FUKIEN SECONDARY SCHOOL

S5 Final Examination (2020-2021)

Mathematics Compulsory Part Paper 2

(1 hour 15 minutes)

Date: 11th June 2021 Name: _____

Time: 11:15 a.m. – 12:30 p.m. Class: _____ No.: _____

Instructions to students:

1. Read carefully the instructions on the Answer Sheet and insert the information required in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF PAPER'** after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. $4-4x^2-4xy-y^2=$

   A. $(2-2x-y)(2+2x+y)$.
   B. $(2-2x-y)(2+2x-y)$.
   C. $(2-2x+y)(2+2x+y)$.
   D. $(2-2x+y)(2+2x-y)$.

2. $\dfrac{3^{3a-1}}{27^{a-1}}=$

   A. 1.
   B. 9.
   C. $\dfrac{1}{3^{2a}}$.
   D. $\dfrac{1}{9^{2a}}$.

3. $\dfrac{1}{\sqrt{7}}=$

   A. 0.380 (correct to 3 decimal places).
   B. 0.3779 (correct to 4 decimal places).
   C. 0.37796 (correct to 5 significant figures).
   D. 0.377965 (correct to 6 significant figures).

4. If $f(x-2)=x^2-2x$, then $f(1)=$

   A. –1.
   B. 0.
   C. 1.
   D. 3.

5. If h and k are constants such that $2x^2 + hx - 12 \equiv (kx - 3)(4 - x)$, then

   A. $h = -2$.

   B. $h = 2$.

   C. $h = -5$.

   D. $h = 5$.

6. If $f(x) = x^{2021} + 2021x + k$ is divisible by $x + 1$, where k is a constant, then $k =$

   A. 2019.

   B. 2020.

   C. 2021.

   D. 2022.

7. Let k be a constant. If the equation $2x^2 - kx + 8 = 0$ has no real roots, then

   A. $k < 8$.

   B. $k > -8$.

   C. $-8 < k < 8$.

   D. $k < -8$ or $k > 8$.

8. The solution of $3 - 7x \leq 10$ or $\frac{5x+4}{2} > x - 4$ is

   A. $x \geq -1$.

   B. $x \leq -1$.

   C. $x > -4$.

   D. $x < -4$.

9. If the salary of Peter is 60% lower than the salary of Anson, then the salary of Anson is

   A. 150% higher than the salary of Peter.

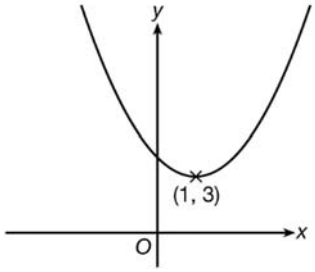
   B. 67% higher than the salary of Peter.

   C. 60% higher than the salary of Peter.

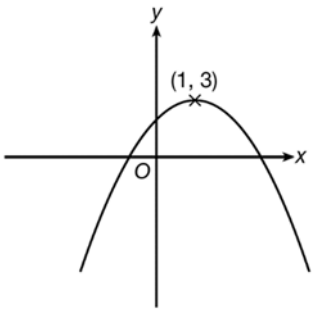
   D. 50% higher than the salary of Peter.

10. Which of the following may represent the graph of $y = -(1 - x)^2 + 3$?

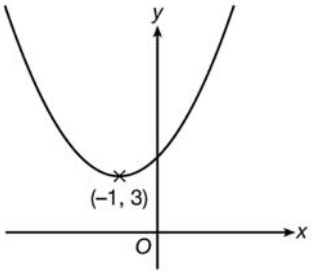
A.



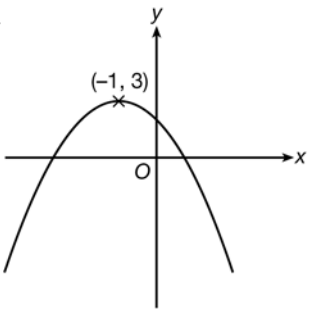
B.



C.



D.



11. If $a = 3b$ and $b : c = \frac{2}{3} : 1$, then $a : b : c =$

A. 2 : 3 : 2.

B. 3 : 3 : 2.

C. 2 : 6 : 9.

D. 6 : 2 : 3.

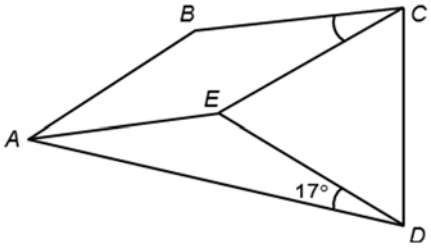
12. In the figure, $ABCE$ is a rhombus. If ΔCDE is an equilateral triangle, then $\angle BCE =$

A. 17°.

B. 26°.

C. 34°.

D. 43°.



13. Suppose $z \propto \sqrt{y}$ and $y \propto \frac{1}{x}$. Which of the following must be a constant?

A. $\sqrt{x}z$

B. $\sqrt{y}z$

C. $\sqrt{x}y$

D. $\sqrt{x}yz$

14. It is given that $a = \frac{v^2}{r}$. If v is increased by 10% and a is increased by 12%, then r is

A. increased by $\frac{225}{28}\%$.

B. increased by $\frac{162}{25}\%$.

C. decreased by $\frac{25}{14}\%$.

D. decreased by $\frac{275}{28}\%$.

15. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(n + 1)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

1st pattern 2nd pattern 3rd pattern

A. 21

B. 28

C. 36

D. 45

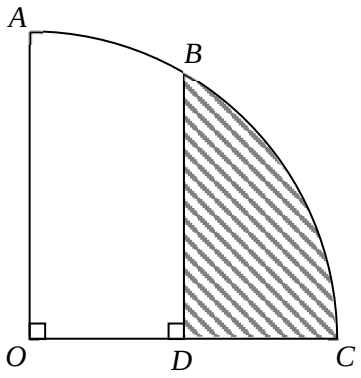
16. The figure shows a quadrant $OABC$ of a circle. If $OC = 2$ cm and $OD = 1$ cm, then the area of the shaded region BCD is

A. $\left(\frac{2\pi}{3} - \frac{\sqrt{3}}{2}\right)$ cm^2.

B. π cm^2.

C. $\frac{\pi}{2}$ cm^2.

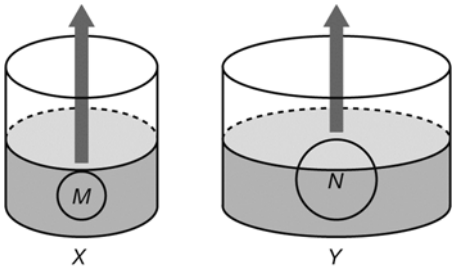
D. $\left(\frac{\pi}{3} + \frac{\sqrt{3}}{2}\right)$ cm^2.



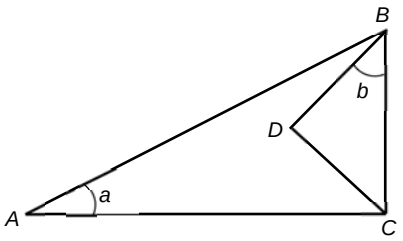
17. If an interior angle of a regular n-sided polygon is greater than an exterior angle by 135°, which of the following is true?
    A. The value of n is 14.
    B. The sum of interior angles of the polygon is 2520°.
    C. Each interior angle of the polygon is 158°.
    D. The number of diagonals of the polygon is 30.

18. In the figure, X and Y are two right cylindrical containers each containing some water. The two containers are placed on the same horizontal surface. The internal base radii of X and Y are in the ratio 1 : 3. M and N are two spheres in X and Y respectively. Suppose both spheres are totally immersed in the water and their radii are in the ratio 2 : 3. If M is taken out from X, the drop in water level in X is 1 cm. If N is taken out from Y, the drop in water level in Y is

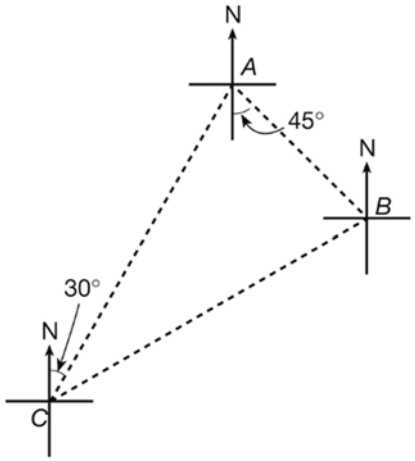
    A. $\frac{1}{2}$ cm.
    B. $\frac{1}{6}$ cm.
    C. $\frac{8}{27}$ cm.
    D. $\frac{3}{8}$ cm.



19. In the figure, $\angle ACB = \angle BDC = 90°$. Find $\frac{AC}{CD}$.
    A. $\frac{1}{\tan a \cos b}$
    B. $\frac{1}{\tan a \sin b}$
    C. $\tan a \cos b$
    D. $\tan a \sin b$

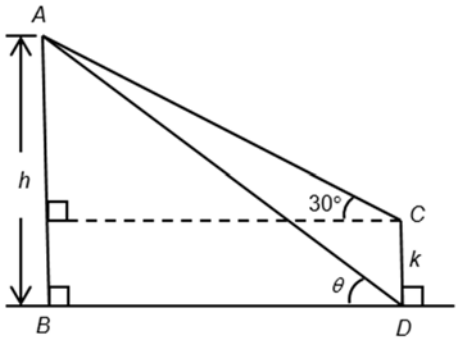


20. In the figure, the compass bearing of B from A is S45°E and that of A from C is N30°E. If $AC = BC$, then the true bearing of C from B is



A. 210°.
B. 225°.
C. 240°.
D. 255°.

21. In the figure, AB and CD are two buildings of heights h and k respectively. If the angles of elevation of A from C and D are 30° and θ respectively, then $k =$



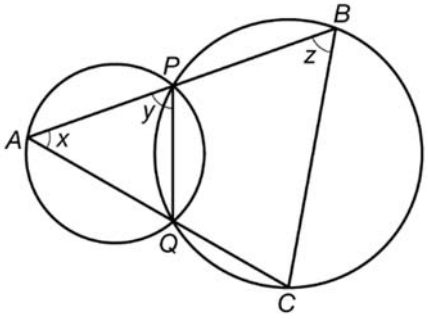
A. $h(1-\sqrt{3}\tan\theta)$.
B. $h\left(1-\dfrac{\tan\theta}{\sqrt{3}}\right)$.
C. $h\left(1-\dfrac{\sqrt{3}}{\tan\theta}\right)$.
D. $h\left(1-\dfrac{1}{\sqrt{3}\tan\theta}\right)$.

22. If $\sin x = \dfrac{1}{2}$, where $90° < x < 180°$, then $\tan x =$

A. $\dfrac{1}{\sqrt{3}}$.
B. $-\dfrac{1}{\sqrt{3}}$.
C. $\sqrt{3}$.
D. $-\sqrt{3}$.

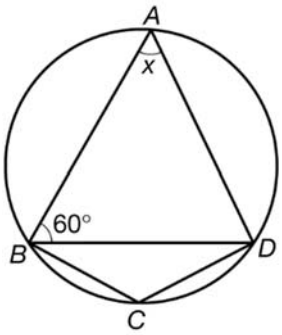
23. In the figure, two circles intersect at P and Q. APB and AQC are straight lines. Which of the following must be true?

A. $y = z$
B. $x + y + z = 90°$
C. $x + y + z = 180°$
D. $x + y + 2z = 180°$



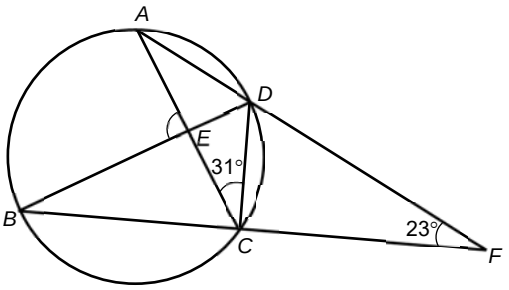
24. In the figure, $\overset{\frown}{BC} : \overset{\frown}{CD} : \overset{\frown}{DA} = 2 : 2 : 3$. If $\angle ABD = 60°$, then $x =$

A. 40°.
B. 60°.
C. 80°.
D. 100°.



25. In the figure, BD is a diameter of the circle $ABCD$. AC and BD intersect at E. AD produced and BC produced meet at F. If $\angle AFB = 23°$ and $\angle DCE = 31°$, then $\angle AEB =$

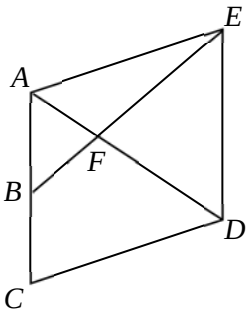
A. 82°.
B. 90°.
C. 95°.
D. 118°.



26. In the figure, $ACDE$ is a parallelogram and $AB : ED = 1 : 2$. AD and BE intersect at F.

If the area of $\triangle ABF$ is 4 cm^2, then the area of $ACDE$ is

A. 24 cm^2.
B. 32 cm^2.
C. 48 cm^2.
D. 56 cm^2.



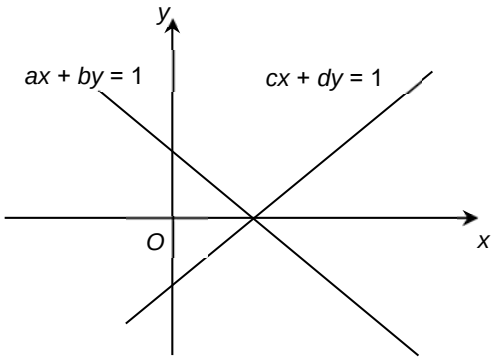
27. The x-intercept of a straight line L is twice its y-intercept. If L passes through (6, 2), then the equation of L is

A. $x + 2y = 6$.
B. $x + 2y = 10$.
C. $x - 2y = 6$.
D. $x - 2y = 10$.

28. In the figure, the two straight lines intersect at a point on the positive x-axis. Which of the following are true?

I. $b > 0$
II. $d < b$
III. $a = c$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III



29. The equation of the circle C is $5x^2 + 5y^2 + 12x - 6y = 11$. Which of the following is/are true?

I. The origin lies inside C.
II. The area of C is 4π.
III. The coordinates of the centre of C are $(-6, 3)$.

A. II only
B. III only
C. I and II only
D. I and III only

30. The equation of circle C is $x^2 + y^2 - 12x + 8y + 48 = 0$. If P is a moving point in the rectangular plane such that the distance from P to C is always 3 units, then the locus of P is

A. a straight line.
B. a parabola.
C. a circle.
D. a pair of circles.

Section B

31. $\dfrac{2x}{(2x-1)^2}-\dfrac{1}{1-2x}=$

A. $\dfrac{1}{2x-1}$.

B. $-\dfrac{1}{(2x-1)^2}$.

C. $\dfrac{1}{(2x-1)^2}$.

D. $\dfrac{4x-1}{(2x-1)^2}$.

32. $110001011001_2 =$

A. $2^{11}+2^{10}+89$.

B. $2^{11}+2^{10}+177$.

C. $2^{12}+2^{11}+89$.

D. $2^{12}+2^{11}+177$.

33. For $0°<\theta<360°$, how many roots does the equation $4-\sin\theta=4\cos^2\theta$ have?

A. 1

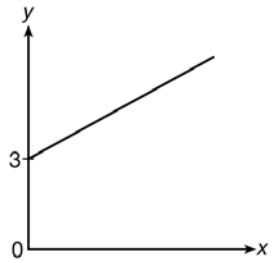
B. 2

C. 3

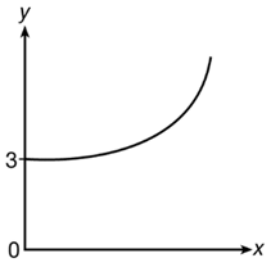
D. 5

34. Which of the following may represent the graph of $y = 2.5^{-x} + 2$?

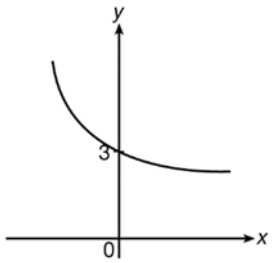
A.



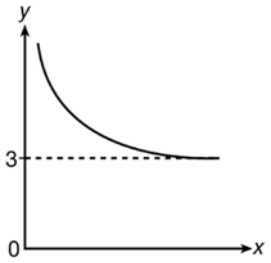
B.



C.



D.



35. If $2(\log_4 x)^2 + \log_4 x = 6$, then $x =$

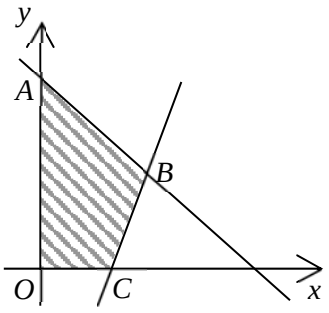
A. 8.

B. $\frac{1}{8}$ or 16.

C. 1 or 2.

D. 8 or $\frac{1}{16}$.

36. In the figure, the equations of the straight lines AB and BC are $x + y = 6$ and $3x – y = 6$ respectively. If (x , y) is a point lying in the shaded region $OABC$ (including the boundary), then the maximum value of $3x – 2y + 15$ is



A. 12.

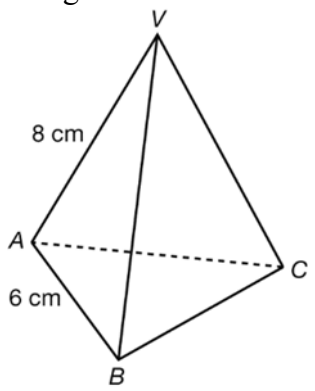
B. 15.

C. 18.

D. 21.

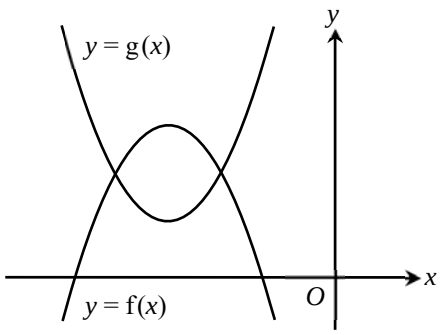
37. The figure shows a right pyramid *VABC* with equilateral triangular base *ABC*. The slant height of the pyramid is 8 cm and the side length of its base is 6 cm. Find the height of the pyramid *VABC* respect to the base *VAB*, correct to 3 significant figures.

A. 5.05 cm
B. 5.20 cm
C. 7.21 cm
D. 7.42 cm



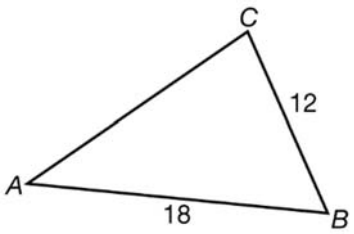
38. The figure shows the graphs of $y = f(x)$ and $y = g(x)$. Which of the following may be correct?

A. $g(x) = f(-x) - 3$
B. $g(x) = f(-x) + 3$
C. $g(x) = -f(x) - 3$
D. $g(x) = -f(x) + 3$



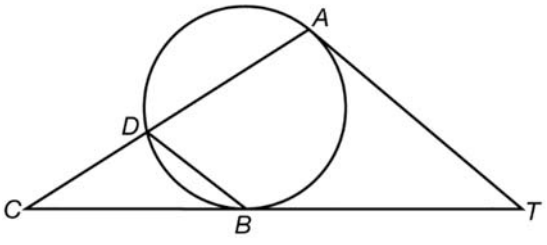
39. In the figure, ΔABC is an acute-angled triangle. If $\sin B = \frac{\sqrt{3}}{2}$, find *AC*.

A. $6\sqrt{7}$
B. $5\sqrt{11}$
C. $5\sqrt{13}$
D. $6\sqrt{11}$



40. In the figure, *TA* and *TC* are tangents to the circle at *A* and *B* respectively. *AC* cuts the circle at *D*. It is given that $\angle ATB = 40°$ and $\angle ACB = 32°$. Find $\angle DBC$.

A. 32°
B. 38°
C. 40°
D. 42°



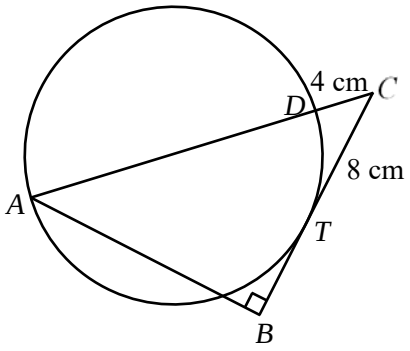
41. In the figure, AD is a diameter of the circle. BC is the tangent to the circle at T such that $AB \perp BC$ and ADC is a straight line. If $TC = 8$ cm and $CD = 4$ cm, find the length of BT.

A. 7.2 cm

B. 6 cm

C. 4.8 cm

D. 4 cm



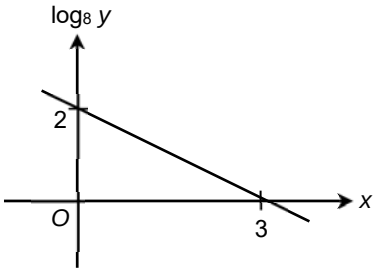
42. The graph in the figure shows the linear relation between x and $\log_8 y$. If $y = \dfrac{h}{k^x}$, then $k =$

A. 4.

B. 64.

C. $-\dfrac{2}{3}$.

D. $\dfrac{1}{4}$.



43. Let x_n be the nth term of an arithmetic sequence. If $x_{18} + x_{20} = 92$ and $x_{200} + 300 = x_{100}$, which of the following are true?

I. The first term of the sequence is 100.

II. $x_1 + x_2 + x_3 + \cdots + x_{2\,021} < -5.9 \times 10^6$

III. x_{33} is the smallest positive term of the sequence.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

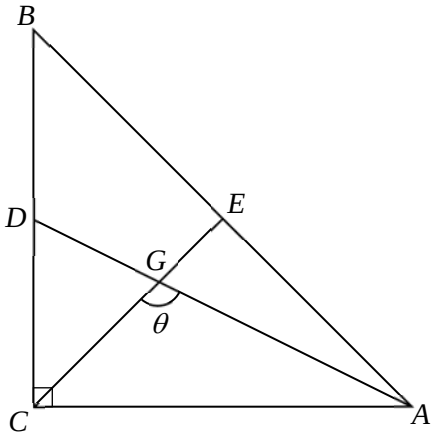
44. The figure shows the right-angled triangle ABC, where $\angle BCA = 90°$, $AC = BC$ and G is the centroid of $\triangle ABC$. AG produced meets BC at D. CG produced meets AB at E. Find $\sin\theta$.

A. $\frac{\sqrt{2}}{3}$

B. $\frac{3\sqrt{10}}{10}$

C. $\frac{2\sqrt{5}}{6}$

D. $\frac{3\sqrt{5}}{5}$



45. Find the range of the values of k such that the circle $(x + k)^2 + y^2 = 8$ and the straight line $x + y = 0$ intersect at two distinct points.

A. $k \leq -4$ or $k \geq 4$

B. $k < -4$ or $k > 4$

C. $-4 \leq k \leq 4$

D. $-4 < k < 4$

— End of Paper —

No	Answer
1.	A
2.	B
3.	C
4.	D
5.	C
6.	D
7.	C
8.	C
9.	A
10.	B
11.	D
12.	B
13.	A
14.	A
15.	B
16.	A
17.	B
18.	D
19.	B
20.	C
21.	D
22.	B
23.	C
24.	C
25.	C
26.	C
27.	B
28.	D
29.	C
30.	C

No	Answer
31.	D
32.	A
33.	C
34.	C
35.	D
36.	D
37.	A
38.	D
39.	A
40.	B
41.	C
42.	A
43.	A
44.	B
45.	D