**Problem Solving Select Many Practice Test 3**

**Question 1**

**Find the domain for which the functions f(x) = 2x -1 and g(x) = 1-3x are equal. Indicate all correct options.**

1. {1/5}
2. {0.4}
3. {1, 5}
4. {0.2, 0.3}
5. {2/5}

**Correct Answer:**

**Explanation:**

We have f(x) = g(x)
2x -1 = 1 - 3x
5x = 2
x = 2/5 = 0.4
The functions f(x) and g(x) are equal on the set {2/5}.
Options (B) and (E) are correct.

**Question 2**

**The average marks obtained by 20 students in an exam is 45. Which of the following statements is true? Indicate all correct options.**

1. The total marks obtained is 900
2. If 10 students scored 40 and 10 scored 50, the average marks would remain the same
3. If each student scored 5 marks more, the average would remain the same
4. If 15 students scored x marks less and 5 students scored x marks more, the average would decrease by x/2
5. If the marks of 5 students were entered wrongly as 10 lesser, then the correct average would be lesser than 45.

**Correct Answer: A, B and D**

**Explanation:**

Total marks obtained = Average \* number of students
= 45\*20 = 900
Option A is true.
Average marks if 10 students scored 40 and 10 socred 50
= (40\*10+50\*10)/20
= (400+500)/20 = 900/20 = 45
Option B is true.

Average marks if each scored 5 marks more = (900+20\*5)/20
= (900+100)/20 = 1000/20 = 50
Option C is false.

Average marks if 15 scored x marks less and 5 scored x marks more = [15(45-x) + 5(45+x)]/20
= (675-15x+225+5x)/20
= (900-10x)/20
= 45 - x/2
Option D is true.

Correct average if the marks of 5 were entered as 10 lesser = (900+10\*5)/20
= (900+50)/20
= 950/20 = 47.5
Option E is false.

**Question 3**

**If Adam walks at 5/4 of his usual speed, he shall reach his office 6 minutes earlier than he usually does. Which of the following statements is true? Indicate all correct options.**

1. His office is 5 km away
2. Usually he takes 30 minutes to reach his office
3. He shall reach his office in 24 minutes if he walks at 5/4 of his usual speed.
4. Usually he takes 24 minutes to reach his office
5. He shall reach his office in 18 minutes if he walks at 5/4 of his usual speed.

**Correct Answer: B and C**

**Explanation:**

Let his usual speed be x m/min
Let his office be y meters away.
Time = distance/speed
Time taken usually = y/x
According to the given conditions,
y/x - 6 = y/(5x/4)
y/x - 6 = (4/5)y/x
(y/x)(1-4/5) = 6
(y/x)(1/5) = 6
y/x = 6\*5 = 30 minutes
He takes 30 minutes to reach his office usually.
He takes 30-6=24 minutes to reach his office if he walks at 5/4 of his usual speed.

**Question 4**

**A and B start from a point and run in opposite directions along the circumference of a circular park. The circumference of the park is 4200 meters. The speeds of A and B are 500 m/min and 700 m/min respectively. Which of the following is true? Indicate all correct options.**

1. They meet each other in 3.5 minutes
2. A covers 1750 meters when they meet
3. B covers 1750 meters when they meet
4. A covers 2450 meters when they meet
5. B covers 2450 meters when they meet

**Correct Answer: A, B and E**

**Explanation:**

Let them meet after x minutes.
Speed = distance/time
Distance covered by A and B in x minutes = 500x and 700x meters

Total distance covered by them in x minutes = 4200 meters
500x+700x = 4200
1200x=4200
x=4200/1200 = 3.5 minutes
Distance covered by A and B = 500\*3.5 and 700\*3.5
= 1750 meters and 2450 meters respectively
Options A, B and E are true.

**Question 5**

**Two cars A and B start from a point in opposite directions at speeds 45 km/hr and 50 km/hr respectively. Which of the following statements is true? Indicate all correct options.**

1. They are 95 meters apart in 1000 seconds
2. They are 1000 meters apart in 95 seconds
3. B takes 0.1 hours lesser than A takes to cover 45 km
4. B covers 45 km within an hour
5. A covers 50 km within an hour

**Correct Answer: A, C and D**

**Explanation:**

Speed = Distance/time
Let the time be x seconds
45 + 50 = 0.095/x
x = 95/0.095 = 1000 seconds
Option A is true.

Time taken by B to cover 45 km = 45/50
= 0.9 hours
Time taken by A to cover 45 km = 45/45
= 1 hour

Time taken by A = time taken by B + 0.1
Option C is true.

B covers 50 km in an hour and hence option D is true.
A covers 45 km in an hour and hence option E is false.

**Question 6**

**Let A = {-1, 0, 2, 3, 5, 6} and f(x) = x2 -x -2. Find f(A). Indicate all correct options.

[x2 = x\*x]**

1. {-1, 0, 2, 3, 5, 6}
2. {f(-1), f(0), f(2), f(3), f(5), f(6)}
3. {-2, 4, 18, 28}
4. {0, -2, 4, 18, 28}
5. { 0, 1, 2, 6, 20}

**Correct Answer: B and D**

**Explanation:**

f(A) = {f(-1), f(0), f(2), f(3), f(5), f(6)}
= {0, -2, 0, 4, 18, 28}= {-2, 0, 4, 18, 28}
Options (B) and (D) are correct.

**Question 7**

**A(3, sqrt(3)), B(0,2\*sqrt(3)) and O(0,0) are three points in a plane. Which of the following is true? Indicate all correct options.**

1. AB > BO
2. AO = BO
3. Angle ABO < Angle BOA
4. Angle ABO = Angle BAO
5. BO = AB

**Correct Answer: B, D and E**

**Explanation:**

AB = sqrt{(3-0)2+[sqrt(3)-2\*sqrt(3)]2}= sqrt(12)
BO = sqrt{(0-0)2+[0-2\*sqrt(3)]2}= sqrt(12)
AO = sqrt{(3-0)2+[sqrt(3)-0]2}= sqrt(12)
AB=BO=AO. Hence, the triangle is equilateral and all its sides and angles are equal.
Options B, D and E are true.

**Question 8**

**A and B can do a piece of work in 24 days, B and C can do it in 30 days and C and A can do it in 40 days.
Which of the following statements is true? Indicate all correct options.**

1. A takes 40 days to do the work
2. B takes 40 days to do the work
3. C takes 120 days to do the work
4. B takes 120 days to do the work
5. C takes 60 days to do the work

**Correct Answer: B and C**

**Explanation:**

Work done by A and B in one day = 1/24
Work done by B and C in one day = 1/30
Work done by C and A in one day = 1/40
Work done by A minus work done by C in one day = 1/24-1/30=1/120
Twice work done by A in one day = 1/40+1/120=1/30
Work done by A in one day = 1/60
A takes 60 days
Work done by B in one day = 1/24-1/60=1/40
B takes 40 days.
Work done by C in one day = 1/40-1/60=1/120
C takes 120 days.
Options B and C are true.

**Question 9**

**A shopkeeper marks his goods at 20% profit and gives a discount of 5%. Which of the following is true? Indicate all correct options.**

1. He gained 15%
2. He suffered a loss in the transaction
3. He gained 14%
4. If the cost price was Rs.200, the selling price after the discount was Rs. 228
5. If 20 such items were sold, the net profit percent would remain the same

**Correct Answer: C, D and E**

**Explanation:**

Let CP, SP and MP be the cost price, selling price and the marked price respectively.
Let the CP be Rs 100.
MP would be 100 + 20 = Rs120
After discount of 5% the SP would be
SP=(100-discount%)/100\*MP
=(100-5)\*120/100=114
gain%=14%
Option A and B are false and C is true.

SP = (100+gain%)CP/100
= (100+14)\*200/100
= 114\*2 = 228
Option D is true

Option E is true since the profit percent is independent of the number of items.

**Question 10**

**The present age of a man is equal to the sum of the present ages of his sons. Twenty years back his age was equal to three times the sum of their ages then. Which of the following statements is true? Indicate all correct options.**

1. He is presently 56 years old
2. The man is 50 years old
3. After six years the man will be 50 years old
4. After six years the man will be 56 years old
5. If his sons were twins, each would be 25 years old

**Correct Answer: B, D and E**

**Explanation:**

Let the present age of the man be x years and the sum of the ages of his sons be y years.
x = y
Twenty years back, his age was (x-20) and the sum of the ages of his sons was (y-40).
x-20 = 3(y-40)
y-20=3y-120
2y=100
y=50
The present age of the man is 50 years. His age will be 56 years after 6 years.
Options B and D are true and A and C are false.
If his sons were twins, they will be 50/2 = 25 years old today. Option E is true.

**Question 11**

**Let f be a real function defined by f(x) = ax2+b. Which of the following is true if f(1) = 2 and f(2) = 5? Indicate all correct options.
[x2=x\*x]**

1. a = 2
2. b = -1
3. a = b
4. b = 1
5. a < b

**Correct Answer: C and D**

**Explanation:**

f(x) = ax2+b
f(1) = 2
a(1)2+b = 2
a+b = 2 ...(1)

f(2) = 5
a(2)2+b = 5
4a + b = 5 ...(2)

Subtract (1) from (2)
4a + b - a - b = 5 - 2
3a = 3
a = 1
Putting a = 1 in (1)
1+b = 2
b = 2-1=1
Options (C) and (D) are true.

**Question 12**

**For a sum of money, the rate of interest is 100%. Which of the following is true? Indicate all correct options.**

1. It becomes four times itself in 2 years when interest is compounded annually
2. It doubles itself in 2 years when simple interest is applied
3. It doubles itself in 2 years when compound interest is applied
4. It becomes four times itself in 3 years when simple interest is applied
5. It becomes four times itself in 2 years when compound interest is applied.

**Correct Answer: A and D**

**Explanation:**

Let P, r and t be the principle, rate and time.
Amount = Compound interest (CI) + P = P[(1+r/100)t]
Amount = Simple interest (SI) +P = P\*r\*t/100 + P
When time is two years and interest is CI
Amount = P[(1+100/100)t]
4P= P\*2t
4 = 2t
Hence, time is two years. Option A is true and C and E are false.
When time is two years and interest is SI
Amount = P + P\*100\*t/100
2P = P + Pt
1 = t
Hence, time is one year. Option B is false.
When time is four years and interest is SI
Amount = P + P\*100\*t/100
4P = P + Pt
3 = t
Hence, time is three years. Option D is true.
[100t = 100\*100\*...t times]

**Question 13**

**A watch shows the correct time at 12 noon. It loses 30 minutes every hour after that. Which of the following statements is true?
Indicate all correct options.**

1. It shows 12:30 p.m. at 1 a.m.
2. It shows 12:30 p.m. at 1 p.m.
3. It shows 2 p.m. at 5 p.m.
4. It shows 2 p.m. at 4 p.m.
5. It shows 1 p.m. at 2 p.m.

**Correct Answer: B, D and E**

**Explanation:**

It shows the correct time at 12 noon.
At 1 p.m., the watch shows 12:30 p.m
At 2 p.m., the watch shows 1 p.m.
At 3 p.m., the watch shows 1:30 p.m.
At 4 p.m., the watch shows 2 p.m.
At 5 p.m., the watch shows 2:30 p.m.
Options B, D and E are true.

**Question 14**

**Consider the numbers 13, 26 and 52. Which of the following statements is true? Indicate all correct options.**

1. The three numbers are in GP
2. Their sum is divisible by 13
3. The smallest number that is exactly divisible by them is 52
4. The three numbers are in AP
5. The product of the first and the last numbers is twice the second number

**Correct Answer: A, B and C**

**Explanation:**

13, 26 and 52 can be written as 13, 13\*2, 13\*2\*2.
Hence, the numbers are in GP with 13 as the first number and 2 as the common ratio.
Option A is true.

13+26+52 = 91 = 7\*13
Hence, the sum is divisible by 13
Option B is true.

The smallest number is the LCM of the three = 13\*2\*2 = 52
Option C is true.

26\*2 = 52 < 13+52 = 65
Hence, option D and E are false.

**Question 15**

**The length and breadth of a cuboid are increased by 10% each while the height is decreased by 10%. Which of the following statements is true?
Indicate all correct options.**

1. The volume of the cuboid increases
2. The volume of the cuboid decreases
3. The volume decreases by 9%
4. The volume increases by 8%
5. The volume increases by 8.9%

**Correct Answer: A and E**

**Explanation:**

Let the length, breadth and height of the cuboid be l, b and h initially.
Initial volume = l\*b\*h = lbh
New length = l + 10l/100 = 110l/100
New breadth = b + 10b/100 = 110b/100
New height = h - 10h/100 = 90h/100

New Volume = (110l/100)\*(110b/100)\*(90h/100)
= 1.089 lbh

Percentage increase in volume = (1.089lbh-lbh)/lbh\*100
= 8.9%
Options A and E are true.