

COMPOUND PROPORTIONS AND RATES OF WORK

KCSE 1989 – 2012 Form 3 Mathematics

(a) Rates of work

1.

1990 Q17 P1

A hot water tap can fill a bath in 5 minutes while a cold water tap can fill the same bath in three minutes. The drain pipe can empty the full bath in $3\frac{3}{4}$ minutes. The two taps and the drain pipe are fully open for $1\frac{1}{2}$ minutes after which the drain pipe is closed. How much longer will it take to fill the bath? (8 marks)

(b) Mixtures

2.

1994 Q17 P2

Aden bought 3 brands of tea A, B and C. The cost price of the three brands were sh. 25, sh. 30 and sh. 45 per kilogram respectively. He mixed the three brands in ratio 5 : 2 : 1 respectively. After selling the mixture, he made a profit of 20%.

a) How much profit did he make per kilogram of the mixture? (4 marks)

b) After one year, the cost price of each brand was increased by 12%.

i) For how much did he sell one kilogram of the mixture to maintain 20% profit?

(Give your answer to the nearest 5ct.) (2 marks)

What would have been his percentage profit if he sold one kilogram of the mixture at sh. 40.25? (2 marks)

1995 Q 11 P1

3. Akinyi bought maize and beans from a wholesaler. She then mixed the maize and beans in the ratio 4:3 she brought the maize at KShs. 12 per kg and the beans 4 per kg. If she was to make a profit of 30% what should be the selling price of 1kg of the mixture? (4 marks)

1997 Q 14 P2

4. Mogaka and Onduso working together can do a piece of work in 6 days, Mogaka, working alone takes 5 days longer than Onduso. How many days does it take Onduso to do the work alone?

1997 Q 17 P2

5. A company is to construct a parking bay whose area is 135m^2 . It is to be covered with concrete slab of uniform thickness of 0.15. To make the slab cement, ballast and sand are to be mixed so that their masses are in the ratio 1:4:4. The mass of m^3 of dry slab is 2,500kg.

Calculate

(a) (i) The volume of the slab

(ii) The mass of the dry slab

(iii) The mass of cement to be used

(b) If one bag of the cement is 50 kg, find the number of bags to be purchased

(c) If a lorry carries 7 tonnes of sand, calculate the number of lorries of sand to be purchased

6. **1998 Q 17 P1**

Wainaina has two dairy farms. A and B. Farm A produces milk with $3\frac{1}{2}$ percent fat and farm B produces milk with $4\frac{3}{4}$ percent fat.

(a) Determine

(i) The total mass fat in 50 kg of milk from farm A and 30 kg of milk from farm B

(ii) The percentage of fat in a mixture of 50 kg of milk from A and 30 kg of milk from B

(b) Determine the range of values of mass of milk from farm B that must be used in a 50 kg mixture so that the mixture may have at least 4 percent fat.

7. **1999 Q 3 P2**

The mass of a mixture A of beans and maize is 72kg. The ratio of beans to maize is 3:5 respectively

- (a) Find the mass of maize in the mixture
- (b) A second mixture of B of beans and maize of mass 98 kg in mixed with A. The final ratio of beans to maize is 8:9 respectively. Find the ratio of beans to maize in B

8. **1999 Q 15 P2**

A construction firm has tractors T_1 and T_2 . Both tractors working together can complete a piece of work in 6 days while T_1 alone can complete the working 15 days. After two tractors had worked together for four days, tractor T_1 broke down. Find the time it takes tractor T_2 to complete the remaining work

9. **1999 Q 17 P2**

A retailer bought 49kg of grade 1 rice at Kshs. 65 per kilogram and 60 kg of grade II rice at Kshs 27.50 per kilogram. He mixed the two types of rice.

- (a) Find the buying price of one kilogram of the mixture
- (b) He packed the mixture into 2 kg packets

- (i) If he intends to make a 20% profit find the selling price per packet
- (ii) He sold 8 packets and then reduced the price by 10% in order to attract customers.

Find the new selling price per packet.

- (iii) After selling of the remainder at reduced price, he raised the price so as to realize the original goal of 20% profit overall. Find the selling price per packet of the remaining rice.

10 **2002 Q 2 P2**

Kipketer can cultivate a piece of land in 7 hours while Wanjiku can do the same work in 5 hours. Find the time they would take to cultivate the piece of land when working together.

11 **2002 Q 5 P2**

A trader sells a bag of beans for shs. 2100 and that of maize at shs. 1200. He mixed beans and maize in the ratio 3:2. Find how much the trader should sell a bag of the mixture to realize the same profit.

12 **2003 Q 13 P2**

Machine A can do a piece of work in 6 hours while machine B can do the same work in 9 hours. Machine A was set to do the piece of work but after $3\frac{1}{2}$ hours, it broke down and machine B did the rest of the work. Find how long machine B took to do the rest of the work (3mks)

13 **2003 Q 18 P2**

A dealer has three grades of coffee X,Y and Z. Grade X costs sh 140 per kg, grade y costs sh 160 per kg grade Z costs sh.256 per kg.

- a) The dealer mixes grades X and Y in the ration 5:3 to make a brand of coffee which sells at sh 180 per kg.
- b) The dealer makes a new brand by mixing the three grades of coffee. In the ratios $X:Y = 5:3$ and $Y:Z = 2:5$

Determine:

i)The ratio X: Y: Z in its simplest form (2mks)

ii)The selling price of the new brand of he has to make a 30% profit. (3mks)

2004 Q 12 P2

- 14 An industrialist has 450 litres of a chemical which is 70% pure. He mixes it with a chemical of the same type but 90% pure so as to obtain a 75% pure. Find the amount of the 90% pure chemical used

2004 Q 17 P2

- 15 Farmer has two tractors A and B. The tractors, working together can plough a farm in $2\frac{1}{2}$ h. One day, the tractors started to plough the farm together. After 1 h 10 min tractor B broke down but A continued alone and completed the job after a further 4 h.

Find:

- The fraction of the job done by the tractors, working together for one hour
- The fraction of the job done by tractor A and B broke down
- The time each tractor working alone would have taken to plough the farm.

2005 Q 6 P2

- 16 Pipe A can fill an empty water tank in 3 hours while, pipe B can fill the same tank in 6 hours, when the tank is full it can be emptied by pipe C in 8 hours. Pipes A and B are opened at the same time when the tank is empty. If one hour later, pipe C is also opened, find the total time taken to fill the tank (4 marks)

2006 Q 21 P2

- 17 A solution whose volume is 80 litres is made 40% of water and 60% of alcohol. When x litres of water are added, the percentage of alcohol drops to 40%
- Find the value of x (4 marks)
 - Thirty litres of water is added to the new solution. Calculate the percentage
 - If 5 litres of the solution in (b) is added to 2 litres of the original solution, calculate in the simplest form, the ratio of water to that of alcohol in the resulting solution (4 marks)

2007 Q 9 P2

- 18 Water and milk are mixed such that the ratio of the volume of water to that of milk is 4: 1. Taking the density of water as 1 g/cm^3 and that of milk as 1.2 g/cm^3 , find the mass in grams of 2.5 litres of the mixture. (3 marks)

2007 Q 17 P2

- 19 A tank has two inlet taps P and Q and an outlet tap R. when empty, the tank can be filled by tap P alone in $4\frac{1}{2}$ hours or by tap Q alone in 3 hours. When full, the tank can be emptied in 2 hours by tap R.

- The tank is initially empty. Find how long it would take to fill up the tank
 - If tap R is closed and taps P and Q are opened at the same time (2 marks)
 - If all the three taps are opened at the same time (2 marks)
- The tank is initially empty and the three taps are opened as follows
 - P at 8.00 a.m
 - Q at 8.45 a.m
 - R at 9.00 a.m

(i) Find the fraction of the tank that would be filled by 9.00 a.m (3 marks)

(ii) Find the time the tank would be fully filled up (3 marks)

2008 Q 17 P2

- 20 a) A trader deals in two types of rice; type A and with 50 bags of type B. If he sells the mixture at a profit of 20%, calculate the selling price of bag of the mixture. (4mks)

b) The trader now mixes type A with type B in the ratio $x: y$ respectively. If the cost of the mixture is Ksh 383.50 per bag, find the ratio $x: y$. (4mks)

c) The trader mixes one bag of the mixture in part (a) with one bag of the mixture in part (b). Calculate the ratio of type A rice to type B rice in this mixture. (2mks)

2009 Q 3 P1

- 21 Given that the ratio $x:y = 2:3$, find the ratio $(5x - 2y) : (x+y)$ (3 marks)

2009 Q 17 P2

- 22 A water vendor has a tank of capacity 18 900 litres. The tank is being filled with water from two pipe A and B which are closed immediately when the tank is full. Water flows at the rate of $150\,000\text{cm}^3/\text{minute}$ through pipe A and $120\,000\text{cm}^3/\text{minute}$ through pipe B.
- (a) If the tank is empty and the two pipes are opened at the same time, calculate the time it takes to fill the tank (3 marks)
- (b) On a certain day the vendor opened the two pipes A and B to fill the empty tank. After 25 minutes he opened the outlet tap to supply water to his customers at an average rate of 20 litres per minute.
- (i) Calculate the time it took to fill the tank on that day (4 marks)
- (ii) The vendor supplied a total of 542 jerricans, each containing 25 litres of water, on that day. If the water that remained in the tank was 6300 litres, calculate, in litres, the amount of water that was wasted (3 marks)

2010 Q 4 P2

- 23 A tea dealer mixes two brands of tea, x and y, to obtain 35 kg of the mixture worth Ksh.65 per kg. If brand x is valued at Ksh.68 per kg and brand y at Ksh. 53 per kg, Calculate the ratio, in its simplest form, in which the brands x and y are mixed. (3 marks)

2011 Q 2 P2

- 24 Three grades A,B and C of rice were mixed in the ratio 3:4:5. The cost per kg of each of the grades A,B and C were Ksh. 120,Ksh 90 and Ksh 60 respectively. Calculate:
- (a) The cost of one kg of the mixture (2 mks)
- (b) The selling price of 5kg of the mixture given that the mixture was sold at 8% profit. (8 mks)

25 2012 Q3 P2

- An inlet tap can fill an empty tank in 6 hours. It takes 10 hours to fill the tank when the inlet tap and an outlet tap are both opened at the same time. Calculate the time the outlet tap takes to empty the full tank when the inlet tap is closed. (3 marks)