Solution. By problem. 40 bbls. and 60 chests=space.
And 24 " " 54 " = $\frac{3}{4}$ space.
$\therefore$ 32 " " 72 " = space.
$\therefore$ 8 " = 12 "
$\therefore$ 1 " = $1\frac{1}{2}$ "
$\therefore$ 40 " = 60 "
$\therefore$ 60+60 = 120 " car would hold.
And $\frac{2}{3}\times 120$ = 80 bbls. " " "

7. A tailor bought 4 pieces of cloth, each containing 30 yards, 3·75 quarters, at $2 per yard. He sold $\frac{1}{3}$ of it at $2.20 per yard, and made up the remainder into suits, each containing 7 yds. 2 qrs., which he sold for $18.50 each. How much did he gain?

Solution. 30 yds., 3·75 qrs. $\times 4 = 123\frac{3}{4}$ yds.
$123\frac{3}{4}\times \$2 = \$247.50$ cost of cloth.
$41\frac{1}{4}$ yds. $\times \$2.20 = \$90.75$ price of cloth sold.
$82\frac{1}{2}$ " $\div 7\frac{1}{2}$ yds. $= 11$ suits.
$11\times \$18.50 = \$203.50$ price of suits.
$\$203.50 \times \$90.75 = \$294.25 - \$247.50 = \$46.75$ gain.

8. A man walking at the rate of $2\frac{1}{2}$ miles an hour, walks around a field, whose length is half as much again as its breadth, in 15 minutes. Find the length and breadth of the field.

Solution. $2\frac{1}{2}$ miles=800 rods.
In 60 min. he walks 800 rods.
$\therefore$ 1 " " $13\frac{1}{3}$ "
$\therefore$ 15 " " 200 "
$\therefore 200 \div 2 = 100$ sum of length and breadth.
By problem, sides are as 3 to 2.
$\therefore \frac{2}{5}$ of 100=40 rods in breadth,
and $\frac{3}{5}$ of 100=60 " length.

9. A merchant bought 60 yards of broadcloth, $1\frac{7}{8}$ yards wide, for $4 per yard, but the cloth being wet shrank $\frac{1}{20}$ of its length and breadth. For what must it be sold per square yard to gain $\frac{1}{6}$ of cost?

Solution. $60\times \$4 = \$240$ cost.
$\frac{6}{5}$ of $240 = $288 selling price.
$\frac{21}{20}$ of $\frac{15}{8}\times\frac{21}{20}$ of $\frac{60}{1} = 103\frac{7}{32}$ square yards.
$\$288 \div 103\frac{7}{32} = \$2.77\frac{7}{15}$. Ans.

10. By selling sugar at $42 per barrel of 280 lbs., I gain $\frac{1}{7}$ of cost. What fraction of the cost is gained by selling at $13.50 per cwt? Ans. $\frac{1}{8}$.

Solution. If 280 lbs. are sold for $42.
$\therefore$ 1 lb. is " 15c.
If 100 lbs. are " $13.50.
$\therefore$ 1 lb. is " $13\frac{1}{2}$c.
If $\frac{7}{7}$ of cost=15c.
$\therefore \frac{1}{7}$ " = 3c.
$\therefore \frac{4}{7}$ " =12c.
$\therefore$ $13\frac{1}{2} - 12 = 1\frac{1}{2}$c. gain per lb.
$\therefore \frac{1\frac{1}{2}}{12} = \frac{1}{8}$. Ans.

11. A person, standing on one side of a strait, noticed that he heard the report of a cannon, fired on the opposite side, $4\frac{1}{2}$ seconds before the ball struck an object near him. If sound travels 1,140 feet per second, and a cannon ball, on an average, 800 feet per second, find the width of the strait? Ans. $2\frac{7}{17}$ miles.

Solution. In 1 sec. ball travels 800 feet.
$\therefore$ "$4\frac{1}{2}$ " " 3,400 feet, distance gained by sound in crossing.
By problem: sound gains 340 feet in 1 sec.
$\therefore$ " 1 foot in $\frac{1}{340}$ "
$\therefore$ " 3,400 feet in 10 sec. time in which sound crosses.
$\therefore 1140\times 10 \div 5280 = 2\frac{7}{11}$ miles. Ans.

12. A locomotive, whose driving wheel is 192 inches in circumference, makes the run from Toronto to Hamilton, a distance of 40 miles, in $1\frac{3}{4}$ hours, allowing 15 minutes for stoppages. What is the average number of revolutions made by the wheel per minute? Ans. $146\frac{2}{3}$.

Solution. $192 \div 12 = 16$ feet circumference.
$40\times 5280 = 211200$ distance in feet.
$211200 \div 90 = 2346\frac{2}{3}$ distance in feet travelled per minute.
$2346\frac{2}{3} \div 16 = 146\frac{2}{3}$ revolutions. Ans.

13. A mill-race 60 feet long 5 feet 6 inches wide, is frozen to a depth of 8 inches. If water expands $\frac{1}{16}$ of its bulk in freezing, and a pint of water contains 34·56 cubic inches, find how many gallons of water the ice contains, and the weight of the ice in tons, if a gallon of water weighs 10 lbs. avoir.

Solution. $60\times\frac{11}{2}\times\frac{8}{12} = 220$ cub. feet of ice in race
If $\frac{15}{16} = 220$ " "
$\therefore \frac{16}{16} = 200$ " "
If 34.56 cub. in. = 1 pint
$\therefore 200\times 1728$ cub. in. = 10000 pints or 1250 gallons.
If 1 gallon weighs 10 lbs.
$\therefore$ 1250 gallons weigh 12500 lbs. or $6\frac{1}{4}$ tons.

14. A farmer has a pile of wood for which he is offered $40.00 by one party; another offers him $4.00 per cord. If the pile is 6 feet high and 4 feet wide, how long must it be that he may gain $2.00 by the latter offer?

Solution. By problem $42.00 = second offer.
$\therefore 42.00 \div 4.00 = 10\frac{1}{2}$ No. of cords.
$\therefore 10\frac{1}{2}\times 128 = 1344$ cub. ft. in pile.
$\therefore 134\frac{4}{4} \div 24 = 56$ feet length of pile.

15. A steamer whose rate of sailing is $10\frac{1}{2}$ miles per hour, leaves Southampton for Bruce Mines, a distance of 175 miles, at 6 o'clock a.m. Another which leaves at 45 minutes past 10 o'clock a.m., arrives at Bruce Mines 15 minutes before the first. Compare their rates of sailing.

Solution. First steamer sails $\frac{21}{2}$ miles per hour.
$\therefore$ " " " $\frac{1}{2}$ " $\frac{1}{21}$ "
$\therefore$ " " " $\frac{8}{21}$ " $\frac{8}{21}$ "
$\therefore$ " " " 175 " $16\frac{2}{3}$ "
$\therefore$ " " arrives at B. M. 40 min. past 10 p.m.
and second " " " 25 " " 10 p.m.
$\therefore$ " " makes the trip in $10\frac{1}{2}$ hours.
$175 \div 10\frac{1}{2} = 15$ miles rate per hour of second.
$\therefore$ rates are as $10\frac{1}{2}$ to 15,
$\therefore$ " " 7 to 10. Ans.

16. A man bought a house, which cost him $\frac{1}{25}$ of purchase money to put in repairs; it then stood empty for a year, during which time he reckoned he was losing $\frac{1}{20}$ of his total outlay. He then sold for $1192.00 gaining $\frac{1}{10}$ of purchase money. What did he give for the house?

Solution. Let 1 = cost.
$\therefore \frac{1}{25}$ = " of repairs.
$\therefore \frac{26}{25}\times\frac{1}{20} = \frac{13}{250}$ = loss by being empty.
$\therefore \frac{26}{25}\times\frac{263}{250} = \frac{263}{250}$ total cost of house.
and $\frac{263}{250}\times\frac{10}{9} = \frac{263}{225}$ selling price.
$\therefore \frac{263}{225} = \$1192$
$\therefore \frac{1}{225} = 4$
$\therefore \frac{250}{225} = \$1000$. Ans.

17. A gentleman on arriving at Halifax, which is in 63° 36′ west long., set his watch to true time. What time will his watch indicate at noon, when he arrives at Quebec in west longitude, 71°, 12′, 15″.

Solution. 71°, 12′, 15″ − 63°, 36′ = 7°, 36′, 15″ = 27375″ dif. in Lon.
There are 360° in a circle and 1440 minutes in a day.
$\therefore 1440 \div 360 = 4$ min. for every degree of Lon.
and 1° = 3600″.
$\therefore$ If 3600″ = 4 min. dif. in time,
$\therefore$ 1″ = $\frac{1}{900}$″
$\therefore$ 27375″ = 30″, 25 sec.
$\therefore$ 30 min. 25 sec. past 12 o'clock is the time by his watch.

18. If the price of gold be $20.00 an oz., and alloy 75 cents per oz., find the price of an ornament weighing 3 ozs., 16 carats fine, allowing $\frac{1}{4}$ of the cost of the material for workmanship.

Solution. By problem, gold=16 parts out of 24,
$\therefore$ gold = $\frac{2}{3}$ of ornament or 2 ozs., and alloy = 1 oz.
$\therefore$ 2 oz. $\times$ $20.00 = $40.00,
and 1 oz. $\times$ 75c. = 75 cents.
$\therefore \frac{4}{3}\times \$40.75 = \$50.93\frac{3}{4}$ cost of ornament.

19. A cistern can be filled by two pipes, A and B, in 4 minutes and five minutes respectively, and emptied by C in $2\frac{2}{3}$ minutes. A is opened for 2 minutes, then A and B together for 1 minute, when C is also opened. In what time would the cistern which now contains 361 gallons be full? and how many gallons would have passed through A and B respectively? Ans. $1\frac{1}{2}$ min. $473\frac{1}{3}$ and 190.

Solution. By problem—
A is open for 3 min. filling $\frac{3}{4}$ of cistern.
And B " " 1 " " $\frac{1}{5}$ "
$\frac{3}{4}+\frac{1}{5} = \frac{19}{20}$ part filled. C empties $\frac{3}{2}$ in a min.
$\therefore \frac{1}{4}+\frac{1}{5}-\frac{3}{2} = \frac{1}{30}$ part filled in 1 min. when all 3 are open.
If $\frac{1}{30}$ is filled in 1 min.
$\therefore \frac{30}{30}$ are " 30 "
$\therefore \frac{1}{20}$ is " $1\frac{1}{2}$ " Ans. or time required to fill cistern.