Rate

1. The distance between P and Q is d metres. A man ran from P to Q in x seconds, and back from Q to P in y seconds. What was the average speed of the man in metres per second for the whole journey?

   A. $\frac{x+y}{2d}$

   B. $\frac{xd+yd}{2}$

   C. $\frac{1}{2}(\frac{d}{x}+\frac{d}{y})$

   D. $\frac{d}{x+y}$

   E. $\frac{2d}{x+y}$

   [1977-CE-MATHS 2-7]

2. If Mr. Chan walks x miles in y hours, then how many miles can he walk in w minutes at the same speed?

   A. $\frac{xw}{y}$ miles

   B. $\frac{xy}{w}$ miles

   C. $\frac{wy}{x}$ miles

   D. $\frac{xy}{60w}$ miles

   E. $\frac{xw}{60y}$ miles

   [SP-CE-MATHS A2-40]

3. A train travelled a journey of d km at a speed of x km/h. How many hours would have been saved if its speed had been 10 km/h faster?

   A. $\frac{x(x+10)}{d}$

   B. $\frac{d}{x(x+10)}$

   C. $(\frac{x+10}{d}-\frac{x}{d})$

   D. $(\frac{1}{x}-\frac{1}{x+10})$

   E. $(\frac{d}{x}-\frac{d}{x+10})$

   [1978-CE-MATHS 2-43]

4. A piece of work can be completed by A alone in x days, or by B alone in y days. If A and B work together, how many days will they take to complete the work?

   A. $x+y$

   B. $\frac{x+y}{2}$

   C. $\frac{1}{x}+\frac{1}{y}$

   D. $\frac{2}{x}+\frac{2}{y}$

   E. $\frac{xy}{x+y}$

   [1979-CE-MATHS 2-35]

5. A certain sum of money is just sufficient to pay the wages of one man for m days or the wages of one boy for n days. For how many days will this sum be just sufficient to pay the wages of one man and one boy together?

   A. $m+n$

   B. $\frac{m+n}{2}$

   C. $\frac{1}{m}+\frac{1}{n}$

   D. $\frac{m+n}{mn}$

   E. $\frac{mn}{m+n}$

   [1980-CE-MATHS 2-28]

6. A factory employs x workers each working n hours a day. The whole factory produces k watches per day. If y workers go on leave, then how many hours a day should the remaining workers work in order to produce the same number of watches per day?

   A. $\frac{nx}{y}$

   B. $\frac{ny}{x}$

   C. $\frac{nx}{ky}$

   D. $\frac{nx}{x-y}$

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

   [1981-CE-MATHS 2-38]

7. A man drives 20 km at 40 km/h. At what speed must he drive on his return journey so that the average speed for the double journey is 60 km/h?

   A. 50 km/h
   B. 80 km/h
   C. 100 km/h
   D. 120 km/h
   E. 160 km/h

   [1982-CE-MATHS 2-12]

8. Two men cycle round a circular track which is 3 km long. If they start at the same time and at the same spot but go in opposite directions with speeds 6 km/h and 9 km/h

respectively, for how long must they cycle before they meet for the first time?

A. 12 minutes
B. 15 minutes
C. 18 minutes
D. 24 minutes
E. 60 minutes

[1983-CE-MATHS 2-14]

9. A man drives a car at 30 km/h for 3 hours and then at 40 km/h for 2 hours. His average speed for the whole journey is

A. 14 km/h.
B. 30 km/h.
C. 34 km/h.
D. 35 km/h.
E. 70 km/h.

[1984-CE-MATHS 2-14]

10. A alone can complete a job in 8 hours. B alone takes 12 hours and C alone takes 6 hours. After A and B have worked together on the job for 3 hours, C joins them. How much longer will they take to complete the job?

A. 1 hour
B. $1\frac{1}{2}$ hour
C. 2 hours
D. $2\frac{1}{2}$ hours
E. 3 hours

[1984-CE-MATHS 2-15]

11. It takes John 40 minutes to walk from his home to school. If he increases his walking speed by 2 km/h, then it takes only 30 minutes. What is the distance between John's home and his school?

A. 1 km
B. 4 km
C. 6 km
D. 8 km
E. 12 km

[1985-CE-MATHS 2-14]

12. A man drives a car at 45 km/h for 3 hours and then at 50 km/h for 2 hours. His average speed for the whole journey is

A. 47 km/h.
B. 47.5 km/h.
C. 48 km/h.
D. 48.5 km/h.
E. 49 km/h.

[1986-CE-MATHS 2-11]

13. A man walks from place A to place B at a speed of 3 km/h and cycles immediately back to place A along the same road at a speed of 15 km/h. The average speed for the whole trip is

A. 5 km/h.
B. 6 km/h.
C. 9 km/h.
D. 10 km/h.
E. 12 km/h.

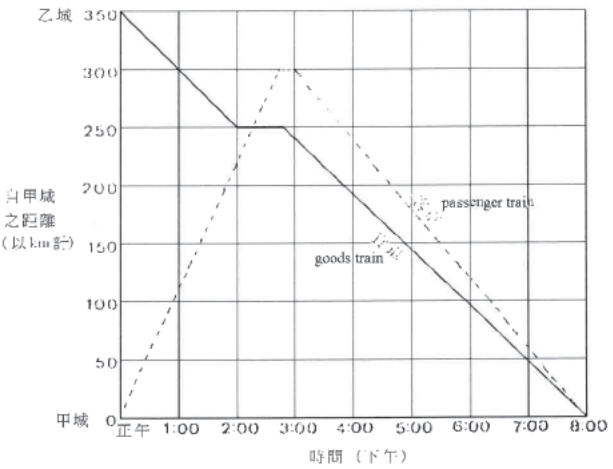
[1987-CE-MATHS 2-43]

14. John goes to school and returns home at speeds x km/h and $(x+1)$ km/h respectively. The school is 2 km from John's home and the total time for the two journeys is 54 minutes. Which of the following equations can be used to find x?

A. $\frac{x}{2} + \frac{x+1}{2} = \frac{54}{60}$
B. $\frac{2}{x} + \frac{2}{x+1} = \frac{54}{60}$
C. $\frac{\frac{1}{2}[x+(x+1)]}{4} = \frac{54}{60}$
D. $\frac{4}{\frac{1}{2}[x+(x+1)]} = \frac{54}{60}$
E. $2x + 2(x+1) = \frac{54}{60}$

[1999-CE-MATHS 2-42]

Travel Graphs



The figure above shows the travel graph of a passenger train and a goods train travelling on the railway line between town A and town B which are 350 km apart. Study the graph and answer the following two questions.

15. Which of the following statements are correct?

    (1) The goods train travelled from town B to town A.
    (2) When the 2 trains met, the goods train was not in motion.
    (3) Between noon and 8:00 p.m., the goods train travelled a greater distance than the passenger train.

    A. (1) only
    B. (2) only
    C. (1) and (2) only
    D. (2) and (3) only
    E. (1), (2) and (3)

    [1978-CE-MATHS 2-28]

16. What is the average speed of the passenger train on its return journey?

    A. 3.75 km/h
    B. 40 km/h
    C. 60 km/h
    D. 75 km/h
    E. 80 km/h

    [1978-CE-MATHS 2-29]

HKDSE Problems

17. Mary performs a typing task for 7 hours. Her average typing speeds for the first 3 hours and the last 4 hours are 63 words per minute and 56 words per minute respectively. Find her average typing speed for the 7 hours.

    A. 17 words per minute
    B. 35 words per minute
    C. 59 words per minute
    D. 60 words per minute

    [2012-DSE-MATHS 2-11]

Ratio

1. If $a : b = 2 : 3$ and $b : c = 4 : 3$, then $a : b : c =$

A. $2 : 3 : 4$.
B. $2 : 4 : 3$.
C. $4 : 6 : 3$.
D. $8 : 9 : 12$.
E. $8 : 12 : 9$.

[1979-CE-MATHS 2-13]

2. If $3x - 2y = x + 3y$, then $x^2 : y^2 =$

A. $2 : 5$.
B. $5 : 2$.
C. $4 : 25$.
D. $25 : 4$.
E. $1 : 4$.

[1981-CE-MATHS 2-12]

3. If $2x = 3y = 5z$, then $x : y : z =$

A. $2 : 3 : 5$.
B. $5 : 3 : 2$.
C. $6 : 10 : 15$.
D. $15 : 10 : 6$.
E. $25 : 9 : 4$.

[1983-CE-MATHS 2-10]

4. Three numbers are in the ratio $2 : 3 : 5$. The ratio of their average to the largest of the three numbers is

A. $1 : 3$.
B. $1 : 2$.
C. $3 : 5$.
D. $2 : 3$.
E. $2 : 1$.

[1983-CE-MATHS 2-43]

5. If $\dfrac{3x + 2y}{x + 5y} = 1$, then $\sqrt{x+y} : \sqrt{x-y} =$

A. $1 : \sqrt{5}$.
B. $3 : 2$.
C. $\sqrt{5} : \sqrt{6}$.
D. $\sqrt{5} : 1$.
E. $\sqrt{7} : 2$.

[1984-CE-MATHS 2-11]

6. If $a : b = 1 : 2$ and $b : c = 1 : 3$, then $a + b : b + c =$

A. $1 : 5$.
B. $2 : 3$.
C. $3 : 4$.
D. $3 : 5$.
E. $3 : 8$.

[1985-CE-MATHS 2-11]

7. If $r = \sqrt[3]{h^3 - 7r^3}$, then the ratio $r : h$ is

A. $1 : 8$.
B. $1 : 2\sqrt{2}$.
C. $1 : 2$.
D. $1 : \sqrt{2}$.
E. $1 : \sqrt[3]{2}$.

[1986-CE-MATHS 2-1]

8. If $a : b = 3 : 2$, $b : c = 4 : 3$, then $a + b : b + c =$

A. $7 : 10$.
B. $5 : 7$.
C. $1 : 1$.
D. $7 : 5$.
E. $10 : 7$.

[1987-CE-MATHS 2-34]

9. If $3a = 2b = 5c$, then $\dfrac{1}{a} : \dfrac{1}{b} : \dfrac{1}{c} =$

A. $3 : 2 : 5$.
B. $5 : 2 : 3$.
C. $\dfrac{1}{3} : \dfrac{1}{2} : \dfrac{1}{5}$.
D. $\dfrac{1}{5} : \dfrac{1}{2} : \dfrac{1}{3}$.
E. $\dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{5}$.

[1987-CE-MATHS 2-42]

10. If $a : b = 3 : 4$ and $b : c = 2 : 5$, then $a^2 : c^2 =$

A. $3 : 10$.
B. $9 : 25$.
C. $9 : 100$.
D. $36 : 25$.
E. $36 : 100$.

[1990-CE-MATHS 2-9]

11. If $\dfrac{1}{a} : \dfrac{1}{b} = 2 : 3$ and $a : c = 4 : 1$, then $a : b : c =$

A. $12 : 8 : 3$.
B. $8 : 3 : 2$.
C. $4 : 6 : 1$.
D. $2 : 3 : 8$.
E. $2 : 3 : 4$.

[1991-CE-MATHS 2-10]

12. If $a : b = 2 : 3$, $a : c = 3 : 4$ and $b : d = 5 : 2$, find $c : d$.

A. 1 : 5
B. 16 : 45
C. 10 : 3
D. 20 : 9
E. 5 : 1

[1992-CE-MATHS 2-10]

13. If $a : b = 2 : 3$ and $b : c = 5 : 3$, then $\frac{a+b+c}{a-b+c} =$

A. -2.
B. $\frac{5}{2}$.
C. 4.
D. $\frac{17}{2}$.
E. 31.

[1993-CE-MATHS 2-35]

14. If $a : b = 2 : 3$, $a : c = 3 : 4$ and $a : d = 4 : 5$, then $b : c : d =$

A. 2 : 3 : 4.
B. 3 : 4 : 5.
C. 3 : 6 : 10.
D. 18 : 16 : 15.
E. 40 : 45 : 48.

[1994-CE-MATHS 2-42]

15. If $125^x = 25^y$ and x, y are non-zero, find $x : y$.

A. 1 : 25
B. 1 : 5
C. 2 : 3
D. 3 : 2
E. 5 : 1

[1995-CE-MATHS 2-12]

16. If $\frac{x+2y}{3x-4y} = 5$, then $x : y =$

A. 3 : 7.
B. 7 : 3.
C. 7 : 11.
D. 9 : 7.
E. 11 : 7.

[1998-CE-MATHS 2-15]

17. If $x : y = 3 : 4$ and $2x + 5y = 598$, find x.

A. 23
B. 26
C. 69
D. 78
E. 104

[1999-CE-MATHS 2-12]

18. If $81^x = 27^{2y}$ and x, y are non-zero integers, then $x : y =$

A. 2 : 3.
B. 3 : 4.
C. 4 : 3.
D. 3 : 2.

[2003-CE-MATHS 2-13]

19. If $(a-b) : (b-2a) = 2 : 3$, then $a : b =$

A. 3 : 5.
B. 5 : 3.
C. 5 : 7.
D. 7 : 5.

[2004-CE-MATHS 2-13]

20. Let x and y be non-zero numbers. If $2x - 3y = 0$, then $(x+3y) : (x+2y) =$

A. 3 : 2.
B. 4 : 3.
C. 9 : 7.
D. 11 : 8.

[2005-CE-MATHS 2-13]

21. Let x, y and z be non-zero numbers. If $x : y = 1 : 2$ and $y : z = 3 : 1$, then $(x+y) : (y+z) =$

A. 3 : 4.
B. 4 : 3.
C. 8 : 9.
D. 9 : 8.

[2006-CE-MATHS 2-13]

22. Let a and b be non-zero numbers. If $7a + 5b = 3a + 8b$, then $a : b =$

A. 3 : 4.
B. 4 : 3.
C. 10 : 13.
D. 13 : 10.

[2007-CE-MATHS 2-13]

23. Let m and n be non-zero numbers. If $\frac{2m-n}{m-2n} = 3$, then $m : n =$

A. 1 : 5.
B. 5 : 1.
C. 5 : 7.
D. 7 : 5.

[2011-CE-MATHS 2-12]

Applications of Ratio

24. On a plan, 1 cm represents 50 cm. On the plan, the area of a classroom is 100 cm^2. What is the actual area of the classroom in m^2?

A. 25
B. 50
C. 500
D. 2500
E. 5000

[1978-CE-MATHS 2-38]

25. The running speeds of three boys A, B and C are in the ratios $a : b : c$. The time that A, B and C takes to complete a 1500 m race are in the ratios

A. $a : b : c$.
B. $c : b : a$.
C. $b + c : a + c : a + b$.
D. $\frac{1}{a} : \frac{1}{b} : \frac{1}{c}$.
E. $\frac{a}{b} : \frac{b}{c} : \frac{c}{a}$.

[1981-CE-MATHS 2-36]

26. The daily wages of a man and a boy are in the ratio 2 : 1. In a day a man has to work 8 hours but a boy only 6 hours. The hourly wages of a man and a boy are in the ratio

A. 8 : 3.
B. 2 : 1.
C. 3 : 2.
D. 4 : 3.
E. 1 : 1.

[1981-CE-MATHS 2-39]

27. The scale of a map is 1 : 20000. On the map, the area of a farm is 2 cm^2. The actual area of the farm is

A. 400 m^2.
B. 800 m^2.
C. 40 000 m^2.
D. 80 000 m^2.
E. 8 000 000 m^2.

[1983-CE-MATHS 2-40]

28. A is 25% taller than B. B is 25% shorter than C. A's height : C's height =

A. 1 : 1.
B. 5 : 4.
C. 3 : 4.
D. 5 : 3.
E. 15 : 16.

[1984-CE-MATHS 2-12]

29. If A, B and C can finish running the same distance 3, 4 and 5 minutes respectively, then A's speed : B's speed : C's speed =

A. 3 : 4 : 5.
B. 5 : 4 : 3.
C. 9 : 8 : 7.
D. 20 : 15 : 12.
E. 25 : 16 : 9.

[1986-CE-MATHS 2-42]

30. The radii of two solid spheres made of the same material are in the ratio 2 : 3. If the smaller sphere weighs 16 kg, then the larger one weighs

A. 24 kg.
B. 36 kg.
C. 48 kg.
D. 54 kg.
E. 60 kg.

[1987-CE-MATHS 2-4]

31. If a is 10% less than b and b is 10% greater than c, then $a : c$ =

A. 1 : 1.
B. 9 : 10.
C. 10 : 9.
D. 99 : 100.
E. 100 : 99.

[1987-CE-MATHS 2-41]

32. The weight of a gold coin of a given thickness varies as the square of its diameter. If the weights of two such coins are in the ratio 1 : 4, then their diameters are in the ratio

A. 1 : 2.
B. 2 : 1.
C. 1 : 4.
D. 4 : 1.
E. 1 : 16.

[1988-CE-MATHS 2-44]

33. The costs of two kinds of coffee A and B are \$12/kg and \$20/kg respectively. In what ratio by weight should A and B be mixed so that the mixture will cost \$15/kg?

A. 4 : 3
B. 5 : 2
C. 5 : 3
D. 3 : 2
E. 5 : 4

[1989-CE-MATHS 2-36]

34. If 1 U. S. dollar is equivalent to 7.8 H. K. dollars and 1000 Japanese yen are equivalent to 53.3 H. K. dollars, how many Japanese yen are equivalent to 50 U. S. dollars?

A. 1 463
B. 3 417
C. 7 317
D. 8 315
E. 20 787

[1990-CE-MATHS 2-10]

35. Coffee A and coffee B are mixed in the ratio $x : y$ by weight. A costs \$50/kg and B costs \$40/kg. If the cost of A is increased by 10% while that of B is decreased by 15%, the cost of the mixture per kg remains unchanged. Find $x : y$.

A. 2 : 3
B. 5 : 6
C. 6 : 5
D. 3 : 2
E. 55 : 34

[1992-CE-MATHS 2-45]

36. The following table shows the compositions of Tea A and Tea B which are mixtures of Chinese tea and Indian tea:

	Ratio of Chinese tea and Indian tea by weight
Tea A	3 : 1
Tea B	2 : 3

If 4 kg of tea A and 10 kg of tea B are mixed, find the ratio of Chinese tea and Indian tea in the mixture.

A. 2 : 5
B. 16 : 17
C. 1 : 1
D. 5 : 4
E. 23 : 17

[1996-CE-MATHS 2-44]

37. In a map of scale 1 : 500, the length and breath of a rectangular field are 2 cm and 3 cm respectively. Find the actual area of this field.

A. 30 m^2
B. 150 m^2
C. 1500 m^2
D. 3000 m^2
E. 15000 m^2

[1997-CE-MATHS 2-11]

38. If 1 Australian dollar is equivalent to 4.69 H.K. dollars and 100 Japanese yen are equivalent to 5.35 H.K. dollars, how many Japanese yen are equivalent to 1 Australian dollar? Give your answer correct to the nearest Japanese yen.

A. 4
B. 25
C. 88
D. 114
E. 2509

[1999-CE-MATHS 2-13]

39. Tea A and tea B are mixed in the ratio $x : y$ by weight. A costs \$80/kg and B costs \$100/kg. If the cost of A is increased by 10% and that of B is decreased by 12%, the cost of the mixture per kg remains unchanged. Find $x : y$.

A. 1 : 1
B. 2 : 3
C. 3 : 2
D. 5 : 6
E. 6 : 5

[2000-CE-MATHS 2-36]

40. If 1 Euro is equivalent to 6.94 H. K. dollars and 1 U. S. dollar is equivalent to 7.78 H. K. dollars, how many Euros are equivalent to 100 U. S. dollars? Give your answer correct to the nearest Euro.

A. 89
B. 112
C. 129
D. 144

[2002-CE-MATHS 2-10]

41. The scale of a map is 1 : 4 000. If the actual area of a sports field is 8 000 m^2, find its area on the map.

A. 0.02 cm^2
B. 0.05 cm^2
C. 2 cm^2
D. 5 cm^2

[2003-CE-MATHS 2-15]

42. A box contains two kinds of coins: \$5 and \$2. The ratio of the number of \$5 coins to the number of \$2 coins is 4 : 5. If the total value of the coins is \$90, then the total number of coins in the box is

A. 9.
B. 18.
C. 27.
D. 36.

[2004-CE-MATHS 2-14]

43. The scale of a map is 1 : 20 000. If two buildings are 3.8 cm apart on the map, then the actual distance between the two buildings is

A. 0.076 km.
B. 0.76 km.
C. 7.6 km.
D. 76 km.

[2004-CE-MATHS 2-15]

44. The scale of a map is 1 : 8000. If the area of a park on the map is 2 cm^2, then the actual area of the park is

A. 4000 m^2.
B. 6400 m^2.
C. 12800 m^2.
D. 16000 m^2.

[2006-CE-MATHS 2-15]

45. The costs of rice of brand A and rice of brand B are \$8/kg and \$4/kg respectively. If x kg of rice of brand A and y kg of rice of brand B are mixed so that the cost of the mixture is \$5/kg, find $x : y$.

A. 1 : 2
B. 2 : 1
C. 1 : 3
D. 3 : 1

[2008-CE-MATHS 2-13]

46. The scale of a map is 1 : 5000. If the area of a garden on the map is 4 cm^2, then the actual area of the garden is

A. 100 m^2.
B. 200 m^2.
C. 10 000 m^2.
D. 20 000 m^2.

[2009-CE-MATHS 2-13]

47. If tea of brand A costs \$80/kg and tea of brand B costs \$40/kg, then a mixture of 4 kg of tea of brand A and 6 kg of tea of brand B costs

A. \$52/kg.
B. \$56/kg.
C. \$60/kg.
D. \$64/kg.

[2010-CE-MATHS 2-15]

Proportion

48. a, b, c are positive numbers such that $\frac{a}{b} = \frac{b}{c} = k$ (k being a constant), which of the following must be true?

(1) $b^2 = k^2$
(2) $\frac{a+b}{b+c} = k$
(3) $\frac{a}{c} = k^2$

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1984-CE-MATHS 2-39]

49. If $\frac{a}{b} = \frac{c}{d} = k$ and a, b, c, d are positive, then which of the following *must* be true?

A. $\frac{a+c}{b+d} = k$
B. $ab = cd = k$
C. $ac = bd = k$
D. $a = c = k$
E. $\frac{ac}{bd} = k$

[1992-CE-MATHS 2-7]

50. If $\frac{a}{b} = \frac{c}{d}$, which of the following must be true?

(1) $\frac{a}{c} = \frac{b}{d}$
(2) $\frac{a+b}{b} = \frac{c+d}{d}$
(3) $\frac{a-b}{b} = \frac{c-d}{d}$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-16]

HKDSE Problems

51. If x, y and z are non-zero numbers such that $2x = 3y$ and $x = 2z$, then $(x+z) : (x+y) =$

A. 3 : 5.
B. 6 : 7.
C. 9 : 7.
D. 9 : 10.

[SP-DSE-MATHS 2-13]

52. Let α and β be non-zero constants. If $(\alpha+\beta):(3\alpha-\beta)=7:3$, then $\alpha:\beta=$

A. $5:9$.
B. $9:5$.
C. $19:29$.
D. $29:19$.

[PP-DSE-MATHS 2-12]

53. If x and y are non-zero numbers such that $\frac{6x+5y}{3y-2x}=7$, then $x:y=$

A. $4:5$.
B. $4:13$.
C. $5:4$.
D. $13:4$.

[2012-DSE-MATHS 2-9]

54. The actual area of a playground is $900\ m^2$. If the area of the playground on a map is $36\ cm^2$, then the scale of the map is

A. $1:25$.
B. $1:50$.
C. $1:500$.
D. $1:250\,000$.

[2013-DSE-MATHS 2-12]

55. It is given that $\frac{4}{5a}=\frac{5}{7b}=\frac{7}{9c}$, where a, b and c are positive numbers. Which of the following is true?

A. $a<b<c$
B. $a<c<b$
C. $b<a<c$
D. $b<c<a$

[2014-DSE-MATHS 2-12]

56. Let a, b and c be non-zero numbers. If $a:c=5:3$ and $b:c=3:2$, then $(a+c):(b+c)=$

A. $7:5$.
B. $8:5$.
C. $16:15$.
D. $19:15$.

[2015-DSE-MATHS 2-11]

57. If x and y are non-zero numbers such that $(3y-4x):(2x+y)=5:6$, then $x:y=$

A. $7:8$.
B. $8:29$.
C. $9:32$.
D. $13:34$.

[2016-DSE-MATHS 2-11]

58. The cost of flour of brand X is \$42/kg. If 3 kg of flour of brand X and 2 kg of flour of brand Y are mixed so that the cost of the mixture is \$36/kg, find the cost of flour of brand Y.

A. \$27/kg
B. \$30/kg
C. \$32/kg
D. \$39/kg

[2016-DSE-MATHS 2-13]

59. The scale of a map is $1:20\,000$. If the area of a zoo on the map is $4\ cm^2$, then the actual area of the zoo is

A. $8\times10^4\ m^2$.
B. $1.6\times10^5\ m^2$.
C. $3.2\times10^5\ m^2$.
D. $1\times10^6\ m^2$.

[2017-DSE-MATHS 2-11]

60. Let a, b and c be non-zero numbers. If $3a=4b$ and $a:c=2:5$, then $\frac{a+3b}{b+3c}=$

A. $\frac{5}{3}$
B. $\frac{13}{33}$
C. $\frac{30}{53}$
D. $\frac{75}{38}$

[2018-DSE-MATHS 2-10]

61. The costs of tea of brand A and brand B are \$140/kg and \$315/kg respectively. If x kg of tea of brand A and y kg of brand B are mixed so that the cost of the mixture is \$210/kg, then $x:y=$

A. $2:3$
B. $3:2$
C. $4:9$
D. $9:4$

[2019-DSE-MATHS 2-12]

62. The actual area of a golf courses is $0.75km^2$. If the area of the course on a map is $300\ cm^2$, then the scale of the map is

A. $1:250$
B. $1:5\,000$
C. $1:62\,500$
D. $1:25\,000\,000$

[2020-DSE-MATHS 2-10]

Direct & Inverse Variations

1. It is given that $x \propto \frac{1}{y}$. If y increases by 100%, then

   A. x increases by 50%.
   B. x increases by 75%.
   C. x decreases by 50%.
   D. x decreases by 75%.
   E. x decreases by 100%.

   [1979-CE-MATHS 2-49]

2. y varies inversely as x^2. If x is increased by 100%, then y is

   A. increased by 100%.
   B. increased by 300%.
   C. decreased by 25%.
   D. decreased by 75%.
   E. decreased by 100%.

   [1988-CE-MATHS 2-39]

3. Given that $y \propto \frac{1}{x}$. If x is increased by 25%, find the percentage change in y.

   A. Decreased by 20%
   B. Decreased by 25%
   C. Decreased by 80%
   D. Increased by 20%
   E. Increased by 25%

   [1989-CE-MATHS 2-35]

4. Let x vary inversely as $\sqrt{y}$. If y is increased by 69%, then x will be

   A. increased by 23.1% (3 sig. fig.).
   B. increased by 30%.
   C. decreased by 23.1% (3 sig. fig.).
   D. decreased by 30%.
   E. decreased by 76.9% (3 sig. fig.).

   [1994-CE-MATHS 2-43]

5. x and y are two variables. The table below shows some values of x and their corresponding values of y.

x	2	3	6	12
y	36	16	4	1

   Which of the following may be a relation between x and y?

   A. $x \propto \sqrt{y}$
   B. $x \propto y$
   C. $x \propto \frac{1}{\sqrt{y}}$
   D. $x \propto \frac{1}{y}$
   E. $x \propto \frac{1}{y^2}$

   [1995-CE-MATHS 2-11]

6. It is given that y varies inversely as x^3. If x is increased by 100%, then y is

   A. increased by 800%.
   B. increased by 700%.
   C. decreased by 300%.
   D. decreased by 87.5%.
   E. decreased by 12.5%.

   [1999-CE-MATHS 2-45]

7. It is given that y varies inversely as x. If x is increased by 50%, then y is decreased by

   A. $33\frac{1}{3}\%$.
   B. 50%.
   C. $66\frac{2}{3}\%$.
   D. 100%.

   [2002-CE-MATHS 2-15]

Joint Variation

8. If x varies inversely as y^2 and y varies as $\sqrt{z}$, then x varies as

   A. z.
   B. z^2.
   C. z^4.
   D. $\frac{1}{z}$.
   E. $\frac{1}{z^2}$.

   [SP-CE-MATHS 2-18]

9. If z varies directly as x and inversely as y, then

   A. $\frac{xz}{y}$ = a constant.
   B. $\frac{yz}{x}$ = a constant.
   C. $\frac{z^2}{xy}$ = a constant.
   D. $\frac{z^2y}{x}$ = a constant.
   E. xyz = a constant.

   [1978-CE-MATHS 2-31]

10. If z varies inversely as x and directly as y, then

A. xyz is a constant.

B. $\frac{xz}{y}$ is a constant.

C. $\frac{yz}{x}$ is a constant.

D. $\frac{xz^2}{y}$ is a constant.

E. $\frac{z^2}{xy}$ is a constant.

[1989-CE-MATHS 2-9]

11. Suppose x varies directly as y^2 and inversely as z. Find the percentage increase of x when y is increased by 20% and z is decreased by 20%.

A. 15.2%

B. 20%

C. 50%

D. 72.8%

E. 80%

[1992-CE-MATHS 2-11]

12. The price of a cylindrical cake of radius r and height h varies directly as the volume. If $r = 5$ cm and $h = 4$ cm, the price is \$30. Find the price when $r = 4$ cm and $h = 6$ cm.

A. \$25

B. \$28.80

C. \$31.50

D. \$36

E. \$54

[1993-CE-MATHS 2-14]

13. Suppose x varies directly as y and inversely as z. When $y = 2$ and $z = 3$, $x = 7$. When $y = 6$ and $z = 7$, $x =$

A. 1.

B. $\frac{49}{9}$.

C. 9.

D. $\frac{49}{4}$.

E. 49.

[1997-CE-MATHS 2-39]

14. If x varies inversely as y and directly as z^2, then

A. $\frac{x}{yz^2}$ is a constant.

B. $\frac{xy}{z^2}$ is a constant.

C. $\frac{xz^2}{y}$ is a constant.

D. $\frac{z^2}{y}$ is a constant.

E. $\frac{1}{y} + z^2$ is a constant.

[1998-CE-MATHS 2-17]

15. y varies directly as x^2 and inversely as $\sqrt{z}$. If $y = 1$ when $x = 2$ and $z = 9$, find y when $x = 1$ and $z = 4$.

A. $\frac{2}{3}$

B. $\frac{8}{3}$

C. $\frac{1}{6}$

D. $\frac{3}{8}$

E. $\frac{9}{26}$

[2000-CE-MATHS 2-35]

16. Suppose z varies directly as x^2 and inversely as y. When $x = 4$ and $y = 3$, $z = 2$. When $x = 2$ and $z = 3$, $y =$

A. $\frac{1}{2}$.

B. 1.

C. 2.

D. 18.

[2003-CE-MATHS 2-14]

17. If z varies directly as y^2 and inversely as x, which of the following must be constant?

A. xy^2z

B. $\frac{y^2z}{x}$

C. $\frac{xz}{y^2}$

D. $\frac{z}{xy^2}$

[2005-CE-MATHS 2-14]

18. It is given that x varies directly as y and inversely as z^2. If y is decreased by 10% and z is increased by 20%, then x is decreased by

A. 10%.
B. 23.6%.
C. 25%.
D. 37.5%.

[2006-CE-MATHS 2-14]

19. Suppose that y varies directly as x and inversely as z^2. If x and z are both decreased by 20%, then y

A. is decreased by 17%.
B. is decreased by 20%.
C. is increased by 20%.
D. is increased by 25%.

[2008-CE-MATHS 2-14]

20. It is given that z varies directly as x and directly as y^2. If x is decreased by 20% and y is increased by 15%, then z

A. is increased by 5.8%.
B. is decreased by 5.8%.
C. is increased by 8%.
D. is decreased by 8%.

[2010-CE-MATHS 2-16]

21. It is given that a varies directly as b and inversely as c^2. When $b = 6$ and $c = 3$, $a = -2$. When $a = -9$ and $c = 4$, $b =$

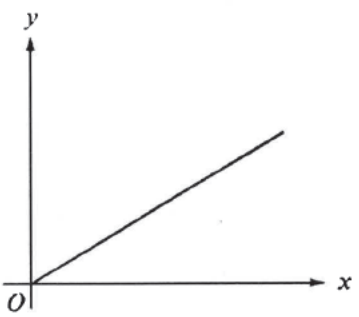
A. 5.
B. 36.
C. 48.
D. 576.

[2011-CE-MATHS 2-13]

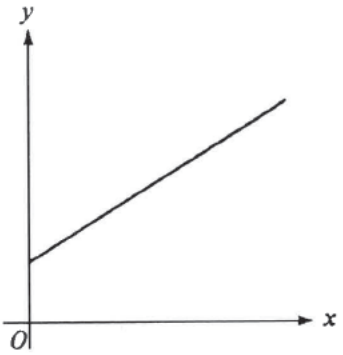
Partial Variation

22. Which of the following graphs shows that y is partly constant and partly varies inversely as x?

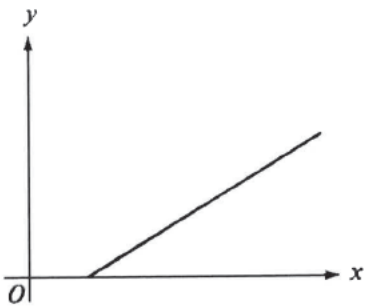
A.



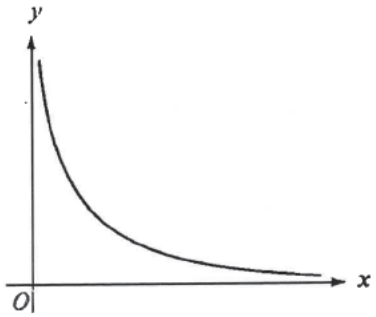
B.



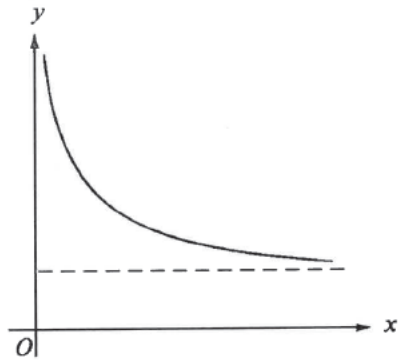
C.



D.



E.



[1990-CE-MATHS 2-43]

23. Let y vary partly as $\frac{1}{x}$ and partly as x. When $x = 1$, $y = 5$ and when $x = 4$, $y = \frac{25}{2}$. Find y when $x = 2$.

A. $\frac{5}{2}$
B. 4
C. $\frac{25}{4}$
D. 7
E. $\frac{17}{2}$

[1991-CE-MATHS 2-9]

24. Suppose y is partly constant and partly varies inversely as x. When $x = 1$, $y = 7$ and when $x = 3$, $y = 3$. Find y when $x = 2$.

A. 2.5
B. 3.5
C. 4
D. 5
E. 6.5

[2001-CE-MATHS 2-29]

25. It is known that y varies partly as x and partly as $\sqrt{x}$. When $x = 1$, $y = 4$ and when $x = 4$, $y = 10$. Find y when $x = 16$.

A. 28
B. 52
C. 80
D. 256

[2004-CE-MATHS 2-16]

26. It is given that y is partly constant and partly varies directly as x. When $x = 2$, $y = 17$ and when $x = 4$, $y = 11$. Find the value of x when $y = 5$.

A. –3
B. 6
C. 8
D. 112

[2007-CE-MATHS 2-14]

27. It is known that $f(x)$ varies partly as x and partly as x^2. If $f(1) = 5$ and $f(2) = 16$, then $f(3) =$

A. 21.
B. 27.
C. 33.
D. 57.

[2008-CE-MATHS 2-15]

28. It is given that y is partly constant and partly varies inversely as x. When $x = 1$, $y = -1$ and when $x = 2$, $y = 1$. Find the value of x when $y = 2$.

A. –4
B. 1
C. 2.5
D. 4

[2009-CE-MATHS 2-14]

HKDSE Problems

29. It is given that z varies directly as x and inversely as y. When $x = 3$ and $y = 4$, $z = 18$. When $x = 2$ and $z = 8$, $y =$

A. 1.
B. 3.
C. 6.
D. 9.

[SP-DSE-MATHS 2-14]

30. If z varies directly as x and inversely as y^2, which of the following must be constant?

A. $\frac{x}{y^2z}$
B. $\frac{z}{xy^2}$
C. $\frac{yz}{x^2}$
D. $\frac{xz}{y^2}$

[PP-DSE-MATHS 2-13]

31. It is given that y partly varies directly as x^2 and partly varies inversely as x. When $x = 1$, $y = -4$ and when $x = 2$, $y = 5$. When $x = -2$, $y =$

A. –11.
B. –5.
C. 5.
D. 11.

[2012-DSE-MATHS 2-10]

32. It is given that z varies directly as x and inversely as $\sqrt{y}$. If y is decreased by 64% and z is increased by 25%, then x

A. is increased by 20%.
B. is increased by 80%.
C. is decreased by 25%.
D. is decreased by 75%.

[2013-DSE-MATHS 2-13]

33. If z varies inversely as x and directly as the cube of y, which of the following must be constant?

A. xy^3z
B. x^3yz^3
C. $\frac{y^3}{xz}$
D. $\frac{y}{x^3z^3}$

[2014-DSE-MATHS 2-13]

34. It is given that z varies as x^3 and y^2. When $x = 2$ and $y = 1$, $z = 14$. When $x = 3$ and $y = -2$, $z =$

A. -189.
B. -126.
C. 126.
D. 189.

[2015-DSE-MATHS 2-12]

35. It is given that z varies directly as $\sqrt{x}$ and inversely as y. If x is decreased by 36% and y is increased by 60%, then z

A. is increased by 24%.
B. is increased by 28%.
C. is decreased by 40%.
D. is decreased by 50%.

[2016-DSE-MATHS 2-12]

36. It is given that y is the sum of two parts, one part is a constant and the other part varies as x^2. When $x = 1$, $y = 7$ and when $x = 2$, $y = 13$. If $x = 3$, then $y =$

A. 19.
B. 20.
C. 23.
D. 47.

[2017-DSE-MATHS 2-12]

37. If w varies directly as the square root of u and inversely as the square of v, which of the following must be constant?

A. u^4vw^2
B. uv^4w^2
C. $\frac{vw^2}{u^4}$
D. $\frac{v^4w^2}{u}$

[2018-DSE-MATHS 2-11]

38. It is given that z varies directly as the square of x and inversely as the square root of y. If x is decreased by 40% and y is increased by 44%, then z

A. is decreased by 70%
B. is increased by 70%
C. is decreased by 76%
D. is increased by 76%

[2019-DSE-MATHS 2-13]

39. It is given that w varies as the cube of u and the square root of v. When $u = 2$ and $v = 4$, $w = 8$. When $u = 4$ and $v = 9$, $w =$

A. 96
B. 324
C. 384
D. 729

[2020-DSE-MATHS 2-11]