REFERENCE DATA

SOLID	VOLUME	OTHER		
Right circular cone	$V = \frac{1}{3}\pi r^2 h$	$L = cl$	V = volume r = radius h = height	L = lateral area c = circumference of base l = slant height
Sphere	$V = \frac{4}{3}\pi r^3$	$S = 4\pi r^2$	V = volume r = radius S = surface area	
Pyramid	$V = \frac{1}{3}Bh$		V = volume B = area of base h = height	

PRACTICE TEST 1

Math Level IC

50 Questions • Time—60 Minutes

1. Which of the following illustrates a distributive principle?

(A) $5 + 4 = 4 + 5$
(B) $(3 + 4) + 5 = 3 + (4 + 5)$
(C) $(6 \cdot 2) + 4 = (2 \cdot 6) + 4$
(D) $6 \cdot (2 \cdot 4) = (4 \cdot 2) \cdot 6$
(E) $6 \cdot (2 + 4) = 6 \cdot 2 + 6 \cdot 4$

2. 

In the figure, $AC = 9$, $BC = 3$, and D is 3 times as far from A as from B. What is BD?

(A) 6
(B) 9
(C) 12
(D) 15
(E) 18

3. If n is a positive integer, which of the following is always odd?

(A) $19n + 6$
(B) $19n + 5$
(C) $19n^2 + 5$
(D) $18n + 4$
(E) $18n + 5$

4. Let R be the set of all numbers r such that $-5 < r < 8$. Let S be the set of all numbers s such that $3 < s < 10$. The intersection, T, of R and S is the set of all numbers t such that

(A) $-5 < t < 3$
(B) $-5 < t < 8$
(C) $0 < t < 8$
(D) $3 < t < 8$
(E) $8 < t < 10$

5. If $b > 1$ and $b^y = 1.5$, then $b^{-2y} =$

(A) -3.0
(B) -2.25
(C) $-\frac{1}{2.25}$
(D) $\frac{1}{2.25}$
(E) $\frac{1}{3.0}$

6. $(y-2)(y+7)^2 < 0$, if and only if

(A) $y < 2$
(B) $-7 < y < 2$
(C) $y > -7$
(D) $y < 2$ and $y \neq -7$
(E) $2 < y < 7$ and $y > 7$

7. A computer is programmed to add 3 to the number N, multiply the result by 3, subtract 3, and divide this result by 3. The computer answer will be

(A) $N + 1$
(B) $N + 2$
(C) N
(D) $N - 2$
(E) $N + \frac{1}{3}$

8. $\frac{2x-4}{4x+20} \cdot \frac{x^2-25}{x^2-7x+10}$ where $(x \neq 5) =$

(A) $\frac{1}{4}$
(B) $\frac{1}{2}$
(C) $\frac{2}{x-5}$
(D) $\frac{2}{x+5}$
(E) none of these

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9. If $S = \frac{rL - a}{r - 1}$, $r =$

(A) $\frac{a - S}{S - L}$
(B) $\frac{1}{S - L}$
(C) $\frac{S - a}{S - L}$
(D) 1
(E) $\frac{S - a}{L - S}$

10. $\frac{1 - \frac{9}{y^2}}{1 - \frac{3}{y}} - \frac{3}{y}$, where $(y \neq 0) =$

(A) $\frac{y - 3}{y}$
(B) $\frac{y + 3}{y}$
(C) 3
(D) 1
(E) $3y - 1$

11. If I varies inversely as d^2 and $I = 20$ when $d = 3$, what is I when $d = 10$?

(A) 6
(B) $66\frac{2}{3}$
(C) 18
(D) 1.8
(E) 12

12. If y is the measure of an acute angle such that $\sin y = \frac{a}{5}$, $\tan y =$

(A) $\frac{\sqrt{25 - a^2}}{5}$
(B) $\frac{a}{\sqrt{25 - a^2}}$
(C) $\frac{5}{\sqrt{25 - a^2}}$
(D) $\frac{a}{5 - a}$
(E) $\frac{a}{\sqrt{25 + a^2}}$

13. How many degrees between the hands of a clock at 3:40?

(A) 150°
(B) 145°
(C) 140°
(D) 135°
(E) 130°

14. The legs of a right triangle are in the ratio of 1:2. If the area of the triangle is 25, what is the hypotenuse?

(A) $5\sqrt{5}$
(B) $5\sqrt{3}$
(C) 10
(D) $10\sqrt{3}$
(E) $10\sqrt{5}$

15. If $x = 1 + \sqrt{2}$, then $x^2 - 2x + 1$ equals

(A) $1+\sqrt{2}$
(B) $\sqrt{2}-1$
(C) 2
(D) $\sqrt{2}$
(E) $2+\sqrt{2}$

16. A point is 17 in. from the center of a circle of radius 8 in. The length of the tangent from the point to the circle is

(A) $\sqrt{353}$
(B) 15
(C) 9
(D) $9\sqrt{3}$
(E) $15\sqrt{2}$

17. In the formula $f = \frac{C}{L}$, if $C = 3 \times 10^{10}$ and $L = 6 \times 10^{-5}$, $f =$

(A) 2×10^{15}
(B) 2×10^{5}
(C) 5×10^{14}
(D) 2×10^{14}
(E) 5×10^{15}

18. What is the approximate slope of the line $\sqrt{14}x - 3y = \sqrt[3]{7}$?

(A) 1.15
(B) 1.25
(C) 1.35
(D) 1.45
(E) 1.55

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19. How many numbers in the set {–8, –5, 0, 10, 20} satisfy the condition $|x - 5| < 11$?

(A) none
(B) one
(C) two
(D) three
(E) four

20. The graph of $x^2 - \sqrt{5}x - 2$ has its minimum value at which approximate value of x?

(A) .83
(B) 1.12
(C) 1.21
(D) 1.35
(E) 2.47

21. In ΔPQR, if the measure of $\angle Q$ is 50° and the measure of $\angle P$ is $p°$, and if $\overline{PQ}$ is longer than $\overline{PR}$, then

(A) $0 < p < 40$
(B) $0 < p < 80$
(C) $40 < p < 80$
(D) $80 < p < 90$
(E) $80 < p < 130$

22. Three parallel lines are cut by three nonparallel lines. What is the maximum number of points of intersection of all six lines?

(A) 10
(B) 11
(C) 12
(D) 13
(E) 14

23. In figure 23, $m\angle QSR = 30°$ in circle O. What is the measure of angle QPR?

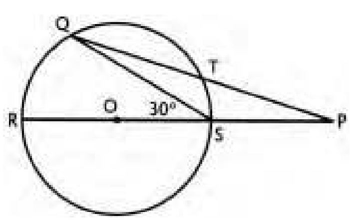

Fig. 23

(A) 10
(B) 15
(C) 20
(D) 25
(E) cannot be determined from the information given

24. If $f(x) = x^3 - 3$ and $g(x) = 7x - 5$, what is the approximate value of $f(g(3.9))$?

(A) 389.23
(B) 938.32
(C) 4261.48
(D) 11086.57
(E) 14257.91

25. For what value(s) of y on the curve shown in figure 25 does $y = 4x$?

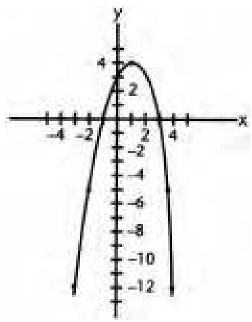

Fig. 25

(A) no value
(B) +4 only
(C) +3 only
(D) –5 only
(E) +4 and –12

26. In figure 26, $\overline{RT}$ is a diameter of the semicircle. If $RS = 2$ and $ST = 3$, then the area of the semicircle is

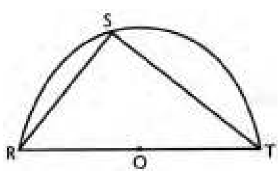

Fig. 26

(A) $\frac{13\pi}{2}$
(B) $\frac{13\pi}{4}$
(C) $\frac{13\pi}{6}$
(D) $\frac{13\pi}{8}$
(E) cannot be determined from the information given

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27. A triangle with vertices (0, 0), (4, 3), and (–3, 4) belongs to which of the following classes?

I—Scalene Triangles
II—Isosceles Triangles
III—Right Triangles
IV—Equilateral Triangles

(A) none
(B) I only
(C) II and III only
(D) IV only
(E) III only

28. The equation of the graph in figure 28 is

(A) $y = |x|$
(B) $y = x$
(C) $y = -x$
(D) $y = 2x$
(E) $y = x^2$

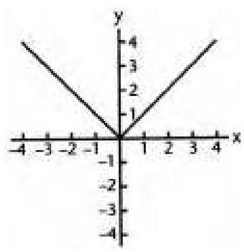

Fig. 28

29. What is the approximate length of the line segment joining the points N (7, –2) and J (–2, 7)?

(A) 3.16
(B) 9.83
(C) 10.00
(D) 11.42
(E) 12.73

30. If the graph of the equation $x + y - 8 + 4k = 0$ passes through the origin, the value of k is

(A) –2
(B) 2
(C) 0
(D) 1
(E) –1

31. If $x = -8$, the value of $x^{2/3} + 2x^0$ is

(A) -2
(B) 4
(C) -4
(D) 6
(E) -6

32. If $2^{3x+10} = \left(\frac{1}{4}\right)^x$, $x =$

(A) 0
(B) 1
(C) -1
(D) 2
(E) -2

33.

x	2	4	7	11
y	3	7	13	21

The equation expressing the relationship between x and y in the above table is

(A) $y = 2x + 1$
(B) $y = x + 2$
(C) $y = 2x - 1$
(D) $2x + y = 7$
(E) none of these

34. The graph of the equation $x^2 - 2y^2 = 8$ is

(A) a circle
(B) an ellipse
(C) a hyperbola
(D) a parabola
(E) two straight lines

35. The fraction $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{2}}$ is equal to

(A) $\sqrt{3}$
(B) $\frac{\sqrt{3}-2}{2}$
(C) $\sqrt{6}$
(D) $\frac{\sqrt{6}-2}{2}$
(E) $\sqrt{3}-1$

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36. For what values of K does the equation $Kx^2 - 4x + K = 0$ have real roots?

(A) +2 and –3
(B) $-2 \leq K \leq 2$
(C) $K \leq 2$
(D) $K \geq -2$
(E) $-4 \leq K \leq 4$

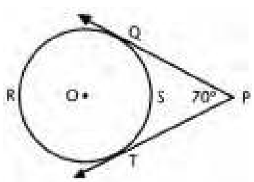
37. The radiator of a car contains 10 quarts of a 20% solution of alcohol. If 2 quarts of water are added, what percent of the resulting solution is alcohol?

(A) 18%
(B) $16\frac{2}{3}\%$
(C) $15\frac{1}{4}\%$
(D) 14%
(E) $12\frac{1}{2}\%$

38. Express the infinite decimal .212121 … as a common fraction.

(A) $\frac{21}{100}$
(B) $\frac{23}{99}$
(C) $\frac{7}{100}$
(D) $\frac{7}{99}$
(E) $\frac{7}{33}$

39. $\overrightarrow{PQ}$ are $\overrightarrow{PT}$ tangent to circle O. If angle P measures 70°, how many degrees are in minor arc QT?



(A) 140
(B) 125
(C) 120
(D) 110
(E) 100

40. A cubic foot of water is poured into a rectangular aquarium with base 15 in. by 18 in. To what height in inches does the water rise?

(A) $6\frac{2}{5}$
(B) 6
(C) $5\frac{3}{4}$
(D) $5\frac{1}{2}$
(E) 5

41. A car drives a distance of *d* miles at 30 mph and returns at 60 mph. What is its average rate for the round trip?

(A) 45 mph
(B) 43 mph
(C) 40 mph
(D) $\frac{2d}{35}$ mph
(E) $\frac{35}{2d}$ mph

42. If $y = \sqrt{7}x^2 + \sqrt{5}x + \sqrt{3}$, what is the approximate sum of the roots?

(A) 1.53
(B) 1.18
(C) –.65
(D) –.77
(E) –.85

43. A circle is inscribed in a triangle with sides 9, 12, and 15. The radius of the circle is

(A) 2
(B) 3
(C) 3.5
(D) 4
(E) 4.6

44. The interior angles of a regular polygon are each 165°. How many sides does the polygon have?

(A) 17
(B) 20
(C) 22
(D) 24
(E) 28

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45. Find the root(s) of the equation $y+\sqrt{y+5}=7$.

(A) 11
(B) 4
(C) 4 and 11
(D) ±4
(E) none of these

46. Which of the following is the approximate equation of a line perpendicular to $\frac{x}{.47}+\frac{y}{.53}=1$ and passing through the point $\left(\frac{1}{2},-\frac{1}{2}\right)$

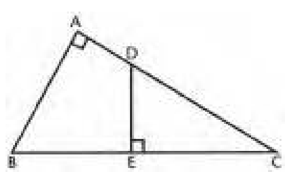
(A) $\left(y-\frac{1}{2}\right)=-1.13\left(x-\frac{1}{2}\right)$
(B) $\left(x-\frac{1}{2}\right)=.89\left(y+\frac{1}{2}\right)$
(C) $\left(y-\frac{1}{2}\right)=-1.13\left(x+\frac{1}{2}\right)$
(D) $\left(y+\frac{1}{2}\right)=-1.13\left(x-\frac{1}{2}\right)$
(E) $\left(y+\frac{1}{2}\right)=.89\left(x-\frac{1}{2}\right)$

47. In how many points do the graphs of the equations $x^2+y^2=25$ and $y^2=4x$ intersect?

(A) 0
(B) 1
(C) 2
(D) 3
(E) 4

48. In right triangle ABC, $\overline{DE}\perp\overline{BC}$. If $AB=6$, $AC=8$, $BC=10$, and $DE=4$, find EC.

(A) $5\frac{1}{3}$
(B) $6\frac{2}{3}$
(C) 5
(D) 6
(E) $4\frac{3}{4}$



49. A man can do a job in h hours alone and his son can do it in $2h$ hours alone. Together, how many hours will it take them to do the job?

(A) $3h$

(B) $\frac{h}{3}$

(C) $\frac{3h}{2}$

(D) $\frac{2h}{3}$

(E) $\frac{h}{2}$

50. The diagonals of a parallelogram divide the figure into four triangles that are

(A) congruent
(B) similar
(C) equal in area
(D) isosceles
(E) none of these

PRACTICE TEST 1

Answer Key

Math Level IC

1.	E	**11.**	D	**21.**	B	**31.**	D	**41.**	C
2.	A	**12.**	B	**22.**	C	**32.**	E	**42.**	E
3.	E	**13.**	E	**23.**	E	**33.**	C	**43.**	B
4.	D	**14.**	A	**24.**	D	**34.**	C	**44.**	D
5.	D	**15.**	C	**25.**	E	**35.**	D	**45.**	B
6.	D	**16.**	B	**26.**	D	**36.**	B	**46.**	E
7.	B	**17.**	C	**27.**	C	**37.**	B	**47.**	C
8.	B	**18.**	B	**28.**	A	**38.**	E	**48.**	A
9.	C	**19.**	D	**29.**	E	**39.**	D	**49.**	D
10.	D	**20.**	B	**30.**	B	**40.**	A	**50.**	C

SOLUTIONS

1. **The correct answer is (E).** The distributive principle refers to the product of a single quantity and sum of quantities; that is, $a(b + c) = ab + ac$.

2. **The correct answer is (A).**

Let $BD = x$. Then $AD = 3BD$ or $12 + x = 3x$.

Subtract x from both sides.

$$12 = 2x$$
$$x = 6$$

3. **The correct answer is (E).** Examine each choice in turn.

(A) $19n + 6$: If n is even, $19n$ is even, and the sum of two even numbers is even.

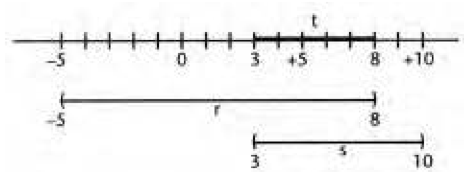
(B) $19n + 5$: If n is odd, $19n$ is odd, and the sum of two odd numbers is even.

(C) $19n^2 + 5$: If n is odd, n^2 is odd, $19n^2$ is odd, and the sum of two odd numbers is even.

(D) $18n + 4$: $18n$ is always even, and the sum of two even numbers is even.

(E) $18n + 5$: $18n$ is always even, and the sum of an even and an odd number is odd.

4. The correct answer is (D). Put both sets on a number line and determine their intersection.



The heavy line is the intersection of the sets $3 < t < 8$.

5. The correct answer is (D).

$$b^{-2y} = \frac{1}{b^{2y}} = \frac{1}{\left(b^{y}\right)^{2}}$$

These equalities follow from the laws of exponents. Substitute $b^y = 1.5$.

$$b^{-2y} = \frac{1}{(1.5)^2} = \frac{1}{2.25}$$

6. The correct answer is (D).

$(y - 2)(y + 7)^2 < 0$

$(y + 7)^2$ is always a positive quantity when $y \neq -7$. $(y–2)$ must then be a negative quantity to make the above product negative.

$y–2<0$

$y<2$

7. The correct answer is (B).

$$\begin{aligned}\frac{3(N+3)-3}{2} &= \frac{3N+9-3}{3}\\ &= \frac{3N+6}{3}\\ &= N+2\end{aligned}$$

8. The correct answer is (B).

$$\frac{2x-4}{4x+20}\cdot\frac{x^2-25}{x^2-7x+10}$$

Factor wherever possible.

$$\frac{\cancel{2}(\cancel{x-2})}{\underset{2}{\cancel{4}}(\cancel{x+5})}\cdot\frac{(\cancel{x-5})(\cancel{x+5})}{(\cancel{x-2})(\cancel{x-5})}=\frac{1}{2}$$

9. The correct answer is (C).

$$S = \frac{rL - a}{r - 1}$$

Multiply both sides by (r–1).

$$S(r-1) = rL - a$$
$$Sr - S = rL - a$$

Add S and $-rL$ to both sides.

$$Sr - rL = S - a$$
$$r(S - L) = S - a$$

Divide both sides by S – L.

$$r = \frac{S - a}{S - L}$$

10. The correct answer is (D).

$$\frac{1 - \frac{9}{y^2}}{1 - \frac{3}{y}} - \frac{3}{y}$$

$$= \frac{\left(1 + \frac{3}{y}\right)\cancel{\left(1 - \frac{3}{y}\right)}}{\cancel{\left(1 - \frac{3}{y}\right)}} - \frac{3}{y}$$

$$= 1 + \frac{3}{y} - \frac{3}{y} = 1$$

11. The correct answer is (D). $I = \frac{K}{d^2}$ where K is the constant of proportionality. To determine K, substitute I = 20 and d = 3.

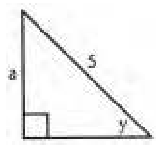
$$20 = \frac{K}{9} \text{ or } K = 180$$

The formula then becomes $I = \frac{180}{d^2}$

Substitute d = 10 in the formula.

$$I = \frac{180}{100}$$
$$I = 1.8$$

12. The correct answer is (B).



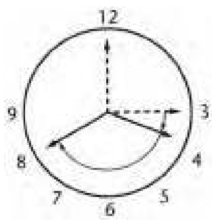
Construct a right triangle with a hypotenuse 5 and leg a opposite $\angle y$.

$\sin y = \dfrac{a}{5}$

By the Pythagorean theorem, the leg adjacent to $\angle y$ becomes $\sqrt{25 - a^2}$.

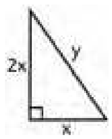
$\tan \angle y = \dfrac{\text{opposite leg}}{\text{adjacent leg}} = \dfrac{a}{\sqrt{25 - a^2}}$

13. The correct answer is (E).



Consider the position of the hands at 3 o'clock. The large hand is at 12 and the small hand at 3. At 3:40 the large hand is at 8 and the small hand has moved $\frac{2}{3}$ of the distance between the 3 and 4. Since there are 30° between the 3 and the 4, the small hand has moved $\frac{2}{3} \times 30° = 20°$. Between the 3 and the 8 there are $5 \times 30° = 150°$ of arc. Therefore at 3:40, the angle between the hands is $150° – 20° = 130°$.

14. The correct answer is (A).



Designate the legs of the right triangle by x and $2x$. The area of the triangle is then

$$A = \frac{1}{2} \cdot x \cdot 2x = 25$$
$$\frac{1}{2} \cdot 2x^2 = 25$$
$$x^2 = 25$$
$$x = 5 \text{ and } 2x = 10$$

If the legs are 5 and 10, the hypotenuse y is

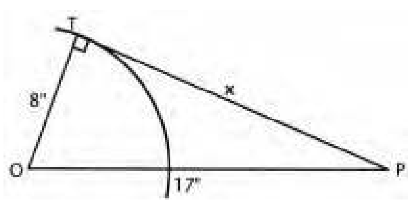
$$y^2 = 5^2 + 10^2 = 125$$
$$y = \sqrt{125} = \sqrt{25 \cdot 5} = 5\sqrt{5}$$

15. The correct answer is (C). Substitute $x = 1 + \sqrt{2}$ in the expression $x^2 - 2x + 1$.

$$\left(1+\sqrt{2}\right)^2 - 2\left(1+\sqrt{2}\right) + 1$$
$$= 1 + 2\sqrt{2} + 2 - 2 - 2\sqrt{2} + 1 = 2$$

or $x^2 - 2x + 1 = (x-1)^2 = \left(1+\sqrt{2}-1\right)^2 = 2$

16. The correct answer is (B).



Let the tangent $PT = x$; then $OP = 17$ and $OT = 8$.

The radius $\overline{OT} \perp \overline{PT}$ so that OPT is a right Δ.

$x^2 + 8^2 = 17^2$ by the Pythagorean Theorem

$$x^2 + 64 = 289$$
$$x^2 = 225$$
$$x = 15$$

17. The correct answer is (C).

$$f = \frac{C}{L}$$

Substitute,

$$f = \frac{3 \cdot 10^{10}}{6 \cdot 10^{-5}}$$

When we divide powers of the same base, we subtract exponents.

$$\begin{aligned} f &= \frac{1}{2} \times 10^{15} \\ &= .5 \times 10^{15} \\ &= 5 \times 10^{14} \end{aligned}$$

18. The correct answer is (B).

$$\sqrt{14}x - 3y = \sqrt[3]{7} \Rightarrow 3y = \sqrt{14}x - \sqrt[3]{7}$$

$$y = \frac{\sqrt{14}}{3}x - \frac{\sqrt[3]{7}}{3}$$

$$\text{slope} = \frac{\sqrt{14}}{3} \approx 1.247$$

19. The correct answer is (D). $|x - 5| < 11$ is equivalent to

$x - 5 < 11$ when $x - 5 > 0$ or $x > 5$.

Thus $x < 16$ when $x > 5$ or $5 < x < 16$.

Only the value $x = 10$ in the given set is in this interval.

$|x - 5|$ is equivalent to $-(x - 5)$ when $x - 5 < 0$ or $x < 5$.

Solving the inequality $5 - x < 11$, we get $-x < 6$ or $x > -6$ when $x < 5$.

Or $-6 < x < 5$.

The values $x = -5$ and $x = 0$ in the given set lie in this interval. Hence, there are three such values.

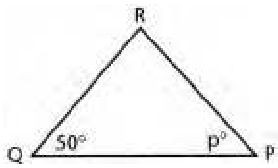
An alternate method of solution would be to list each of the 5 values of the given set in the inequality.

$|-8 - 5| = |-13| = 13$, which is not less than 11, etc.

20. The correct answer is (B). The x value of the minimum point is

$$x = \frac{-b}{2a} = \frac{-\left(-\sqrt{5}\right)}{2(1)} = \frac{\sqrt{5}}{2} \approx 1.12$$

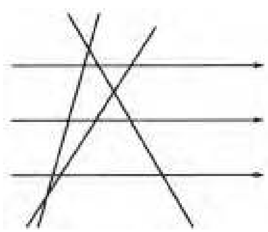
21. The correct answer is (B).



If $PQ > PR$, then $m\angle R > m\angle Q$, since the larger angle lies opposite the longer side. If $m\angle R > 50°$, and $m\angle Q = 50°$, then the measure of angle p is less than 80, since there are 180° in the sum of the measures of the angles of a triangle. However, $m\angle R$ may have any value less than 130°, in which case p must be greater than but not equal to 0.

$0 < p < 80$

22. The correct answer is (C).



The three parallel lines intersect each of the three nonparallel lines in 3 points, making a total of 9. The 3 nonparallel lines form a triangle, giving us 3 more points of intersection at the vertices. Hence, there are a total of 12.

23. The correct answer is (E). In order to determine angle P from the figure given in the problem, we have to know both arcs intercepted on the circle by $\overline{PQ}$ and $\overline{PR}$. Arc QR is apparently 60°, but there is no way of determining arc ST. Hence P cannot be determined from the given information.

24. The correct answer is (D).

$$\begin{aligned} g(3.9) &= 7(3.9) - 5 \\ &= 22.3 \\ f(22.3) &= (22.3)^3 - 3 \\ &= 11086.567 \end{aligned}$$

25. The correct answer is (E). Draw the line graph of $y = 4x$ on the same set of axes. This line passes through the origin and has a slope of 4. It thus intersects the curve in (1,4) and (–3, –12). Thus the desired values of y are +4 and –12.

26. The correct answer is (D). Angle S is a right angle since it is inscribed in a semicircle. Thus ΔRST is a right Δ with $\overline{RT}$ the hypotenuse. By the Pythagorean Theorem

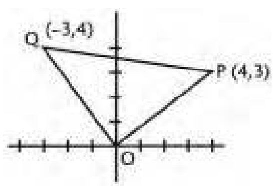
$$RT^2 = RS^2 + ST^2$$
$$RT^2 = 2^2 + 3^2$$
$$RT^2 = 4 + 9 = 13$$
$$RT = \sqrt{13}$$

radius OT is then $= \frac{1}{2}\sqrt{13}$

area of semicircle $= \frac{1}{2}\pi r^2$

$$= \frac{1}{2}\pi\left(\frac{1}{2}\sqrt{13}\right)^2 = \frac{1}{2}\pi \cdot \frac{13}{4}$$
$$= \frac{13\pi}{8}$$

27. The correct answer is (C).



slope of $\overline{OP} = \frac{3}{4}$

slope of $\overline{OQ} = -\frac{4}{3}$

Since slopes are negative reciprocals, $\overline{OP} \perp \overline{OQ}$

Also $OP = \sqrt{3^2 + 4^2} = \sqrt{9+16} = \sqrt{25} = 5$

$OQ = \sqrt{(-3)^2 + 4^2} = \sqrt{9+16} = 5$

$OP = OQ$ and the triangle is right, isosceles.

28. The correct answer is (A). The line in the first quadrant is the graph of $y = x$ for $x \geq 0$.

The line in the second quadrant is the graph of $y = -x$ for $x \leq 0$.

$y = |x|$ means $y = x$ for $x \geq 0$ and $y = -x$ for $x \leq 0$.

Hence, the equation is $y = |x|$.

29. The correct answer is (E).

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-2-7)^2 + (7-(-2))^2} \\ &= \sqrt{81+81} \\ &= \sqrt{162} \\ &\approx 12.73 \end{aligned}$$

30. The correct answer is (B). If the graph of the equation passes through the origin, the values $x = 0$, $y = 0$ must satisfy the equation.

Substitute.

$$\begin{aligned} 0+0-8+4k &= 0 \\ 4k &= 8 \text{ or } k = 2. \end{aligned}$$

31. The correct answer is (D). Substitute –8 for x in $x^{2/3} + 2x^0$.

$$\begin{aligned} &(-8)^{2/3} + 2 \cdot 8^0 \\ &= \sqrt[3]{(-8)^2} + 2 \cdot 1 \\ &= \sqrt[3]{64} + 2 = 4 + 2 = 6 \end{aligned}$$

32. The correct answer is (E).

$$2^{3x+10} = \left(\frac{1}{4}\right)^x = \left(2^{-2}\right)^x$$

$$2^{3x+10} = 2^{-2x}$$

Set the exponents equal.

$$\begin{aligned} 3x + 10 &= -2x \\ 5x &= -10 \\ x &= -2 \end{aligned}$$

33. The correct answer is (C). Make a table of Δx and Δy (change in x and y).

Δx	2	3	4
Δy	4	6	8

$$\frac{\Delta y}{\Delta x} = \frac{4}{2} = \frac{6}{3} = \frac{8}{4} = 2$$

Since the slope is constant, the graph is a straight line of the form $y = 2x + b$.

Substituting $x = 2$, $y = 3$ we see $b = -1$. Hence, the equation is $y = 2x - 1$.

34. The correct answer is (C). Divide both sides by 8.

$$\frac{x^2}{8} - \frac{y^2}{4} = 1$$

This now resembles the standard form

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

which is the equation of a hyperbola.

35. The correct answer is (D). Rationalize the denominator by multiplying numerator and denominator by $\sqrt{2}$.

$$\frac{\sqrt{3}-\sqrt{2}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}-2}{2}$$

36. The correct answer is (B). For the equation $Kx^2 - 4x + K = 0$ to have real roots, its discriminant must be ≥ 0.

$$16 - 4K^2 \geq 0$$
$$16 \geq 4K^2$$
$$4 \geq K^2$$

This is equivalent to

$|K| \leq 2$ or $-2 \leq K \leq 2$

37. The correct answer is (B). In the original solution there are $.20 \times 10 = 2$ quarts of alcohol. After 2 quarts of water are added, the resulting solution has the same 2 quarts of alcohol in 12 quarts of solution.

$$\frac{2}{12} = \frac{1}{6} = 16\frac{2}{3}\%$$

38. The correct answer is (E). Write .212121 … as the sum of the terms of an infinite geometric progression.

$$S = .21 + .0021 + .000021 + \cdots$$
$$a = .21 \text{ and } r = .01$$
$$S = \frac{a}{1-r} = \frac{.21}{1-.01} = \frac{.21}{.99}$$
$$S = \frac{21}{99} = \frac{7}{33}$$

39. The correct answer is (D). $\text{m}\angle P = \frac{1}{2}\left(\overparen{QRT} - \overparen{QST}\right)$

Let m $\overparen{QST} = x^{\circ}$

Then m $\overparen{QRT} = 360 - x^{\circ}$

Substitute in the first equation.

$$70 = \frac{1}{2}(360 - x - x)$$

Combine terms and multiply by 2.

$$\begin{aligned} 140 &= 360 - 2x \\ 2x &= 360 - 140 \\ 2x &= 220 \\ x &= 110 \end{aligned}$$

40. The correct answer is (A). Assume the water rises to a height of x inches.

Then $15 \cdot 18 \cdot x = 12 \cdot 12 \cdot 12$ (1 cu ft).

$$\begin{aligned} 270x &= 1728 \\ x &= 6\frac{2}{5} \end{aligned}$$

41. The correct answer is (C).

Average rate= $\dfrac{\text{total distance}}{\text{total time}}$

The time going is $\dfrac{d}{30}$ and the time coming is $\dfrac{d}{60}$.

The total time is

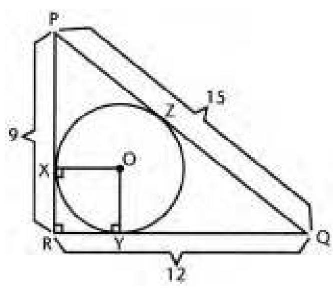
$$\frac{d}{30}+\frac{d}{60}=\frac{2d}{60}+\frac{d}{60}=\frac{3d}{60}=\frac{d}{20}$$

Average rate= $\dfrac{2d}{\frac{d}{20}}=\dfrac{40d}{d}=40$ mph

42. The correct answer is (E).

$$\begin{aligned}\text{Sum of roots} &= \frac{-b}{a}\\ &= \frac{-\sqrt{5}}{\sqrt{7}}\\ &\approx -.845\end{aligned}$$

43. The correct answer is (B).



Since $15^2 = 9^2 + 12^2$, ΔPQR is a right triangle with a right angle at R. $OX = OY$ = radius of the inscribed circle, and since $OXRY$ is a square the radius also equals RX or RY.

Let $RX = RY = r$.

Then $PX = 9 - r = PZ$ and $QY = 12 - r = QZ$

$$\begin{aligned}\text{Since } PZ + QZ &= 15\\ 9 - r + 12 - r &= 15\\ 21 - 2r &= 15\\ r &= 3\end{aligned}$$

44. The correct answer is (D). If each interior angle is 165°, each exterior angle is 180° – 165° = 15°. Since the sum of the exterior angles is 360°, there are $\frac{360}{15}=24$ exterior angles and therefore 24 sides.

45. The correct answer is (B).

$$y+\sqrt{y+5}=7$$

Subtract y from both sides.

$$\sqrt{y+5}=7-y$$

Square both sides.

$y + 5 = (7 - y)^2 = 49 - 14y + y^2$

Subtract $(y + 5)$ from both sides,

$$\begin{aligned} y^2-15y+44&=0 \\ (y-11)(y-4)&=0 \\ y=11 \text{ or } y&=4 \end{aligned}$$

Substituting in the original equation, we see that only $y = 4$ checks.

Another method would be to substitute each answer choice into the original equation and see which one works.

46. The correct answer is (E). First find the slope of the given line

$$\frac{x}{.47}+\frac{y}{.53}=1$$

Multiply the entire equation by (.47) (.53)

$.53x + .47y = (.47)(.53)$

$y = -1.128x + .53$

A perpendicular line has the negative reciprocal as its slope

$$\therefore m=\frac{-1}{-1.128}=+.887$$

Through the point $\left(\frac{1}{2},-\frac{1}{2}\right)$

$$\begin{aligned} y-y_1&=m(x-x_1) \\ \left(y+\frac{1}{2}\right)&=.89\left(x-\frac{1}{2}\right) \end{aligned}$$

47. The correct answer is (C). By substituting $y^2 = 4x$ into $x^2 + y^2 = 25$, we obtain $x^2 + 4x - 25 = 0$

Solve by the quadratic formula.

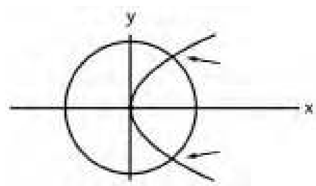
$$x = \frac{-4 \pm \sqrt{116}}{2} = -2 \pm \sqrt{29}$$

One root is positive and the other negative. Since $y = \pm 2\sqrt{x}$, the negative value of x gives us imaginary values of y, but the positive value of x gives us two real values of y. Hence, there are *two* points of intersection.

or

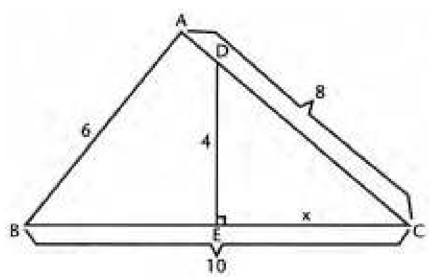
$x^2 + y^2 = 25$ is a circle with center at the origin and a radius of 5

$y^2 = 4x$ is a parabola with vertex at (0,0) open to the right



2 points of intersection

48. The correct answer is (A).



Since $\Delta ABC \sim \Delta EDC$, we may obtain the proportion

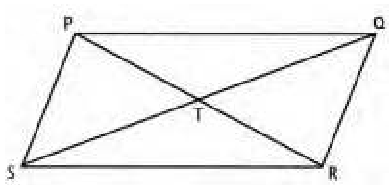
$$\frac{4}{6} = \frac{x}{8}$$

Cross–multiplying $6x = 32$

$$x = 5\frac{1}{3}$$

49. The correct answer is (D). The man does $\frac{1}{h}$ of the job in 1 hour. The son does $\frac{1}{2h}$ of the job in 1 hour. Together they do $\frac{1}{h}+\frac{1}{2h}=\frac{3}{2h}$ of the job in 1 hour. Therefore, in $\frac{2h}{3}$ hours they will do $\frac{3}{2h}\cdot\frac{2h}{3}=1$ complete job together. Therefore, it takes them $\frac{2h}{3}$ hours.

50. The correct answer is (C).



$\Delta PQT \cong \Delta RST$ and $\Delta PST \cong \Delta RQT$

In ΔPQS, $\overline{PT}$ is a median, since the diagonals of a parallelogram bisect each other. Consequently, ΔPST and ΔPTQ are equal in area as they have equal bases ($ST = TQ$) and a common altitude (perpendicular from P to $\overline{SQ}$). Therefore, all four triangles are equal in area.