REG-2425-MOCK-SET 6-MATH-CP 2

Answers:

1. B	2. C	3. A	4. B	5. D	6. B	7. C	8. D	9. D	10. B
11. A	12. D	13. A	14. C	15. D	16. B	17. C	18. D	19. A	20. A
21. C	22. B	23. D	24. B	25. A	26. C	27. B	28. C	29. C	30. A
31. D	32. C	33. A	34. C	35. A	36. B	37. C	38. A	39. B	40. D
41. A	42. D	43. B	44. B	45. D					

Suggested Solutions:

1. B

$$\begin{aligned}\frac{125^{2n+1}}{-25^{3n+1}} &= \frac{5^{6n+3}}{-5^{6n+2}} \\ &= -5^{(6n+3)-(6n+2)} \\ &= -5\end{aligned}$$

2. C

Check the coefficient of each term.

	$-3x$	$-4y^2$	$-6y$
A.	✗		
B.	✗		
C.	✓	✓	✓
D.	✓	✓	✗

3. A

$$\begin{aligned}\frac{\alpha + y}{x} &= \frac{\alpha\beta}{2} \\ 2\alpha + 2y &= \alpha\beta x \\ \alpha(2 - \beta x) &= -2y \\ \alpha &= \frac{2y}{x\beta - 2}\end{aligned}$$

4. B

$$\begin{aligned}-f(2) + f(-2) &= 2(-1+1) + 2[-(2) + (-2)] - [-(2)^2 + (-2)^2] \\ &= -8\end{aligned}$$

5. D

$(\log 5)^8 \approx 0.056\,972\,897$

A. ✗. It should be 0.057 instead.

B. ✗. It has only 2 significant figures.

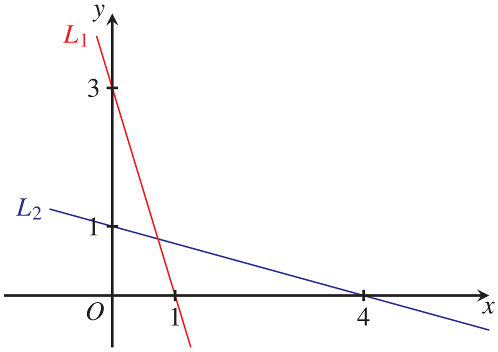
C. ✗. It should be 0.0570 instead.

D. ✓.

6. B

Assign reasonable values to the intercepts.

L_1:
$(1,\ 0) \to b = 1$
$(0,\ 3) \to a = -\dfrac{1}{3}$
L_2:
$(0,\ 1) \to d = -2$
$(4,\ 0) \to c = -\dfrac{1}{2}$
The result follows.



7. C

Compare the coefficients of x.

$$5a - a = 9 - 1$$
$$a = 2$$

Compare the constant term.

$$5 - 5a^2 = -9 - b$$
$$b = 6$$

8. D

$f(-4) = 6 = 7(-4)^{2018} + 16a - 20 + c$

$26 = 7(4^{2018}) + 16a + c$

Remainder $= 7(4^{2018}) + 16a + 20 + c$

$= 26 + 20$

$= 46$

9. D

A. ✗. y-intercept $= 29 - (0-2)^2 = 25$

B. ✗. When $x = -3$, $y = 29 - (-3-2)^2 = 4 \neq 22$.

C. ✗. Vertex is $(2,\ 29)$.

D. ✓. $0 = 29 - (x-2)^2$

$x = 2 \pm \sqrt{29}$

10. B

$$\text{Interest} = 58\,000 \times \left(1 + \frac{4\%}{4}\right)^{5\times4} - 58\,000$$

$$\approx \$12\,771$$

11. A

Let $z = \dfrac{kx^3}{\sqrt{y}}$, where k is a constant.

Then $k = \dfrac{\sqrt{y}z}{x^3}$.

$\dfrac{yz^2}{x^6} = k^2$ is a constant.

12. D

The inequalities can be reduced to $x > 2$ and $x < 6$.

Thus, $2 < x < 6$. There are 3 integers satisfying the compound inequality: 3, 4 and 5.

13. A

$$\text{Lower limit} = (11.5)(5.5) - \frac{(4.5)(3.5)}{2} = 55.375$$

$$\text{Upper limit} = (12.5)(6.5) - \frac{(3.5)(2.5)}{2} = 76.875$$

The answer is A.

14. C

The numbers are formed by +6, +10, +14, . . .

The sequence of numbers of dots is 1, 7, 17, 31, 49, 71, 97, . . .

Required number is 97.

15. D

Height of the trapezium $= \sqrt{15^2 - (27-18)^2}$

$= 12$ cm

$$20\,250 = (30)^3 - \frac{(18+27)(12)}{2} \times h$$

$h = 25$

16. B

Let $QT = 3$ cm. Then $TR = 2$ cm and $PS = 5$ cm.

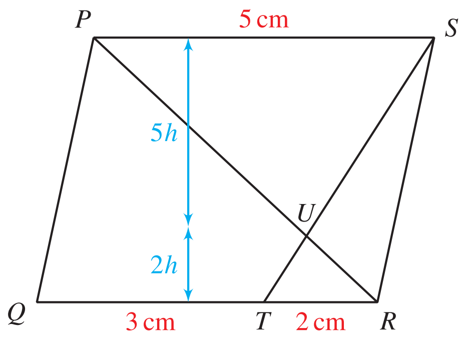
$\triangle PSU \sim \triangle RTU$ (ratio 5 : 2)

$$\frac{(2)(2h)}{2} = 12$$

$h = 6$

Required area $= \frac{(5)(7h)}{2} - \frac{(2)(2h)}{2}$

$= 93$ cm^2



17. C

$\angle POR = \tan^{-1}\frac{PQ}{OQ} + \cos^{-1}\frac{OQ}{OR}$

$= 105°$

$PR = 7 + \sqrt{14^2 - 7^2}$

$= (7 + 7\sqrt{3})$ cm

Required area $= 14^2\pi \times \frac{105°}{360°} - \frac{(PR)(7)}{2}$

≈ 112.7 cm^2

18. D

I. ✓. Note that regular pentagon is cyclic.
$\angle BAC = \angle CAD = \angle DAE$ *(equal chords, equal ∠s)*

II. ✓. $\angle FBC = \angle FCB = \angle ADE = \angle DAE$ *(equal chords, equal ∠s)*
$\triangle ADE \sim \triangle BCF$

III. ✓. Note that $\angle AED = \angle BFC = \angle AFD$ and $\angle FDE = \angle FAE$.
$AFDE$ is a parallelogram, opposite sides are equal.
Since $AE = ED$, four sides of $AFDE$ are equal and $AFDE$ is then a rhombus.

19. A

$CD = AD \tan \alpha = l \tan \alpha$

$BD = CD \tan \beta = l \tan \alpha \tan \beta$

20. A

Compare coefficients of x.

$$2q = r$$
$$\frac{q}{r} = \frac{1}{2}$$

Compare constant term.

$$6p = 5r$$
$$\frac{p}{r} = \frac{5}{6}$$

Thus, $p : q : r = 5 : 3 : 6$.

21. C

$\angle POS = \angle ROS = \dfrac{136°}{2} = 68°$

$\angle SPO = \angle PSO = \dfrac{180° - 68°}{2} = 56°$

22. B

There are 2 axes of reflectional symmetry.

23. D

Let the exterior angle be θ.

$$\theta + 7\theta = 180°$$
$$\theta = 22.5°$$

I. ✓. $n = \dfrac{360°}{22.5°} = 16$

II. ✗. Number of diagonals $= C_2^{16} - 16 = 104$

III. ✓.

24. B

Denote the pole by O.

$\angle POR = 293° - 113° = 180°$ and $\angle POQ = 113° - 23° = 90°$

Required area $= \dfrac{(12+5)(10)}{2}$

$= 85$

25. A

The locus of P is a circle with centre $A\ (2,\ -5)$ and radius AB.

A. ✓. Centre $(2,\ -5)$ and $8^2 + 3^2 - 4(8) + 10(3) - 71 = 0$.

B. ✗. Centre $(-2,\ 5)$

C. ✗. Centre $(-2,\ 5)$

D. ✗. Centre $(2,\ -5)$ but $8^2 + 3^2 - 4(8) + 10(3) - 75 = -4 \neq 0$.

26. C

$5h - 2(4) - 2 = 0$

$h = 2$

Equation of L is in the form $2x + 5y + k = 0$, where k is a constant.

$2(2) + 5(4) + k = 0$

$k = -24$

Equation of L is $2x + 5y - 24 = 0$.

27. B

y-coordinate of centre $= \dfrac{2\sqrt{3} + 8\sqrt{3}}{2}$

$= 5\sqrt{3}$

Centre of circle is the centroid/orthocentre/circumcentre/incentre of $\triangle CAB$.

(Note: four centres coincide when it is equilateral triangle.)

A. ✗. Centre $\left(-5,\ 5\sqrt{3}\right)$ should not lie on the line AB.

B. ✓.

C. ✗. y-coordinate of centre $= -5\sqrt{3} \neq 5\sqrt{3}$

D. ✗. y-coordinate of centre $= -5\sqrt{3} \neq 5\sqrt{3}$

28. $\boxed{\text{C}}$

$$\text{Required probability} = 1 - \left(\frac{8}{10}\right)^4$$
$$\approx 0.590$$

29. $\boxed{\text{C}}$

Median = 90

Range = 100 − 40 = 60

Inter-quartile range = 100 − 60 = 40

30. $\boxed{\text{A}}$

$$30 + b = \frac{16 + 21 + 22 + \ldots + 53}{23}$$

$$690 + 23b = 751 + a + b$$

$$22b = 61 + a$$

Since b is an integer, $61 + a$ is a multiple of 22.

Note that $2 \le a \le 5$ and $3 \le b \le 6$.

We have $a = 5$ and $b = 3$.

Thus, $a + b = 8$.

31. $\boxed{\text{D}}$

$$8^2 + 4 \times 8^{16} = 64 + 4 \times 2^{48}$$
$$= 4 \times 16 + 4 \times 16^{12}$$
$$= 4000000000040_{16}$$

32. $\boxed{\text{C}}$

For the point $\left(\frac{1}{3},\ 0\right)$,

$$\log_8 x = \frac{1}{3} \quad \text{and} \quad \log_4 y = 0$$
$$x = 8^{\frac{1}{3}} \qquad\qquad y = 1$$
$$= 2$$

Only option C satisfies this.

33. A

Note that $f(2) = f(5) = 0$.

A. ✓.

B. ✗. When $x = -1$, $y = f(1-1) = f(0) \neq 0$.

C. ✗. When $x = -1$, $y = -f(-1) - 1 \neq 0$.

D. ✗. When $x = -1$, $y = -f(-1) + 1 \neq 0$.

34. C

$$(2-i)z = (2-i)(1+i)(2x-yi)$$
$$= (3+i)(2x-yi)$$
$$= (6x+y) + (2x-3y)i$$

Since x and y are positive integers such that $6x + y = 25$ and $x > y$,
we have $x = 4$ and $y = 1$.
Thus, $x - y = 4 - 1 = 3$.

35. A

$$\frac{36}{2k} = \frac{72k}{36}$$
$$36 = 4k^2$$
$$k = 3 \quad \text{or} \quad -3 \text{ (rejected)}$$

The geometric sequence is 216, 36, 6, . . .

$$\text{Required sum} = \frac{216}{1 - \frac{6}{36}}$$
$$= \frac{1296}{5}$$

36. B

I. ✓. $$\text{Required sum} = \frac{(a_{31} + a_{50})20}{2}$$
$$= \frac{(-314 - 542)20}{2}$$
$$= -8560$$

II. ✗. $$58 - 12n = -76$$
$$n = \frac{67}{6} \text{ (rejected)}$$

III. ✓. $$\text{Required sum} = \frac{[46 + (58 - 12n)]n}{2}$$
$$= 52n - 6n^2$$

37. C

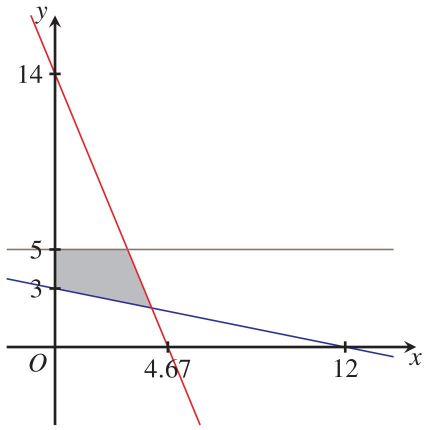
Line	x-intercept	y-intercept
$x = 0$	0	
$y = 5$		5
$x + 4y - 12 = 0$	12	3
$3x + y - 14 = 0$	4.67	14

Sketch the graph using the intercepts.

Value of $3x + 2y - 4$ is greater when x and y are greater, i.e., top right corner.
The top right corners are $(3,\ 5)$ and $(4,\ 2)$.

$(x,\ y)$	$(3,\ 5)$	$(4,\ 2)$
$3x + 2y - 4$	15	12

Required value is 15.



38. A

$3\cos^2\theta + \cos\theta - 4 = 0$

$\cos\theta = 1 \quad \text{or} \quad -\frac{4}{3} \text{ (rejected)}$

$\theta = 0°$

There is 1 root.

39. B

$4^2 = 6^2 + 4^2 - 2(6)(4)\cos\angle ACB$

$\angle ACB \approx 41.4°$

$AD^2 = 4^2 + 4^2 - 2(4)(4)\cos\angle ACB$

$AD \approx 2.83 \text{ cm}$

40. D

Let D be a point on BC such that $PD \perp BC$.

Required angle is $\angle ADP$.

$$BC = \sqrt{4^2 + 3^2} = 5\text{ m}$$

$$\frac{(PD)(BC)}{2} = \frac{(PB)(PC)}{2}$$

$$PD = 2.4\text{ m}$$

$$\tan \angle ADP = \frac{5}{2.4} = \frac{25}{12}$$

41. A

Centre of small circle lies on RT, then $\angle SRT = \angle TRU$.

$\angle RTU = \angle RUQ = 40^\circ$ and $\angle RTS = 90^\circ$

$\angle SRU = 180^\circ - (40^\circ + 90^\circ) = 50^\circ$

$\angle TRU = \frac{50^\circ}{2} = 25^\circ$ and $\angle PUT = \angle TRU = 25^\circ$

42. D

$$\text{Required number} = C_6^{13} - C_3^7 C_3^6 = 1016$$

43. B

$$\text{Required probability} = \frac{2!7!4!}{11!} = \frac{1}{165}$$

44. B

Let the standard deviation be σ.

$$\frac{76 - 64}{\sigma} = 1.5$$

$$\sigma = 8$$

$$\text{Standard score of Billy} = \frac{54 - 64}{8} = -1.25$$

45. D

Let the common difference be d.

Note that $2x_3 = 2(x_1 + 2d)$, $2x^6 = 2(x_4 + 2d)$ and $2x_9 = 2(x_7 + 2d)$.

The new numbers are formed by adding $2d$ and then multiply by 2 to each number.

Thus, $\frac{v_1}{v_2} = \frac{v_1}{2^2 v_2} = \frac{1}{4}$.