C.  $1 \pmod{7}$     D.  $-1 \pmod{7}$
- Find the sum of the infinite series  $1+a+a^2+a^3+\dots$ , given that  $-1 < a < 1$ .  
A.  $\frac{1-a^n}{1-a}$     B.  $\frac{a}{1-a}$     C.  $\frac{1}{1-a}$     D.  $\frac{1}{a-1}$
- Find the  $n$ th term of the arithmetic sequence  $-8, -5, -2, 1, 4, \dots$   
A.  $-8+3(n-1)$     B.  $-8(3)^{n-1}$     C.  $3-8(n-1)$     D.  $-8^n$
- Evaluate  $(0.11)^4$  correct to 3 s. f.  
A. 0.0001464    B. 0.000150  
C. 0.000146    D. 0.000140
- $x \propto \frac{1}{y}$  and  $y \propto \frac{1}{Z^2}$ . How does  $x$  vary with  $Z$ ?  
A.  $x \propto \frac{1}{Z^2}$     B.  $x \propto \frac{1}{Z}$     C.  $x \propto Z^2$     D.  $x \propto Z$
- $Y$  varies directly as  $x$  and inversely as  $Z$ . If  $y = 2$ ,  $x = 3$  and  $Z = 9$ , find  $y$  when  $x = 1$  and  $Z = 3$ .  
A. 7    B. 5    C. 4    D. 2
- If  $y$  is inversely proportional to  $x$  and  $y = 0.2$  when  $x = 2.5$ , find  $y$  when  $x = 5$ .  
A. 0.6    B. 0.5    C. 0.4    D. 0.1

Given the universal set  
 $U = \{a, d, f, c, r, w, t, v\}$   
let  $A = \{a, c, d, v\}$  and  $B = \{c, f, r\}$   
be subsets of  $U$ .

Use the information above to answer questions 12 and 13

- Find  $A \cap B^c$   
A.  $\{c\}$     B.  $\{a, d, v\}$     C.  $\{a, d, f, r, c, v\}$     D.  $\{a, d, f, r, t, v, w\}$
- Find  $(A \cup B)^c$   
A.  $\{ \}$     B.  $\{w\}$     C.  $\{a, c, d, f, r, v\}$     D.  $\{a, c, d, f, r, t, v, w\}$
- Solve the equation  $2^{2x} - 6(2^x) + 8 = 0$   
A.  $x = 1$  or  $2$     B.  $x = -1$  or  $-2$     C.  $x = -1$  or  $2$     D.  $x = 2$  or  $4$
- Simplify  $\frac{a^2 - ab - ac + bc}{a^2 - ab + ac - bc}$   
A.  $\frac{(a-c)}{(a+c)}$     B.  $\frac{(a+c)}{(a-c)}$     C.  $\frac{b-c}{b+c}$     D.  $\frac{b+c}{b-c}$
- Find the range of values of  $x$  for which  $\frac{2x}{5} + \frac{2}{7} \geq \frac{2}{5}$ .  
A.  $x \leq \frac{2}{7}$     B.  $x < 1\frac{5}{7}$     C.  $x \geq \frac{2}{7}$     D.  $x \geq 1\frac{5}{7}$
- Given the simultaneous equations  $x^2 - y^2 = 8$  and  $x + y = 4$ , find  $x - y$   
A. -2    B. -1    C. 2    D. 3



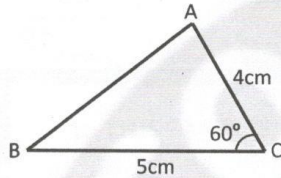
Use the information above to answer questions 18 and 19.

- Which angle does  $\angle AOC$  represent?  
A.  $30^\circ$     B.  $60^\circ$     C.  $120^\circ$     D.  $150^\circ$
- Which of the following angles cannot be constructed from the diagram?  
A.  $150^\circ$     B.  $120^\circ$     C.  $75^\circ$     D.  $60^\circ$

20. In  $\triangle ABC$ ,  $B = 83^\circ$ ,  $b = 3\text{cm}$  and  $c = 2\text{cm}$ . Calculate  $C$ , correct to 1 decimal place.  
 A.  $40.4^\circ$  B.  $41.4^\circ$  C.  $41.5^\circ$  D.  $42.4^\circ$

21. A town P is 45m due east of a town Q. The bearing of a tower from P and Q are  $N20^\circ W$  and  $N45^\circ E$  respectively. Calculate the distance of the tower from Q.  
 A. 37m B. 38m C. 46m D. 47m

22. Find  $|AB|$  from the diagram below.



- A. 3.5cm B. 4.6cm C. 5.2cm D. 7.3cm
23. If  $5 \tan^2 \theta - 6 = 0$ , find the value of  $\theta$  for  $0^\circ < \theta < 90^\circ$ .  
 A.  $47.6^\circ$  B.  $51.2^\circ$  C.  $60.4^\circ$  D.  $62.1^\circ$
24. Given  $\triangle ABC$ ,  $A = 40^\circ$ ,  $C = 70^\circ$  and  $b = 5.5\text{cm}$ . Find  $a$ .  
 A. 4.5cm B. 3.8cm C. 2.5cm D. 1.7cm

Use the information below to answer questions 25 and 26.

The marks of students in a mathematics test are 4, 5, 11, 7, and 13.

25. Calculate the mean mark.  
 A. 4 B. 6 C. 8 D. 10
26. Calculate the standard deviation of the marks.  
 A. 2.0 B. 3.5 C. 4.0 D. 5.5
27. A class contains 27 boys and 23 girls. The average height of the boys is 1.92m and the average height of the girls is 1.73m. Calculate the average height of the class.  
 A. 0.83m B. 1.80m C. 1.83m D. 2.80m

28. Find the range of the following numbers  
 21, 11, 19, 16, 28, 14, 18, 23, 25, 09.  
 A. 11 B. 16 C. 18 D. 19

29. Two dice are thrown together once. What is the probability of getting an even product?  
 A.  $\frac{1}{4}$  B.  $\frac{1}{2}$  C.  $\frac{2}{3}$  D.  $\frac{3}{4}$

30. Given that  $y = 2x^{-3} - 4x^{-1} + 16$ , find its gradients.  
 A.  $2(2x^{-2} - 3x^{-4})$  B.  $2 + 3x^2$   
 C.  $2(2 - 3x)$  D.  $2(2 - 3x^2)$

31. If two fair dice are tossed together once, what is the probability of obtaining a sum of 9?  
 A.  $\frac{1}{8}$  B.  $\frac{1}{9}$  C.  $\frac{1}{4}$  D.  $\frac{1}{3}$

32. If  $x = \frac{1}{2}$  is a solution of  $x^2 + x + n = 0$ , find the other solution.

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

33. Find the values of  $m$  in  $2m + \frac{6}{m} = 7$ .

- A.  $1\frac{1}{3}$  and  $-2$  B. 1 and  $-3\frac{1}{2}$   
 C.  $-2$  and  $1\frac{1}{3}$  D. 1 and  $2\frac{1}{2}$

34. Suppose a quadratic equation has roots 3 and 6. Then the equation can be written as:  
 A.  $3x^2 + 9x + 21 = 0$ .  
 B.  $2x^2 - 6x + 18 = 0$ .  
 C.  $x^2 - 9x + 18 = 0$ .  
 D.  $x^2 - 9x - 21 = 0$ .

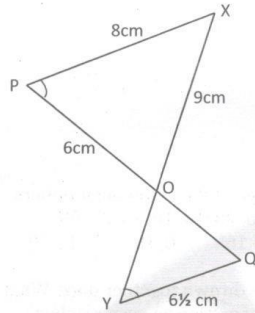
35. Solve the equation  $\frac{12}{1+y} = y$ .

- A.  $-\frac{1}{2}$  and  $-8$  B.  $-4$  and  $3$   
 C. 3 and 7 D. 4 and 8

36. If the bearing of X from Y is  $225^\circ$ . What is the bearing of Y from X?

- A.  $045^\circ$  B.  $060^\circ$   
 C.  $180^\circ$  D.  $220^\circ$

37. Calculate OY in the figure below:



- A. 13cm    B.  $6\frac{7}{8}$  cm    C. 5cm    D.  $4\frac{7}{8}$  cm

Study the sample below and use it to answer questions 38 and 39.

Sample

D1 =

D2 =

D3 =

D5 =

38.  $D_6 \div D_5 =$

- A. 5  
B. 6  
C. 8  
D. 20

39.  $\frac{D_6}{D_4} \times D_2 =$

- A. 60  
B. 30  
C. 15  
D. 3

40. What number should come next in this series  
12, 11, 9, 6.

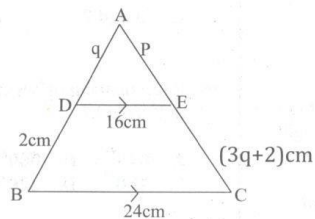
- A. -3  
B. 2  
C. 3  
D. 4

## PART TWO THEORY (15 Minutes)

1. (a) A regular hexagon has sides of length 6cm. Find the perpendicular distance between two opposite faces.
- (b) If  $\theta$  is an acute angle, and  $\tan \theta = \frac{3}{4}$  evaluate  $\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta}$

(10marks)

2. (a) Find the values of p and q in the diagram below.



(Not drawn to scale)

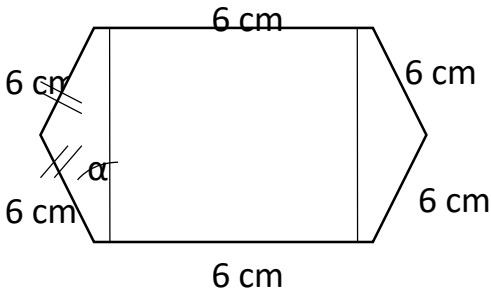
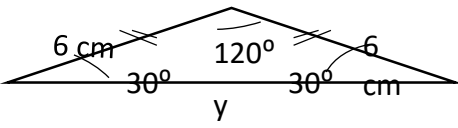
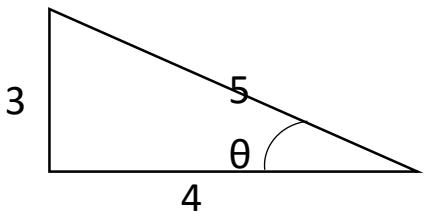
- (b) Find the distance of a chord of length 12cm from the centre of a circle of radius 10cm.

(10marks)

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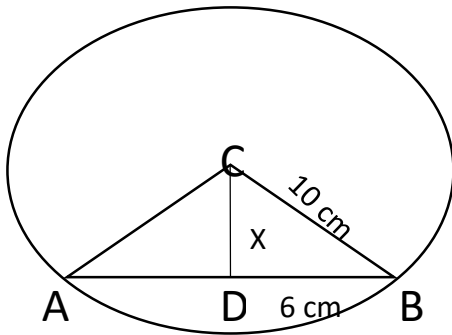
- |             |                 |
|-------------|-----------------|
| <b>1. D</b> | <b>21.D</b>     |
| <b>2. D</b> | <b>22.B</b>     |
| <b>3. A</b> | <b>23.A</b>     |
| <b>4. B</b> | <b>24.B</b>     |
| <b>5. C</b> | <b>25.C</b>     |
| <b>6. C</b> | <b>26.B</b>     |
| <b>7. A</b> | <b>27.C</b>     |
| <b>8. C</b> | <b>28.D</b>     |
| <b>9. C</b> | <b>29.D</b>     |
| <b>10.D</b> | <b>30.A</b>     |
| <b>11.D</b> | <b>31.B</b>     |
| <b>12.B</b> | <b>32.A</b>     |
| <b>13.B</b> | <b>33.BONUS</b> |
| <b>14.A</b> | <b>34.C</b>     |
| <b>15.A</b> | <b>35.B</b>     |
| <b>16.C</b> | <b>36.A</b>     |
| <b>17.C</b> | <b>37.D</b>     |
| <b>18.D</b> | <b>38.B</b>     |
| <b>19.C</b> | <b>39.A</b>     |
| <b>20.B</b> | <b>40.B</b>     |

## Senior category 2017 Cowbellpedia (Theory Answers)

S/N	Solution	Distribution of marks	Total
1a.	 <p>Each external angle of hexagon = <math>360^\circ</math>  <math>\alpha = 180^\circ - (90^\circ + 60^\circ)</math>  <math>\alpha = 180^\circ - 150^\circ</math>  <math>\alpha = 30^\circ</math></p>  <p>Sine rule:</p> $\frac{y}{\sin 120^\circ} = \frac{6}{\sin 30^\circ}$ $y = \frac{6 \sin 120^\circ}{\sin 30^\circ}$ $y = 6 \times \frac{\sqrt{3}}{2} \times 2$ $y = 6\sqrt{3} \text{ cm}$	<p><math>B_1</math> for <math>60^\circ</math>  <math>M_1</math> for solving  <math>A_1</math> for <math>\alpha = 30^\circ</math></p> <p><math>M_1</math> for applying Sine rule</p> <p><math>M_1</math> for finding <math>y</math></p> <p><math>A_1</math> for <math>y = 6\sqrt{3} \text{ cm}</math></p>	6 marks
1b.		<p><math>B_1</math> for using pythagora's theorem</p> <p><math>B_1</math> for both <math>\cos \theta</math> &amp; <math>\sin \theta</math></p> <p><math>M_1</math> for substituting</p> <p><math>A_1</math> for 7</p>	4 marks

<p>2a.</p>	$\cos \theta = \frac{4}{5}, \sin \theta = \frac{3}{5}$ $\cos \theta + \sin \theta = \frac{4}{5} + \frac{3}{5}$ $\cos \theta - \sin \theta = \frac{4}{5} - \frac{3}{5}$ $= \frac{7}{5} \times \frac{5}{1}$ $= 7$ $\frac{2+q}{q} = \frac{16}{24} = \frac{2+P}{3q+2+P}$ $\frac{2+q}{q} = 16$ $\frac{2+q}{24} = 16(2+q)$ $24q = 32 + 16q$ $24q - 16q = 32$ $8q = 32$ $q = \frac{32}{8}$ $q = 4 \text{ cm}$	<p>M<sub>1</sub> for cross multiplying</p> <p>M<sub>1</sub> for solving A<sub>1</sub> for q=4 cm</p> <p>M<sub>1</sub> for substitution</p> <p>M<sub>1</sub> for cross multiplying</p> <p>M<sub>1</sub> for solving</p> <p>A<sub>1</sub> for P =28cm</p>	<p>7 marks</p>
<p>2b.</p>	<p>Also,</p>	<p>M<sub>1</sub> for using Pythagoras theorem</p> <p>M<sub>1</sub> for solving</p> <p>A<sub>1</sub> for X = 8 cm</p>	<p>3 marks</p>

$$\begin{aligned}
 16 &= P \\
 24 &= 3(4) + 2 + P \\
 16 &= P \\
 24 &= 14 + P \\
 24P &= 16(14 + P) \\
 24P &= 224 + 16P \\
 24P - 16P &= 224 \\
 8P &= 224 \\
 P &= 224/8 \\
 P &= 28 \text{ cm}
 \end{aligned}$$



$$\begin{aligned}
 BC^2 &= CD^2 + BD^2 \\
 10^2 &= x^2 + 6^2 \\
 100 &= x^2 + 36 \\
 x^2 &= 100 - 36 \\
 x^2 &= 64 \\
 x &= \sqrt{64} \\
 x &= 8 \text{ cm}
 \end{aligned}$$

TOTAL

20 marks