SHUN TAK FRATERNAL ASSOCIATION LEUNG KAU KUI COLLEGE

Final Examination 2017-2018

Form **FIVE** Mathematics Paper II

Date of Examination : 11-06-2018 Time allowed : 1 hour 15 mins.

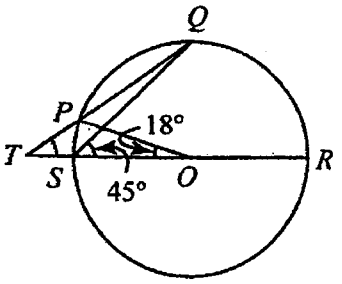
1. All questions carry equal marks.
2. **ANSWER ALL QUESTIONS.**
3. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
4. No marks will be deducted for wrong answers.

There are 45 questions in this paper.

The diagrams in this paper are not necessarily drawn to scale.

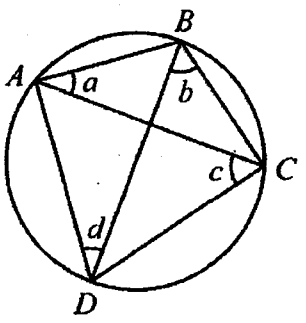
Choose the best answer for each question.

1. In the figure, O is the centre of the circle. If TPQ and TSOR are straight lines, then $\angle PTS =$



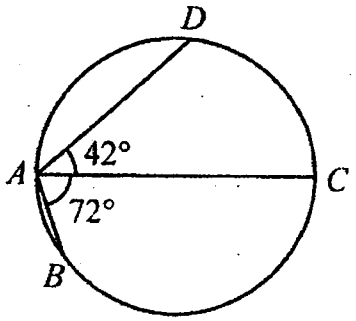
   A. 18°
   B. 27°
   C. 36°
   D. 42°

2. In the figure, ABCD is inscribed in a circle. Find $a + b + c + d$.



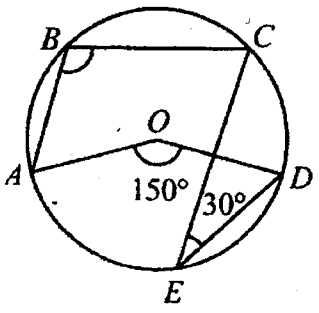
   A. 90°
   B. 180°
   C. 270°
   D. 360°

3. In the figure, AC is a diameter. If $\widehat{CD} = 7$ cm, find the length of $\widehat{AB}$.



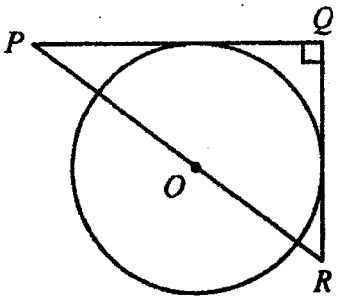
   A. 3 cm
   B. 4 cm
   C. 5 cm
   D. 6 cm

4. In the figure, O is the centre of the circle. If $\angle AOD = 150°$ and $\angle CED = 30°$, find $\angle ABC$.



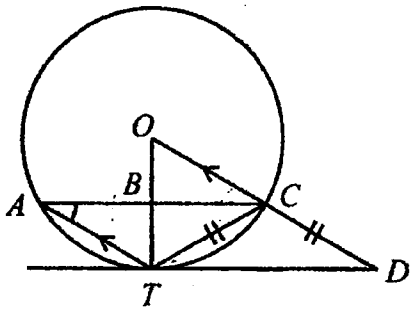
   A. 150°
   B. 105°
   C. 100°
   D. 95°

5. In the figure, O is the centre of the circle and PQR is a straight line. PQ and QR are tangents to the circle. If PR = 15 and PQ = 12, find the radius of the circle.



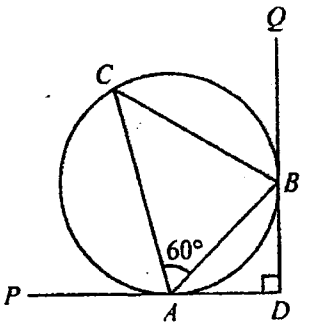
   A. $\frac{24}{7}$
   B. 5
   C. $\frac{36}{7}$
   D. 6

6. In the figure, TD is the tangent to the circle at T, O is the centre of the circle and OCD is a straight line. If CT = CD and AT // OC, find $\angle CAT$.



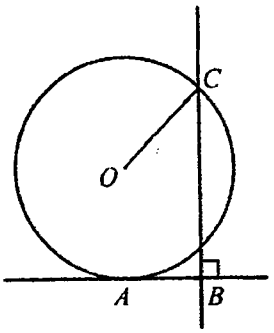
A. 15°
B. 30°
C. 45°
D. 60°

7. In the figure, PAD and QBD are tangents to the circle at A and B respectively. If BD ⊥AD and $\angle CAB = 60°$, find the ratio $\widehat{AB}:\widehat{AC}$.



A. 3 : 5
B. 3 : 4
C. 1 : 2
D. 2 : 5

8. In the figure, AB is the tangent to the circle (centre O) at A. If AB = 10 cm and BC = 25 cm, find OC.



A. 10 cm
B. 12.5 cm
C. 14.5 cm
D. 15 cm

9. The solution of $\frac{x}{3} - 8 \le 3x$ or $1 - 4x \le 9$ is

A. $x \ge -3$
B. $x \ge -2$
C. $-3 \le x \le -2$
D. $x \le -3$ or $x \ge -2$

10. If $a < b < c < 0$, which of the following must be true?

I. $b + c > a + c$
II. $ab > ac$
III. $a^2 > b^2$

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

11. If the solutions of the inequality $x^2 + 3x + m > 0$ are $x < n$ or $x > 2$, then

A. $m = 10$ and $n = 5$

B. $m = 10$ and $n = -5$

C. $m = -10$ and $n = 5$

D. $m = -10$ and $n = -5$

12. If $x^2 - kx + 5 > 2(2x - k)$ for all real values of x, then

A. $-2 < k < 2$

B. $-4 < k < 5$

C. $k < -2$ or $k > 2$

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

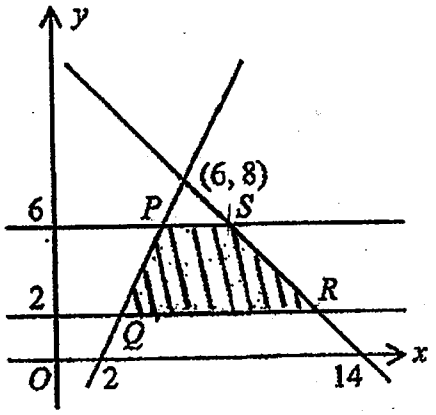
13. In the figure, PS and QR are parallel to the x-axis. If (x, y) is a point lying in the shaded region PQRS (including the boundary), at which point does $2x + 3y + 1$ attain its greatest value?

A. P

B. Q

C. R

D. S



14. The figure shows a shaded region (including the boundary). If (h, k) is a point lying in the shaded region, which of the following are true?

I. $2 \le h \le 4$

II. $1.5 \le k \le 3$

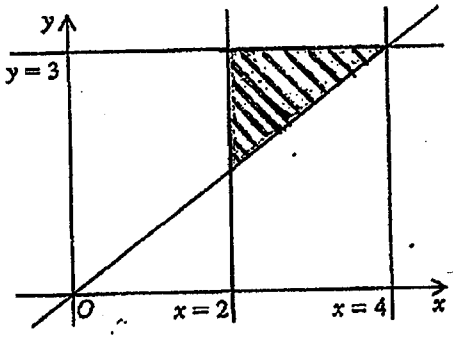
III. $3h - 4k \le 0$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



15. In the figure, (x, y) is a point in the shaded region (including the boundary). Which of the following expressions attains/attain the minimum value when $x = 5$ and $y = 1$?

I. $x + y$

II. $3x - 2y$

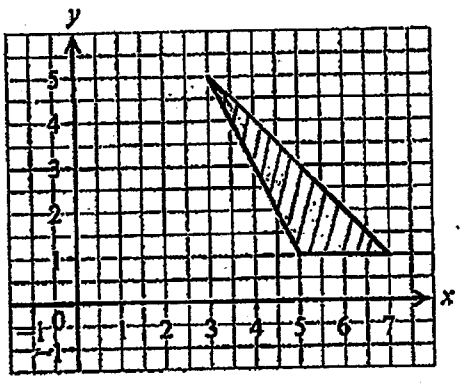
III. $4x + 3y$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



16. Find the maximum value of $5x - 2y$ subject to the constraints : $\begin{cases} x+y \le 8 \\ 2y \ge 21-7x \\ 0 \le x \le 6 \\ y \ge 0 \end{cases}$.

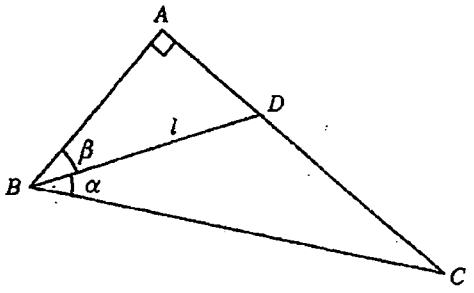
A. 5
B. 19
C. 26
D. 30

17. If $\alpha + \beta = 90^\circ$, where $\alpha > 0^\circ$ and $\beta > 0^\circ$, which of the following must be true?

I. $\sin\alpha + \cos(180^\circ + \beta) = 0$
II. $\cos\alpha - \cos(270^\circ - \beta) < 0$
III. $\dfrac{\tan\alpha}{\tan\beta} > 1$

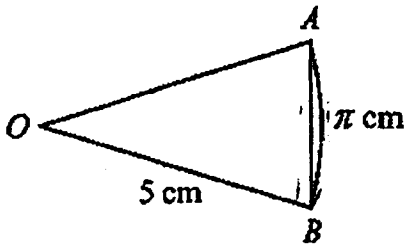
A. I only
B. III only
C. I and II only
D. II and III only

18. In the figure, AB is perpendicular to AC. If BD = DC and BD = l, then BC =



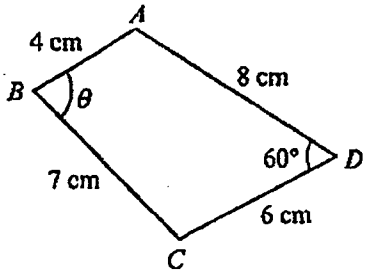
A. $\dfrac{l\cos\alpha}{\sin\beta}$
B. $\dfrac{2l\sin\beta}{\cos\alpha}$
C. $\dfrac{l(\cos\beta+1)}{\sin\alpha}$
D. $\dfrac{l(\sin\beta+1)}{\cos\alpha}$

19. In the figure, OAB is a sector with centre O and $\overset{\frown}{AB} = \pi$ cm, find the area of ΔOAB.



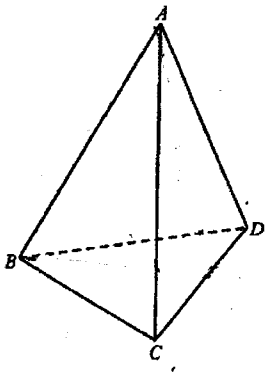
A. 3.11 cm^2
B. 7.35 cm^2
C. 7.85 cm^2
D. 18.5 cm^2

20. Find θ in the figure, correct to 3 significant figures.



A. 80.0°
B. 76.6°
C. 75.4°
D. 71.1°

21. The figure shows a tetrahedron ABCD such that the base is an equilateral triangle and the lateral faces are isosceles triangles. It is given that AC = 2BC. Find the angle between the plane ACD and the plane BCD correct to the nearest degree.

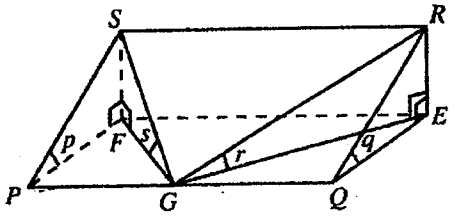


A. 55°
B. 60°
C. 72°
D. 81°

22. If the height of a regular tetrahedron is 4 cm, then the volume of the tetrahedron is

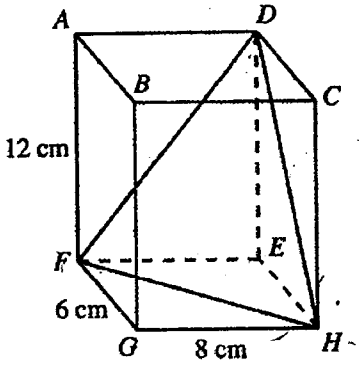
A. $4\ cm^3$
B. $2\sqrt{3}cm^3$
C. $4\sqrt{6}cm^3$
D. $8\sqrt{3}cm^3$

23. In the figure, PQRS is a rectangular inclined plane. E and F are vertically below R and S respectively. P, Q, E and F lie on the same horizontal ground. G is a point on PQ such that PG : GQ = 4 : 5. If ∠SPF = p, ∠RQE = q, ∠RGE = r and ∠SGF = s, which of the following is true?



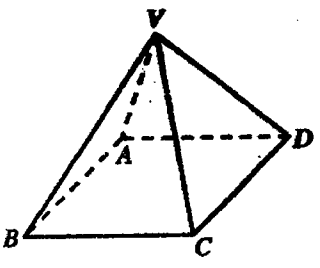
A. p > r > s
B. p > s > r
C. r > q > s
D. r > s > q

24. The figure shows a cuboid ABCDEFGH. If the angle between the triangle DFH and the plane EFGH is θ, then tan θ =



A. $\frac{2}{3}$
B. $\frac{3}{2}$
C. 2
D. $\frac{5}{2}$

25. The figure shows a right pyramid VABCD with a square base. If the angle between VA and VC is 90°, then ∠AVD =



A. 45°
B. 60°
C. 75°
D. 90°

26. The equation of the straight lines L_1 and L_2 are $x + 2y = 3$ and $3x + 6y = 8$ respectively. If P is a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2, then the locus of P is

A. circle
B. square
C. pair of straight lines
D. pair of parallel straight lines

27. The coordinates of the points A and B are (–4, –4) and (2, –2) respectively. Let P be a moving point in the rectangular coordinate plane such that PA = PB. Find the equation of the locus of P.

A. $x + 3y + 6 = 0$
B. $x + 3y - 6 = 0$
C. $3x + y + 6 = 0$
D. $3x + y - 6 = 0$

28. Let P be a moving point on the rectangular coordinate plane such that P maintains an equal distance from the point F(2, 4) and the x-axis. Find the equation of the locus of P.

A. $y = \frac{1}{4}(x^2 - 8x + 40)$

B. $y = \frac{1}{4}(x^2 - 16x + 80)$

C. $y = \frac{1}{8}(x^2 - 4x + 20)$

D. $y = \frac{1}{8}(x^2 - 4x - 12)$

29. If a diameter of the circle $x^2 + y^2 + 8x - ky + 12 = 0$ passes through the point (–1, –5) and the slope of the diameter is $\frac{1}{3}$, then k =

A. –12
B. –3
C. 3
D. 12

30. The equation of the circle C is $4x^2 + 4y^2 - 16x + 40y - 53 = 0$. Which of the following are true?

I. The radius of C is 6.5 .
II. The coordinates of the centre of C are (2, –5) .
III. The origin lies outside C .

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

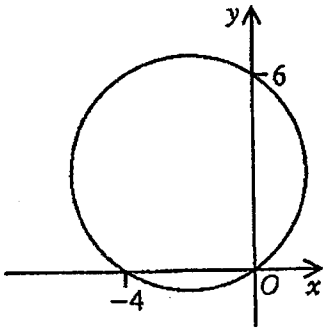
31. Find the constant k such that the circle $x^2 + y^2 - 4x - 6y = 0$ and the straight line $2x - 3y + k = 0$ intersect at only one point.

A. -8
B. -4
C. 4
D. 8

32. The equation of the circle S is $x^2 + y^2 + 8x - 10y + 16 = 0$. If S cuts the y-axis at the points A and B, and touches the x-axis at the point C, find the area of ΔABC.

A. 6
B. 8
C. 12
D. 16

33. In the figure, the equation of the circle is



A. $(x-2)^2 + (y+3)^2 = 13$
B. $(x+2)^2 + (y-3)^2 = 13$
C. $(x-2)^2 + (y+3)^2 = \sqrt{13}$
D. $(x+2)^2 + (y-3)^2 = 169$

34. If the mean and the mode of the ten numbers 13, 8, 4, 0, 9, 4,10, x, y and z are 7.5 and 8 respectively, then the median of these ten numbers is

A. 6
B. 7
C. 8
D. 9

35. The mean height of 12 senior staff members and 60 junior staff members is 165 cm. If the mean height of the junior staff members is 164 cm, then the mean height of the senior staff members is

A. 166 cm
B. 168 cm
C. 170 cm
D. 172 cm

36. Consider the following data :

22 29 24 24 26 27 29 a b

If both the mean and the median of the above data are 27, which of the following are true?

I. $a \geq 27$

II. $b \leq 35$

III. $a + b = 62$

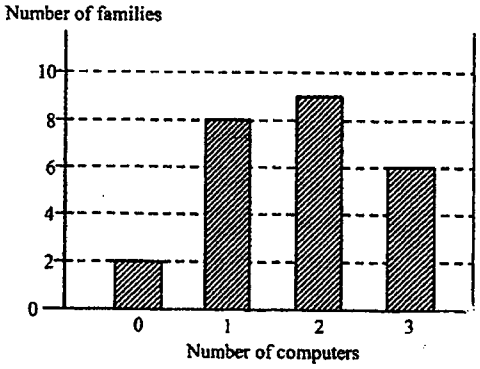
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

37. The bar chart below shows the distribution of the numbers of computers owned by a group of families. Find the variance of the distribution correct to 2 decimal places.



A. 0.46

B. 0.53

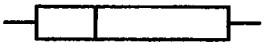
C. 0.82

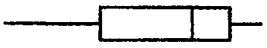
D. 0.91

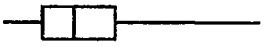
38. The stem-and-leaf diagram shows the distribution of the weights (in kg) of some people.

Stem(tens)	Leaf(units)
4	3 4 5 7
5	0 0 2 3 3 4 5 7 9
6	1 1 2 4 8
7	3 5
8	9

Which of the following box-and-whisker diagram may represent the distribution of their weights?

A. 

B. 

C. 

D. 

39. Let x_1, y_1 and z_1 be the mean, the median and the variance of a group of numbers $\{a_1, a_2, a_3, \ldots, a_{10}\}$ respectively while x_2, y_2 and z_2 be the mean, the median and the variance of the group of numbers $\{a_2, a_3, \ldots, a_{10},\}$ respectively. If $x_1 = a_1$, which of the following must be true?

I. $x_1 = x_2$

II. $y_1 = y_2$

III. $z_1 \leq z_2$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

40. In a talent show, Ben gets 276 marks and his standard score is -3 while Clement gets 320 marks and his standard score is 1. Find the standard deviation of the talent show scores.

A. 7 marks
B. 9 marks
C. 11 marks
D. 13 marks

41. 10 Korean tourists and 2 Japanese tourists are asked to sit in a row. If no Japanese tourists are allowed to sit with each other, how many different rows can be formed?

A. 39 916 800
B. 79 833 600
C. 199 584 000
D. 399 168 000

42. If the first four digits and the last four digits of an eight-digit phone number are formed by a permutation of 1, 2, 3, 4 and a permutation of 6, 7, 8, 9 respectively, how many different eight-digit phone numbers can be formed?

A. 16
B. 256
C. 576
D. 40 320

43. There are 11 boys and 21 girls in a class. If a team of 3 boys and 4 girls is selected from the class to form a study group, how many different groups can be formed?

A. 987 525
B. 3 365 856
C. 142 203 600
D. 258 854 211

44. There are 11 red balls and 9 green balls in a box. If 5 balls are selected from the box and at least two red balls are selected, how many different combinations can be formed?

A. 190
B. 4 620
C. 13 992
D. 15 504

45. In how many ways can a group of 12 students be split into 3 non-overlapping committees of size 3, 4 and 5?

A. 220
B. 27 720
C. 83 160
D. 392 040

END OF PAPER II

補充答題紙(A) SUPPLEMENTARY ANSWER SHEET(A)

考生中文姓名	考生手提電話號碼	座位編號

試題編號 Question No.

1	2	3	4	5	6	7	8	9	10	11	12	
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13	14	15	16	17	18	19	20	21	22	23	24	≥25

請在此貼上電腦條碼
Please stick the barcode label here.

每題另起新頁作答。
Start each question on a new page.

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

1. $\angle PQS = \frac{1}{2} \cdot \angle POS = \frac{1}{2} \cdot 18^\circ = 9^\circ$ C

$\angle PTS = \angle QSO - \angle PQS = 45^\circ - 9^\circ = \underline{\underline{36^\circ}}$

2. $\angle BOC = \angle BAC = a$; $\angle BCA = \angle BDA = d$ B

In $\triangle BCD$, $a+b+c+d = \underline{\underline{180^\circ}}$

3. Join BC : $\angle ABC = 90^\circ \rightarrow \angle ACB = 180^\circ - \angle ABC - \angle BAC$

$= 180^\circ - 90^\circ - 72^\circ = 18^\circ$

$\overset{\frown}{AB} : \overset{\frown}{CD} = \angle ACB : \angle CAD = 18^\circ : 42^\circ$ A

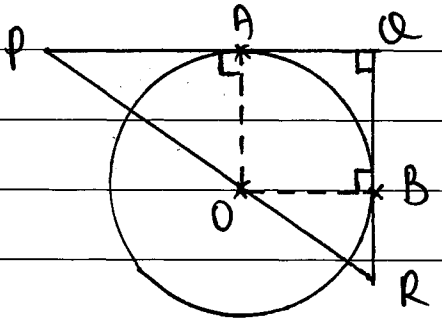
$\frac{\overset{\frown}{AB}}{7} = \frac{18}{42} = \frac{3}{7} \rightarrow \overset{\frown}{AB} = \underline{\underline{3\text{ cm}}}$

4. Join OC : $\angle COD = 2\angle CED = 2 \cdot 30^\circ = 60^\circ$ B

$\angle ABC = \frac{1}{2} \cdot \text{reflex} \angle AOC = \frac{1}{2} \cdot (150^\circ + 60^\circ) = \underline{\underline{105^\circ}}$

5. Let r = radius, C

$OA = OB = BQ = AQ = r$



$\frac{RQ}{PQ} = \frac{OA}{PA} \rightarrow \frac{\sqrt{15^2-12^2}}{12} = \frac{r}{12-r}$

$\rightarrow \frac{9}{12} = \frac{r}{12-r} \rightarrow 108 - 9r = 12r \rightarrow r = \frac{108}{21} = \underline{\underline{\frac{36}{7}}}$

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

本頁積分 Page Total

試題編號 Question No.

1	2	3	4	5	6	7	8	9	10	11	12	
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13	14	15	16	17	18	19	20	21	22	23	24	≥25

每題另起新頁作答。
Start each question on a new page.

6. Let $\angle CAT = \theta$: $\angle CTD = \angle CAT = \theta$; $\angle COT = 2\angle CAT = 2\theta$

$\angle CDT = \angle CTD = \theta$; $\angle OTD = 90^\circ$ B

$\therefore$ In ΔOTD, $\angle OTD + \angle COT + \angle CDT = 180^\circ$

$90^\circ + 2\theta + \theta = 180^\circ$

$\theta = 30^\circ$

7. $AD = BD \rightarrow$ In ΔABD, $\angle ABD = \angle BAD = \frac{180^\circ - 90^\circ}{2} = 45^\circ$

$\angle ACB = \angle ABD = 45^\circ \rightarrow \angle CBA = 180^\circ - \angle CAB - \angle ACB$

$= 180^\circ - 60^\circ - 45^\circ$

$= 75^\circ$ A

$\therefore \overset{\frown}{AB} : \overset{\frown}{AC} = \angle ACB : \angle CBA = 45^\circ : 75^\circ = 3:5$

8. Let $r = OC$: $OA = MB = OC = r$

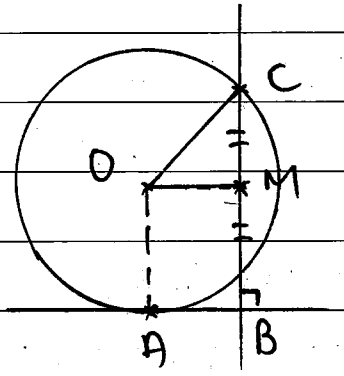
In ΔOCM : $OC^2 = CM^2 + OM^2$

$r^2 = (25-r)^2 + 10^2$

$r^2 = 625 - 50r + r^2 + 100$

$50r = 725$

$r = \frac{725}{50} = 14.5$ C



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9. $\frac{x}{3}-8 \leq 3x$ or $1-4x \leq 9$ A

$x-24 \leq 9x$ $-4x \leq 8$

$-8x \leq 24$ $x \geq -2$

$x \geq -3$ $\therefore x \geq -2$

10. I: $b>a \rightarrow b+c>a+c$ D

II: $b<c \rightarrow ab>ac$ ($\because a<0$)

III: $a^2-b^2=(a-b)(a+b)>0 \rightarrow a^2>b^2$

11. $n+2=\frac{-3}{1} \rightarrow n=-5$; $2n=\frac{m}{1} \rightarrow 2(-5)=m$ D

$\rightarrow m=-10$

12. $x^2-kx+5>2(2x-k) \rightarrow x^2-kx+5>4x-2k$ A

$\rightarrow x^2-(k+4)x+5+2k>0$

$\Delta<0$: $(k+4)^2-4(5+2k)<0 \rightarrow k^2+8k+16-20-8k<0$

$\rightarrow k^2-4<0 \rightarrow -2<k<2$

13. Slope of $SR=\frac{8-0}{6-14}=-1$; Slope of $2x+3y+1=0$ $=\frac{-2}{3}$ D

$\because -1<\frac{-2}{3}$ $\therefore 2x+3y+1$ attains its greatest value at S.

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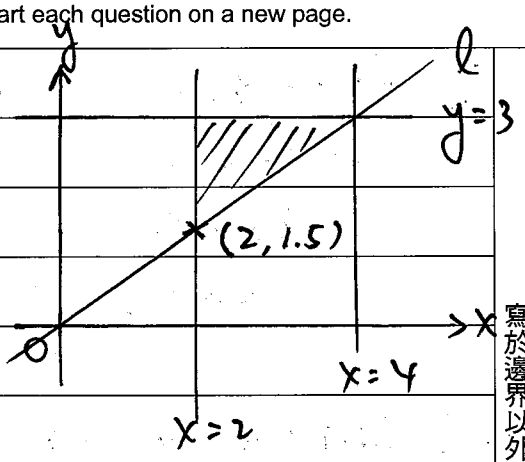
14. Equation of l: $\frac{y-0}{x-0} = \frac{3-0}{4-0}$

D

$4y = 3x$

$3x - 4y = 0$

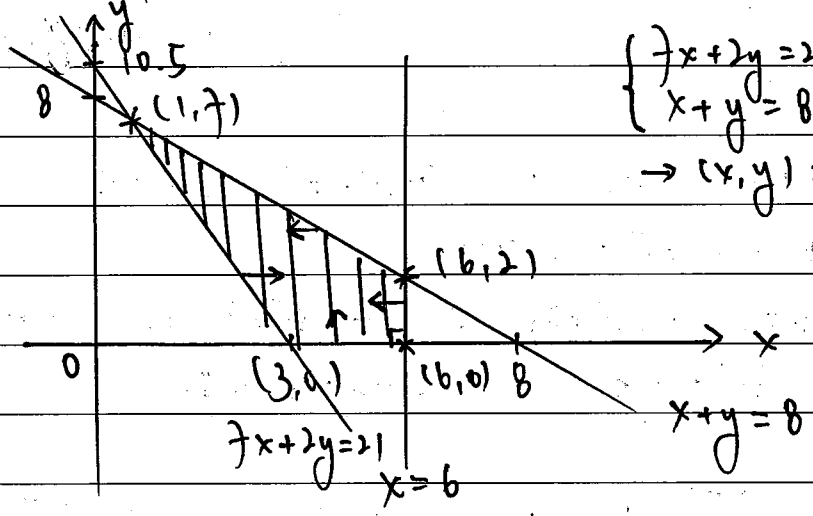


15.

Value	$x+y$	$3x-2y$	$4x+3y$
(5, 1)	6	13	23
(7, 1)	8	19	31
(3, 5)	8	−1	27

B

16.



$\begin{cases} 7x+2y=21 \\ x+y=8 \end{cases}$

$\rightarrow (x, y) = (1, 7)$

let $P(x,y) = 5x-2y$: $P(1,7) = -9$; $P(3,0) = 15$; $P(6,0) = 30$;

$P(6,2) = 26$ ∴ D

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17. I: $\sin\alpha + \cos(180^\circ+\beta) = \sin\alpha - \cos\beta = \sin\alpha - \cos(90^\circ-\alpha)$
$= \sin\alpha - \sin\alpha = 0$

II: $\cos\alpha - \cos(270^\circ-\beta) = \cos\alpha + \sin\beta$
$= \cos\alpha + \sin(90-\alpha)$
$= 2\cos\alpha > 0$

III: Take $\alpha = 30^\circ$, $\beta = 60^\circ$: $\frac{\tan\alpha}{\tan\beta} = \frac{\tan 30^\circ}{\tan 60^\circ} = \frac{1}{3} < 1$

A.

18. $AD = l\sin\beta \rightarrow AC = l + l\sin\beta$

$\therefore \frac{AC}{BC} = \cos\alpha \rightarrow \frac{l+l\sin\beta}{BC} = \cos\alpha \rightarrow BC = \frac{l(1+\sin\beta)}{\cos\alpha}$

D

19. Area of $\Delta OAB = \frac{5\pi}{2} = 7.85\ cm^2$

C

20. $\cos 60^\circ = \frac{8^2+6^2-AC^2}{2(8)(6)} \rightarrow AC = \sqrt{52}\ cm$

$\cos\theta = \frac{4^2+7^2-\sqrt{52}^2}{2(4)(7)} \rightarrow \theta = 76.6^\circ$

21. Let $l = BC$; Let M = mid pt of CD:

$BM = BC\sin 60^\circ = l\cdot\frac{\sqrt{3}}{2} = \frac{\sqrt{3}l}{2}$

$MC = BC\cos 60^\circ = \frac{l}{2}$

$\therefore AM = \sqrt{(2l)^2 - (\frac{l}{2})^2} = \sqrt{4l^2 - \frac{l^2}{4}} = \frac{\sqrt{15}}{2}l$

In ΔAMB, $\cos\angle AMB = \frac{\frac{15}{4}l^2 + \frac{3}{4}l^2 - (2l)^2}{2\cdot\frac{\sqrt{15}}{2}l\cdot\frac{\sqrt{3}}{2}l}$

$\rightarrow \angle AMB = 81.42689...^\circ = 81^\circ$

D

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22. Let l = length of a side : D.

Height of the base triangle $= \sqrt{l^2 - (\frac{l}{2})^2} = \frac{\sqrt{3}l}{2}$

$\therefore 4^2 + (\frac{\sqrt{3}l}{2} \cdot \frac{2}{3})^2 = l^2$

$16 + \frac{1}{3}l^2 = l^2$

$16 = \frac{2}{3}l^2$

$l^2 = 24$

$l = \sqrt{24}$ cm

$\therefore$ Required volume $= \frac{1}{3} \cdot 4 \cdot \frac{1}{2}\sqrt{24}^2 \sin 60^\circ$

$= 16 \cdot \frac{\sqrt{3}}{2}$

$= \underline{\underline{8\sqrt{3}\ cm^3}}$

23. $PF = QE < FG < EG \rightarrow \frac{SF}{PF} = \frac{RE}{QE} > \frac{SF}{FG} > \frac{RE}{EG}$

$\rightarrow \tan p = \tan q > \tan s > \tan r$

$\rightarrow p = q > s > r$ B.

24. $FH = \sqrt{6^2 + 8^2} = 10$ cm ; Distance from E to FH $= \frac{6 \times 8}{10} = 4.8$ cm

$\therefore \tan\theta = \frac{12}{4.8} = \underline{\underline{\frac{5}{2}}}$ D.

25. Let $VA = l$: $VA = VD = l$ B.

In ΔAVC : $AC = \sqrt{l^2 + l^2} = \sqrt{2}l$

$\therefore AD^2 + DC^2 = AC^2 \rightarrow 2 \cdot AD^2 = 2l^2 \rightarrow AD = l$

$\therefore \angle AVD = \underline{\underline{60^\circ}}$

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26. Since $L_1 // L_2$, the locus of P is a straight parallel to both L_1 and L_2 and passes through the mid pt of the y-intercepts of L_1 and L_2. D(?)

27. Let $P=(x,y)$: $PA=PB \rightarrow (x+4)^2+(y+4)^2=(x-2)^2+(y+2)^2$

$8x+16+8y+16=-4x+4+4y+4$

$12x+4y+24=0$

$3x+y+6=0$ C

28. Let $P=(x,y)$: $PF=\sqrt{y^2} \rightarrow (x-2)^2+(y-4)^2=y^2$ C.

$x^2-4x+4+y^2-8y+16=y^2$

$x^2-4x+20=8y$

$y=\frac{1}{8}(x^2-4x+20)$

29. Centre of circle $=\left(\frac{8}{-2},\frac{-k}{-2}\right)=\left(-4,\frac{k}{2}\right)$ A

$\frac{\frac{k}{2}-(-5)}{-4-(-1)}=\frac{1}{3} \rightarrow \frac{k+10}{-6}=\frac{1}{3} \rightarrow k+10=-2 \rightarrow k=-12$

30. C: $x^2+y^2-4x+10y-\frac{53}{4}=0$

I. Radius $=\sqrt{\left(\frac{-4}{2}\right)^2+\left(\frac{10}{2}\right)^2+\frac{53}{4}}=6.5$

II. Centre $=\left(\frac{-4}{-2},\frac{10}{-2}\right)=(2,-5)$

III. Put $(x,y)=(0,0)$: A

LHS $=4(0)^2+4(0)^2-16(0)+40(0)-53=-53<0$

∴ The origin lies inside the circle.

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31. $\begin{cases} y = \frac{2x+k}{3} & \text{— (1)} \\ x^2+y^2-4x-6y=0 & \text{— (2)} \end{cases}$ A

Put (1) into (2): $x^2+\left(\frac{2x+k}{3}\right)^2-4x-6\left(\frac{2x+k}{3}\right)=0$

$x^2+\frac{1}{9}(4x^2+4kx+k^2)-4x-4x-2k=0$

$9x^2+4x^2+4kx+k^2-72x-18k=0$

$13x^2+(4k-72)x+k^2-18k=0$

$\Delta=0$: $(4k-72)^2-4(13)(k^2-18k)=0$

$(2k-36)^2-13k^2+234k=0$

$4k^2-144k+1296-13k^2+234k=0$

$-9k^2+90k+1296=0$

$k=-8$ or 18

32. Put $x=0$: $y^2-10y+16=0 \rightarrow y=8$ or $y=2$ C

Put $y=0$: $x^2+8x+16=0 \rightarrow x=-4$

$\therefore$ Required area $=\frac{(8-2)\cdot 4}{2}=12$

33. Centre $=\left(\frac{-4+0}{2}, \frac{6+0}{2}\right)=(-2,3)$ B

Radius $=\sqrt{4^2+6^2}\cdot\frac{1}{2}=\sqrt{13}$

$\therefore$ Required equation: $(x+2)^2+(y-3)^2=13$

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34. $\frac{48+x+y+z}{10} = 7.5 \rightarrow x+y+z = 27$ C

$\because$ mode = 8 $\therefore$ at least 2 out of x, y, z are 8

Assume $x = y = 8$, $z = 27-16 = 11$ $\therefore$ Median = 8

35. $\frac{12\mu + 60 \cdot 164}{12+60} = 165 \rightarrow \mu = 170$ C

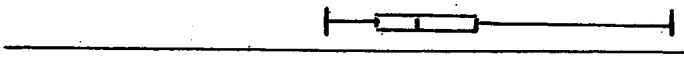
36. $\frac{181+a+b}{9} = 27 \rightarrow a+b = 62$ D

For the set $\{22, 24, 24, 26, 27, 29, 29\}$, median = 26

$\therefore a, b \geq 27 \rightarrow \because a \geq 27$, $b \leq 62-27 = 35$

37. $\sigma^2 = 0.8224$ C

38. Min = 43 ; $Q_1 = 50$; $Q_2 = 55$; $Q_3 = 63$; Max = 89



C

39. $10x_1 = a_1 + a_2 + \cdots + a_{10}$; $z_1 = \frac{(a_1-x_1)^2 + (a_2-x_1)^2 + \cdots + (a_{10}-x_1)^2}{10}$

$9x_1 = a_2 + \cdots + a_{10}$ $\quad 10z_1 = (a_2-x_2)^2 + \cdots + (a_{10}-x_2)^2$

$x_1 = \frac{a_2 + \cdots + a_{10}}{9}$ $\quad 10z_1 = 9z_2$

$x_1 = x_2$ $\quad z_2 = \frac{10}{9} z_1$

$z_2 \geq z_1$

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Consider the set $\{1,2,3,4,5,6,7,\ ,9,15\}$, mean = 6 and median = 5.5

For the set $\{1,2,3,4,5,7,8,9,15\}$, median = 5 B

40. $\frac{276-\mu}{\sigma} = -3 \rightarrow \mu - 3\sigma = 276$ $\therefore \mu = 309$ C

$\frac{320-\mu}{\sigma} = 1 \rightarrow \mu + \sigma = 320$ $\sigma = 11$

41. Required number $= P_{10}^{10} \cdot P_2^{11} = 399168000$ D

42. Required number $= P_4^4 \cdot P_4^4 = 576$ C

43. Required number $= C_3^{11} \cdot C_4^{21} = 987525$ A

44. Required number $= C_5^{20} - C_5^9 - C_1^{11} \cdot C_4^9 = 13992$ C

45. Required number $= C_3^{12} \cdot C_4^9 \cdot C_5^5 = 27720$ B

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