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 5

EMSAT

Prepared by: Mr. Mohammad Hussein

50 Questions • Time—60 Minutes

1. If $.0000058 = 5.8 \times 10^n$, n =

(A) – 4
(B) – 5
(C) – 6
(D) – 7
(E) 5

2. In triangle NJL the measure of angle N is 90° and the measure of angle L is 24°. If $NL = 10$, what is the approximate length of $\overline{JL}$?

(A) 10.75
(B) 10.85
(C) 10.95
(D) 11.05
(E) 11.15

3. If $4x - 3 > x + 9$, then

(A) $x > 2$
(B) $x > 3$
(C) $x > 4$
(D) $8 > x > 4$
(E) $x > 0$

4. $\left(\frac{1}{r}+\frac{1}{s}\right)\left(\frac{r}{r+s}\right)=$

(A) $\frac{1}{r}$

(B) $\frac{r}{(r+s)^2}$

(C) $\frac{r}{s}$

(D) $\frac{s}{r}$

(E) $\frac{1}{s}$

5. What is the approximate value of $(\sin 17°)^2 + (\cos 17°)^2$?

(A) .03
(B) .18
(C) .72
(D) 1.00
(E) 1.27

6. In figure 6, m$\angle P$ = 2 m$\angle Q$ and m$\angle QRS$ = 108°. Triangle PQR is

(A) isosceles
(B) right
(C) obtuse
(D) scalene
(E) equilateral

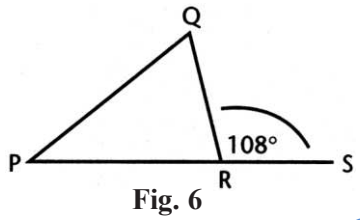

Fig. 6

7. For what value or values of y is the equation $\sqrt{y^2+27} = 2y$ satisfied?

(A) ± 3
(B) + 3 only
(C) – 3 only
(D) ± 9
(E) + 9 only

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8. In figure 8, $m\angle R > m\angle T$ and $\overline{RP}$ and $\overline{TP}$ are bisectors of $\angle R$ and $\angle T$ respectively. Then

(A) $PT < RP$
(B) $PT = RP$
(C) $RP + PT > RS + ST$
(D) $PT > RP$
(E) no relationship between PT and RP can be determined from the given information

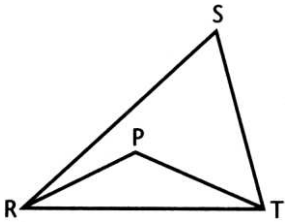

Fig. 8

9. If $x^5 - 8 = 159$, what is the approximate value of x?

(A) 2.67
(B) 2.71
(C) 2.78
(D) 2.81
(E) 2.84

10. In figure 10, $\overline{FG} \parallel \overline{HK}$, $\overline{FH} \perp \overline{GH}$, and $\overline{GK} \perp \overline{HK}$. If $FG = 5$ and $m\angle F = r$, $HK =$

(A) $5 \sin^2 r$
(B) $5 \cos^2 r$
(C) $10 \sin^2 r$
(D) $5 \sin r$
(E) none of these

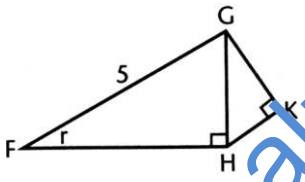

Fig. 10

11. If the graph of the equation $y = 2x^2 - 6x + C$ is tangent to the x-axis, the value of C is

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

12. If $\sqrt[3]{2x+4} = -.375$, then $x \approx$

(A) –2.03
(B) –1.97
(C) –.87
(D) –.34
(E) 1.43

13. In the formula $T = 2\pi\sqrt{\frac{L}{g}}$, π and g are constants. If we solve the formula for L,

(A) $\frac{Tg}{2\pi}$
(B) $\frac{Tg^2}{2\pi}$
(C) $\frac{T^2}{4\pi^2 g}$
(D) $\frac{T^2}{4\pi g^2}$
(E) $\frac{gT^2}{4\pi^2}$

14. A point P is 10 inches from a plane m. The locus of points in space which are 7 inches from P and 5 inches from plane m is

(A) a plane
(B) a circle
(C) two circles
(D) a point
(E) two points

15. The equation of the graph in figure 15 is

(A) $y = x + 1$
(B) $y = |x - 1|$
(C) $y = x^2 + 1$
(D) $y = |x + 1|$
(E) $y = |x|$

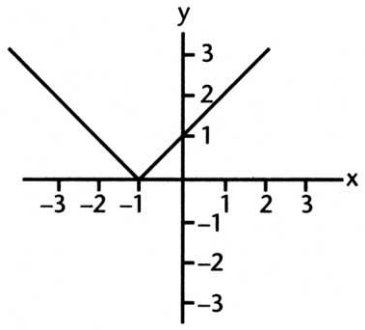

Fig. 15

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16. Select the correct order for defining the following terms:

I—natural number
II—imaginary number
III—rational number
IV—integer

(A) I, IV, III, II
(B) I, II, III, IV
(C) I, III, II, IV
(D) IV, I, III, II
(E) I, IV, II, III

17. If the reciprocal of $y - 1$ is $y + 1$, y equals

(A) -1
(B) $+1$
(C) 0
(D) ± 1
(E) none of these

18. In a right triangle having angles of 30° and 60°, the 60° angle is bisected. What is the ratio of the segments into which the angle bisector divides the opposite leg?

(A) 2:3
(B) 3:4
(C) 1:2
(D) 3:5
(E) 2:5

19. The equation $4y^2 - 3y + C = 0$ has real roots. The value of C for which the product of the roots is a maximum is

(A) $\frac{9}{16}$
(B) $\frac{9}{4}$
(C) $\frac{4}{9}$
(D) $\frac{3}{4}$
(E) $-\frac{4}{3}$

20. The sum of all the *even* numbers between 1 and 51 is

(A) 1300
(B) 650
(C) 325
(D) 675
(E) none of these

21. If $\frac{a}{b}=\frac{c}{d}$ (a, b, c, d positive numbers), which one of the following is not always true?

(A) $\frac{a}{c}=\frac{b}{d}$

(B) $\frac{b}{a}=\frac{d}{c}$

(C) $\frac{a+b}{b}=\frac{c+d}{d}$

(D) $\frac{a}{d}=\frac{b}{c}$

(E) $\frac{a}{b}=\frac{a+c}{b+d}$

22. The equation of the locus of points equidistant from $P(-2,-3)$ and $Q(-2,5)$ is

(A) $y=1$
(B) $y=-1$
(C) $x=1$
(D) $x=-1$
(E) $y=-x$

23. If $f(x)=\frac{x+1}{x-1}$, what is the value of $f\left(f\left(f\left(f\left(\frac{3}{5}\right)\right)\right)\right)$?

(A) –4
(B) 0
(C) .6
(D) 1.3
(E) 7

24. The base of a triangle is 16 inches and its altitude is 10 inches. The area of the trapezoid cut off by a line 4 inches from the vertex is

(A) 134.4
(B) 67.2
(C) 38.6
(D) 72
(E) not determined from the information given

25. The locus of the centers of all circles of given radius r, in the same plane, passing through a fixed point P, is

(A) a straight line
(B) two straight lines
(C) a circle
(D) two circles
(E) a point

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26. The number of distinct points common to the graphs of $x^2 + y^2 = 4$ and $y^2 = 4$ is

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

27. Given the statement: All seniors are mature students. The statement that negates this statement is:

(A) All non-seniors are mature students.
(B) Some non-seniors are mature students.
(C) No seniors are mature students.
(D) All seniors are immature students.
(E) At least one senior is an immature student.

28. For what approximate value of c is the parabola $y = 2.8x^2 - \sqrt{5}x + c$ tangent to the x-axis?

(A) .35
(B) .45
(C) .55
(D) .65
(E) .75

29. The set of y-values that satisfies the inequality $|y - 5| < 6$ is

(A) $1 < y < 11$
(B) $y > 11$
(C) $y < 11$
(D) $-1 < y < 11$
(E) $|y| < 5$

30. The equation $r + \frac{5}{r-1} = 1 + \frac{5}{r-1}$ has

(A) no root
(B) one integral root
(C) two equal roots
(D) two unequal, rational roots
(E) infinitely many roots

31. A cylindrical tank is $\frac{1}{2}$ full. When 6 quarts are added, the tank is $\frac{2}{3}$ full. The capacity of the tank, in quarts, is

(A) 18
(B) 24
(C) 36
(D) 40
(E) 48

32. The diameters of two wheels are 10 in. and 14 in. The smaller makes 50 more revolutions than the larger in going a certain distance. This distance, in inches, is

(A) 3500
(B) 1750
(C) 1750π
(D) 3500π
(E) none of these

33. The graphs of the equations $2x - 3y = 5$ and $4x - 6y = 7$

(A) form an acute angle
(B) intersect in two points
(C) are parallel lines
(D) are coincident lines
(E) are perpendicular lines

34. In figure 34, what is the approximate length of side $\overline{JL}$?

(A) 5.41
(B) 5.35
(C) 5.27
(D) 5.23
(E) 5.14

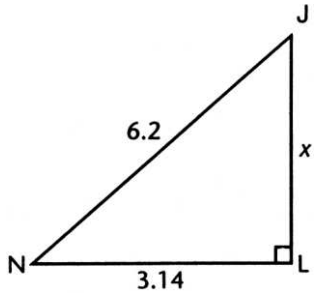

Fig. 34

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35. In Figure 35, Circles O and O are internally tangent to each other. Circle O passes through the center of O. If the area of circle O is 16, the area of circle O is

(A) $2\sqrt{2}$
(B) 2
(C) $2\sqrt{\pi}$
(D) $4\sqrt{\pi}$
(E) 4

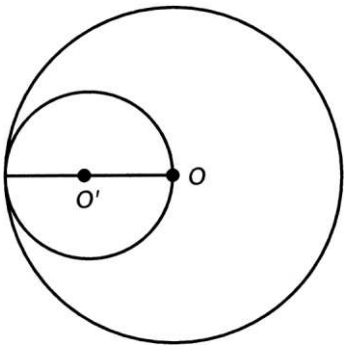

Fig. 35

36. In the right triangle in figure 36, $z = 26$ and $x - y = 14$. $x + y =$

(A) 17
(B) 34
(C) 30
(D) 32
(E) 28

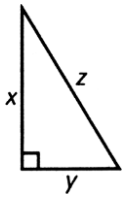

Fig. 36

37. A circle is inscribed in a square and then a smaller square is inscribed in the circle. The ratio of the area of the smaller square to that of the larger square is

(A) 1:4
(B) $\sqrt{2}:2$
(C) 1:2
(D) $1:2$
(E) 2:3

38. $f(x) = x - \frac{1}{x}$, then $f\left(\frac{1}{x}\right) =$

I: $f(x)$
II: $f(-x)$
III: $-f(x)$
IV: $\frac{1}{f(x)}$

(A) I and II
(B) II and III
(C) III and IV
(D) II only
(E) II and IV

39. Which one of the following is an irrational number?

(A) $\sqrt[3]{-27}$
(B) $\sqrt{2}(3\sqrt{2} + 2\sqrt{8})$
(C) $\frac{3\sqrt{18}}{2\sqrt{6}}$
(D) $\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{25}{2}}$
(E) $\frac{2\sqrt{5}}{\sqrt{45}}$

40. Quadrilateral $PQRS$ is inscribed in a circle of radius 10. If angle PQR measures 150°, and L is the length of arc PQR, then

(A) $L < 10$
(B) $10 < L < 10.5$
(C) $10.5 < L < 11$
(D) $11 < L < 12$
(E) $L > 12$

41. If S represents the set of all real numbers x such that $1 \le x \le 3$, and T represents the set of all real numbers x such that $2 \le x \le 5$, the set represented by $S \cap T$ is

(A) $2 \le x \le 3$
(B) $1 \le x \le 5$
(C) $x \le 5$
(D) $x \ge 1$
(E) none of these

42. Which of the following is an approximate of a zero of the equation $x^2 - 3x = 7$?

(A) –4.54
(B) –1.54
(C) 1.54
(D) 3.54
(E) 5.54

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43. A boy grew one year from a height of x inches to a height of y inches. The percent of increase was

(A) $\frac{100(y-x)}{y}$

(B) $\frac{100(x-y)}{x}$

(C) $\frac{y-x}{x}$

(D) $\frac{100(y-x)}{x}$

(E) $\frac{x-y}{x}$

44. In figure 44, how are the coordinates of P related?

(A) $x < y$

(B) $x > y$

(C) $x = y$

(D) $x \leq y$

(E) $xy = 1$

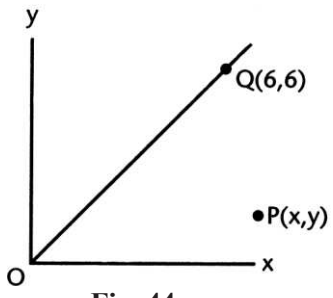

Fig. 44

45. A boy wishes to cut the largest possible square out of a piece of cardboard in the shape of a right triangle, with legs of 8 inches and 12 inches as shown in figure 45. The side of the square, in inches, is

(A) 4

(B) 5

(C) 4.8

(D) 4.5

(E) 4.3

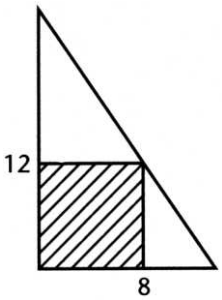

Fig. 45

Questions 46–50 pertain to the following situation: Two cubes have edge lengths in the ratio of 2:3 respectively.

46. The ratio of their surface areas is

(A) $\frac{4}{9}$

(B) $\frac{8}{27}$

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

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

(E) $\frac{\sqrt{3}}{\sqrt{2}}$

47. The ratio of their volumes is

(A) $\frac{4}{9}$

(B) $\frac{8}{27}$

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

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

(E) $\frac{\sqrt{3}}{\sqrt{2}}$

48. The ratio of the sum of the lengths of the edges of the smaller to the sum of the lengths of the edges of the larger is

(A) $\frac{4}{9}$

(B) $\frac{8}{27}$

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

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

(E) $\frac{\sqrt{3}}{\sqrt{2}}$

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49. The ratio of the length of the diagonal of a face of the first cube to the length of the diagonal of a face in the second is

(A) $\frac{4}{9}$

(B) $\frac{8}{27}$

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

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

(E) $\frac{\sqrt{3}}{\sqrt{2}}$

50. The ratio of the length of a diagonal of the first cube to the length of the diagonal of one of its faces is

(A) $\frac{4}{9}$

(B) $\frac{8}{27}$

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

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

(E) $\frac{\sqrt{3}}{\sqrt{2}}$

PRACTICE TEST 5

Answer Key

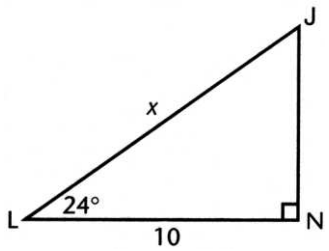
EMSAT

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

Solutions

1. The correct answer is (C). $.0000058 = 5.8 \times 10^{n} = 5.8 \times 10^{-6}$, $n = -6$

2. The correct answer is (C).



$$\cos 24° = \frac{10}{x}$$

$$x = \frac{10}{\cos 24°}$$

$$\approx 10.946$$

3. The correct answer is (C).

$$4x - 3 > x + 9$$

$$4x - x > 9 + 3$$

$$3x > 12$$

$$x > 4$$

4. **The correct answer is (E).**

$$\left(\frac{1}{r}+\frac{1}{s}\right)\left(\frac{r}{r+s}\right)=\frac{r+s}{rs}\cdot\frac{r}{r+s}=\frac{\cancel{(r+s)}\cdot\cancel{r}}{\cancel{r}s\cancel{(r+s)}}=\frac{1}{s}$$

5. **The correct answer is (D).**

$$\begin{aligned}&(\sin 17^\circ)^2+(\cos 17^\circ)^2\\&=\sin^2(17^\circ)+\cos^2(17^\circ)\\&=\sin^2\theta+\cos^2\theta\\&=1\end{aligned}$$

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

$$\begin{aligned}m\angle QRS &= m\angle P + m\angle Q\\ &= 2m\angle Q + m\angle Q\\ 108^\circ &= 3m\angle Q\\ m\angle Q &= 36^\circ\\ m\angle P &= 72^\circ\end{aligned}$$

$m\angle R = 180^\circ - m\angle QRS = 180^\circ - 108^\circ = 72^\circ$

$m\angle P = m\angle R$, so ΔPQR is isosceles

7. **The correct answer is (B).**

$$\begin{aligned}\sqrt{y^2+27}&=2y\\ y^2+27&=4y^2\\ 27&=3y^2\\ y^2&=9\\ y&=\pm 3\end{aligned}$$

Check $y = 3$

$\sqrt{9+27}=6, \sqrt{36}=6,$ which check.

Check $y = -3$.

$\sqrt{9+27}=-6, \sqrt{36}=-6,$ which does not check.

Hence only +3 is a solution.

8. **The correct answer is (D).** Since $m\angle R > m\angle T$, $\frac{1}{2}m\angle R > \frac{1}{2}m\angle T$ or $m\angle PRT > m\angle PTR$. In ΔPRT, $PT > RP$.

9. **The correct answer is (C).**

$$\begin{aligned}x^5&=167\\ x&=(167)^{\frac{1}{5}}\\ &\approx 2.783\end{aligned}$$

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

From ΔFGH, $GH = 5 \sin r$.

Since $\angle FGK$ is a right angle, $m\angle HGK = r$.

In ΔHGK, $HK = GH \sin r$ or $HK = 5 \sin^2 r$

11. **The correct answer is (D).** The roots of $2x^2 - 6x + C = 0$ are equal and the discriminant is equal to 0.

$$\begin{aligned} b^2 - 4ac &= 0 \\ 36 - 4 \cdot 2 \cdot C &= 0 \\ 36 &= 8C \\ C &= 4\frac{1}{2} \end{aligned}$$

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

$$\begin{aligned} \sqrt[3]{2x+4} &= -.375 \\ 2x+4 &= (-.375)^3 \\ 2x &\approx -4.0527 \\ x &\approx -2.026 \end{aligned}$$

13. **The correct answer is (E).**

$$T = 2\pi\sqrt{\frac{L}{g}}$$

Squaring, we obtain $T^2 = 4\pi^2 \cdot \frac{L}{g}$

$$\frac{gT^2}{4\pi^2} = L$$

14. **The correct answer is (B).** The locus of points 7" from P is a sphere of radius 7". The locus of points 5" from m consists of two planes above and below m. The sphere intersects only the upper plane in a *circle*.

15. **The correct answer is (D).** The right branch of the graph has slope 1 and y-intercept of 1.

Hence, its equation is $y = x + 1$.

To the left of $x = -1$, this line, $y = x + 1$, continues below the y-axis. We reflect it above the x-axis by making the equation $y = |x + 1|$.

16. **The correct answer is (A).** We first define natural numbers, then integers, to include negative numbers, then rational numbers, and then imaginary numbers.

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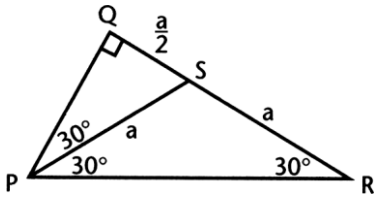
17. The correct answer is (E). $\dfrac{1}{y-1} = y+1$

$$1 = (y+1)(y-1) = y^2 - 1$$
$$2 = y^2$$
$$y = \pm\sqrt{2}$$

18. The correct answer is (C).



Let $RS = a$. Since ΔPSR is isosceles, $PS = a$.

In right ΔPQS, $QS = \dfrac{a}{2}$

$$\frac{QS}{SR} = \frac{1}{2}$$

19. The correct answer is (A). $4y^2 - 3y + C = 0$

Since the roots are real,

$$9 - 16C \geq 0$$

or $9 \geq 16C$

$$C \leq \frac{9}{16}$$

The product of the roots is $\dfrac{C}{4}$, and this is a maximum when $C = \dfrac{9}{16}$.

20. The correct answer is (B). $2 + 4 + 6 + \ldots + 50$

$$S = \frac{n}{2}(a+1)$$
$$= \frac{25}{2}(2+50)$$
$$= \frac{25}{2} \cdot 52 = 650$$

21. The correct answer is (D). If $\dfrac{a}{b} = \dfrac{c}{d}$, by cross-multiplying, $ad = bc$. Therefore it is not possible for $\dfrac{a}{d} = \dfrac{b}{c}$.

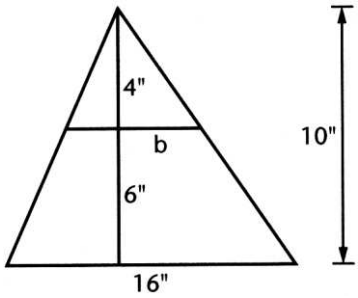
22. The correct answer is (A).

$$(x+2)^2 + (y+3)^2 = (x+2)^2 + (y-5)^2$$
$$y^2 + 6y + 9 = y^2 - 10y + 25$$
$$16y = 16$$
$$y = 1$$

23. The correct answer is (C).

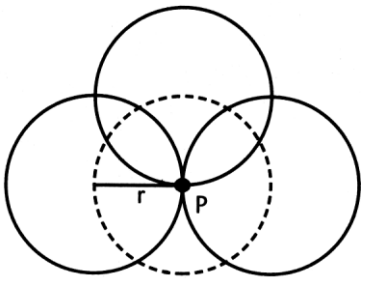
$$f(x)=\frac{x+1}{x-1}$$
$$f\left(\frac{3}{5}\right)=-4$$
$$f(-4)=.6$$
$$f(.6)=-4$$
$$f(-4)=.6$$

24. The correct answer is (B).



$$\frac{b}{4}=\frac{16}{10}$$
$$b=\frac{64}{10}=6.4$$
$$A=\frac{1}{2}h(b+b')$$
$$A=\frac{1}{2}\cdot 6(16+6.4)$$
$$=3\cdot 22.4$$
$$=67.2\ \text{in}^2$$

25. The correct answer is (C). The locus of the centers is a circle with P as center and r asradius.



26. The correct answer is (C). The graph of $x^2 + y^2 = 4$ is a circle of radius 2 with center at the origin. The graph of $y^2 = 4$ consists of two horizontal lines, $y = +2$ and $y = -2$. These lines are tangent to the circle at (0, 2) and (0, –2). There are two points in common.

27. The correct answer is (E). If "at least one senior is an immature student," it is false that "all seniors are mature students."

28. The correct answer is (B). Tangent to the x-axis means the roots are real and equal.

Therefore, $b^2 - 4ac = 0$

$a = 2.8,\ b = -\sqrt{5}\ \ c = c$

$$\left(-\sqrt{5}\right)^2 - 4(2.8)c = 0$$
$$11.2c = 5$$
$$c = \frac{5}{11.2} \approx .4464$$

29. The correct answer is (D). If $y \geq 5$, $y - 5 < 6$ and $y < 11$

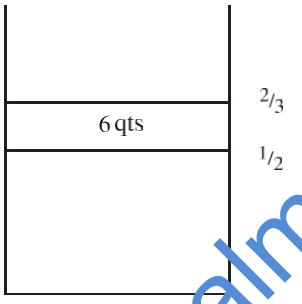
If $y < 5$, $5 - y < 6$, $-y < 1$ and $y > -1$

The set of values is $-1 < y < 11$.

30. The correct answer is (A). If we subtract $\frac{5}{r-1}$ from both sides of the equation, it appears that $r = 1$.

But $\frac{5}{r-1}$ is not defined for $r = 1$. Hence, there is no root.

31. The correct answer is (C).



Let x quarts = capacity.

$$\frac{1}{2}x + 6 = \frac{2}{3}x$$
$$3x + 36 = 4x$$
$$36 = x$$

32. The correct answer is (C). Let N = no. of revolutions made by the larger wheel.

$$\frac{10}{14} = \frac{N}{N+50} = \frac{5}{7}$$
$$7N = 5N + 250$$
$$2N = 250$$
$$N = 125$$

$$\text{distance} = 125 \times \text{circumference}$$
$$= 125 \times 14\pi$$
$$= 1750\pi$$

33. The correct answer is (C). These graphs have the same slope but different y-intercept. Hence, the graphs of the equations are parallel lines.

34. The correct answer is (B).

$x^2 + (3.14)^2 = (6.2)^2$

$x^2 = 38.44 - 9.86$

$x \approx 5.346$

35. The correct answer is (E). The radius of O is one-half that of O. Therefore, the area of circle O is $\frac{1}{4}$ that of O. The area of O is $\frac{1}{4}$ of 16, or 4.

36. The correct answer is (B).

$$x^2 + y^2 = 26^2,\ x - y = 14 \text{ or } x = 14 + y$$
$$(14 + y)^2 + y^2 = 26^2$$
$$14^2 + 28y + y^2 + y^2 = 26^2$$
$$2y^2 + 28y + 196 = 676$$
$$y^2 + 14y + 98 = 338$$
$$y^2 + 14y - 240 = 0$$
$$(y + 24)(y - 10) = 0$$
$$y = -24 \text{ or } y = 10$$

Alternate solution:

$x^2 + y^2 = 26^2$
$(x - y)^2 = 14^2$

$x^2 + y^2 - 2xy = 14^2$

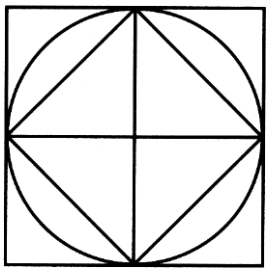
Substitute $x^2 + y^2 = 26^2$

$26^2 - 2xy = 14^2$
$2xy = 26^2 - 14^2$
$2xy = 676 - 196 = 480$
$(x + y)^2 = x^2 + 2xy + y^2$
$= 26^2 + 2xy$
$= 676 + 2xy$

Substitute $2xy = 480$ from above.

$= 676 + 480$
$= 1156$
$x + y = \sqrt{1156} = 34$

37. The correct answer is (C).



The smaller square is made up of 4 congruent triangles, and the larger square is made up of 8 congruent triangles. The ratio of their areas is 1:2.

38. The correct answer is (B).

$$f(x) = x - \frac{1}{x}$$

$$f\left(\frac{1}{x}\right) = \frac{1}{x} - x$$

$$f(-x) = -x + \frac{1}{x} = \frac{1}{x} - x$$

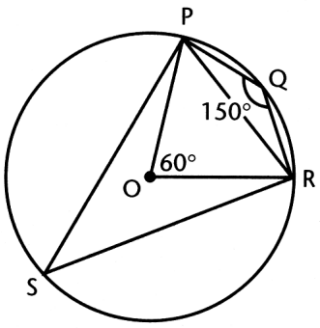
Hence, $f\left(\frac{1}{x}\right) = f(-x)$

Also, $-f(x) = -x + \frac{1}{x} = \frac{1}{x} - x$

$f\left(\frac{1}{x}\right) =$ II and III

39. The correct answer is (C). $\frac{3\sqrt{18}}{2\sqrt{6}} = \frac{3\sqrt{18}}{2\sqrt{6}} = \frac{3}{2}\sqrt{3}$ which is an irrational number. The other choices are all rational.

40. The correct answer is (B).



Minor $\overset{\frown}{PQR} = L$

If $\overset{\frown}{PSR} = 300°$, $\overset{\frown}{PQR} = 60°$

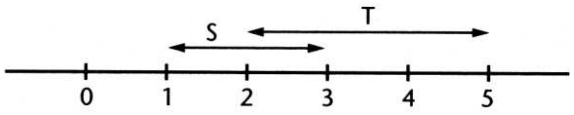
$$L = \frac{60}{360} \cdot 2\pi \cdot 10$$

$$= \frac{1}{6} \cdot 20\pi = \frac{10\pi}{3}$$

$$\approx \frac{10 \cdot 3.14}{3} \approx 10.4$$

$$10 < L < 10.5$$

41. The correct answer is (A).



The set $S \cap T$ consists of all real numbers x such that $2 \le x \le 3$.

42. The correct answer is (B).

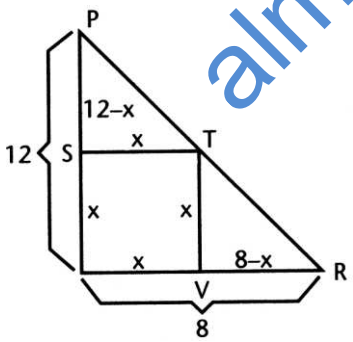
$$x^2 - 3x - 7 = 0$$
$$a = 1, b = -3, c = -7$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-7)}}{2(1)}$$
$$= \frac{3 \pm \sqrt{37}}{2}$$
$$\frac{3+\sqrt{37}}{2} \approx 4.54 \quad \frac{3-\sqrt{37}}{2} \approx -1.54$$

43. The correct answer is (D).

$$\%\ \text{increase} = \frac{\text{increase}}{\text{original}} \cdot 100$$
$$= \frac{y-x}{x} \cdot 100 = \frac{100(y-x)}{x}$$

44. The correct answer is (B). For any point on line $\overleftrightarrow{OQ}$ the abscissa equals the ordinate. Since P is to the right of the line $x = y$, it follows that $x > y$.

45. The correct answer is (C).



Since $\Delta PST \sim \Delta TVR$,

$$\frac{12-x}{x} = \frac{x}{8-x}$$
$$x^2 = (12-x)(8-x)$$
$$x^2 = 96 - 20x + x^2$$
$$20x = 96$$
$$x = 4.8$$

46. The correct answer is (A).

$$\frac{S}{S'} = \frac{2^2}{3^2} = \frac{4}{9}$$

47. The correct answer is (B).

$$\frac{V}{V'} = \frac{2^3}{3^3} = \frac{8}{27}$$

48. The correct answer is (C).

$$\frac{12 \cdot 2}{12 \cdot 3} = \frac{2}{3}$$

49. The correct answer is (C).

$$\frac{d}{d'} = \frac{2\sqrt{2}}{3\sqrt{2}} = \frac{2}{3}$$

50. The correct answer is (E).

$$\frac{D}{d} = \frac{2\sqrt{3}}{2\sqrt{2}} = \frac{\sqrt{3}}{\sqrt{2}}$$