Reference Guide For The Pharmacy College Admission Test - PCAT

2014-2015 Edition

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Dedicated To
My beloved
grandfather

PREFACE:

I am very pleased to introduce a review guide for the PCAT (Pharmacy College Admission Test). So far, I have written pharmacy licensing review books related to the NAPLEX, FPGEE and PTCE.

This review guide covers verbal ability, biology, chemistry and mathematics in order to prepare you for your exam. The detailed explanations in each of these sections will help make you familiar with the exam content and hopefully help you to ultimately succeed in earning an excellent score.

Each answer is explained thoroughly to refresh your memory on specific topics. Please do not go through only the questions and answers. Try to understand and learn the reason for each specific answer, and grasp the explanation in order to improve your comprehension skills for other questions. It is the most productive and efficient way to get the most out of this review guide.

I hope my efforts will help you to pass your key exam. As always, any questions or comments are welcome.

Good Luck,

MANAN H. SHROFF

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Biology

1. Which of the following organelles helps green plants synthesize organic compounds like starch in the presence of sunlight?

a. Mitochondria
b. Chloroplast
c. Ribosomes
d. Golgi body

2. Which of the following is described as the "power house of the cell?"

a. Endoplasmic reticulum
b. Ribosomes
c. Mitochondria
d. Vacuoles

3. Production of ATP is defined as a(n):

a. Exothermic reaction
b. Endothermic reaction
c. Uniforming reaction
d. Interacting-absorbing reaction

4. Which of the following is described as a physical basis of life?

a. Protoplasm
b. Chloroplast
c. Ribosomes
d. Nucleus

5. Virus should be classified as:

a. Akaryotic
b. Eukaryotic
c. Prokaryotic
d. Nokaryotic

6. Which of the following is NOT present in prokaryotic organisms but is present in eukaryotic organisms?

a. Cell wall
b. Plasma membrane
c. Ribosome
d. Nucleolus

7. Endoplasmic reticulum is visible in the cytoplasm of all the Eukaryotic cells EXCEPT:

a. Amoeba
b. Yeast
c. Mushroom
d. Sperm

8. Which of the following is the major source of digestive enzymes?

a. Golgi body
b. Mitochondria
c. Lysosome
d. Chloroplast

9. The oxidation of one glucose molecule will generate how many molecules of ATP during one Kreb's cycle?

a. 16
b. 22
c. 38
d. 2

10. Which of the following molecules play an important role in the process of photosynthesis?

a. Grana
b. Thylakoids
c. Lamellae
d. Chlorophyll

11. Which of the following is an essential organelle for survival of a cell?

a. Mitochondria
b. Nucleus
c. Lysosome
d. Nucleolemma

12. Which of the following differentiates the nucleus from the cytoplasm?

a. Ribosomes
b. Nucleus
c. Vacuoles
d. Nucleolemma

13. A plant cell wall is normally formed of:

a. Chlorophyll
b. Cellulose
c. Chitin
d. Periactin

14. A small saclike structure filled with liquid and appearing like small dots in the cytoplasm is known as:

a. Chromosomes
b. Nucleus
c. Vacuoles
d. Nucleolus

15. In the process of Mitosis, if the number of chromosomes in the mother cell is designated as 2n, how many chromosomes will be present in each daughter cell?

a. 2n
b. n
c. 4n
d. 8n

16. In which stage of the cell cycle is the cell synthesizing its structural proteins and enzymes to perform its functions?

a. S phase
b. G_1 phase
c. G_2 phase
d. G_3 phase

17. How many chromosomes will be present in red blood cells of humans?

a. 46
b. 23
c. 92
d. 0

18. In the prophase of mitosis, the protoplasm forms ray-like structures surrounding each centrosome known as:

a. Chromatid
b. Centromere
c. Asters
d. Karyokinesis

19. How many number of chromosomes are found in sex cells of humans?

a. 92
b. 46
c. 23
d. 0

20. Which of the following is the basic unit of classification?

a. Genus
b. Species
c. Family
d. Class

21. Blue green algae should be classified under which of the following living kingdoms?

a. Monera
b. Protista
c. Metaphyta
d. Metazoa

22. All of the following are TRUE about the Monera kingdom EXCEPT:

a. Monera are so small in size that they can be only seen with the help of a microscope.

b. Organisms found in this kingdom have cell walls surrounding the cell.

c. Mitochondria, endoplasmic reticulums, and Golgi bodies are present in the cytoplasm of Monera organisms.

d. A Monera organism contains primitive nucleis in their cytoplasm.

23. Which of the following portions of the bacteriophage play an important role in transferring genetic information?

a. Capsid
b. Core
c. Tail
d. Tail fibers

24. There are very minute hair-like processes that are present on the cell wall of E.coli. These processes are known as:

a. Pili
b. Flagella
c. Cilia
d. Plasmids

24A. Microorganisms that convert complex organic compounds into simple inorganic compounds are known as:

a. Transformers
b. Dictators
c. Decomposers
d. Protectors

25. Nitrogen fixing bacteria on root nodules of Leguminous plants are known as:

a. Azobacteria
b. Nanobacteria
c. Rhizobium bacteria
d. Mycobacteria

26. Red is the dominant color for flowers, and white is the recessive color. What percentage of the second generation offspring is expected to be white heterozygous if the homozygous red flower is crossed with a homozygous white flower?

a. 50%
b. 75%
c. 25%
d. 100%

27. Which of the following cells of humans contain multiple alleles?

a. RBC
b. WBC
c. Thrombocytes
d. Eosinophils

28. Which of the following characteristics in a human is due to a condition known as polygenetic inheritance?

a. Skin color
b. Strength of the bone
c. Nail of middle finger
d. Free earlobes

29. Due to a sex-linked trait, which of the following disorders is more frequently seen in men compared to women?

a. Hypertension
b. Colorblindness
c. Hemophilia
d. Both B and C

30. Which of the following is the building block of nucleic acids?

a. Protein
b. Amino acids
c. Starch
d. Nucleotides

31. If one of the chains of the DNA has the sequence of nitrogen bases AAGCC, what would be the sequence of nitrogen bases on the other chain?

a. CCAGG
b. GCATT
c. TTCGG
d. GGATT

32. Which of the following nitrogen bases is present in RNA but absent in DNA?

a. Cytosine
b. Uracil
c. Guanine
d. Adenine

33. Which of the following types of RNA is used to synthesize ribosomes?

a. r RNA
b. t RNA
c. m RNA
d. u RNA

34. Hydrolysis of a molecule of maltose yields:

a. glucose + glucose
b. glucose + galactose
c. glucose + fructose
d. fructose + lactose

35. Which of the following components of a starch is insoluble in water?

a. Amylose
b. Amylodextrin
c. Amylopectin
d. Amylase

36. Which of the following polysaccharides is largely stored in the liver and muscles?

a. Cellulose
b. Starch
c. Glycogen
d. Inulin

37. Which of the following alcohol is a principal constituent of a lipid?

a. Ethanol
b. Methanol
c. Glycerol
d. Butanol

38. Which of the following steroids contains hydroxyl (-OH) groups but does not contain any carboxyl (-COOH) or keto (> C = O) groups?

a. Cholesterol
b. Progesterone
c. Cortisone
d. Cortisol

39. Upon oxidation one gram of fat provides:

a. 4 calories
b. 9 calories
c. 7 calories
d. 5 calories

120. (c) Let's say the carpenter requires x number of hours to complete the porch alone. Therefore:

	Hours to build a porch	Job done in 1 hour
Carpenter	x	1/x
Partner	20	1/20
Together	8	1/8

$$\frac{1}{x}+\frac{1}{20}=\frac{1}{8}$$

$$160+8x=20x$$

$$12x=160$$

$$x=13.33$$

Thus, if carpenter works alone, he requires 13.33 hours to finish the job. If his partner works alone, he requires 20 hours to finish the same job. If they work together, they can finish the same job within 8 hours.

121. (d) Let's say Micky takes x number of hours to fix the bathroom, then Billy would take x + 4 hours.

	Hours to fix the bathroom	Job done in 1 hour
Micky	x	1/x
Billy	x + 4	1/(x + 4)
Together	1.5	1/1.5

$$\frac{1}{x}+\frac{1}{x+4}=\frac{1}{1.5}$$

$$1.5(x+4)+1.5(x)=(x)(x+4)$$

$$1.5x+6+1.5x=x^2+4x$$

$$x^2+x-6=0$$

$$(x+3)(x-2)=0$$

$$x=-3 \text{ or } x = 2$$

Thus, Micky takes 2 hours to fix a bathroom whereas Billy requires (x + 4) 6 hours to finish the same job. If they work together, they can finish the job within 1.5 hours.

122. (a) Let's say Hely needs x number of hours to prepare the report, then Ria would need x + 4 number of hours to complete the report.

	Hours to complete the report	Job done in 1 hour
Hely	x	1/x
Ria	x + 4	1/(x + 4)
Together	8/3	3/8

$$\frac{1}{x}+\frac{1}{x+4}=\frac{3}{8}$$

$$8(x+4)+8x=3x(x+4)$$

$$8x+32+8x=3x^2+12x$$

$$3x^2-4x-32=0$$

$$3x(x-4)+8(x-4)=0$$

$$(3x+8)(x-4)=0$$

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

$$3x-3=x$$

$$3x-x=3$$

$$2x=3$$

$$x=\frac{3}{2}$$

Thus, it takes 1.5 hours to drain the bathtub completely.

128. (c) Let's say the second inlet pipe requires x hours to fill the pool, therefore:

	Hours to fill swimmingpool	Part filled 1 hour
Inlet-1	5	1/5
Inlet-2	x	1/x
Together	3	1/3

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

$$3x+15=5x$$

$$5x-3x=15$$

$$2x=15$$

$$x=\frac{15}{2}=7.5$$

Thus, it requires 7.5 hours to fill the swimminpool by the second inlet pipe. If both pipes are used simultaneously, it should take them 3 hours to fill the whole pool.

129. (d) $x-3=\sqrt{3x-9}$

$$(x-3)^2 = 3x-9$$

$$x^2-6x+9=3x-9$$

$$x^2-9x+18=0$$

$$x^2-6x-3x+18=0$$

$$x(x-6)-3(x-6)$$

$$(x-3)(x-6)=0$$

$$x-3=0 \text{ or } x-6=0$$

$$x=3 \text{ or } x=6$$

130.(c) $\sqrt{2x+6}-4=9$

$$\sqrt{2x+6}=13$$

$$(2x+6)=13^2$$

$$2x+6=169$$

$$2x=163$$

$$x=81.5$$

131.(c) $\left(32x^5\right)^{\frac{3}{5}}.\left(27x^3\right)^{-\frac{5}{3}}$

$$\left(2^5.x^5\right)^{\frac{3}{5}}.\left(3^3.x^3\right)^{-\frac{5}{3}}$$

$$(2x)^3.(3x)^{-5}$$

$$\frac{8x^3}{243x^5}=\frac{8}{243x^2}$$

$3x + 8 = 0$ or $x - 4 = 0$

$x = -(8/3)$ or $x = 4$

Thus, Hely can finish the report in 4 hours while Ria would take 8 hours (x + 4) to finish it.

123. (d) We have $2x^2 + 7x - 15 = 0$, therefore:

$2x^2 + 10x-3x-15 = 0$
$2x(x + 5) -3(x + 5) = 0$
$(2x - 3)(x + 5) = 0$
$2x-3 = 0$ or $x + 5 = 0$
$x = 3/2$ or $x = -5$

124. (c) We have $8x^2 + 2x - 15 = 0$, therefore:

$8x^2 + 12x - 10x -15 = 0$
$4x(2x + 3) -5(2x + 3) = 0$
$(4x - 5)(2x + 3) = 0$
$2x + 3 = 0$ or $4x - 5 = 0$
$x = -3/2$ or $x = 5/4$

125. (d) Since y varies directly as x, we can say:

$y = kx$, where k = constant
x = variable
y = variable

$y = kx$
$4 = 14k$

$k = \frac{14}{4}$

$k = 0.285$

Now, we can substitute k and x values in the above equation, and this will give us a new y value.

$y = 0.285x$
$y = 0.285(16)$
$y = 4.56$

126. (c) Since y is directly proportional to x^2, we can say:

$y = kx^2$
$16 = k(3)^2$
$16=9k$

$k = \frac{16}{9} = 1.77$

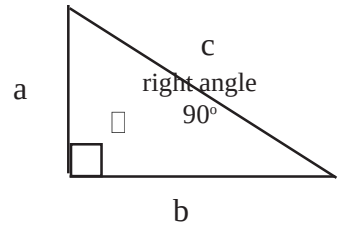
We can substitute k and x values in the above equation, and this will give us a new y value.

$y = kx^2$
$y = 1.77(9)^2$
$y = 1.77(81)$
$y = 143.37$

127. (c) Let's say x is the time to drain the bath-tub. In this situation, the inlet and outlet valves worked against each other. Therefore:

	Hours to fill or drain	Part filled or drained in 1 hour
Inlet	1 hour	1/1
Outlet	x	1/x
Together	3	1/3

132. (d)



$c^2 = a^2 + b^2$
$c^2 = (3)^2 + (4)^2$
$c^2 = 9 + 16$
$c^2 = 25$
$c = 5$

133.(d) $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$d = \sqrt{\left(\frac{5}{4} - \frac{1}{2}\right)^2 + \left(\frac{7}{2} - \frac{3}{5}\right)^2}$$

$$d = \sqrt{\left(\frac{3}{4}\right)^2 + \left(\frac{29}{10}\right)^2}$$

$$d = \sqrt{\frac{9}{16} + \frac{841}{100}}$$

$$d = \sqrt{\frac{900 + 13456}{1600}}$$

$$d = \sqrt{\frac{14356}{1600}}$$

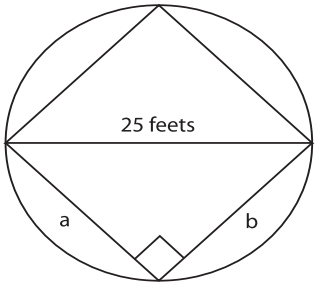
$$d = \sqrt{\frac{14161 + 195}{1600}}$$

$$d = \sqrt{\frac{14161}{1600}} + \sqrt{\frac{195}{1600}}$$

$$d = \frac{119}{40} + \frac{\sqrt{195}}{40}$$

$$d = \frac{1}{40}\left(119 + \sqrt{195}\right)$$

134. (a) A square is said to be inscribed in a circle if each corner of the square lies on the circle. Therefore:



$c^2 = a^2 + b^2$

$c = \sqrt{a^2 + b^2}$

$25 = \sqrt{x^2 + x^2}$ (where a = b)

$(25)^2 = 2x^2$

$x^2 = 312.5$

$x = 17.67$

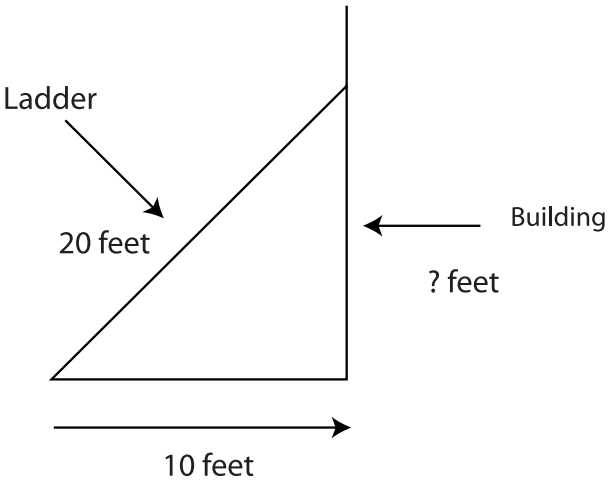
Therefore, the perimeter of the square should be:

$A = 4x$

$A = 4(17.67)$

$A = 70.71$ feet

135. (c) Let's say the ladder is x feet up the building. Therefore:



$$\frac{1}{x}+\frac{1}{x+12}=\frac{2}{5}$$

$$5x+60+5x=2x(x+12)$$

$$10x+60=2x^2+24x$$

$$2x^2+24x-10x-60=0$$

$$2x^2+14x-60=0$$

$$x^2+7x-30=0$$

$$x^2-3x+10x-30=0$$

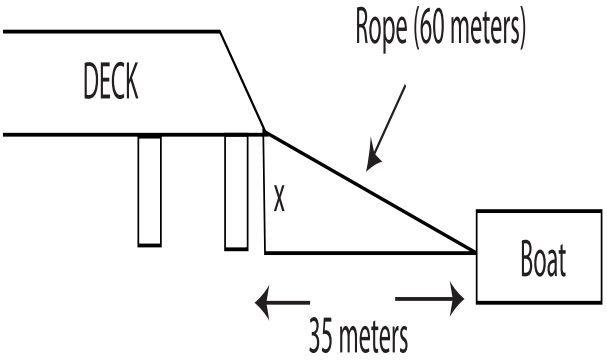
$$x(x-3)+10(x-3)=0$$

$$(x+10)(x-3)=0$$

x = -10 or x = 3

Thus, it would take 3 hours for Micky to paint the cabin by himself, while it would take (x + 12 = 15) 15 hours to Jim to do the same job by himself. If both work together, they can finish up the job in 2.5 hours.

140. (a) Let's say x is the height of the dock. Therefore, we can say:



$$c=\sqrt{a^2+b^2}$$

$$60=\sqrt{35^2+x^2}$$

$$60^2=35^2+x^2$$

$$x^2=60^2-35^2$$

$$x^2=3600-1225$$

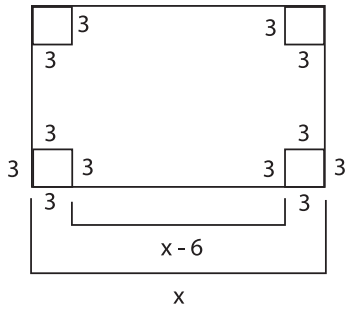
$$x^2=2375$$

$$x=\sqrt{2375}$$

x = 48.73 meters

Thus, the height of the dock above the deck of the boat should be 48.73 meters.

141. (c) Let x be one side of the cardboard. Therefore, the length of the new cardboard should be x - 6 and the height of the cardboard should be 3 inches.



$$V=lwh$$

$$3(x-6)(x-6)=2700$$

$$(x-6)^2=900$$

$$(x-6)^2=30^2$$

$$x-6=30$$

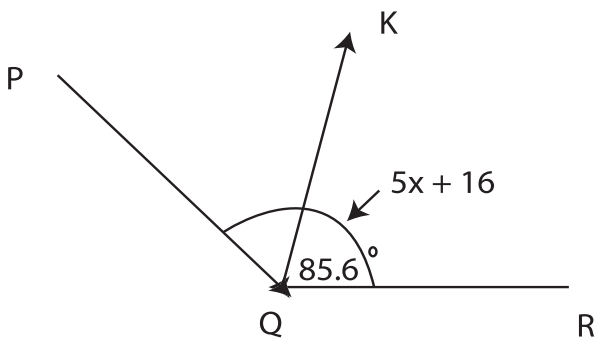
$$x=36$$

147.(d) Since Q is the midpoint of $\overline{PR}$, we can say:

$5x + 4 + 5x + 4 = 120$
$10x + 8 = 120$
$10x = 112$

$$x = \frac{112}{10} = 11.2$$

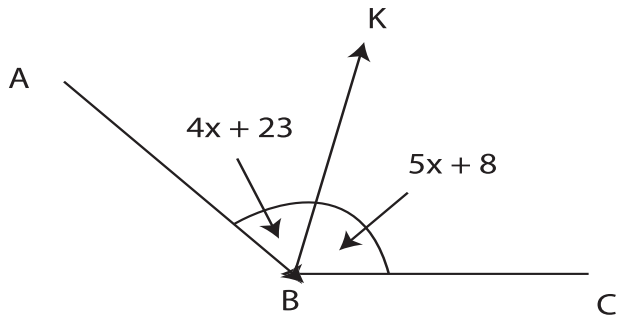
148. (b) Since $\overrightarrow{QK}$ bisects ∠PQR, ∠RQK should be one half the measure of ∠PQR. Therefore, the measure of ∠PQR should be 2 x 85.6° = 171.2°



$5x + 16 = 171.2$
$5x = 171.2 - 16$
$5x = 155.2$

$$x = \frac{155.2}{5} = 31.04$$

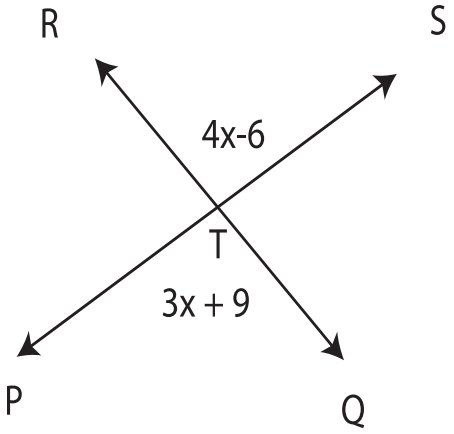
149. (d) Since $\overrightarrow{BK}$ bisects ∠ABC, the measure of ∠ABK should be the same to the measure of ∠KBC. Therefore, we can say:



$4x + 23 = 5x + 8$
$5x - 4x = 23 - 8$
$x = 15$

$\angle ABC = 4x + 23 + 5x + 8$
$\angle ABC = 9x + 31$
$\angle ABC = 9(15) + 31$
$\angle ABC = 166°$

150. (a) In this figure, the vertical pair is congruent; therefore each angle has the same measure.



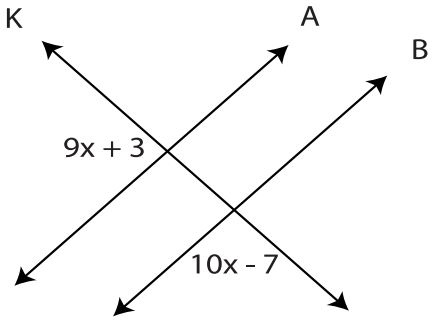
$4x - 6 = 3x + 9$
$x = 15$

Therefore, the ∠PTQ should be:

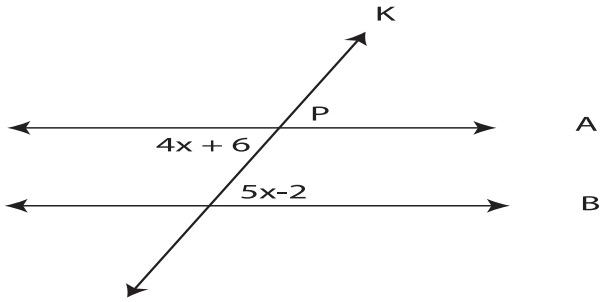
$\angle PTQ = 3x + 9$
$\angle PTQ = 3(15) + 9$
$\angle PTQ = 54$

151.(a) The two marked angles are supplementary and therefore we can say:

$9x + 3 + 10x - 7 = 180$
$19x - 4 = 180$
$19x = 184$
$x = 9.68$



152. (c) From the figure, we can say:



$4x + 6 = 5x - 2$ (see problem 145)
$x = 8$

Therefore the measure of $\angle KPA$:

$\angle KPA = 4x + 6$ ($\angle KPA = 4x + 6$)
$\angle KPA = 4(8) + 6$
$\angle KPA = 38$

153. (b) Since $\overline{xy} = \overline{yz} = \overline{zx}$ are similar in size, therefore $\angle XYZ = \angle YZX = \angle ZXY = x$

$x + x + x = 180^o$
$3x = 180^o$
$x = 60^o$
$\angle XYZ = 60^o$

154.(a) The sum of the exterior angles of a triangle is 360^o. Therefore, we can say:

$4x + 6 + 2x + 16 + 5x + 8 = 360$
$11x + 30 = 360$
$11x = 330$
$x = 30$

155.(d) The exterior angle whose measure is 105^o, is equal to the sum of the angle of measure 45^o and $\angle ABC$. Therefore, we can say:

$\angle ABC + 45^o = 105^o$
$\angle ABC = 60^o$

156. (a) Since $\overline{AK}$ is the median of $\overline{BC}$, therefore we can say:

$3x + 2 = 4x - 5$
$x = 7$

Therefore, the length of $\overline{BC}$:

$\overline{BC} = 3x + 2 + 4x - 5$
$\overline{BC} = 7x - 3$
$\overline{BC} = 7(7) - 3$
$\overline{BC} = 46$

157. (d) As previously stated,

$\angle ACK = \angle ABC + \angle BAC$
$2x + 7 = 2x - 11 + x - 2$
$3x - 2x = 13 + 7$
$x = 20$

Therefore the measure of $\angle ACK$:

$\angle ACK = 2x + 7 = 2(20) + 7$
$= 47^o$

158. (d) As stated previously, the sum of the degree measures of the exterior angles in a triangle is 360^o. Therefore, we can say:

$2x + 5x + 3x = 360$
$10x = 360$
$x = 36$

Therefore, the measure of the largest angle should be: $5x = 5.(36) = 180^o$

159. (b) The opposite sides of rectangles are always same. Therefore, we can say:

$2x + 9 = 3x - 3$
$3x - 2x = 9 + 3$
$x = 12$

Also, we can say $\overline{AB} = \overline{CD}$

$AB = 5x - 4$
$AB = 5\ (12)-4$
$AB = 56$

160. (c) The sum of the consecutive angles in a parallelogram is 180^o. Therefore, we can write:

$7x - 6 + 10x - 18 = 180$
$17x - 24 = 180$
$17x = 204$
$x = 12$

161. (b) The diagonals of a rectangle are congruent. They also bisect each other, therefore the measure of $\overline{RQ} = 4x + 6 + 4x + 6$.

$\overline{PS} = \overline{QR}$

$66 = 4x + 6 + 4x + 6$

$66 = 8x + 12$

$8x = 54$

$x = 6.75$

162. (c) The measure of an inscribed angle is one-half the measure of the arc that intercepts it. Therefore we can say:

$\text{Arc}(PR) = 2\ \angle PQR$
$100 = 2\ \angle PQR$
$\angle PQR = 50^o$

163. (d) If the triangle is not inscribed in the circle, the measure of an angle is similar to the measure of the arc that intercepts. In this case, $\angle PQR = \text{arc}(PR)$. To find out the measure of arc(RT) we must find out the angle of $\angle RQT$.

$\angle PQR + \angle RQT = 180$
$30 + \angle RQT = 180$
$\angle RQT = 150 = \text{arc}\ (RT)$

164. (c) In this type of circle, PQ and PR are known as secants, and the length of such secants can be solved by using the following formula:

$\overline{PT}.\overline{PQ} = \overline{PS}.\overline{PR}$

$5\ (4x + 5) = 3\ (7x + 3)$
$20x + 25 = 21x + 9$
$x = 16$

$\overline{QT} = 4x$

$\overline{QT} = 4(16)$

$\overline{QT} = 64$

165. (a) In the figure, PQ should be classified as a secant and PR should be classified as a tangent. The length of the tangent and secant can be represented by the following formula:

$\overline{PS}.\overline{PQ} = \overline{PR}^2$

$4(x + 4) = 8^2$
$4x + 16 = 64$
$4x = 48$
$x = 12$

From the value of x, we can find the measure of $PQ = 4 + x = 4 + 12 = 16$

166. (d) This type of geometry problem can be solved by using the following equation:

PK. KR = QK.KS
9.2x = 19.4
18x = 76
x = 4.22

$\overline{PR} = 9 + 2x$

$\overline{PR} = 9 + 2(4.22)$

$\overline{PR} = 9 + 8.44$

$\overline{PR} = 17.44$

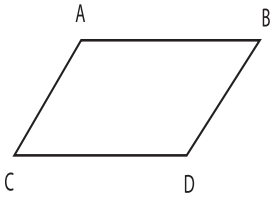
167. (a) When solving problems related to parallelograms, we should remember two important geometric properties:

1. In parallelograms, opposite angles are always congruent. e.g. ∠CAB = ∠CDB

2. In parallelograms, the sum of the consecutive angles is 180°. e.g. ∠CDB + ∠DBA = 180°

Therefore, we can say:

∠CAB = ∠CDB
Y = 91°



∠CDB + ∠DBA = 180°
91 + ∠DBA = 180°
∠DBA = X = 89°

168. (a) In an isosceles trapezoid (e.g. AC = BD), the base angles (∠CDB and ∠ACD) are congruent. Therefore, we can say:

∠ACD = ∠CDB
5x + 7 = 10x - 23
5x = 30
x = 6

Putting this x value in the equation:

∠ACD = 5x + 7 = 5(6) + 7 = 37°

169. (c) In the parallelogram, the sum of all of the exterior angles is equal to 360°. Therefore, we can say:

∠1 + ∠2 + ∠3 + ∠4 = 360°

Also,

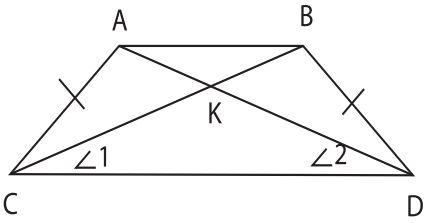
∠1=∠4 and ∠2 = ∠3

$\overline{AD} = \overline{BC}$ and $\overline{PS} = \overline{QR}$, therefore:

7x - 9 = 4x
3x = 9
x = 3

170. (b) Before we solve this problem, we must summarize, learn and remember the following geometrical properties.

1. **<u>Isosceles Trapezoid:</u>**



A. In an isosceles trapezoid, two opposite sides which are not bases are always congruent.

$\overline{AC} = \overline{BD}$

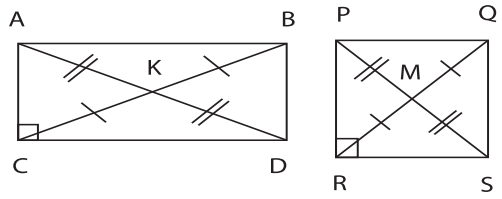
B. In an isosceles trapezoid, the base angles are always congruent.

∠1 = ∠2

C. The diagonal of an isosceles trapezoid are congruent.

$\overline{AD} = \overline{BC}$

2. **Rectangle and square:**



A. The diagonal of every rectangular and square bisect each other.

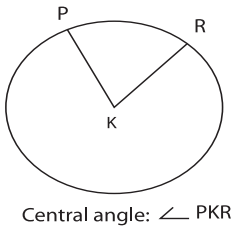
$\overline{AK} = \overline{KD}$ and $\overline{KC} = \overline{KB}$

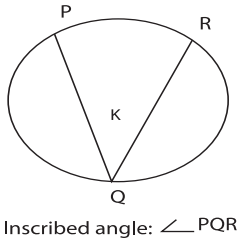
$\overline{PM} = \overline{MS}$ and $\overline{RM} = \overline{MQ}$

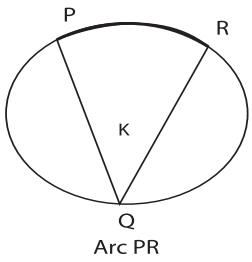
B. The diagonal of every rectangular and square are congruent.

$\overline{AD} = \overline{BC}$ and $\overline{PS} = \overline{QR}$

3. **Circle:**







A. The measure of the central angle in a circle is equal to the measure of the intercepted arc.

$\angle PKR$ = Arc PR

B. The measure of an inscribed angle in a circle is equal to one-half the measure of the intercepted arc.

$$\angle PQR = \frac{1}{2} (\text{Arc PR})$$

Now back to our original problem. From the stated rule, we can say:

$2x + 10 = 4x - 30$
$2x = 40$
$x = 20$

Therefore, the length of AC should be:

$\overline{AC} = 2x + 10$
$\overline{AC} = 2(20) + 10$
$\overline{AC} = 50$

171. (c) As stated previously, the diagonals of the rectangle are congruent and they also bisect each other, therefore we can say:

$\overline{AD} = \overline{AK} + \overline{KD}$
$\overline{AD} = 2(\overline{AK})$ $(\overline{AK} = \overline{KD})$
$\overline{AD} = 2(55)$
$\overline{AD} = 110$
$\overline{BC} = \overline{AD}$
$\overline{BC} = 110$
$\overline{BC} = \overline{BK} + \overline{KC}$
$110 = 2.5x + 2.5x$
$5x = 110$
$x = 22$

172. (d) In the circle K, PQ is the diameter of the circle and PK and QK are radii of the circle. Therefore,

PK = QK
$3x + 5 = 6x - 1$
$3x = 6$
$x = 2$

173. (c) The measure of an inscribed angle in a circle is equal to one-half the measure of the intercepted arc, therefore we can say:

$$\angle PRQ = \frac{1}{2}\overline{PQ}$$

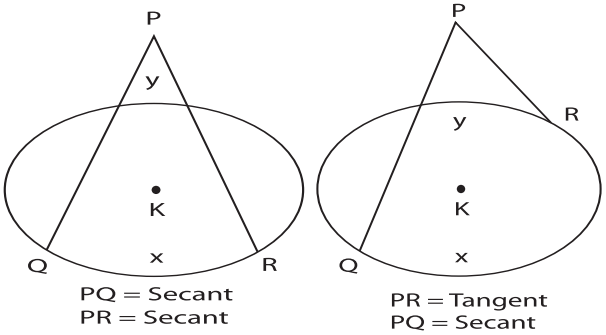
$$2x + 3 = \frac{1}{2}(106)$$

$$2x + 3 = 53$$

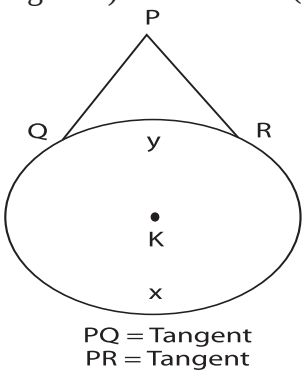
$$2x = 50$$

$$x = 25$$

174. (d) Before solving this kind of problem, remember the following properties:



(Figure 1) (Figure 2)



(Figure 3)

Two secant segments (PQ and PR in Figure 1), two tangent segments (PQ and PR in Figure 3), and one secant and one tangent (PQ and PR in Figure 2) form an angle (∠RPQ) exterior to the circle K. The measure of this angle (∠RPQ) is one-half of the difference between the intercepted arcs of the angles.

$$\angle RPQ = \frac{1}{2}(x - y)$$

For the given circle K in question 174, PQ is the diameter (arc) of the circle, therefore:

$$PQ = 180^0$$

$$PQ = PS + SQ$$

$$180 = PS + 105$$

$$PS = 75$$

$$\angle RPQ = ½ (PQ - PS)$$

$$\angle RPQ = ½ (180 - 75)$$

$$\angle RPQ = ½ (105)$$

$$\angle RPQ = 52.5$$

175. (c) This type of problem can be solved by using the following formula:

$$\angle PKQ = ½ (x + y)$$

$$\angle PKQ = ½ (PQ + RS)$$

$$\angle PKQ = ½ (70 + 110)$$

$$\angle PKQ = ½ (180)$$

$$\angle PKQ = 90^0$$

176. (d) This type of problem can be solved by using the proportional formula.

$$\frac{\overline{TU}}{\overline{PQ}} = \frac{\overline{UW}}{\overline{QS}}$$

$$\frac{TU}{3} = \frac{25}{5}$$

$$TU = 3 \times \frac{25}{5}$$

$$TU = 15$$

$$c^2 = a^2 + b^2$$

$$c = \sqrt{a^2 + b^2}$$

$$20 = \sqrt{10^2 + x^2}$$

$$(20)^2 = 10^2 + x^2$$

$$x^2 = 400 - 100 = 300$$

$$x = 17.32$$

Thus, the ladder should be 17.32 feet up the building.

136.(a) Multiply the second equation by 5, and then add it to equation 1.

$$\begin{array}{l} 3x + 5y = 10 \\ +\ 2x(5) - y(5) = 5(1/5) \\ \hline 3x + 10x + 5y - 5y = 10 + 1 \\ 13x = 11 \end{array}$$

$$x = \frac{11}{13}$$

137. (c) Let's say the slower boat is travelling x mph. Therefore, the faster boat should be travelling (x + 20) mph.

$$r = \frac{d}{t}$$

$$r = \frac{45 \text{miles}}{\frac{5}{3}\text{hours}}$$

$$r = \frac{45x3}{5}$$

$$r = 27 \text{mph}$$

Thus, the total rate should be 27 miles per hour. Therefore, we can say:

x + x + 20 = 27
2x = 7
x = 3.5 mph

The slower boat is travelling 3.5 mph while the faster boat is travelling (x + 20) 23.5 mph.

138.(d) Let's say the owner has x pounds of $2.50 per pound candy. Therefore, we can say he must have (25-x) pounds of $3.00 per pound candy. Therefore:

$$\$2.50x + \$3.00(25 - x) = \$2.75(25)$$

$$2.5x + 75 - 3x = 68.75$$

$$-0.5x = -6.25$$

$$x = 12.50 \text{ pound of } \$\ 2.50$$

The owner suppose to mix 12.5 pounds of $2.50 per pound candy with (25-x = 12.5) 12.5 pounds of $3.00 per pound candy in order to get 25 pounds of $2.75 per pound candy.

139. (a) Let's say it takes Micky x number of hours to paint the cabin by himself. Therefore, Jim should take (x + 12) hours.

	Hours to paint the cabin	Job done in 1 hour
Micky	x	1/x
Jim	x + 12	1/(x + 12)
Together	5/2	2/5

142. (c) $AB + BC = AC$
$AB = AC - BC$
$AB = 14 - 4$
$AB = 10$

143. (d) The length of segment MR should be:

$MR = 18 - 7$
$MR = 11$

The midpoint of segment MR should be $\frac{1}{2}MR$

$$\text{Midpoint} = \frac{1}{2}MR$$

$$\text{Midpoint} = \frac{1}{2}(11)$$

$$\text{Midpoint} = 5.5$$

144. (d) AB + BC = AC, therefore:

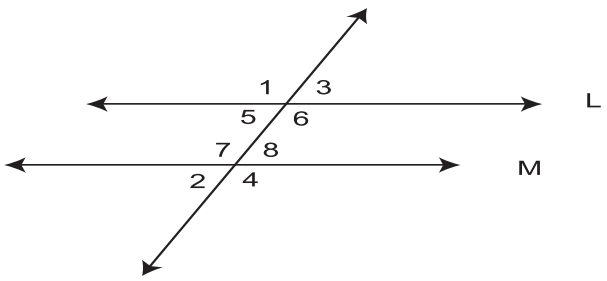
$$\frac{AB}{BC} = \frac{7}{12}$$

$$\frac{AB+BC}{BC} = \frac{7+12}{12}$$

$$\frac{AB+BC}{BC} = \frac{19}{12}$$

$$\frac{AC}{BC} = \frac{19}{12}$$

145.(c) The value of x can be calculated by using the following theorem.



$m\angle 1 = m\angle 7$	$m\angle 1 = m\angle 6$
$m\angle 2 = m\angle 5$	$m\angle 5 = m\angle 3$
$m\angle 3 = m\angle 8$	$m\angle 2 = m\angle 8$
$m\angle 6 = m\angle 4$	$m\angle 7 = m\angle 4$

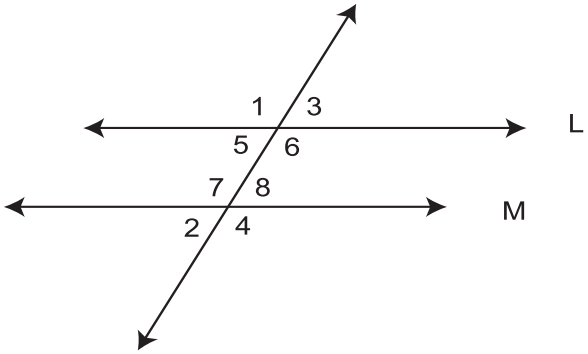
$m\angle 1 + m\angle 3 = 180^o$

$m\angle 1 + 113 = 180^o$

$m\angle 1 = 67^o$

$m\angle 1 = m\angle 7 = 67^o$

146. (c) The value of x can be calculated by using the following theorem.



$m\angle 1 + m\angle 3 = 180^o$

$m\angle 1 + 85 = 180^o$

$m\angle 1 = 95^o$

$m\angle 1 + m\angle 5 = 180^o$

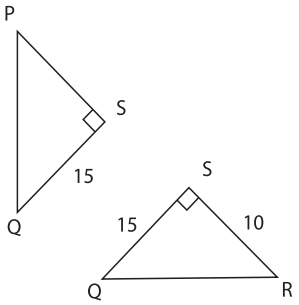
$95^o + m\angle 5 = 180^o$

$m\angle 5 = x = 85$

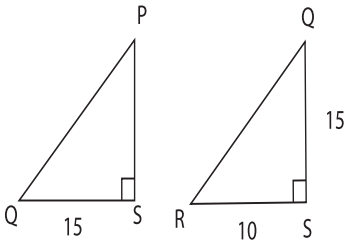
177. (a) Using the same proportional formula:

$$\frac{PS}{PS+SQ}=\frac{ST}{QR}$$
$$\frac{3}{3+9}=\frac{ST}{25}$$
$$ST=25.\left(\frac{3}{12}\right)$$
$$ST=\frac{25}{4}=6.25$$

178. (b) If we carefully observe the figure, we can see the following triangles, one of which is bigger and the other which is smaller.

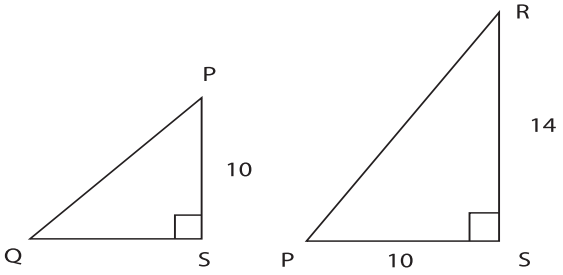


Rearranging both triangles,



$$\frac{PS}{QS}=\frac{QS}{RS}$$
$$\frac{PS}{15}=\frac{15}{10}$$
$$PS=\frac{15x15}{10}=\frac{225}{10}=22.5$$
$$\overline{PR}=\overline{PS}+\overline{SR}$$
$$\overline{PR}=22.5+10$$
$$\overline{PR}=32.5$$

179. (c) We can split the figure into two right angles.

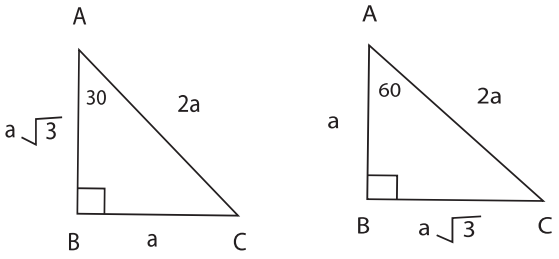


Using the same proportional formula, we can say:

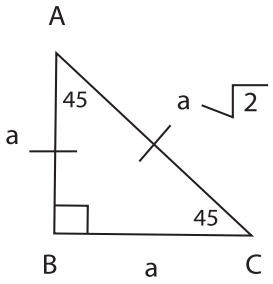
$$\frac{QS}{PS}=\frac{PS}{RS}$$
$$QS=\frac{PS.PS}{RS}$$
$$QS=\frac{10.10}{14}$$
$$QS=7.142$$

180. (b) Before we solve this type of problem, we must remember the following properties of right angle triangles.

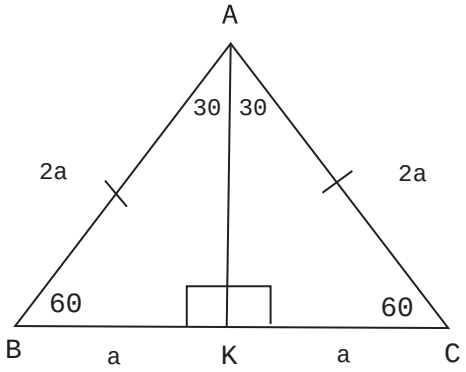
1. In a 30°-60°-90° triangle, the hypotenuse is twice the length of the shorter side, and the longer side length is the product of the shorter side length and the square root of three.



2. In an isosceles right triangle, the length of the hypotenuse is the length of a leg multiplied by the square root of two.



3. The altitude of an equilateral triangle forms two smaller congruent triangles that are 30°-60° - 90° triangles.



In question 180, ∠ A = 30°, ∠B = 90° and ∠ c = 60°. Therefore, BC is the shorter side. As per the rule, in a 30°-60°-90° triangle, the hypotenuse is the twice the length of the shorter side. So the length of AC should be:

$$\overline{AC} = 2\overline{BC}$$

$$\overline{AC} = 2(5)$$

$$\overline{AC} = 10$$

181. (d) Time to clean the whole house:

$$= \frac{7}{\left(\frac{4}{5}\right)}$$

$$= \frac{7x5}{4}$$

$$= \frac{35}{4} = 8\frac{3}{4}$$

182. (c) To solve percentage related problems, we use the following equation:

$175 = 100 percent
$35 = ?

$$= \frac{35x100}{175}$$

$$= 20\%$$

183. (c) 6% of $3\frac{5}{2}$ is:

$$= \frac{\frac{11}{2}x6}{100} \quad \left(3\frac{5}{2} = \frac{11}{2}\right)$$

$$= \frac{11x6}{200}$$

$$= 0.33$$

184. (a) 20% of 500 liters is:

$$= \frac{500x20}{100}$$

$$= \frac{500}{5} = 100 \text{ liters}$$

185. (d) Find 33% of $\frac{7}{3}$ of $\frac{5}{8}$

$$= \frac{33}{100} x \frac{7}{3} x \frac{5}{8}$$

$$= \frac{11x7x5}{100x8}$$

$$= \frac{11x7}{20x8}$$

$$= 0.481$$

186. (c) $= \frac{13}{45} x100$

$= 28.88\%$

187. (d) 22% of $4\frac{1}{2}$ of $\frac{3}{8}$:

$= \frac{9}{2} x \frac{3}{8} x \frac{22}{100}$

$= \frac{27x11}{8x100} = 0.371$

188. (c) 2.5% of $\frac{5}{7} \div \frac{2}{7}$.

$= \frac{2.5}{100} x \frac{5}{7} x \frac{7}{2}$

$= 0.0625$

$= 6.25x10^{-2}$

189. (d) 0.45% of $\frac{2}{6}$ of $\frac{3}{8}$.

$= \frac{0.45}{100} x \frac{2}{6} \text{ x } \frac{3}{8}$

$= 0.056 \text{ x } 10^{-2}$

190. (a) $= \left(\frac{3}{4} \div \frac{5}{6}\right) \text{ x } 100$

$= \frac{3}{4} \text{ x } \frac{6}{5} \text{ x } 100$

$= 90\%$

191. (a) Suppose that the event that a clerk remains absent on any working day is denoted by A. Similarly the event that a peon remains absent is denoted by B. According to the information given in the problem:

P(A) = 0.08, P(B) = 0.05 and P(A∩B) = 0.02

Now A∪B denotes the event that at least one of the two employees remains absent on any working day. Therefore, the probability of this event is:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = 0.08 + 0.05 - 0.02$$

$$P(A \cup B) = 0.11$$

192. (b) There are a total of 14 balls in a box. 3 balls can be drawn at random in $\binom{14}{3}$ = 364ways.

$$\frac{n!}{r!(n-r)!} = \frac{14!}{3!(11)!} = \frac{12x13x14}{1x2x3} = 364$$

Therefore n = 364.

Suppose E denotes the event that three balls drawn all are white. There are 4 white balls in the box and 3 white balls can be drawn in $\binom{4}{3}$ = 4 ways.

$$\frac{n!}{r!(n-r)!} = \frac{4!}{3!(1)!} = \frac{1x2x3x4}{1x2x3} = 4$$

$$P(E) = \frac{4}{364}$$

$$P(E) = \frac{1}{91}$$

$$P(E) = 0.010$$

193. (a) The sum of probability of success and failure is always equal to 1. It is denoted by the following formula:

p + q = 1, where

p = probability of success
q = probability of failure

Therefore:

$0.3 + q = 1$
$q = 0.7$

194. (a)

$p + q = 1$
$p + 0.6 = 1$
$p = 0.4$
$p = 0.4 \times 100$
$p = 40\%$

195. (c) We have a total of 12 balls. One out of 12 balls can be drawn $\binom{12}{1}$.

$$\binom{12}{1} = \frac{12!}{1!(12-1)!}$$

$$= \frac{12!}{1!(11)!}$$

$$= 12$$

Therefore, n = 12.

Let A be the event that the ball drawn is white or red. Since there are 4 white and 5 red balls, the ball drawn must be one of these (4 + 5 = 9) Therefore,

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$\binom{9}{1} = \frac{9!}{1!(9-1)!}$$

$$\binom{9}{1} = \frac{9!}{1!(8)!} = 9$$

$$P(A) = \frac{9}{12}$$

$$P(A) = \frac{3}{4}$$

$$P(A) = 0.75$$

196. (a) The number of ways of drawing 2 cards from 52 = $\binom{52}{2} = \frac{52!}{2!(52-2)!}$

$$= \frac{52!}{2!(50)!}$$

$$= \frac{51x52}{2}$$

$$= 26x51 = n$$

Event A = both are heart cards. There are 13 heart cards out of 52 cards. Hence, the number of ways of drawing 2 cards out of 13 is as follows:.

$$\binom{13}{2} = \frac{13!}{2!(13-2)!}$$

$$= \frac{13!}{2!(11)!}$$

$$= \frac{12x13}{2}$$

$$= 78 = r$$

$$P(A) = \frac{r}{n}$$

$$P(A) = \frac{78}{26x51} = \frac{1}{17}$$

197. (c) The number of ways of selecting 3 bulbs from 8 = $\binom{8}{3} = \frac{8!}{3!(8-3)!}$

$= \frac{8!}{3!(5)!}$

$= \frac{6x7x8}{2x3}$

$= 56$

Let A be the event of the room being lit. For A to happen, one, two or all three of the selected bulbs should be good. If we work this way, the calculations would be lengthy. So we take the other route.

Let A' be the event which is the complement of A, i.e. event A' = the room does not get lit

For A' to happen, all three selected bulbs must be defective. Since the number of defective bulbs is 4.

$$A' = \binom{4}{3} = \frac{4!}{3!(4-3)!} = 4 = r$$

$$P(A') = \frac{4}{56} = \frac{1}{14}$$

$$P(A) = 1 - P(A')$$

$$P(A) = 1 - \left(\frac{1}{14}\right) = \frac{13}{14}$$

198. (d) The number of ways of drawing 2 cards from 52 is = $\binom{52}{2} = \frac{52!}{2!(52-2)!}$

$= \frac{52!}{2!(50)!}$

$= \frac{51x52}{2}$

$= 26x51 = n$

Event A = both are face cards. There are 12 face cards out of 52 cards. Hence, the number of ways of drawing 2 cards out of 12 are:

$$\binom{12}{2} = \frac{12!}{2!(12-2)!}$$

$$= \frac{11x12}{2} = 66 = r$$

$$P(A) = \frac{r}{n} = \frac{66}{26x51} = \frac{33}{663} = \frac{11}{221}$$

199. (c) We have total 9 balls. Two out of 9 balls can be drawn in the following manner.

$$\binom{9}{2} = \frac{9!}{2!(9-2)!}$$

$$= \frac{9!}{2!(7)!}$$

$$= \frac{8x9}{2} = 36 = n$$

Let A be the event that both balls drawn are black. Since there are 3 black balls, two balls drawn must be out of 3. Therefore,

$$\binom{3}{2} = \frac{3!}{2!(3-2)!}$$

$$= \frac{3!}{2!(1)!}$$

$$= \frac{2x3}{2} = 3 = r$$

$$P(A) = \frac{r}{n} = \frac{3}{36} = \frac{1}{12}$$

200. (a) We have a total of 400 screws, out of which two screws are randomly picked. Therefore,

$$\binom{400}{2} = \frac{400!}{2!(400-2)!}$$

$$= \frac{400!}{2!(398)!} = \frac{399x400}{2} = 399x200 = n$$

Let A be the event that both screws are defective. Since there are 50 defective screws, two screws drawn must be out of 50. Therefore,

$$\binom{50}{2} = \frac{50!}{2!(50-2)!}$$

$$= \frac{50!}{2!(48)!} = \frac{49x50}{2} = 49x25 = r$$

$$P(A) = \frac{r}{n}$$

$$P(A) = \frac{49x25}{399x200} = \frac{49x25}{79800} = \frac{49}{3192} = \frac{7}{456}$$

Verbal Ability Answers

Analogy Answers

1. C
2. C
3. A
4. B
5. D
6. A
7. D
8. B
9. C
10. C
11. A
12. A
13. D
14. B
15. A
16. C
17. D
18. B
19. A
20. B
21. C
22. D
23. A
24. B
25. B
26. D
27. C
28. D
29. A
30. B

Sentence Completion Answers

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

Reading Comprehension

Reading Comprehension Answers

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